CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-1

Time : 3 Hours   **Maximum Marks : 80**
General Instructions :
(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii)This question paper consists of a total of 30 questions.

Section A

1. Name a device that helps to maintain a potential difference across a conductor.   [1]

Ans :

Electric cell or electric battery.

2. What change in colour is observed when white silver chloride is left exposed to sunlight? What type of chemical reaction is this?   [1]

Ans :

The white solid turns grey.
Type of chemical reaction is photo-decomposition.

3. **Answer question numbers 3.1–3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**
The ciliary muscles of eye control the curvature of the lens in the eye and hence can alter the effective focal length of the system. When the muscles are fully relaxed, the focal length is maximum. When the muscles are strained the curvature of lens increases (that means radius of curvature decreases) and focal length decreases. For a clear vision the image must be on retina. The image distance is therefore fixed for clear vision and it equals the distance of retina from eye-lens. It is about 2.5 cm for a grown-up person.

A person can theoretically have clear vision of objects situated at any large distance from the eye. The smallest distance at which a person can clearly see is related to minimum possible focal length, The ciliary muscles are most strained in this position. For an average grown-up person minimum distance of object should be around 25 cm.

A person suffering for eye defects uses spectacles (Eye glass). The function of lens of spectacles is to form the image of the objects within the range in which person can see clearly. The image of the spectacle-lens becomes object for eye-lens and whose image is formed on retina.

The number of spectacle-lens used for the remedy of eye defect is decided by the power of the lens required and the number of spectacle-lens is equal to

the numerical value of the power of lens with sign. For example power of lens required is +3D (converging lens of focal length 100/3 cm) then number of lens will be +3.
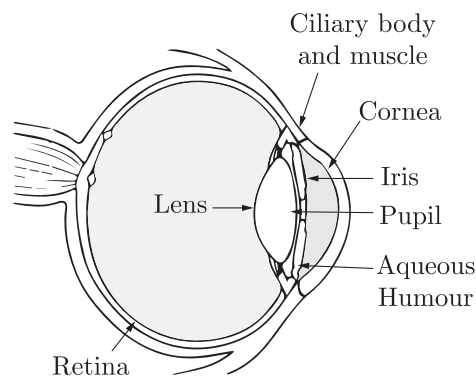
For all the calculations required you can use the lens formula and lens maker's formula. Assume that the eye lens is equiconvex lens. Neglect the distance between eye lens and the spectacle lens.

3.1 What do you mean by the ciliary muscles?   [1]

Ans : The muscles which are used to the change in the focal length of eye lens by changing radii of curvature is known ciliary muscles.

3.2 What is the minimum focal length of eye lens of a normal person?   [1]

Ans : 25/11 cm

3.3 What is the maximum focal length of eye lens of normal person?   [1]

Ans : 2.5 cm

3.4 A near-sighted man can clearly see object only up-to a distance of 100 cm and not beyond this. What is the number of the spectacles lens necessary for the remedy of this defect?   [1]

Ans :

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Here $v = 2.5$ (Distance of retina as positions of image is fixed)

$$u = -x$$

$$\frac{1}{f} = \frac{1}{2.5} + \frac{1}{x}$$

For $f_{min} : x$ is minimum,

$$\frac{1}{f_{min}} = \frac{1}{2.5} + \frac{1}{25}$$

For $f_{max} : x$ is miximum,

$$\frac{1}{f_{max}} = \frac{1}{2.5} + \frac{1}{\infty}$$

For near sighted man lens should make the image of the object within 100 cm range

For lens
$$u = -\infty$$
$$v = -100$$
$$\frac{1}{f_{lens}} = \frac{1}{-100} - \frac{1}{-\infty}$$

4. Question numbers 4.1–4.4 are based on the two table given below. Study these tables related to blood pressure level and answer the question that follow :

Table-A

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (Upper number)	DIASTOLIC mm Hg (Lower number)
Normal	120	80
Elevated	120-129	Less than 80
High Blood Pressure (Hypertension) Stage 1	130-139	80-90
High Blood Pressure (Hypertension) Stage 2	140 or higher	90 or higher
Hypertensive crisis (consult your doctor immediately)	Higher than 180	Higher than 120

Table-B

Time of Measurement	Blood Pressure	
	Patient−X	Patient−Y
Morning	75−115	85−125
Afternoon	79−122	80−120
Evening	82−132	75−110

4.1 In the table B, at which time patent−Y have ideal normal blood pressure? [1]

Ans : Afternoon (80-120)

4.2 Identify the patient, which have hypertension stage-1 blood pressure? [1]

Ans : Patient × (82-132) Evening

4.3 Which Diet is the best for high blood pressure patient? [1]
(a) Grain and fruits
(b) High fat dairy products
(c) Take large amount of sodium in diet
(d) All of the above

Ans : (a) Grain and fruits

4.4 The ideal blood pressure measurement is [1]
(a) 80-120 mm Hg   (b) 85-125 mm Hg
(c) 90-150 mm Hg   (d) 95-100 mm Hg

Ans : (a) 80-120 mm Hg

5. The length of a wire is doubled. By what factor does the resistance change [1]
(a) 4 time as large   (b) twice as large
(c) unchanged   (d) half as large

Ans : (a) 4 time as large

or

If a student while studying the dependence of current on the potential difference keeps the circuit closed for a long time to measure the current and potential difference, then
(a) ammeter's zero error will change
(b) ammeter will give more reading
(c) voltmeter will show constantly higher readings
(d) resistor will get heated up and its value will change

Ans : (d) resistor will get heated up and its value will change

6. A small electric lamp is placed at the focus of a convex lens. When the lamp is switched on, the lens will produce : [1]
(a) converging beam of light
(b) parallel beam of light
(c) diverging beam of light
(d) diffused beam of light

Ans : (b) parallel beam of light

7. Before setting up an experiment to show that seeds release CO_2 during respiration, the seeds should be : [1]
(a) dried completely
(b) boiled to make then soft
(c) soaked in vinegar
(d) kept moist till they germinate

Ans : (d) kept moist till they germinate

8. A well-stained leaf peel mount, when observed under the high power of a microscope, shows nuclei in : [1]
(a) guard cells only
(b) epidermal cells only
(c) guard cells and epidermal cells
(d) guard cells, epidermal cells and stomata

Ans : (c) guard cells and epidermal cells

or

During germination of seed, water enter in seeds through
(a) hilum   (b) micropyle
(c) raphe   (d) cotyledon

Ans : (b) micropyle

9. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$ [1]

The above reaction is an example of a :
(a) combination reaction
(b) double displacement reaction

(c) decomposition reaction

(d) displacement reaction

Ans : (d) displacement reaction

10. Ethanoic acid was added to sodium bicarbonate solution and the gas evolved was tested with a burning splinter Which one of the following four observations is correct? [1]
    (a) The gas burns with a pop sound and the flame gets extinguished
    (b) The gas does not burn but the splinter burns with a pop sound
    (c) The flame extinguishes and the gas does not burn
    (d) The gas burns with a blue flame and the splinter burns brightly

    Ans : (c) The flame extinguishes and the gas does not burn

11. A colourless sample was tested with a strip of pH paper. The colour of the strip changed to green. The sample should be : [1]
    (a) tap water   (b) distilled water
    (c) sodium hydroxide   (d) lemon juice

    Ans : (b) distilled water

12. Beakers A, B and C contain zinc sulphate, silver nitrate and iron (II) sulphate solutions respectively. Copper pieces are added to each beaker. Blue colour will appear in case of [1]
    (a) beaker A (b) beaker B
    (c) beaker C (d) all the beakers

    Ans : (b) beaker B

    or

    A student puts one big iron nail each in four test tubes containing solutions of zinc sulphate, aluminium sulphate, copper sulphate and iron sulphate. A reddish brown coating was observed only on the surface of iron nail which was put in the solution of
    (a) zinc sulphate   (b) iron sulphate
    (c) copper sulphate   (d) aluminium sulphate

    Ans : (c) copper sulphate

    For question numbers 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c)and (d) as given below :
    (a) Both A and R are true and R is correct explanation of the assertion.
    (b) Both A and R are true but R is not the correct explanation of the assertion.
    (c) A is true but R is false.
    (d) A is false but R is true.

13. **Assertion** : Respiration in living beings is called exothermic reaction.
    Reason : Respiration in living beings involves with absorption of heat energy. [1]
    Ans : (c) A is true but R is false.

14. **Assertion**: Copper is used to make hot water tanks and not steel.
    Reason : Copper is a better conductor of heat than steel and it is fairly resistant to corrosion than steel. [1]
    Ans : (a) Both A and R are true and R is correct explanation of the assertion.

Section B

15. How do guard cells regulate opening and closing of stomatal pores? [3]
    Ans :

    The opening and closing of stomatal pore is a function of guard cells. Stomata act as turgor operated valves. The guard cells are thicker on the inner side and thinner on the outer side. The guard cells swell when water flow into them from the surrounding epidermal cells. They get curved out due to thick inner walls and produce a pore in between. Similarly, the pore closes when guard cells lose water to their surrounding cells and shrink back to their original position.

16. 2 g of ferrous sulphate crystals were heated in a hard glass test tube and observations recorded.
    a. What type of odour is observed on heating ferrous sulphate crystals?
    b. Name the products obtained on heating ferrous sulphate crystals.
    c. What type of reaction is taking place.

    Ans :
    a. As of burning sulphur.
    b. Ferric oxide, sulphur dioxide, sulphur trioxide.
    c. Decomposition reaction.

    or

    a. Why metals are not found in their free state generally?
    b. If a strip of aluminium with scratched clean surface is dipped into an aqueous solution of copper sulphate for little time, surface of the strip becomes brownish. What is the reason for this? Write the balanced chemical equation for the reaction. [3]

    Ans :
    a. Most of the metals are found in the form of their compounds, i.e., in the combined state. It is because, their position is above hydrogen in the chemical reactivity series and hence, readily react with air, water, carbon dioxide, etc. They are found in the form of their sulphides, carbonates or oxides.
    b. When a strip of aluminium is dipped into an aqueous solution of copper sulphate it will displace copper and forms aluminium sulphate. Copper will deposit on the surface of aluminium strip so that it will become brownish.

    $$\underset{\substack{\text{Copper}\\\text{sulphate}}}{3CuSO_4(aq)} + \underset{\text{Aluminium}}{2Al(s)} \longrightarrow \underset{\substack{\text{Aluminium}\\\text{sulphate}}}{Al_2(SO_4)_3(aq)} + \underset{\text{Copper}}{3Cu}$$

17. Write the chemical formula for washing soda. How may it be obtained from baking soda? Name an industrial use of washing soda other than washing clothes. [3]
    Ans :

a. The chemical formula of washing soda is $Na_2CO_3 \cdot 10H_2O$.

b. Baking soda ($NaHCO_3$) is strongly heated to form soda ash.

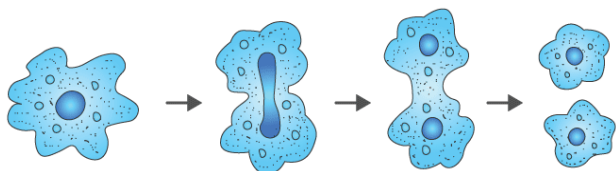$$2NaHCO_3(s) \xrightarrow{\text{heat}} Na_2CO_3 + H_2O(l) + CO_2(g)$$

The soda ash is dissolved in boiling hot water so as to obtain its saturated solution. The saturated solution so obtained is allowed to cool, when washing soda crystals separate out.

$$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3 \cdot 10H_2O$$

c. Washing soda is used in the manufacture of glass.

18. Study the diagram given below:

a. Identify the process.
b. Which organism uses the above method of reproduction?
c. How is the above method different from the process of fragmentation? [3]

Ans :

a. Binary fission.
b. Amoeba.
c. Binary fission occurs in unicellular organisms only. In fragmentation the body of a simple multicellular organism breaks down into many 'fragments'. All cells undergo division and the organism develops from each fragment

or

How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations? Explain with the help of suitable example.

Ans :

In asexual reproduction of organisms, only mitotic divisions are involved and thus the chromosome number remains the same. During asexual reproduction the DNA in the chromosomes of the cells involved are copied and then equally divided among the two daughter cells formed. So, chromosome number remains unchanged. Thus, it maintains constant chromosome number.

In sexual reproduction, organisms produce gametes through a meiosis division - reduction al division, in which the original number of chromosomes becomes half. These two gametes combine to form the zygote and thus the original number of chromosomes is restored. During sexual reproduction germ cells with only half the number of chromosomes are formed. When these germ cells from two individuals combine to form a new individual, the original number of chromosome is restored. Example : In humans, the parents father and mother both have 46 or 23 pairs of chromosomes. In the gametes - the sperm and egg both have half the number of chromosomes i.e., 23 when the sperm and the egg fuse, the zygote has 46 or 23 pairs of chromosomes.

So, the chromosome number remains constant.

19. Out of the elements H(1), Be(4), Na(11) and Mg(12).
    a. Write the pair of elements having similar chemical properties.
    b. State the group number of each pair,
    c. Name one another element belonging to each of these groups. [3]

Ans :

a. Be(4) and Mg(12) have similar chemical properties. H(1) and Na(11) have similar chemical properties.
b. Be and Mg belong to group 2, H and Na belong to group 1.
c. K belongs to group 1 and Ca belongs to group 2

20. What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties. [3]

Ans :

Covalent compounds are those compounds which are formed by sharing of electrons between two atoms and thus containing covalent bonds.

These compounds are different from ionic compounds because the ionic compounds are formed by the transference of electrons while covalent compounds by sharing of electrons.

Characteristics of covalent compounds :

a. They have generally low melting and boiling points.
b. They are generally insoluble or less soluble in water but soluble in organic solvents like ethanol.
c. They do not conduct electricity.

21. Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an observer on the moon? Justify your answer with a reason. [3]

Ans :

Early in the morning, the sun is near the horizon, sunlight reaches us after covering a longer distance through thick layers of atmosphere. So the most of the blue light and other light of shorter wavelengths are scattered away by the particles in the atmosphere. The light that reaches us is of longer wavelengths such as red light thus giving a reddish appearance.

This phenomenon will not be observed by an observer on the moon because of the absence of atmosphere on the moon.

22. Suggest three contraceptive methods to control the size of human population which is essential for the health and prosperity of a country. State the basic principle involved in each. [3]

Ans :

Three contraceptive methods are following :

a. **Barrier method or mechanical method :** Condom or diaphragm is used to prevent the meeting of sperms and ova.
b. **Chemical method :** Oral pills change the hormonal balance of the female partner so that the eggs are not released.
c. **Surgical method :** It is used to block the vas deferens in males or the fallopian tube (oviduct) in females, to prevent the transfer of sperms or eggs and hence no fertilization takes place.

23. Draw the following diagram, in which a ray of light is incident on a concave convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case. [3]

(i)   (ii)   (iii)

Ans :

(i)   (ii)   (iii)
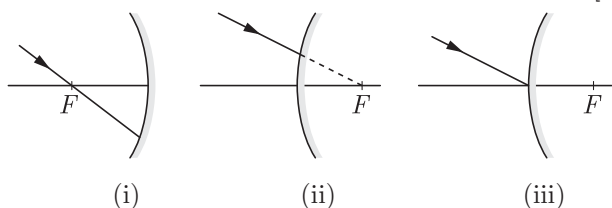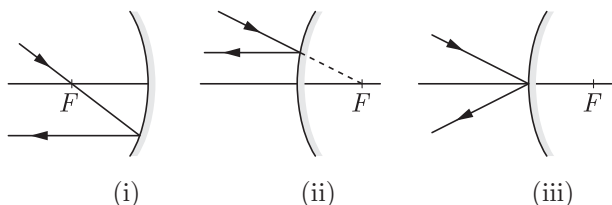
24. a. State the function of 'a fuse' in a circuit. How is it connected in the domestic circuit?
b. An electric fuse of rating 3A is connected in a circuit in which an electric iron of power 1 kW is connected which operates at 220 V What would happen? Explain. [3]

Ans :

a. It prevents damage to the appliance and the circuit due to overloading.
   It is connected in series with the household circuit.

b. $$I = \frac{P}{V} = \frac{1\,\text{kW}}{220\,\text{V}} = \frac{1000\,\text{W}}{220\,\text{V}} = 4.55\,\text{A}$$

   The electric current flowing/required by the electric iron is more than the current that can flow through the fuse without its melting.
   Hence, the fuse wire will melt. The circuit will break and the electric iron will not work.

or

a. List the factors on which the resistance of a conductor in the shape of a wire depends.
b. Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
c. Why are alloys commonly used in electrical heating devices? Give reason.

Ans :

a. Factors on which resistance of a wire depends:
   (i) Resistance is directly proportional to length.
   (ii) Resistance is inversely proportional to area of cross-section.

   $$R \propto l,\ R \propto \frac{1}{A}$$

   $$R \propto \frac{l}{A} \text{ or } R = \rho\frac{l}{A}$$

b. Metal are good conductor due to having large number of free electrons and their low resistivity.
   Glass is a bad conductor because it has no free electrons and its resistivity is higher.

c. Alloys are commonly used in electrical heating devices due to their high resistivity and high melting point which produces more heat.

Section C

25. a. Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.
b. Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.
c. Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction? [5]

Ans :

a. **Chemical test to distinguish saturated and unsaturated hydrocarbons :** Pass the vapours of the samples of saturated and unsaturated hydrocarbons into bromine water taken in two separate test tubes. The one which discharges the colour of bromine water is that of unsaturated hydrocarbon and rest of the other represents saturated hydrocarbon.

b. On burning ethane in air, the products obtained are carbon dioxide and water, with heat and light.
   $$2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(l)$$
   $$+\text{Heat}+\text{Light}$$

c. It is considered a substitution reaction because the hydrogen atoms of methane (CH_4) are replaced by chlorine atoms one by one successively.

or

Account for the following.
a. Dry HCl gas does not change the colour of dry blue litmus paper
b. Antacid tablets are used by a person suffering from stomach pain.
c. Toothpaste is used for cleaning teeth.

Ans :

a. Dry HCl gas on coming in contact with dry blue litmus paper does not produce H^+ ions and hence, the colour of litmus paper does not change.

b. Antacid tablets generally consists of magnesium hydroxide and aluminium hydroxide, which are mild bases. They react chemically with the hydrochloric acid produced in stomach and neutralise it.

c. All toothpaste contain some substances that are basic in nature and hence neutralise acids. So the best way to avoid cavities is to brush your teeth with some toothpaste.

26. Translate the following statements into chemical equations and then balance them.
a. Hydrogen gas combines with nitrogen gas to form ammonia gas.
b. Hydrogen sulphide gas burns in air to give water and sulphur dioxide gas.
c. Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
d. Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.
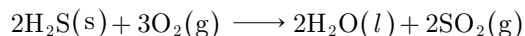e. Zinc metal reacts with dilute sulphuric acid to give zinc sulphate solution and hydrogen gas [5]

Ans :

a. $H_2(g) + N_2(g) \longrightarrow NH_3(g)$ Skeletal equation
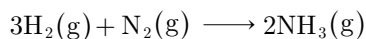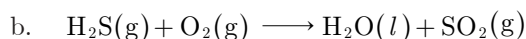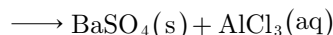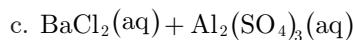
$$3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$$

Balanced equation

b. $H_2S(g) + O_2(g) \longrightarrow H_2O(l) + SO_2(g)$

Skeletal equation

$$2H_2S(s) + 3O_2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$$

Balanced equation

c. $BaCl_2(aq) + Al_2(SO_4)_3(aq)$

$$\longrightarrow BaSO_4(s) + AlCl_3(aq)$$

Skeletal equation

$$3BaCl_2(aq) + Al_2(SO_4)_3(aq)$$

$$\longrightarrow 3BaSO_4(s) + 2AlCl_3(aq)$$

Balanced equation

d. $K(s) + H_2O(l) \longrightarrow KOH(aq) + H_2(g)$

Skeletal equation

$$2K(s) + 2H_2O(l) \longrightarrow 2KOH(aq) + H_2(g)$$

Balanced equation.

e. $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$
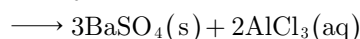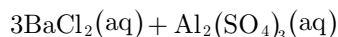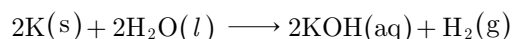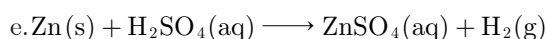
Balanced equation.

27. a.   Draw a neat diagram of an excretory unit of a human kidney and label the following parts.
(i)   Bowman's capsule
(ii) Renal artery
(iii) Glomerulus
(iv) Collecting duct

b.   Give one advantage of having a large number of these highly coiled structures in our kidneys.

c.   Mention any two substances which are selectively reabsorbed as the filtrate flows along the tubular part of this unit.   [5]

Ans :

a.
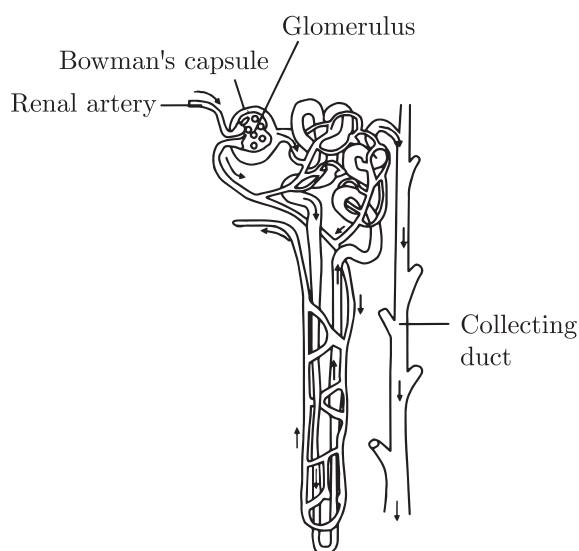
b.   These help in increasing the surface area for filtration and proper re-absorption of useful substances.

c.   Glucose, amino acids, salts, water (any two).

28. a.   Differentiate between pollen grain and ovule.

b.   State in brief functions of the following parts of the human female reproductive system.
(i)   Ovary

(ii) Fallopian Tube

(iii) Uterus   [5]

Ans :

a.

	Pollen grain	**Ovule**
1.	It is male reproductive structure.	It is female reproductive structure.
2.	Pollen grain is a structure contained in the pollen sac.	Ovule is a structure contained in the ovary.
3.	Inside the pollen grain the male gamete is present.	Inside the ovule, embryo sac containing the female gamete (or egg) is present.

b.

(i)   **Ovary :** Ovary produces ova or eggs. Ovary also secrete a hormone oestrogen which helps in the development of secondary sexual characters like breast development.

(ii) **Fallopian tube :** Fallopian tube conveys the egg from the ovary to the uterus and provides the appropriate environment for its fertilisation.

(iii) **Uterus :** After fertilisation, the embryo develops in uterus.

or

a.   Differentiate between germination and fertilisation.

b.   State in brief the functions of the following parts of the human male reproductive system :
(i)   Scrotum
(ii) Testes
(iii) Vas deferens

Ans :

a.

	Fertilisation	**Germination**
1.	It is the fusion of male and female gametes.	In it the food reserves present in a seed are broken down and the embryo start to grow.
2.	It occurs in plants and animals of various types.	It occurs only in seed plants.
3.	It actually brings about fusion of gametes.	During it, seeds convert into seedling.
4.	Fertilisation occurs only after pollination when the pollen grain has germinated and sent the male gametes to the ovule.	It begins when a seed starts to absorb water.

b.

(i)   **Scrotum :** It contains and supports the testes. It is situated outside the body cavity and allow sperm to develop at the optimum temperature, which is slightly lower than body temperature.

(ii) **Testes :** The formation of male germ cells or

sperms takes place in it. Leydig cells of testes secrete hormone testosterone which brings about changes in appearance seen in boys at the time of puberty.

(iii) **Vas deferens :** It ascends into the abdomen, passes over the urinary bladder and receives duct from the seminal vesicles behind the urinary bladder to form the ejaculatory duct.

29. A current of 1 ampere flows in a series circuit containing an electric lamp and a conductor of $5\,\Omega$ when connected to a 10 V battery. Calculate the resistance of the electric lamp. Now if a resistance of 10Ω is connected in parallel with this series combination, what change (if any) in current flowing through $5\,\Omega$ conductor and potential difference across the lamp will take place? Give reason. Draw circuit diagram. [5]

Ans :

The potential difference across the lamp

$$= 10 - 1 \times 5 = 5\,\text{V}$$

Resistance of the electric lamp,

$$R = \frac{V}{I} = \frac{5}{1} = 5\,\Omega$$
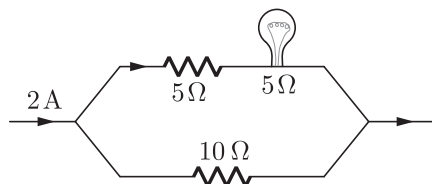
The equivalent resistance of the series combination of 5Ω resistance and 5Ω lamp $= 5\Omega + 5\Omega = 10\Omega$

When a 10Ω resistance is connected in parallel to this combination. The equivalent resistance of the circuit becomes

$$= \frac{10 \times 10}{10 + 10} = \frac{100}{20}$$

$$= 5\,\Omega$$

The current in the circuit $= \frac{10}{5} = 2\,\text{A}$

The current in 5Ω resistance $= 1\,\text{A}$
            (current equally distributed).

No change in current flowing through 5Ω.
Potential difference across the lamp will also remain same.

30. a   Define the following terms in the context of spherical mirrors:
    (i)   Pole
    (ii) Centre of curvature
    (iii) Principal axis
    (iv) Principal focus
    b   Draw ray diagrams to show the principal focus of a :
    (i)   Concave mirror
    (ii) Convex mirror
    c   Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror
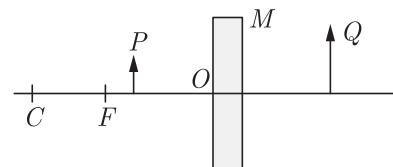
State the type of the mirror M and one characteristic property of the image Q. [5]

Ans :

a.
(i) **Pole :** The centre of the reflecting surface of the mirror is called pole.
(ii) **Centre of curvature :** The centre of the hollow sphere of which the reflecting surface of mirror forms a part is called centre of curvature.
(iii) **Principal axis :** The imaginary line passing through the pole and the centre of curvature of a spherical mirror is called principal axis.
(iv) **Principal focus :** When incident rays parallel to principal axis, after reflection, either converge to or appear to diverge from a fixed point on the principal axis called principal focus.

b. (i) Concave mirror
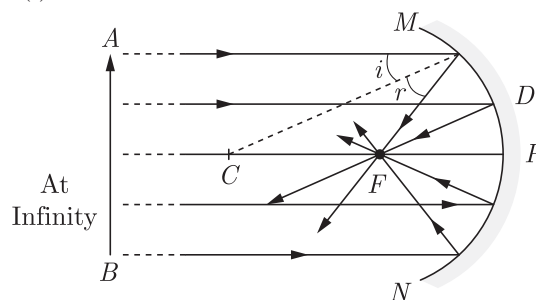
(ii) Convex mirror
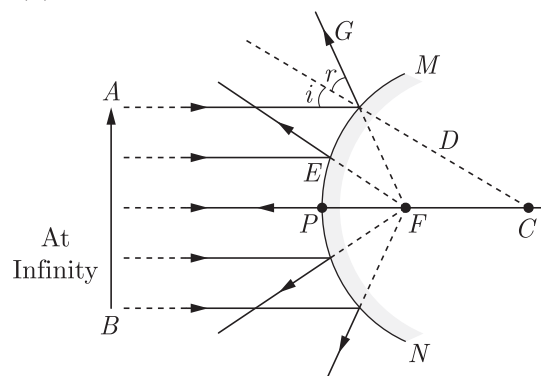
c.   Concave mirror
   Image formed is virtual and erect.

or

a.   Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.

b.   In the above ray diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or −ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the convex lens in the case.

c.   Find the power of a convex lens which forms a real, and inverted image of magnification −1 of an object placed at a distance of 20 cm from its

optical centre.

Ans :

a.
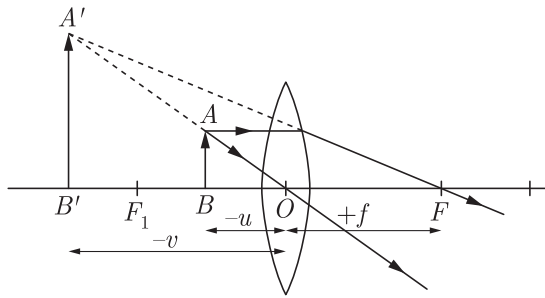
b. Relation between object-distance (u), image-distance (v) and focal length (f):

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

c. Here, $m = -1; \ u = -20$ cm; $v = ? \ f = ?$

$$m = \frac{v}{u} \Rightarrow -1 = \frac{v}{-20} \ \therefore \ v = 20 \ \text{cm}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{20} - \frac{1}{-20}$$

$$= \frac{1}{20} + \frac{1}{20} = \frac{2}{20} = \frac{1}{10}$$

$$f = 10 \ \text{cm}$$

Thus, Power of the lens, $P = \dfrac{100}{f \ (\text{in cm})}$

$$= \frac{100}{10} + 10 \ \text{D}$$

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CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-2

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

Section A

1. The pH of a sample of vegetable soup was found to be 6.5. How is this soup likely to taste? [1]

Ans : Sour

2. What is an alkali? [1]

Ans : An alkali is a base that dissolves in water.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

Metals occur in nature in the free as well as in the combined state. The less reactive metals are generally found in the free state. Most of the metals, however are found in the combined form as minerals. The minerals from which metals can be obtained on a commercial scale are called ores. In other words, the minerals from which metals can be extracted profitably are called ores. Thus, bauxite $(Al_2O_3 \cdot 2H_2O)$ and clay $(Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O)$ are minerals of aluminium. However, it is bauxite that is chiefly used to obtain aluminium commercially. So, bauxite, and not clay, is an ore of aluminium.

3.1 Which metal occurs in native state? [1]

Ans : Ag

3.2 Write the name of the sulphide ore? [1]

Ans : Galena

3.3 What is native of Halide ore? [1]

Ans : Horn silver

3.4 Which is the most abundant metal on the earth's crust? [1]

Ans : Aluminium

4. **Question number 4.1-4.4 are based on the two tables given below study these table related to measurement of voltage and current and answer the question that follow**

Ideal measurement (Table – A)

S.N.	Voltmeter reading (mV)	Ammeter reading (mA)
1.	4	2
2.	6	3
3.	8	4
4.	10	5
5.	12	6

Table – B

Student	S.No.	Voltmeter reading (mV)	Ammeter reading (mA)
Student–A	1.	2	1
	2.	4	2
	3.	6	3
Student–B	1.	4	4
	2.	6	3
	3.	8	4

4.1 Which student measurement is wrong in the table B? [1]

Ans : Student B

4.2 What is the mathematical relation between voltage and current ? [1]

Ans : According to the ohm's Law, current is directly proportional to voltage(V).

4.3 In the following measurement of student B. Which measurement is wrong? [1]
(a) I = 4, V = 4   (b) I = 3, V = 6
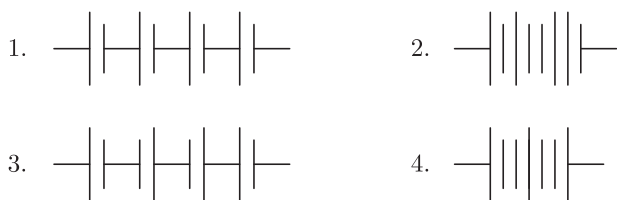(c) I = 4, V = 8   (d) None of these

Ans : (a) I = 4, V = 4

4.4 The value of resistance from the measurement of student A is [1]
(a) 2Ω (b) 3Ω
(c) 4Ω (d) 1Ω

Ans : (a) 2Ω

5. The proper representation of series combination of cells (Figure) obtaining maximum potential is   [1]

1. ⊣|⊢|⊢|⊢|⊢   2. ⊣||||||⊢

3. ⊣|⊢|⊢|⊢|⊢   4. ⊣||||⊢

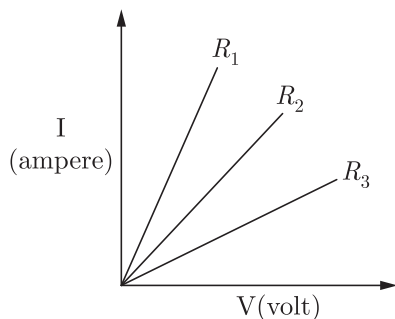(a) 1   (b) 2
(c) 3   (d) 4

Ans : (a) 1

or

A student carries out an experiment and plots the V-I graph of three samples of nichrome wire with resistances R_1, R_2 and R_3 respectively (Figure). Which of the following is true?

(a) $R_1 = R_2 = R_3$ (b) $R_1 > R_2 > R_3$
(c) $R_3 > R_2 > R_1$ (d) $R_2 > R_3 > R_1$

Ans : (c) $R_3 > R_2 > R_1$

6. In order to determine the focal length of a concave mirror by obtaining the image of distant object on screen, the position of screen should be :   [1]
(a) parallel to plane of concave mirror
(b) perpendicular to plane of concave mirror
(c) inclined at an angle 60° to plane of mirror
(d) in any direction with respect to the plane of concave mirror

Ans : (a) parallel to plane of concave mirror

7. After observing a permanent slide of binary fission, a student was asked to specify the total number of daughter cells formed from a single parent Amoeba at the end of binary fission. His reply would be :   [1]
(a) one   (b) two
(c) many in chains   (d) not definite

Ans : (b) two

8. The use of Vaseline in the experiment to show that CO_2 is given out during respiration, is to   [1]
(a) lubricate the joints
(b) make the set-up air-tight
(c) absorb oxygen
(d) absorb carbon dioxide

Ans : (b) make the set-up air-tight

or

A student was provided with a pH chart by the teacher and asked to observe the colour corresponding to pH 1 and 14 respectively. The correct answer would be :
(a) yellow, green   (b) violet, orange
(c) red, blue   (d) blue, mustard

Ans : (c) red, blue

9. While preparing a temporary stained mount of a leaf epidermal peel, the extra stain is removed by :   [1]
(a) washing with water
(b) washing with calcium chloride solution
(c) soaking with blotting paper
(d) absorbing with cotton wool

Ans : (c) soaking with blotting paper

10. On adding acetic acid to solid hydrogen carbonate, a student observes the liberation of a :   [1]
(a) greenish yellow gas with a pungent smell
(b) colourless and odourless gas
(c) yellow coloured and odourless gas
(d) colourless gas with the smell of rotten eggs

Ans : (b) colourless and odourless gas

11. If water has magnesium sulphate dissolved in it, for testing its cleaning action, it is to be considered as :[1]
(a) permanent hard water
(b) hard water
(c) soft water
(d) temporary hard water

Ans : (a) permanent hard water

12. A metal powder was added to dil. HCl and dil. NaOH solutions taken in separate test tubes. On making the contents react in both the test tubes, hydrogen gas was formed in both the cases. The metal used will be: [1]
(a) Cu   (b) Zn
(c) Fe   (d) Pb

Ans : (b) Zn

or

Silver articles become black on prolonged exposure to air. This is due to the formation of
(a) Ag_3N (b) Ag_3O
(c) Ag_3S (d) Ag_3S and Ag_3N

Ans : (c) Ag_3S

For question numbers 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
(a) Assertion is true and reason is correct explanation of assertion.
(b) Assertion is true but reason is false.
(c) Assertion is false but reason is true.
(d) Both are true but reason is not correct explanation of assertion.

13. **Assertion**: Magnesium ribbon should be cleaned before burning in air.
    Reason: Magnesium ribbon is coated with a thin layer of dust containing moisture. [1]
    Ans : (b) Assertion is true but reason is false.

14. **Assertion**: Green plants are autotrophs.
    Reason: Green plants synthesise their own food using sunlight, chlorophyll, carbon dioxide and water [1]
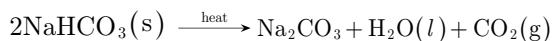   **Ans :** (a) Assertion is true and reason is correct explanation of assertion.

Section B

15. i.   Write the chemical formula for washing soda.
    ii. How may it be obtained from baking soda?
    iii. Name an industrial use of washing soda other than washing clothes. [3]

    Ans :

    i.   The chemical formula of washing soda is $Na_2CO_3 \cdot 10H_2O$.
    ii. Baking soda ($NaHCO_3$) is strongly heated to form soda ash.

    $$2NaHCO_3(s) \xrightarrow{\text{heat}} Na_2CO_3 + H_2O(l) + CO_2(g)$$

    The soda ash is dissolved in boiling hot water so as to obtain its saturated solution. The saturated solution so obtained is allowed to cool, when washing soda crystals separate out.

    $$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3 \cdot 10H_2O$$

    iii. Washing soda is used in the manufacture of glass.

16. Out of the elements H(1), Be(4), Na(11) and Mg(12).
    i.   Write the pair of elements having similar chemical properties.
    ii. State the group number of each pair,
    iii. Name one another element belonging to each of these groups. [3]

    Ans :

    i.   Be(4) and Mg(12) have similar chemical properties. H(1) and Na(11) have similar chemical properties.
    ii. Be and Mg belong to group 2, H and Na belong to group 1.
    iii. K belongs to group 1 and Ca belongs to group 2

    or

    Calcium is an element with atomic number 20. Stating the reason, answer each of the following questions:
    i.   Is calcium a metal or a non-metal?
    ii. Will its atomic radius be larger or smaller than that of potassium with atomic number 19?
    iii. Write the formula of its oxide.

    Ans :

    i.   Calcium is a metal because it can lose electrons to form cations.
    ii. Its atomic radius will be smaller due to more number of protons and electrons, more forces of attraction.
    iii. CaO.

17. Write an equation each for decomposition reactions, where energy is supplied in the form of heat, light or electricity. [3]

    Ans :

    i.   Energy is supplied in the form of heat during the decomposition of ferrous sulphate crystals.

    $$2FeSO_4(s) \xrightarrow{\text{heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$

    ii. Energy is supplied in the form of light, when silver iodide decomposes to form silver and iodine.

    $$2AgI(s) \xrightarrow{\text{light}} 2Ag(s) + I_2(s)$$
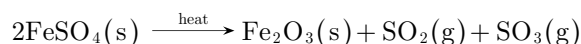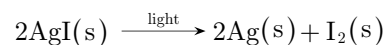
    iii. Energy is supplied in the form of electricity, when molten lead bromide decomposes to lead and bromine.

    $$PbBr_2(l) \xrightarrow{\text{electricity}} Pb(s) + Br_2(l)$$
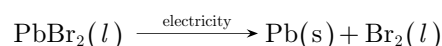
18. How does control and coordination take place in plants? [3]

    Ans :

    The function of control and coordination in plants is performed by chemical substances known as plant hormones or phytohormones.
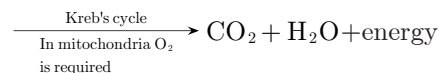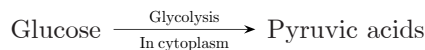   The synthesis and action of phytohormones are greatly influenced by external stimuli. Plants respond to photoperiodic stimulus by specialised pigment present in very small quantity called phytochrome. Thus, phytohormones and phytochromes together are involved in control and coordination between the environment and plant responses.

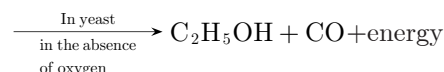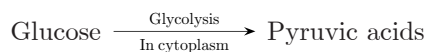   **or**

    Explain the process of break down of glucose in a cell (i) in the presence of oxygen (ii) in the absence of oxygen.

    Ans :

    i.   **In the presence of oxygen** : In all the pathways, the first step in break down of glucose, a six carbon molecule, into a three carbon molecule called pyruvate. This process occurs in the cytoplasm of the cell. In aerobic respiration break down of pyruvate using oxygen takes place in mitochondria. It breaks up the three carbon pyruvate molecule to give three molecules of carbon dioxide, water and lots of energy as compared to anaerobic respiration.
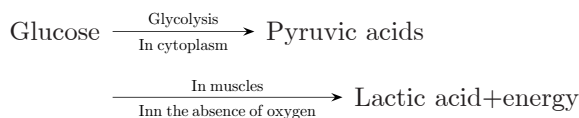
    $$\text{Glucose} \xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}} \text{Pyruvic acids}$$

    $$\xrightarrow[\substack{\text{In mitochondria O}_2 \\ \text{is required}}]{\text{Kreb's cycle}} CO_2 + H_2O + \text{energy}$$

    ii. **In the absence of oxygen** : In the absence of oxygen pyruvate may be converted into ethanol and carbon dioxide which is referred to as fermentation that takes place in yeast.

    $$\text{Glucose} \xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}} \text{Pyruvic acids}$$

    $$\xrightarrow[\substack{\text{in the absence} \\ \text{of oxygen}}]{\text{In yeast}} C_2H_5OH + CO + \text{energy}$$

    Sometime anaerobic respiration also occurs in our muscle cells, when there is lack of oxygen, i.e., during vigorous muscular activities. At that time pyruvate is converted into lactic acid which is also a three carbon molecule. This build-up of lactic acid in our muscles

causes fatigue or muscular cramps.

$$\text{Glucose} \xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}} \text{Pyruvic acids}$$

$$\xrightarrow[\text{Inn the absence of oxygen}]{\text{In muscles}} \text{Lactic acid+energy}$$

19. What are plant hormones? Give its examples. [3]

Ans :

In plants, certain chemical substances are necessary for the purpose of proper growth and development. These chemical substances are called plant hormones or phytohormones. These are the most important coordinating substances in plants.

Examples : Auxin, gibberellin, cytokinin, ethylene, and abscisic acid.

20. How do Mendel's experiment show that traits are inherited independently? [3]

Ans :

According to Mendel's experiments, traits are inherited independently because :

i. When a cross was made between a tall pea plant with round seeds and a short pea plant with wrinkled seed, the F1 progeny plants are all tall with round seeds. This indicates that tallness and round seeds are the dominant traits.

ii. When the F1 plants are self pollinated, the F2 progeny consisted of some tall pea plants with round seeds and some short pea plants with wrinkled seeds which are the parental traits.

iii. There were also some new combinations like tall pea plants with wrinkled seeds and short pea plants with round seeds.

Thus, it may be concluded that tall and short traits and round and wrinkled seed traits have been inherited independently.

21. Name the hormones secreted by the following endocrine glands and specify one function of each: [3]
(a) Thyroid (b) Pituitary (c) Pancreas

Ans :

a. **Thyroid :** Secretes Throxine. It regulates metabolism of carbo¬hydrates, fats and proteins.

b. **Pituitary :** Secretes growth harmone. Growth harmone regulates growth and development of body.

c. **Pancreas :** Secretes insulin. Insulin lowers blood sugar level.

22. Describe an activity to show that the colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light. [3]

Ans :

When a glass prism is used to obtain a spectrum of sunlight and a second identical prism in an inverted position with respect to the first position then it will allow all the colours of spectrum to recombine. Thereby a beam of white light will emerge from the other side of the second prism.
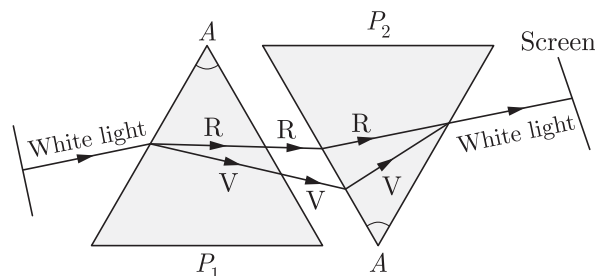
23. i　Name and define SI unit of resistance.

ii. Calculate the resistance of a resistor if the current flowing through it is 200 mA, when the applied potential difference is 0.8 V. [3]

Ans :

i. SI unit of resistance is ohm (Ω)

$$1\,\Omega = \frac{1\,\text{V}}{1\,\text{A}}$$

The resistance of a conductor is said to be 1 ohm if a current of one amp flows through it when a potential differences of 1 volt is applied across it.

ii. Given,

$$\text{Current, } I = 200\,\text{mA}$$
$$= 200 \times 10^{-3}\,\text{A}$$

Potential difference, $V = 0.8\,\text{V}$

As we know that,

$$R = \frac{V}{I} = \frac{0.8}{200 \times 10^{-3}}$$
$$= 4\,\Omega$$

24. i. List the factors on which the resistance of a conductor in the shape of a wire depends.

ii. Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

iii. Why are alloys commonly used in electrical heating devices? Give reason. [3]

Ans :

i. Factors on which resistance of a wire depends:
(a) Resistance is directly proportional to length i.e.,

$$R \propto l$$

(b) Resistance is inversely proportional to area of cross-section i.e.,

$$, R \propto \frac{1}{A}$$

Now, $\qquad R \propto \frac{l}{A}$ or $R = \rho\frac{l}{A}$

ii. Metal are good conductor due to having large number of free electrons and their low resistivity. Glass is a bad conductor because it has no free electrons and its resistivity is higher.

iii. Alloys are commonly used in electrical heating devices due to their high resistivity and high melting point which produces more heat.

or

Name an instrument used for measuring electric potential difference by drawing a diagram. Show how this instrument is connected in an electric circuit. Why does this instrument practically not consume any electric energy from the electric circuit?
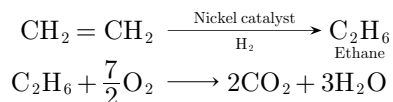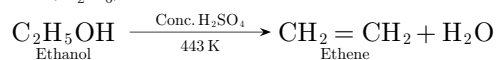
Ans :

Voltmeter is the instrument used for measuring potential difference. Voltmeter is an extremely high resistance instrument. Thus, when connected in parallel, practically extremely small current flows through it. Hence, voltmeter is not consume any electric energy from the electric circuit.
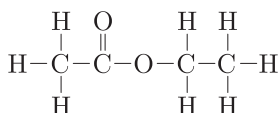
Resistance

V

Voltmeter
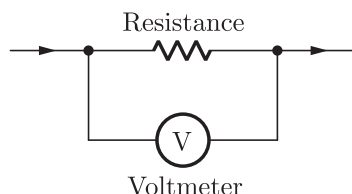
Section C

25. A carbon compound 'P' on heating with excess conc. H_2SO_4 forms another carbon compound 'Q' which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved. [5]

Ans :

P = Ethanol (C_2H_5OH)

Q = Ethene ($CH_2=CH_2$)

R = Ethane (C_2H_6)

$$\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[443\,K]{\text{Conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2=CH_2} + H_2O$$

$$CH_2=CH_2 \xrightarrow[H_2]{\text{Nickel catalyst}} \underset{\text{Ethane}}{C_2H_6}$$

$$C_2H_6 + \frac{7}{2}O_2 \longrightarrow 2CO_2 + 3H_2O$$

or

Answer the following:

i. The structural formula of an ester is :

$$H-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle O}{\|}}{C}-O-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-H$$

Write the structural formulae of the corresponding alcohol and the acid.

ii.
(a) Mention the experimental conditions involved in obtaining ethene from ethanol.
(b) Write the chemical equation for the above reaction.
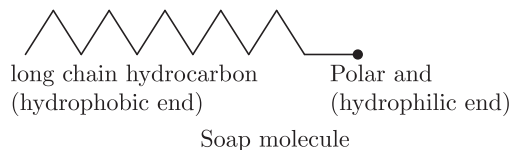
iii. Explain the cleansing action of soap.

Ans :

i.

$$H-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-OH$$

Ethyl alcohol

$$H-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}-\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle O}{|}}{C}}-OH$$

Acetic acid

ii.
(a) When ethanol is heated with excess of concentrated sulphuric acid at 443 K, it gets dehydrated to form ethene.

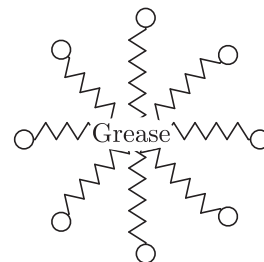(b) $\underset{\text{(Conc.)}}{C_2H_5OH + H_2SO_4} \xrightarrow{443\,K} \underset{\text{ethene}}{H_2C=CH_2} + H_2O$

iii. A molecule of soap is made up of two parts:
(a) An ionic part which is hydrophilic, i.e, water soluble.
(b) A hydrocarbon chain which is hydrophobic i.e., water-repelling and oil soluble.

long chain hydrocarbon (hydrophobic end)   Polar and (hydrophilic end)

Soap molecule

When soap is at the surface of water, the hydrophobic tail protrudes out of water while the ionic end remains inside water. Inside water, the molecules form clusters with the hydrophobic tails in the interior of the cluster and the ionic ends on the surface of the cluster. This formation is called a micelle. Soap, in the form of micelle collects the oily dirt in the centre of the micelle. The micelles stay in solution as a colloid and do not precipitate due to ion-ion repulsion. Thus, the dirt suspended in water is washed away during rinsing.

Grease

A micelle entrapping grease particle

26. Answer the following: [5]
i. How is zygote formed?
ii. State the function of placenta in the mother's body.
iii. At what interval the egg is formed in human female ovary?
iv. Name two STDs caused by bacterial infection.
v. Why is prenatal sex determination prohibited?

Ans :

i. Zygote is formed by the fusion of male and female gamete.
ii. Placenta is a special tissue through which the developing embryo/foetus gets nutrition from mother's blood. It also transports wastes of the embryo into mother's blood.
iii. Ovulation releases mature ovum from the ovary. It happens once during a menstrual cycle that is for roughly 28 days.
iv. STDs caused by bacterial infection are Gonorrhoea and Syphilis.
v. Prenatal sex determination is misused and it may be the reason for female foeticide.

27. i. What is galvanised iron?
ii. How is iron galvanised?
iii. What is the advantage of galvanised iron?
iv. How does galvanised iron get its name? State its two uses. [5]

Ans :

i. The iron whose surface is coated with a thin layer of zinc is called galvanised iron.

ii. The iron sheets are passed through molten zinc, when the zinc sticks to the surface of iron. These sheets are then passed through heavy steel rollers, heated to 300°C, when the thin layer of zinc gets compacted with iron.

iii. Galvanised iron does not rust because the surface of the iron is not exposed to moist air.

iv. It is because of the similarity of the electrochemical process involved in the galvanic cell and coating of zinc with iron, that the product is called galvanised iron.

Uses of galvanised iron are following:

(a) It is used for making iron roofing.

(b) It is used for making suitcase, trunks, drain pipes, etc.

28. How does an artificial kidney or a dialysis machine work? [5]

Ans :

The working of a dialysis machine is

i. An artificial kidney contains a number of tubes. Each tube contains a semi-permeable lining suspended in a tank filled with dialysing fluid having the same osmotic pressure as blood.

ii. The patient's blood is passed through these tubes. The waste products from the blood pass into the dialysing fluid.

iii. The purified blood is sent back into the patient's body. In an adult 180 litre of blood is filtered by the kidneys daily.

or

Give stepwise detail of the working of human kidneys leading to the formation of urine.

Ans :

Each kidney is made up of excretory units called nephrons. Each nephron has a cup shaped upper end called Bowman's capsule containing a bundle of capillaries called glomerulus. The various steps in blood purification are :

i. Waste materials are brought by the renal arteries to the kidneys.

ii. Blood is filtered, from the blood capillaries into the Bowman's capsule.

iii. This filtrate is passed through tubular parts of the nephron where useful products such as glucose, amino acids, etc., are absorbed by the blood capillaries surrounding the nephron.

iv. The nephrons drain the waste into a space inside the kidney leading to the ureter.

v. Human urine contains water and nitrogenous substances most of which is urea. From the ureter, urine is passed to the urinary bladder, where it is stored till thrown out of the body.

29. i. What is a magnetic field? How can the direction of magnetic field lines at a place be determined ?

ii. State the rule for the direction of the magnetic field produced around a current carrying conductor. [5]

Ans :

i. The space surrounding a bar magnet in which its

influence in the form of magnetic force can be detected, is called magnetic field.

The direction of magnetic field at a point is the direction of the resultant force acting at that point. The north end of a compass needle indicates the direction of the magnetic field at a particular point.

ii. **Right hand thumb rule :** Imagine you are holding the conductor with the palm of your right hand, such that the fingers encircle the conductor and the thumb points in the direction of the current. Then the direction of the fingers encircling the conductor, gives the direction of the magnetic lines of force around it.
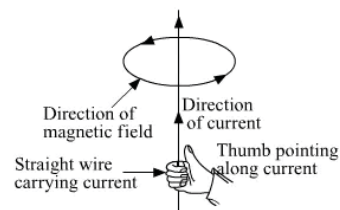

30. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

i. What should be the range of distance of an object placed in front of the mirror?

ii. Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.

iii. Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer.
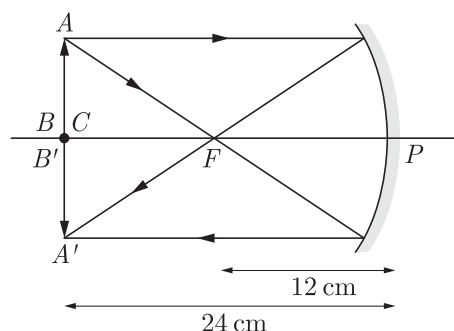
Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams. [5]

Ans :

i. Range of distance of an object – between pole (0 cm) and focus (<12 cm).

ii. The image will larger than the object.
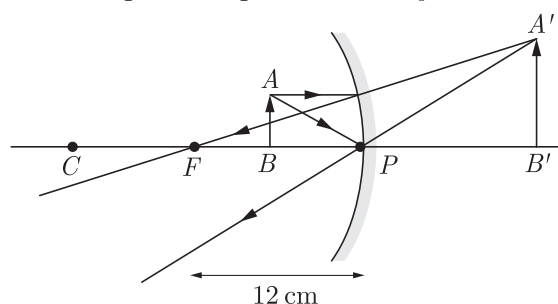
iii. Image also at 24 cm in front of the mirror.

or

i.   Define real image of an object.
ii.   Name the mirror that
      (a) can give real as well as virtual image of an object.
      (b) will always give virtual image of same size of an object.
      (c) will always give virtual and diminished image of an object.
      (d) is used by a doctor in examining teeth.
iii. With the help of a ray diagram explain the use of concave mirror as solar concentrators.

Ans :

i.   Real image of an object is the image formed due to actual intersection of light rays coming from object through an optical device. It can always be taken on screen.
ii.   (a) concave mirror
      (b) plane mirror
      (c) convex mirror
      (d) concave mirror
iii. Concave mirrors can concentrate parallel light ray (from distant objects e.g. sun) at the focus as shown in figure.
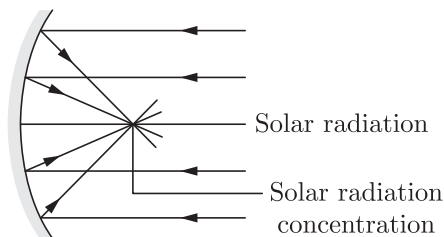
This property of the concave mirror is used in solar contractors (for e.g. solar cookers) as high concentration of sun rays generate high amount of heat which farther can used as a heat source.

CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-3

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

Section A

1. Which one of these has a higher concentration of H^+ ions ?   [1]

1 M HCl or 1 M CH_3COOH

Ans :

1 M HCl has a higher concentration of H^+(aq.) ions as it ionises completely.

2. What effect does an increase in concentration of H^+ (aq.) in a solution have on the pH of the solution? [1]

Ans :

The increase in concentration of H^+(aq.) ions, lowers the pH of the solution.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

The leaf is the main photosynthetic organ in a plant. It controls gas exchange in plants, controls the amount of water loss in plants. Upper epidermis cells contain no chloroplasts – which is not true for the guard cells. They form layers on the upper and lower surface of the leaf. Their function is to prevent water from getting out and stopping unwanted substances/organisms getting in. The palisade mesophyll layer is where most of the photosynthesis occurs in the leaf. The palisade cells contain a lot of chloroplasts to help them perform this photosynthesis. Lower epidermis is the bottom layer of the leaf, and is one cell thick. They may not contain a cuticle within the lower epidermis, there are some holes found in leaves called stoma. These holes allow gases to diffuse in and out of the leaves. The stoma are formed by two highly specialized epidermis cells, called guard cells. Guard cells are the only epidermis cells that contain chloroplasts.

Lamina or leaf blade

Phloem Xylem Vascular bundle
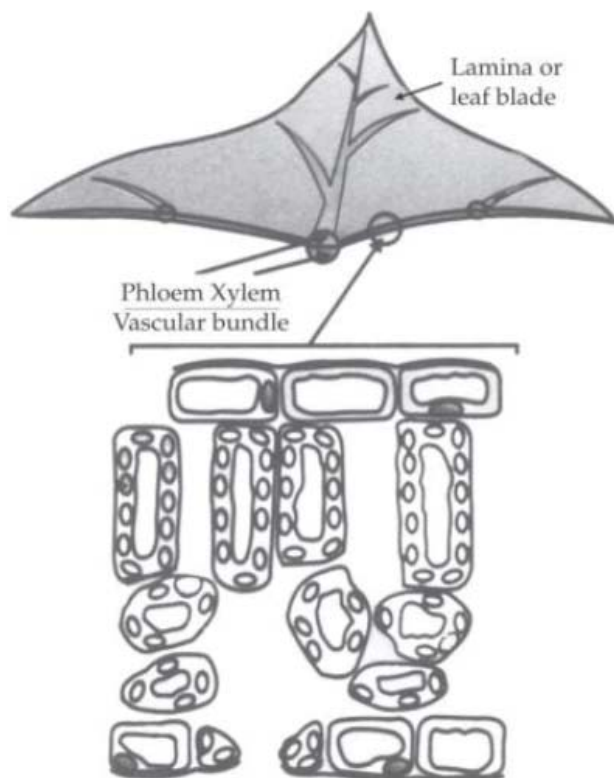
3.1 Mention two function of lower epidermis.   [1]

Ans : (i) To allow transpiration (ii) Allow gas exchange

3.2 Where are chloroplasts present in the leaf?

Ans : Guard cells and palisade cells

3.3 What are the functions of xylem and phloem in leaf?

Ans :

Xylem : transports water and minerals to leaf cells.

Phloem : translocates dissolved food prepared by photosynthesis by palisade cells.

3.4 List one structural and one functional difference between upper and lower epidermis.

Ans :

Structural difference : Upper epidermis has cuticle and does not have stomata or have fewer stomata. Lower may not have cuticle and have more stomata.

Functional difference : Upper epidermis is more for protection while lower is for gas exchange/ transpiration.

4. **Question number 4.1–4.4 are based on the two tables given below study these table related to atomic number and electronic configuration and answer that follows**

Table – A

Element	Atomic number	Electronic Configuration
H	1	1
He	2	2
Li	3	2,1
Be	4	2,2
B	5	2,3

Table – B

Student	Element	Electronic configuration
Student A	C	2, 4
	N	2, 5
	O	2, 6
Student B	F	2, 7
	Ne	2, 7
	Na	2, 8, 1

4.1 In the table B which student write the incorrect electronic configuration and write the its name? [1]

Ans : Student B, Ne

4.2 How many cells are used to write the electronic configuration of element? [1]

Ans : four (K, L, M, N)

4.3 The atomic number of sodium is [1]
   (a) 11   (b) 13
   (c) 14   (d) 9

Ans : (a) 11

4.4 If the atomic number of element is 12 than write down it's electronic configuration. [1]
   (a) 2, 2, 8   (b) 2, 4, 6
   (c) 2, 8, 2   (d) 2, 6, 4

Ans : (c) 2, 8, 2

5. In a milliammeter, there are 20 divisions between 400 mA mark and 500 mA mark. The least count of the milliammeter is [1]
   (a) 0.5 mA   (b) 5 mA
   (c) 10 mA   (d) 50 mA

Ans : (b) 5 mA

or

What is the current through a 5.0 ohm resistor if the voltage across it is 10 V ?
   (a) zero   (b) 0.5 A
   (c) 2.0 A   (d) 5.0 A

Ans : (c) 2.0 A

6. An object is placed at a distance of 10 cm in front of a plane mirror, then the distance of image from mirror will be [1]
   (a) 5 cm   (b) 10 cm
   (c) 20 cm   (d) 0

Ans : (b) 10 cm

7. While performing the experiment to trace the path of ray through glass slab, the teacher instructed her students to ensure that during the experiment, glass slab may not get displaced from its boundary. This instruction was given because if slab gets displaced from its boundary then [1]
   i.   the angle of incident ray will change
   ii. the diagram will not look nice
   iii. the refracted ray will not be traceable
   iv. the emergent ray will not be seen
   (a) (i)   (b) (ii)
   (c) (iii)   (d) (iv)

Ans : (a) (i)

8. In MAIZE plant the flowers are [1]
   (a) absent
   (b) uni-sexual but on different plants
   (c) bisexual
   (d) uni-sexual but on same plant

Ans : (d) uni-sexual but on same plant

or

During binary fission in Amoeba nucleus divided by
   (a) mitosis
   (b) meiosis
   (c) both mitosis and meiosis
   (d) none of these

Ans : (a) mitosis

9. Some crystals of copper sulphate were dissolved in water. The colour of the solution obtained would be : [1]
   (a) green   (b) red
   (c) blue   (d) brown

Ans : (c) blue

10. Which of the following turn pH paper red ? [1]
   (a) Milk of magnesia   (b) Baking soda
   (c) Oxalic acid solution (d) NaCl solution

Ans : (c) Oxalic acid solution

11. In an experimental set up to demonstrate that CO_2 is given out during respiration, the KOH solution should be kept in [1]
   (a) beaker
   (b) bent tube
   (c) without seeds in the flask

(d) in a small test tube in the flask

Ans : (d) in a small test tube in the flask

12. A student takes 5 ml of distilled water in 3 test tubes marked as I, II and III. He dissolves calcium chloride in test tube I, magnesium chloride in test tube II and sodium chloride in test tube III. In which tube/tubes will water behave as hard water :   [1]

(a) I   (b) 11

(c) III   (d) I and II

Ans : (d) I and II

or

Chlorine reacts with saturated hydrocarbons at room temperature in the

(a) absence of sunlight

(b) presence of sunlight

(c) presence of water

(d) presence of hydrochloric acid

Ans : (b) presence of sunlight

For question numbers 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Assertion is true and reason is correct explanation of assertion.

(b) Assertion is true but reason is false.

(c) Assertion is false but reason is true.

(d) Both are true but reason is not correct explanation of assertion.

13. **Assertion**: Plaster of Paris should be stored in moisture proof containers.
Reason : Plaster of Paris on coming in contact of moisture, absorbs water and reacts chemically to form hydrated calcium sulphate, which sets to form a hard mass.   [1]

Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. **Assertion** Covalent compounds are generally good conductor of electricity.
Reason: Covalent compounds have cations and anions which can migrate to the opposite poles of an electrolytic cell.   [1]

Ans : (d) Assertion is true but reason is false.

Section B

15. What are the limitations of extracting energy from:
    i.   wind
    ii.   waves
    iii. tides   [3]

Ans :

i. **Wind :**
    (a) It can be extracted only at limited sites, where the wind blows most of the time in a year.
    (b) The minimum speed of wind should be 15

km/h.
    (c) Large area is required to build the wind farm/ wind mills, which is an expensive affair.
    (d) Efficiency is low and maintenance cost is high.

ii. **Waves :**
    (a) The place and time is limited, when the waves are strong.
    (b) Initial setup cost is expensive.
    (c) Efficiency is low.

iii. **Tides :**
    (a) The areas where tidal energy can be harnessed are very limited.
    (b) Efficiency is low.
    (c) These plants are not cost effective.

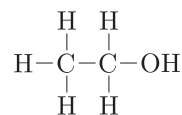16. What is ethanol? Draw the structure of ethanol molecule. How does ethanol behave with the following:
    i.   Sodium
    ii. Excess of con. sulphuric acid at 443 K ?
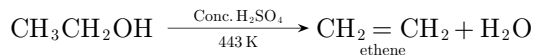   Write chemical equation for each reaction.   [3]

Ans :

Ethanol is the second member of the homologous series of alcohols.

$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-OH$$

i. Ethanol reacts with sodium to liberate hydrogen gas.

$$2CH_3CH_2OH + 2Na \longrightarrow 2\underset{\text{Sodium ethoxide}}{CH_3CH_2ONa} + H_2$$

ii. Concentrated hydrochloric acid dehydrates ethanol to ethene.

$$CH_3CH_2OH \xrightarrow[\text{443 K}]{\text{Conc. H}_2\text{SO}_4} \underset{\text{ethene}}{CH_2 = CH_2} + H_2O$$

or

Three elements A, B and C have atomic number 7, 8 and 9 respectively.

i.   What would be their positions in the Modern Periodic Table (Mention group and period both)?

ii. Arrange A, B and C in the decreasing order of their size.

iii. Which one of the three elements is most reactive and why?

Ans :

i.   A, B and C occupy 2nd period of periodic table and 15, 16 and 17 groups respectively.

ii. A > B > C because atomic size decreases as we move from left to right across a period.

iii. C has electronic configuration 2, 7. It needs only one electron to complete its outermost shell. So, it is more reactive.
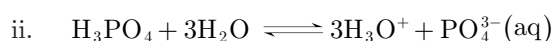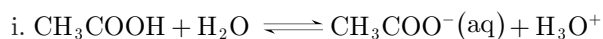
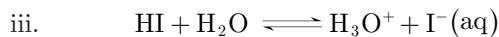17. Write equations to show the presence of all ions in the aqueous solutions of :
    i. CH_3COOH

    ii. H_3PO_4

    iii. HI   [3]

Ans :

i. $CH_3COOH + H_2O \rightleftharpoons CH_3COO^-(aq) + H_3O^+$

ii. $H_3PO_4 + 3H_2O \rightleftharpoons 3H_3O^+ + PO_4^{3-}(aq)$

iii.　　　　$HI + H_2O \rightleftharpoons H_3O^+ + I^-\,(aq)$

18. i.　Name the plant used by Mendel to carry out his experiments.

ii.　Study the following cross and answer the questions that follow :

Parents　　Green and　　　$\times$　　Yellow and
　　　　　Round seed　　　　　　Wrinkled seed
　　　　　F_1 Generation　　　　All Green and
　　　　　　　　　　　　　　　　Round seeds

F_2 Generation	Green and Round (9)	Green and Wrinkled (3)
	Yellow and Round (3)	Yellow and Wrinkle

(a) List the dominant and recessive characters.

(b) Are the characters linked or independent? [3]

Ans :

i.　Garden Pea (Pisum sativum)

ii.

(a) Dominant characters are green colour and round shape.

Recessive characters are yellow colour and wrinkled shape.

(b) These characters are independent.

or

i.　Differentiate between sensory neurons and motor neurons.

ii.　How is brain protected in our body?

iii.　Name the part of the brain responsible for precision of voluntary actions and maintaining body posture and balance of the body.

Ans :

i.　Sensory neurons bring the impulses received by the sense organs to the brain and the spinal cord. The motor neurons carry the message from the brain and the spinal cord to the affected muscles or the glands.

ii.　Brain is protected by the cranial bones and meninges.

iii.　Cerebellum is responsible for precision of voluntary actions, maintaining body posture and balance of the body.

19. The ozone layer is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. The damage of the ozone layer leads to variation in rainfall, ecological disturbances and other effects in global food supply. United Nations Environment programme (UNEP) has signed an agreement to limit this damage in 1986.
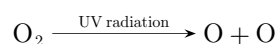
i.　Where is ozone layer found in the atmosphere? [1]

ii.　How is ozone layer formed in the atmosphere? [1]

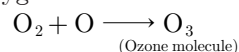iii.　How can you contribute in saving the ozone layer? [1]

Ans :

i.　The ozone layer is found in the stratosphere.

ii.　The ultraviolet radiation coming from the sun splits oxygen gas into free oxygen atoms.

$$O_2 \xrightarrow{\text{UV radiation}} O + O$$

These very reactive oxygen atoms react with oxygen molecules to form ozone molecules.

$$O_2 + O \longrightarrow \underset{\text{(Ozone molecule)}}{O_3}$$

iii.　Use of synthetic chemicals such as chlorofluoro-carbons (CFCs) used as refrigerants and in fire extinguishers, methane (CH_4) and oxides of nitrogen (N_2O) should be minimised for saving the ozone layer. By organising an awareness camp we can make people aware about the ill effects of destruction of ozone layer.

20. Mention the components of the transport system in highly organised plants. State the functions of these components. [3]

Ans :

Transport system in highly organised plants consists of xylem and phloem.

i.　**Xylem**–Xylem moves water and minerals obtained from the soil. It consists of tracheids, vessels, xylem fibres and xylem parenchyma.

ii.　**Phloem**–Phloem transports products of photosynthesis from the leaves to other plant parts. It consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma.

21. (i) Name all the digestive enzymes present in our digestive system.

(ii) Explain the process of digestion of carbohydrates, fats and proteins. [3]

Ans :

i.　The digestive enzymes present in our digestive system are:
Salivary amylase, pepsin, trypsin, lipase, pancreatic amylase and lipase.

ii.　**Carbohydrates :** It is acted upon by salivary amylase in mouth, which converts complex insoluble starch into simple sugar form. The food with carbohydrate which is not digested in mouth, then it is digested by amylase from the pancreas to form glucose.

Fats : Bile from liver breaks the big globules of fats into smaller ones and is acted upon by lipase from pancreas, which digest fats into fatty acids.

Proteins : Proteins are first digested by pepsin in stomach to form peptones. This is further digested by trypsin from pancreas to form amino acids.

The enzymes present in small intestine finally convert protein to amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.
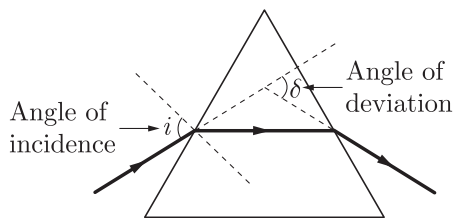
22. i.　What do you mean by dispersion of light?

ii.　Draw a ray diagram to show the path of a light ray that enters the glass prism obliquely Label on it the angle of incidence and angle of deviation. [3]

Ans :

i.　The phenomenon due to which a white light splits into its component colours, when passed through a prism is called dispersion.

ii.

Angle of incidence → i

Angle of deviation

23. i.   Define the term 'volt'.

ii. Calculate the potential difference between the two terminals of a battery, if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to the other.

Ans :

i.   Potential difference between two points in an electric field is said to be 1 volt if the amount of work done in bringing a unit positive charge from one point to another point is 1 J.

ii. Given:
$$W = 100\,\text{J},\ Q = 20\,\text{C},\ V = ?$$

We know that,
$$V = \frac{W}{Q} \Rightarrow V = \frac{100}{20}\,\text{JC}^{-1}$$

$$V = 5\,\text{JC}^{-1}$$

$$V = 5\,\text{Volt}.$$

24. A convex lens forms a real image 4 times magnified at a distance of 60 cm from the lens. Calculate the focal length and the power of the lens. [3]

Ans :

Given,   distance of image, $v = 60$ cm,

$$m = -4\,(\text{For real image})$$

$$m = \frac{v}{u} = -4 \Rightarrow u = \frac{v}{-4} = -\frac{60}{4}$$

$$= -15\ \text{cm}$$

From the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{60} - \frac{1}{-15}$$

$$= \frac{1+4}{60} = \frac{5}{60} = \frac{1}{12}$$

Focal length, $f = 12$ cm $= \dfrac{12}{100}$ m

The power of the lens, $P = \dfrac{1}{f\,(\text{in m})}$

$$= \frac{1}{\frac{12}{100}\text{m}} = \frac{100}{12}\,\text{D}$$

$$= 8.33\,\text{D}$$

or

i.   Define power of a lens and write its S.I unit.

ii. A convex lens of power 4 D is placed at a distance of 40 cm from a wall. At what distance from the lens should a candle be placed so that its image is formed on the wall?

Ans :

i.   Power of a lens is reciprocal of its focal length in metre. The SI unit of it is dioptre.

ii. Focal length of the lens,

$$f = \frac{1}{P}$$

Here,   Power of lens, $P = 4$

Now, $f = \dfrac{1}{4} = 0.25$ m $= 25$ cm

As we know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{25} = \frac{1}{40} - \frac{1}{u}$$

from the lens formula,

$$\frac{1}{u} = \frac{1}{40} - \frac{1}{25} = \frac{5-8}{200} = -\frac{3}{200}$$
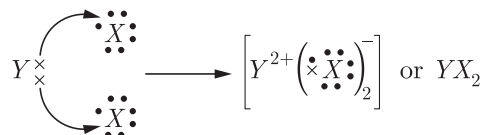
$$u = -\frac{200}{3} = -66.67\ \text{cm}$$

Section C

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

i.   Where in the periodic table are elements X and Y placed?

ii. Classify X and Y as metal (s), non-metal(s) or metalloid(s).

iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.

iv. Draw the electron dot structure of the divalent halide. [5]

Ans :

i.   X belongs to Group 17 and 3rd period.
     Y belongs to Group 2 and 4th period.

ii. X—Non-metal, Y—Metal

iii. Basic oxide; Ionic bonding

iv.

$\left[Y^{2+}\left(\ddot{\ddot{X}}\right)_2\right]^{-}$ or YX_2

or

State the reason why?

i.   Carbon is not used to reduce the oxides of sodium or aluminium.

ii. An iron strip is dipped in a blue copper sulphate solution turns the blue solution pale green.

iii. Metals replace hydrogen from acids whereas non-metals do not.

iv. Calcium does not occur free in nature.

v.   Zinc is used in the galvanisation of iron and not the copper.

Ans :

i.   Sodium or aluminium have a great affinity for oxygen and therefore cannot be reduced by carbon. Hence, carbon is not used to reduce the oxides of sodium or aluminium.

ii. When an iron strip is dipped in a blue copper sulphate solution, iron metal. reacts with copper sulphate solution and displaces copper from copper sulphate solution. Hence, the colour of the solution gradually changes to pale green.

iii. The ionisation energy of metals is higher than hydrogen, so they can replace hydrogen from metals whereas ionisation energy of non-metals is lower than that of hydrogen, hence, they cannot

displace hydrogen from acids.

iv. Calcium is very reactive and combine with oxygen or water vapour present in air to form compounds. Hence, these metals are not found in the free state in nature.

v. Zinc is used in the galvanising of iron because zinc being a more active metal than iron will get oxidised first as it is coated over the surface of iron. Thus, iron escapes rusting. Copper is less reactive than iron hence, it will not react with iron and does not form any oxide layer it.

26. Write fully balanced equations for the reactions of : [5]
   i. Sulphur dioxide and water
   ii. Sodium with water
   iii. Iron with oxygen
   iv. Aluminium and potassium hydroxide.
   v. Iron (III) oxide and dilute sulphuric acid.

   Ans :

   i. $SO_2(g) + H_2O(l) \longrightarrow H_2SO_3$

   ii. $2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$

   iii. $4Fe(s) + 3O_2(g) \xrightarrow{heat} 2Fe_2O_3(s)$

   iv. $2Al(s) + 2KOH(aq) + 2H_2O(l)$
   $$\longrightarrow 2KAlO_2(aq) + 3H_2(g)$$

   v. $Fe_2O_3(s) + 3H_2SO_4(aq) \longrightarrow Fe_2(SO_4)_3 + 3H_2O(l)$

27. i. Draw a diagram depicting the Human Alimentary Canal and label on it, Gall Bladder, Liver and Pancreas.
   ii. State the roles of liver and pancreas.
   iii. Name the organ which performs the following functions in humans :
      (a) Absorption of digested food.
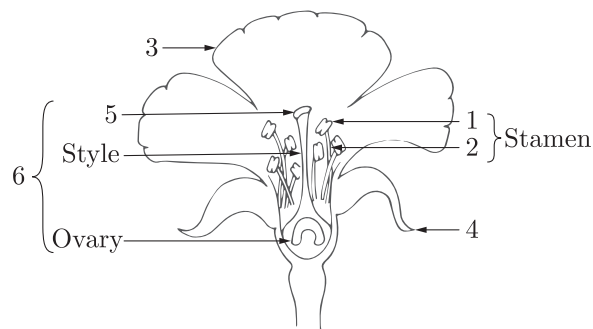   (b) Absorption of water [5]

   Ans :

   i.
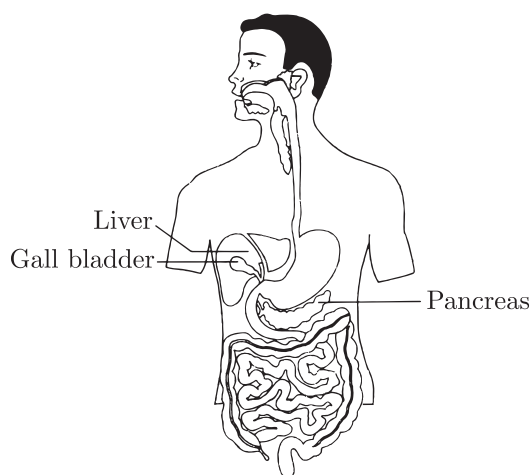
   Human Alimentary canal

   ii. The liver secretes bile which contains bile pigments and bile salts. Bile emulsifies fats present in the food. The pancreas releases the pancreatic juice into the duodenum. The pancreatic amylase breaks down starch and other carbohydrates into glucose.

   iii. (a) Small intestine
      (b) Large intestine

28. i. In the given figure name the parts marked 1 to 6.

   ii. Differentiate between self pollination and cross pollination. [5]

   Ans :

   i. 1. Anther 2. Filament 3. Petal
      4. Sepal 5. Stigma 6. Carpel

   ii.

	Self Pollination	**Cross Pollination**
1.	Self pollination occurs within a flower or between two flowers of the same plant.	Cross pollination occurs between two flowers borne on different plants of the same species.
2.	Flowers are neither attractive, nor do they produce nectar.	Flowers attract insects by various means like coloured petals, nectar, etc.
3.	Pollen grains are produced in small number.	Pollen grains are produced in large numbers.
4.	Wastage of pollen grains occurs, thus economical.	No wastage of pollen grains occurs, hence uneconomical.

   or

   i. Differentiate between fertilisation and germination.
   ii. State in brief the functions of the following parts of the human male reproductive system :
      (a) Scrotum
      (b) Testes
      (c) Vas deferens

   Ans :

   i.

	Fertilisation	**Germination**
1.	It is the fusion of male and female gametes.	In it the food reserves present in a seed are broken down and the embryo start to grow.
2.	It occurs in plants and animals of various types.	It occurs only in seed plants.
3.	It actually brings about fusion of gametes.	During it, seeds convert into seedling.

|	Fertilisation	Germination
4.	Fertilisation occurs only after pollination when the pollen grain has germinated and sent the male gametes to the ovule.	It begins when a seed starts to absorb water

ii.

(a) **Scrotum :** It contains and supports the testes. It is situated outside the body cavity and allow sperm to develop at the optimum temperature, which is slightly lower than body temperature.

(b) **Testes :** The formation of male germ cells or sperms take place in it. Leydig cells of testes secrete hormone testosterone which brings about changes in appearance seen in boys at the time of puberty.

(c) **Vas deferens :** It ascends into the abdomen, passes over the urinary bladder and receives duct from the seminal vesicles behind the urinary bladder to form the ejaculatory duct

29. Derive an expression for equivalent resistance (R), when resistors R_1, R_2, R_3 are connected in series. [5]

Ans :

Consider three resistors of resistances R_1, R_2 and R_3 connected in series, such that I is the current flowing through them. Let R be the equivalent resistance of the circuit. Let V_1, V_2, and V_3; be the potential difference at the ends of resistors R_1, R_2, and R_3. If V is the combined potential difference of all the resistors in series, then :

$$V = V_1 + V_2 + V_3 \qquad ...(1)$$
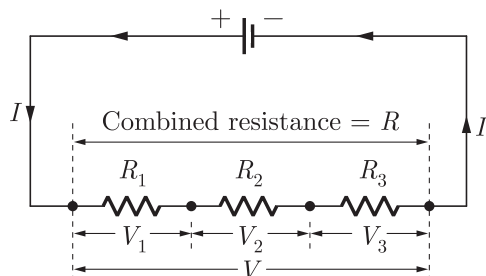
According to the Ohm's law,

$$I = \frac{V}{R} \implies V = IR \qquad ...(2)$$

Applying, Ohm's law to the individual resistors. Current in the resistor R_1:

Similarly, $I = \frac{V_1}{R_1}$ or $V_1 = IR_1$ ...(3)

Current in the resistor R_2; $I = \frac{V_2}{R_2}$ or $V_2 = IR_2$ ...(4)

Current in the resistor R_3; $:I = \frac{V_3}{R_3}$ or $V_3 = IR_3$ ...(5)

Substitute the value of V_1, V_2 and V_3 in Eq. (1)

$$V = IR_1 + IR_2 + IR_3$$

From Eq. (2), we get,

$$IR = I(R_1 + R_2 + R_3)$$
$$R = R_1 + R_2 + R_3$$

Thus, the total resistance in series combination is equal to the sum total of the individual resistances in series.

30. A student finds the writing on the blackboard as blurred and unclear when sitting on the last desk of the class room. He however sees clearly when sitting on the front desk of an approximate distance 2 m from the blackboard.

i. Draw the ray diagram to illustrate the formation of image of the blackboard writing by his eye lens when he sits at the :
(a) last desk
(b) front desk

ii. Name the defect of vision the student is suffering from. Also, list two causes of this defect.

iii. Name the kind of lens that would enable him to see clearly when he is seated at the last desk. Draw the ray diagram to illustrate how this lens helps him to see clearly. [5]
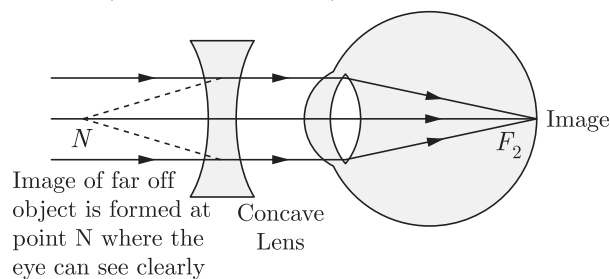
Ans :

i. (a)

(b)
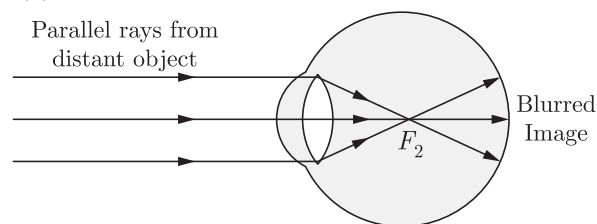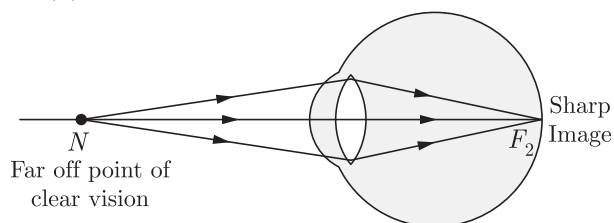
ii. Defect of vision — myopia (Short-sightedness) Two causes of this defect :
(a) Ciliary muscles get weak.
(b) Eye ball gets elongated.

iii. Concave lens is used for the correction of myopic eye (seated at last desk)

or

i. What is meant by dispersion of light?
ii. Describe the formation of rainbow in the sky.
iii. What is meant by accommodation of eye? Name the part of eye which helps in this phenomenon and state how does it help.

Ans :

i. **Dispersion of light :** The phenomenon due to which a white light splits into its component colours, when passed through a prism. White light is combination of seven different colours of light having different wavelengths.

More is the wavelength of light, less is the angle of deviation for the same material and same angle of incidence. This is caused of dispersion of white light.
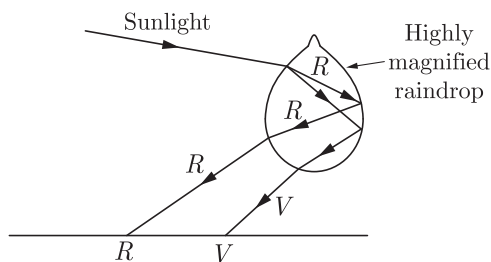
ii. The rainbow is produced due to the dispersion of sunlight by tiny droplets of water suspended in air, just after rain.

From the figure when the sunlight is incident on the side A of the droplet of water, it gets refracted as well dispersed. The dispersed rays on striking the surface B of tiny droplets, suffer total internal reflection and moves towards surface A, the rays further suffer refraction and emerge out as the band of colours in the form of a circular arc (rainbow) along the horizon. The red colour appears upper arc and violet colour on the innermost arc of the rainbow.

iii. **Accommodation of eye :** The phenomenon by which the ciliary muscle alter the focal length of the crystalline lens, so as to focus nearer or far-off objects clearly on the retina is called accommodation of the eye.

In order to focus at far-off objects, the ciliary muscles relax to make crystalline lens thin and its focal length increases. In order to focus nearer objects, ciliary muscles contract to make crystalline lens thick and its focal length decreases.

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CLASS X (2019-20)

SCIENCE (CODE 086)

SAMPLE PAPER-4

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　　　　　**Maximum Marks : 80**

General Instructions :

(i) The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii)This question paper consists of a total of 30 questions.

Section A

1. How will the tendency to gain electrons change as we go from left to right across a period ? Why ?　　[1]

Ans :

On moving from left to right across a period, metallic character decreases and non-metallic character increases.

Since metals tend to lose electrons and non-metals tend to gain electrons, the tendency to gain electrons increases as we move from left to right across a period.

2. A shiny brown coloured element X' on heating in air becomes black in colour. Name the element X' and the black compound formed.　　[1]

Ans :

The shiny brown element is metal copper. The black compound formed is copper (II) oxide.

3. Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.

The arrangement of metals in a vertical column in the decreasing order of their re-activities is called the reactivity series or activity series of metals. The most reactive metal is at the top position of the reactivity series. The least reactive metal is at the bottom of the reactivity series.

Hydrogen, though a non-metal, has been included in the activity series of metals only for comparison. Apart from it, the hydrogen atom also has tendency to lose its valence electron and form cation like the behaviour shown by metals. Thus,

$$H \longrightarrow H^+ + e^-$$
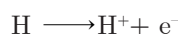
3.1 Which metal can be displaced by copper from its salt solution?　　[1]

Ans : Copper can displace $AgNO_3$ because Copper is more reactive than silver.

3.2 An element 'X' after reacting with acids liberate hydrogen gas and can displace lead and tin from their salt solution. Write down the Name of X metal.　　[1]

Ans : Nickel

3.3 Write down the name of most reactive metal　　[1]

Ans : Potassium

3.4 Which metal does not liberate hydrogen gas after reacting with acid?　　[1]

Ans : Gold

4. **Question number 4.1-4.4 are based on the two table below study these table related to equivalent resistance and answer the question that follows.**

Table -A Combination of resistance
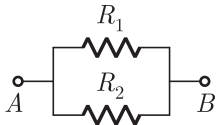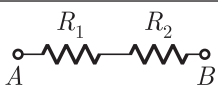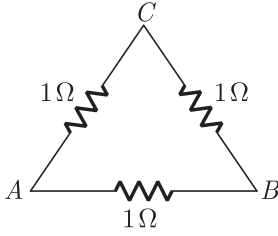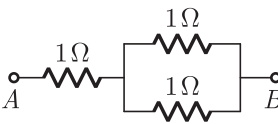
Combination	Circuit	Equivalent resistance
Parallel		$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$
Series		$R_{eq} = R_1 + R_2$

Table -B

Student	Circuit	Equivalent resistance
Student A	Circuit - 1	1Ω
Student B	Circuit - 2	1.5Ω

4.1 Which student measured the wrong equivalent resistance in Table-B? [1]

Ans : Student A

4.2 In which configuration of resistance, the potential difference across each resistance remains same? [1]

Ans : Parallel combination.

4.3 The value of equivalent resistance of circuit-1 is? [1]

   (a) $1\,\Omega$ (b) $2\,\Omega$

   (c) $0.4\,\Omega$ (d) $0.6\,\Omega$

Ans : (d) $0.6\,\Omega$

**4.4** In which configuration of resistance the current across each resistances remain same? [1]
  (a) Series combination
  (b) Parallel combination
  (c) Mixed combination
  (d) None of these

Ans : (a) Series combination

5. The given circuit diagram shows the experiment arrangement of different circuit components for determination of equivalent resistance of two resistors connected in series. The components X, Y and Z shown in the circuit respectively represent. [1]
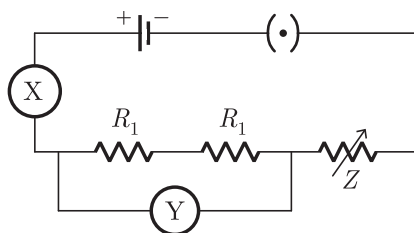

(a) Rheostat, Resistor Ammeter
(b) Voltmeter, Ammeter, Rheostat
(c) Ammeter Voltmeter, Rheostat
(d) Rheostat, Ammeter, Voltmeter

Ans : (c) Ammeter, Voltmeter, Rheostat

or

When a student connects a voltmeter across the terminals of a battery, it measures 6 V. If he connects a resistance of $2\,\Omega$ across the terminals of the battery as shown in the figure, then the current flowing through this resistance (R) must be
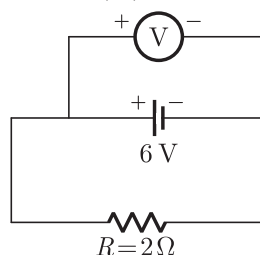
(a) 2 A   (b) 3 A
(c) 4 A   (d) 6 A

Ans : (b) 3 A

6. A student was asked to obtain real image of a tree on the screen with the help of suitable mirror. He can do by taking a : [1]
(a) concave mirror
(b) plane mirror
(c) convex mirror
(d) both either concave or by convex mirror

Ans : (a) concave mirror

7. A student wants to draw diagram for formation of a real image at 2F of a convex lens. For this he must take the object placed at [1]
(a) infinity
(b) focus
(c) between optical centre and focus
(d) 2 F

Ans : (d) 2 F

8. In the experimental set-up to show that CO_2 is given out during respiration, the level of water in the delivery tube (the end that is immersed in water of the beaker) shows a: [1]
(a) gradual fall   (b) rapid fall
(c) rise and fall alternately (d) rise

Ans : (d) rise

or

In binary fission, the parent cell divides by the process
(a) the cytoplasm and nucleus divide at same time
(b) the nucleus first divides then cytoplasm
(c) the cytoplasm first divides then nucleus
(d) the cytoplasm and nucleus do not divide

Ans : (b) the nucleus first divides then cytoplasm

9. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$
The above reaction is an example of a : [1]
(a) combination reaction
(b) double displacement reaction
(c) decomposition reaction
(d) displacement reaction

Ans : (d) displacement reaction

10. The colours obtained on a pH paper for a highly acidic, basic and neutral solutions are [1]
(a) blue, orange, green   (b) yellow, blue, green
(c) red, blue, green   (d) red, green, blue

Ans : (c) red, blue, green

11. When a student boiled the given sample of water containing temporary hardness, he observed that it now gave good amount of lather because by boiling : [1]
(a) the bicarbonate of sodium decomposes
(b) the bicarbonate of magnesium decomposes
(c) the bicarbonate of Zn decomposes
(d) the bicarbonate of Al decomposes

Ans : (b) the bicarbonate of magnesium decomposes

12. Which of the following is not a property of carbon? [1]
(a) Carbon compounds are good conductor of heat and electricity
(b) Carbon compounds are poor conductor of heat and electricity

(c) Most of the carbon compounds are covalent compounds

(d) Boiling and melting point of carbon compounds are relatively lower than those of ionic compounds

Ans : (a) Carbon compounds are good conductor of heat and electricity

or

Which of the following is not the use of graphite?
(a) It is used as lubricant
(b) It is used in manufacturing of lead-pencils
(c) It is used in manufacturing of artificial diamond
(d) It is used for making insulated plates

Ans : (d) It is used for making insulated plates

Graphite can not be used for making insulated plates, as it is a good conductor of electricity.

For question numbers 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
(a) Assertion is true and reason is correct explanation of assertion.
(b) Assertion is true but reason is false.
(c) Assertion is false but reason is true.
(d) Both are true but reason is not correct explanation of assertion.

13. **Assertion** : Copper reacts with silver nitrate solution.
Reason : Copper is placed higher in the metal activity series than silver. Thus, it can displace silver from silver nitrate solution [1]

Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. **Assertion** : Mendeleev did not leave any gap in his periodic table.
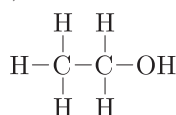**Reason** : Gaps were necessary for unknown elements. [1]

Ans : (c) Assertion is false but reason is true.

Section B

15. An organic compound 'A' is an essential constituent of wine and beer. Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction. [3]
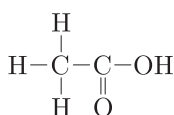
Ans :

Ethyl alcohol is an essential constituent of wine and beer. Therefore, A is ethyl alcohol. Oxidation of ethyl alcohol gives acetic acid. Vinegar contains acetic acid. Therefore, B is acetic acid.
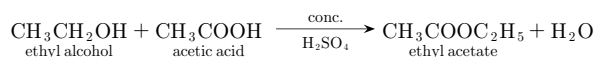
$$\begin{array}{cc} \text{H H} & \text{H} \\ \text{H–C–C–OH} & \text{H–C–C–OH} \\ \text{H H} & \text{H O} \\ \text{Ethyl alcohol} & \text{Acetic acid} \\ \text{(A)} & \text{(B)} \end{array}$$

When A and B react in the presence of an acid catalyst, the ester, ethyl acetate is formed.

$$\underset{\text{ethyl alcohol}}{CH_3CH_2OH} + \underset{\text{acetic acid}}{CH_3COOH} \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc.}} \underset{\text{ethyl acetate}}{CH_3COOC_2H_5} + H_2O$$

16. Give two uses each of the products obtained by the electrolysis of sodium chloride. [3]

Ans :

Hydrogen : It is used for cutting and welding purpose in the oxy-hydrogen flame.

Chlorine :
i. It is used for the sterilisation of drinking water.
ii. It is used in the preparation of pesticides and insecticides.

Sodium hydroxide :
i. It is used in the manufacture of soap and detergents.
ii. It is used in making paper pulp in the paper industry.

or

Name the type of chemical reaction presented by the following equations:

i. $CaCO_3(s) \xrightarrow{\text{heat}} CaO(s) + CO_2(g)$

ii. $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

iii. $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$

Ans :
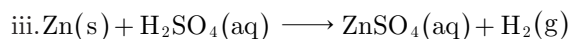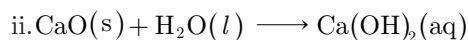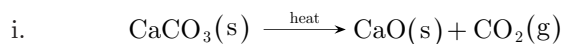
i. Chemical decomposition reactions.
ii. Chemical combination reaction.
iii. Chemical displacement reaction.

17. (a) Name metals among the first five elements of the Modern Periodic Table.
(b) Write their symbols.
(c) Write the formula of their oxides.

Ans :

a. Lithium and Beryllium are metals among first five elements.
b. Lithium (Li), Beryllium (Be).
c. Li_2O and BeO are the formulae of their oxides.

18. List and describe in brief any three ways devised to avoid pregnancy. [3]

Ans :

i. Foam tablets, jellies, creams and spermicide's are common chemicals used by females. These are placed in vagina.
ii. Ovulation and fertilisation can be prevented by changing hormonal balance of the body. It can be done by taking oral pills.
iii. Intrauterine Contraceptive Device (IUCD) such as the loop or the copper-T are placed in the uterus to prevent pregnancy. The drawbacks with these devices are bleeding and discomfort.

or

What are sexually transmitted diseases? Name four such diseases. Which one of them damages the immune system of human body?

Ans :

The diseases which are spread by sexual contact from an infected person to a healthy person, are called sexually transmitted diseases or STDs.

i. AIDS (Acquired Immuno Deficiency Syndrome)
ii. Gonorrhoea
iii. Syphilis
iv. Genital herpes
'AIDS' – damages the immune system of human body.

19. What is biodegradable substances? Describe two ways in which non-biodegradable substances affect our environment. [3]

Ans :

Biodegradable substances : The substances which can be degrade or decomposed by the bacteria and fungi are called biodegradable substances.

Non-biodegradable substances : The substances which cannot be decomposed by bacteria and fungi are called non-biodegradable substances.

The non-biodegradable substances affect our environment as :

i. Non-biodegradable substances chock the sewage system and pollute the soil.
ii. Some of the non-biodegradable substances may toxic for the humans and produce various diseases.

20. Define 'nerve impulse'. Which structure in a neuron helps to conduct a nerve impulse : [3]
i. towards the cell body ?
ii. away from the cell body?

Ans :

The information passing through the neurons in the form of chemical and electrical signals is called nerve impulse.
i. Dendrites –Towards the cell body.
ii. Axon –Away from the cell body.

21. How do auxins promote the growth of a tendril around a support? [3]

Ans :

Auxins stimulate cell elongation and growth. It is observed that the shoot tips bend towards a unilateral source of light. The hormone synthesised at the shoot tips helps in the bending of shoots towards the light source. When light falls on one side of the plant, auxin diffuses towards the shady or dark side of the shoot. More concentration of auxin on the dark side stimulates more cell elongation on this side than the lighted side. As a result, the dark side grows more and the shoot bends towards light.

22. i. What is meant by scattering of light?
ii. Mention the factor on which it depends. Explain why the colour of the clear sky is blue?
iii. An Astronaut in space finds sky to be dark. Explain reason for this observation. [3]

Ans :

i. Scattering of light is the phenomenon due to which light gets deflected by the atoms, molecules or particles of the medium when light falls on them. These are known as scatterer particles.
ii. Factors on which scattering depends are the size of the atoms, molecules of the scatterer.
When sunlight falls on the atoms or molecules of the gases shorter wavelengths like of blue colour get scattered more due to which sky appears blue.
iii. In space there is no atmosphere, so there is no scattering hence the sky appears dark/black.

23. How does a solenoid behave like a magnet ? Can you determine the north and south poles of a current-carrying solenoid with the help of a bar magnet? Explain. [3]

Ans :

When the current flows through a solenoid, each turn of it sets up a magnetic field which is at right angles to the plane of the coil. Thus, each turn in its own right behaves like a magnet, such that its one face is north pole, and the other face is south pole. As these tiny magnets in the form of turns are arranged along the same axis, therefore, the solenoid on the whole behaves like a magnet.

In order to find the polarity of the solenoid, suspend it freely so that it is pointing in the north-south direction. Now, bring the north pole of a permanent bar magnet near one end of the solenoid. If this end gets repelled then this is the north pole of the solenoid.

24. A 5.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. By calculation determine (i) the position and (ii) the size of the image formed. [3]

Ans :

Given, height of object, $h_o = 5$ cm

Focal length of lens, $f = 20$ cm

Image of distance, $u = -30$ cm

(i) Applying, $\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u} \Rightarrow \dfrac{1}{v} = \dfrac{1}{f} + \dfrac{1}{u}$

Focal length $\dfrac{1}{v} = \dfrac{1}{20} + \dfrac{1}{-30}$

$\dfrac{1}{v} = \dfrac{3-2}{60} = \dfrac{1}{60}$ or $v = 60$ cm

(ii) Applying, $\dfrac{h_i}{h_o} = \dfrac{v}{u} \Rightarrow \dfrac{h_i}{5} = \dfrac{60}{-30}$

$h_i = \dfrac{-60 \times 5}{30} = -10$ cm

or

A real image, $\frac{1}{5}$th the size of object is formed at a distance of 18 cm from a mirror. What is the nature of mirror? Calculate its focal length.

Ans :

As we know that,

Imagination, $m = -\dfrac{v}{u} \Rightarrow -\dfrac{1}{5} = \dfrac{-18}{u}$

$u = -5 \times 18 = -90$ cm

$\dfrac{1}{f} = \dfrac{1}{u} + \dfrac{1}{v} = -\dfrac{1}{90} + \dfrac{1}{-18}$

$= \dfrac{-1-5}{90} = -\dfrac{6}{90} = -\dfrac{1}{15}$

$f = -15$ cm

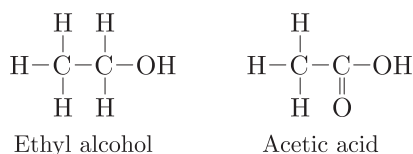Thus, real, inverted and smaller image is formed in the concave mirror.

Section C

25. i. The structural formula of an ester is :

$$
\begin{array}{ccccc}
 & H & O & & H & H \\
 & | & \| & & | & | \\
H- & C- & C- & O- & C- & C-H \\
 & | & & & | & | \\
 & H & & & H & H \\
\end{array}
$$

Write the structural formulae of the corresponding alcohol and the acid.

ii.
  (a) Mention the experimental conditions involved in obtaining ethene from ethanol.
  (b) Write the chemical equation for the above reaction.

iii. Explain the cleansing action of soap.　　[5]

Ans :

i.

$$
\begin{array}{ccc}
 & H & H \\
 & | & | \\
H- & C- & C-OH \\
 & | & | \\
 & H & H \\
\end{array}
\qquad
\begin{array}{ccc}
 & H & \\
 & | & \\
H- & C- & C-OH \\
 & | & \| \\
 & H & O \\
\end{array}
$$

Ethyl alcohol　　　　　　Acetic acid
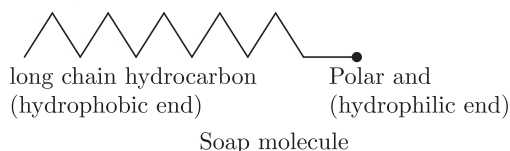
ii.
  (a) When ethanol is heated with excess of concentrated sulphuric acid at 443 K, it gets dehydrated to form ethene.
  (b) $C_2H_5OH + \underset{\text{Conc.}}{H_2SO_4} \xrightarrow{\text{443 K}} \underset{\text{ethene}}{H_2C=CH_2} + H_2O$
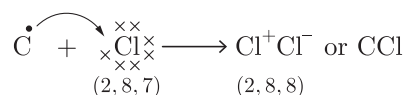
iii. A molecule of soap is made up of two parts:
  (a) An ionic part which is hydrophilic, i.e, water soluble.
  (b) A hydrocarbon chain which is hydrophobic i.e., water-repelling and oil soluble.

long chain hydrocarbon　　　Polar and
(hydrophobic end)　　　　　(hydrophilic end)
Soap molecule

When soap is at the surface of water, the hydrophobic tail protrudes out of water while the ionic end remains inside water. Inside water, the molecules form clusters with the hydrophobic tails in the interior of the cluster and the ionic ends on the surface of the cluster. This formation is called a micelle. Soap, in the form of micelle collects the oily dirt in the centre of the micelle. The micelles stay in solution as a colloid and do not precipitate due to ion-ion repulsion. Thus, the dirt suspended in water is washed away during rinsing.

Figure: A micelle entrapping grease particle

or

Atoms of seven elements A, B, C, D, E, F and G have a different number of electronic shells but have the same number of electrons in their outermost shells. The elements A and C combine with chlorine to form an acdi and common salt respectively. The oxide of element A is a liquid at room temperature and is a neutral substance, while the oxides of the remaining six elements are basic in nature. Based on the above information answer the following questions.

i. What could the element A be ?
ii. Will elements A to G belong to the same period or same group of the periodic table ?
iii. Write the formula of the compound formed by the reaction of element A with oxygen.
iv. Show the formation of the compound by a combination of element C with chlorine with the help of an electronic structure.
v. Which one of the given elements is likely to have the smallest atomic radius ?　　[5]

Ans :

i. Hydrogen
ii. Elements A to G belong to the same group of the periodic table since they contain the same number of electrons in their outermost shells.
iii. $2H_2^+ + O_2 \longrightarrow 2H_2O$ (Since A is hydrogen)
iv.

$$\overset{\bullet}{C} + \underset{(2,8,7)}{\overset{\times\times}{\underset{\times\times}{\times Cl\times}}} \longrightarrow \underset{(2,8,8)}{Cl^+ Cl^-} \text{ or } CCl$$

v Hydrogen (represented by A) is likely to have the smallest atomic radius amongst all the elements in a group. This is because the atomic radius increases while moving down the group.

26. Give reasons for the following :　　[5]
  i. Zinc oxide is considered as an amphoteric oxide.
  ii. Non-metals in general do not displace hydrogen from dilute acids.
  iii. Metals conduct electricity.

Ans :

i. Zinc oxide reacts with acids as well as caustic alkalis to form salt and water as the only products and hence, it is called an amphoteric oxide.
ii. It is because the ionisation potential of most of the non-metals is lower than hydrogen. Thus, non-metals cannot displace hydrogen from dilute acids.
iii. Metals have one to three electrons in their valence shell and these are very loosely held by the nucleus. Thus, when an electric potential is applied at the ends of a metal object, these free electrons start drifting in some particular direction, thereby making the metals good conductors of electricity.

**27.** Make a comparison between photosynthesis and respiration.　　[5]

Ans :

The comparison between photosynthesis and respiration are following :

		Photosynthesis	Respiration
1.		It takes place only in the presence of light.	It occurs in all the tissues during both day and night.
2.		Only green cells of plants can perform photosynthesis.	This occurs in all the cells of an organism.
3.		It takes place inside chloroplast.	Aerobic respiration involves mitochondria and cytoplasm.
4.		It is an anabolic process in which complex compounds (sugars) are broken down into simpler (CO_2 and H_2O) compounds.	It is a catabolic process in which complex compounds (sugars) are formed from the inorganic substances (CO_2 and H_2O).

28. i. What are chromosomes ? Where are they seated ?
ii. What is a sex chromosome ?
iii. Explain the mechanism of sex determination in human beings. [5]

Ans :

i. **Chromosomes :** Chromosomes are the thread like structures found in the nucleus of a cell (plant and animal). These are composed of chromatin and carry the genes from one generation to the next generation.

ii. A chromosome that helps in determining the sex of an individual is known as a sex chromosome.

iii. **The mechanism of sex determination in human beings :** It is assumed that half the children of a couple will be girls and half will be boys. All children of the couple will inherit similar chromosomes (22 + X) from the mother but the sex of the children will depend on the chromosome they inherit from the father. If a child inherits 22 + X chromosomes from the father that will be a girl but when a child will inherit 22 + Y chromosomes from the father that will be a boy. Therefore, the sex of a child is determined by the inheritance of X or Y chromosome from the father.
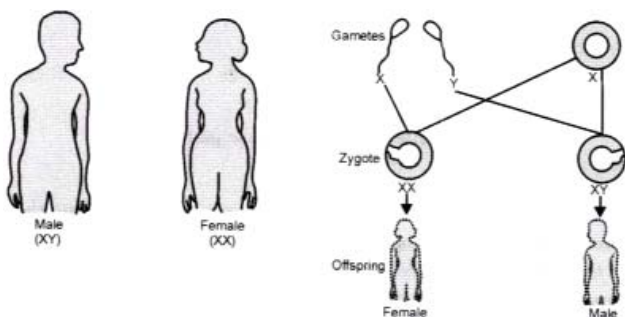
or

What is lymph? Write its important functions.

Ans :

The light yellow fluid in the lymphatic vessels is called lymph. It flows only in one direction from tissues to heart.

Functions of lymph :

i. Lymph functions as a middleman that exchanges materials between blood and tissue fluid.
ii. Lymph helps in maintenance of blood volume.
iii. Lymphocytes mature inside the lymph nodes and are released into lymph passing through the same.
iv. Lymph picks up digested fat from alimentary canal for pouring into blood.
v. Lymph capillaries are specialised to attract and localise germs.
vi. Tissue secretions i.e., hormones, macromolecules, plasma proteins are first poured into lymph for passage into blood.

29. i. Define 1 dioptre of power. Find the focal length of a lens of power -2.0 D. [5]
ii. Why does a lemon kept in a glass tumbler appear to be bigger than its actual size ?
iii. Study the table given below and state the medium in which light ray will travel fastest. Why ?

Medium	A	B	C
Refractive Index	1.33	1.5	2.4

iv. What do you mean by dispersion of light?

Ans :

i. One dioptre is the power of a lens of focal length 1 m.

Focal length, $f = \dfrac{1}{P} = \dfrac{1}{-2.0}$

$$= -0.5 \, \text{m} = -50 \, \text{cm}$$

ii. It is because of refraction from denser medium to rarer medium.

iii. Light ray will travel fastest in medium A due to its least refractive index.

iv. **Dispersion of light :** The phenomenon due to which a white light splits into its component colours, when passed through a prism.
White light is combination of seven different colours of light having different wavelengths. More is the wavelength of light, less is the angle of deviation for the same material and same angle of incidence. This is caused of dispersion of white light.
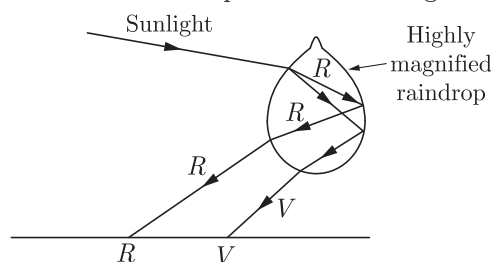
30. i. Two identical resistors each of resistance $10 \, \Omega$ are connected in :
(a) Series (b) Parallel
in turn to a battery of 6 V. Calculate the ratio of power consumed by the combination of resistor in the two cases
ii. List two factors on which the resistance of a conductor depends.
iii. Write a difference between an ammeter and voltmeter. [5]

Ans :

i. (a) When resistors are connected in series.

Then, equivalent resistance, $R_S = 10\,\Omega + 10\,\Omega$
$$= 20\,\Omega$$

Now, Power consumed,
$$P_S = \frac{V^2}{R_S} = \frac{6 \times 6}{20} = 1.8\,\text{W}$$

(b) When resistors are connected in parallel than

equivalent resistance, $\frac{1}{R_P} = \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$

$$R_P = 5\,\Omega$$

Thus, power consumed,
$$P_P = \frac{V^2}{R_P} = \frac{6 \times 6}{5} = 7.2\,\text{W}$$

Then, $\dfrac{P_S}{P_P} = \dfrac{1.8\,\text{W}}{7.2\,\text{W}} = \dfrac{1}{4}$

$$P_S : P_P = 1 : 4$$

ii. Resistance of a conductor depends on:
   (a) length of the conductor
   (b) area of cross-section of conductor.

iii.

	Ammeter	Voltmeter
1.	It is used to measure the current in a circuit.	It is used to measure the potential difference in a circuit.
2.	It is always connected in series in the circuit	It is always connected in parallel in the circuit.

or

i. State the commercial unit of electric energy and find its relation with its SI unit.
ii. The current through a resistor is made three times its initial value. Calculate how it will affect the heat produced in the resistor.
iii. Find the amount of heat generated in a conductor if another conductor of double resistance is connected in the circuit keeping all other factors unchanged.

Ans :

i. Commercial unit of electric energy $= \text{kWh}$

$$1\,\text{kWh} = 3.6 \times 10^6\,\text{J}$$

ii. Initial heat generated in the resistor,
$$H_1 = I^2 R t \qquad\qquad ...(1)$$

when current is made three times i.e. $3I$ now heat generated
$$H_2 = (3I)^2 R t \qquad\qquad ...(2)$$
$$H_2 = 9I^2 R t$$

from equation (1), we get
$$H_2 = 9H_1$$

In later case, heat generated is 9 times the initial heat generated.

iii. If another conductor of $2R$ is connected in series then total resistance $= R + 2R = 3R$.

Now heat generated $H = I^2(3R)t$
$$H = 3I^2 R t$$

CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-5

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

Section A

1. Write the next higher homologue of the following : [1]
  i. C_3H_6

  ii. C_5H_8

  Ans :

  i. C_4H_8

  ii. C_6H_{10}

2. What do we call the movement of shoot towards light? [1]

  Ans :

  Tropic movement i.e., phototropism.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

  The compounds entirely consisting of carbons and hydrogen's are known as hydrocarbons. There are different categories in which hydrocarbons are divided out of which the two are :

  Saturated Hydrocarbons : The hydrocarbons having only sing bonds between the carbon atoms are called saturated hydrocarbons. The includes alkanes having a general formula C_nH_{2n+2}. The first member of homologous series of alkanes is methane ds(CH_4).

  Structure of methane is as follows:

$$H - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - H$$
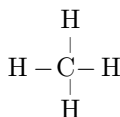
  Unsaturated Hydrocarbons : The hydrocarbons having double and triple bonds between the carbons atoms are called unsaturated hydrocarbons. This includes alkanes and alkynes having general formula C_nH_{2n} and C_nH_{2n+2}, respectively. The first member of homologous series of alkenes is Ethane (C_2H_4). The structure of ethane is as follows: $H_2C = CH_2$.

  The first member of homologous series of alkynes is Ethyne (C_2H_2) having structural formula $HC \equiv CH$.

3.1 Select alkenes and alkynes fron the following: [1]
  C_2H_4, C_3H_4, C_2H_2, C_4H_8
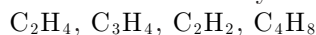
  Ans : C_2H_4 and C_4H_8 are alkenes, C_3H_4 and C_2H_2 are alkynes.

3.2 Name the reaction used to convert saturated hydrocarbons to unsaturated hydrocarbons. [1]

  Ans : Hydrogenation reaction.

3.3 Name the catalyst used in the above conversion reaction. [1]

  Ans : Nickel catalyst

3.4 Draw the structure of hydrocarbons with general formula C_nH_{2n-2} where $n = 3$. [1]

  Ans : Hydrocarbon is C_3H_4

Structure of C_3H_4 is $H - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - C \equiv C - H$
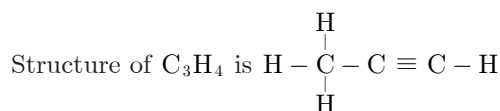
4. **Question numbers 4.1-4.4 are based on the two tables given below. Study these tables and answer the questions that follows:**

Table A

Normal Hemoglobin Count Ranges Widely Accepted by Physicians.	
Birth	13.5 to 24.0 g/dl (mean 16.5 g/dl)
<1 month:	10.0 to 20.0 g/dl (mean 13.9 g/dl)
1 to 2 months:	10.0 to 18.0 g/dl (mean 11.2 g/dl)
2 to 6 months:	9.5 to 14.0 g/dl (mean 12.6 g/dl)
0.5 to 2 yrs:	10.5 to 13.5 g/dl (mean 12.0 g/dl)
2 to 6 yrs:	11.5 to 13.5 g/dl (mean 12.5 g/dl)
6 to 12 yrs:	11.5 to 15.5 g/dl (mean 13.5 g/dl)

Table B

Females	
Age 12 to 18 yrs:	12.0 to 16.0 g/dl (mean 14.0 g/dl)
Age > 18 yrs:	12.1 to 15.1 g/dl (mean 14.0 g/dl)

Male	
Age 12 to 18 yrs:	13.0 to 16.0 g/dl (mean 14.5 g/dl)
Age > 18 yrs:	13.6 to 17.7 g/dl (mean 15.5 g/dl)

4.1 Infer the disease which can be diagnosed from the given data in a girl studying in high school and has hemoglobin 8 g/dl. [1]

Ans : Anaemia

4.2 A student of class 10th likes to eat a diet rich in carbohydrates, junk food has been found anaemic hence he finds it difficult to concentrate on his studies. To help him out of this situations, name any four foods that he must include in his diet. [1]

Ans : Eating iron-rich foods, such as beef, dark green leafy vegetables, dry fruits, and nuts can prevent anaemia caused by iron or vitamin deficiencies.

4.3 A person of 18 years has pale skin, feels dizzy after mild exercise and feels very tired. He got his Hb levels tested. His tests may have shown haemoglobin levels– [1]
(a) 14> g/dl   (b) <11 g/dl
(c) >16 g/dl   (d) <17 g/dl

Ans : (b) <11 g/dl

4.4 Role of haemoglobin is not to [1]
(a) Attach oxygen entering the lungs
(b) Serve as respiratory pigment
(c) Increase residual volume of our lungs.
(d) Decreases residual volume of our lungs

Ans : (c) Increase residual volume of our lungs.

5. 2 ampere current is flowing through a conductor from a 10 volt emf source then resistance of conductor is [1]
(a) 20 Ω   (b) 5 Ω
(c) 12 Ω   (d) 8 Ω

Ans : (b) 5 Ω

or

A voltmeter has a least count 0.05 volt. While doing Ohm's law experiment, a student observed that pointer of the voltmeter coincides with 15th division. The observed reading is :
(a) 0.75 V   (b) 0.075 V
(c) 7.5 V   (d) 75 V

Ans : (a) 0.75 V

6. A convex lens has a focal length of 12 cm. At which of the following positions should an object be placed so that this convex lens may act as magnifying glass ? [1]
(a) 26 cm   (b) 17 cm
(c) 9 cm   (d) 24 cm

Ans : (c) 9 cm

7. The embryonal axis above the cotyledons is called : [1]
(a) Hilum   (b) Radicle
(c) Epicotyle   (d) Seed coat

Ans : (c) Epicotyle

8. When a pH paper is dipped in a solution, the colour of the pH paper changes to deep red. What will be the possible pH of the solution? [1]
(a) 2   (b) 6
(c) 8   (d) none of these

Ans : (a) 2

or

All of the following properties of acetic acid are true except : [1]
(a) it is colourless
(b) it is odourless
(c) it is miscible in water
(d) it turns blue litmus red

Ans : (b) it is odourless

9. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper : [1]
(a) changed to red
(b) changed to first red and then to blue
(c) changed to blue to colourless
(d) remained blue in both the solutions

Ans : (b) changed to first red and then to blue

10. The freshly prepared aqueous solution of ferrous sulphate appears [1]
(a) dark green   (b) pale green
(c) light blue   (d) dark blue

Ans : (b) pale green

11. Kavya observed a slide of Amoeba with elongated nuclei. It would represent : [1]
(a) binary fission
(b) multiple fission
(c) budding
(d) vegetative propagation

Ans : (a) binary fission

12. Mendeleev classified elements in-
(a) increasing order of atomic groups
(b) eight periods and eight groups
(c) seven periods and nine groups
(d) eight periods and seven groups

Ans : (c) seven periods and nine groups

or

Noble gases were included in Mendelev's periodic table in the-
(a) 1st group   (b) 7th group
(c) 8th group   (d) none of these

Ans : (d) none of these

For question numbers 13 and 14, two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Assertion is true and reason is correct explanation of assertion.

(b) Assertion is true but reason is false.

(c) Assertion is false but reason is true.

(d) Both are true but reason is not correct explanation of assertion.

13. Assertion : Aluminium is called a self protecting metal.
   Reason : Aluminium reacts with atmospheric oxygen to form a very thin layer of aluminium oxide, which is sticky in nature.   [1]
   Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. Assertion : The double circulation of blood is necessary in human beings.
   Reason : The double circulation of blood is necessary for constant and efficient supply of oxygen to the body.   [1]
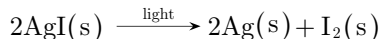   **Ans :** (a) Assertion is true and reason is correct explanation of assertion.

Section B

15. Write an equation each for the decomposition reactions, where energy is supplied in the form of heat, light, or electricity.   [3]
   **Ans :**

   i.   Energy is supplied in the form of heat, during the decomposition of ferrous sulphate crystals.
   $$2FeSO_4(s) \xrightarrow{\text{heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$
   ii. Energy is supplied in the form of light, when silver iodide decomposes to form silver and iodine.
   $$2AgI(s) \xrightarrow{\text{light}} 2Ag(s) + I_2(s)$$
   iii. Energy is supplied in the form of electricity, when molten lead bromide decomposes to form lead and bromine.
   $$PbBr_2(l) \xrightarrow{\text{electricity}} Pb(s) + Br_2(l)$$
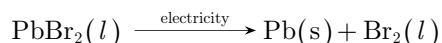
16. Explain the carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most of the other elements?   [3]
   Ans :

   Carbon has 4 electrons in its outermost shell and needs to gain or lose 4 electrons to attain noble gas configuration.

   Losing or gaining 4 electrons is not possible, due to energy considerations; hence it share electrons to form covalent bonds.

   Two reasons for large number of carbon compounds:
   Catenation: The unique ability of carbon to form bonds with other atoms of carbon give rise to along chains of different types of compounds.
   Tetra-valency: Since carbon has a valency of 4, so it is capable of bonding with four other atoms of carbon or atoms of elements like oxygen, hydrogen, nitrogen, sulphur, chlorine etc.

   The reason for the formation of strong bonds by carbon is due to its small size, which enables the nucleus to hold on to the shared pair of electrons

strongly.

                                       or

   i.   Why does distilled water not conduct electricity, whereas rainwater does ?
   ii. Why do the acids not show acidic behaviour in the absence of water ?   [3]
   Ans :

   i.   Distilled water is a covalent compound and as such has no $H^+(aq)$ ions present in it and hence it does not conduct electricity.
        Rainwater contains dissolved gases such as carbon dioxide, sulphur dioxide, nitrogen dioxide, etc. These gases react with rainwater to produce their respective acids. These acids in turn produce $H^+(aq)$ ions, which are responsible for the conduction of current.
   ii. All acids in the pure state are covalent compounds which do not contain any $H^+(aq)$ ions and hence, do not show acidic properties.
        However, when dissolved in water, they produced $H^+(aq)$ ions and hence show acidic behaviour.

17. (i)   Name two metals which react violently with cold water.
   (ii) Write any three observations you would make when such a metal is dropped into water
   (iii) How would you identify the gas evolved, if any, during the reaction ?   [3]
   Ans :

   i.   Sodium and potassium metals react violently with water.
   ii. (a) When sodium is dropped in water it floats on the surface of water.
        (b) It melts to form a silvery ball and darts on the surface of water giving tiny bubbles of a colourless gas.
        (c) The sodium ball gradually decreases in size and finally disappears.
   iii. The colourless gas evolved is hydrogen. When a burning wooden splint is brought near the gas, it burns with a pale blue flame and produces a "pop" sound.

18. What is Chipko movement? How did this movement ultimately benefit the local population and the environment?   [3]
   Ans :

   The Chipko movement was a movement of the local people to resist the deforestation attempt on the hill slopes. It was started in early 1970s in village Reni in Garhwal (Uttarakhand). The women of Reni literally clasped the trees, thus preventing the workers of the contractor to cut the trees.

   Benefits of Chipko movement to the local population
   i.   The Chipko movement helped in the conservation of forests.
   ii. The 'Chipko andolan' forced the government to whom the forest belongs, to re-think their priorities in the use of forest produce.
   iii. It helps to conserve forests, maintain ecological balance and prevent floods and soil erosion.
   iv. It also helps in the availability of forest materials

for the future generations.

or

How is ozone formed in the upper atmosphere? Why is the damage of ozone layer a cause of concern to us? State cause of this damage. [3]

Ans :

The ozone layer occurs naturally in the stratosphere. The ozone layer is formed when intense UV radiation from the sun causes ordinary molecules of oxygen (O_2) in the stratosphere to dissociate into single oxygen atoms (O). Single oxygen atoms are very reactive and combine with O_2 to form O_3.

$$O_2 + UV \text{ radiation} \longrightarrow O + O$$
$$O + O_2 \longrightarrow \underset{\text{Ozone}}{O_3}$$
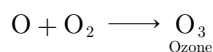
Ozone layer has become a cause of concern because depletion of ozone layer can cause serious effects on human body and other organisms of the environment like eye damage, skin damage, cancer, etc.

CFCs, nitrous oxide, methane, etc., are responsible for the damage of ozone layer.

19. Distinguish between analogous organs and homologous organs. Identify the analogous and homologous organs amongst the following : Wings of an insect, wings of a bat, forelimbs of frog, forelimbs of human. [3]

Ans :

Analogous organs	Homologous organs
These organ are look alike having same functions but are quite different in basic structure and embryonic origin in different species.	These organs are similar in basic structure and embryonic origin but perform different functions in different species.

Analogous organs – Wings of an insect and wings of a bat.

Homologous organs – Forelimbs of frog and forelimbs of human.

20. What is 'phototropism'? How does it occur in plants? Describe an activity to demonstrate phototropism. [3]

Ans :

The movement of plant or a part of plant in response to light is called phototropism.

When a growing plant receives light from one direction, a hormone called auxin is synthesised at the shoot tip which helps the cells to grow longer. Auxin diffuses to the shady side i.e. side opposite to the light. As a result, the cells grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light.

Take a straight potted plant and put it in a place where light is coming from one direction. Plant bends towards the source of light.

21. (a) What is the role of mucus in stomach? [1]
(b) What are the two vital functions of human kidney? [2]

Ans :

(a) To protect the stomach lining from the action of acid and pepsin.

(b) The two vital functions of human kidney are:
   (i) **Excretion :** Removal of toxic wastes like urea, uric acid.
   (ii) **Osmoregulation :** The process of maintaining the right amount of water and proper ionic balance in body. It is done by controlling the amount of water and salts reabsorbed by nephron - tubules.

22. How does the magnitude of induced current change in a closed coil, when
   i.   a more powerful magnet is used ?
   ii. the relative motion of the magnet with respect to the coil increases ?
   iii. the number of turns in the copper coil are decreased ? [3]

Ans :

   i.   The magnitude of the induced current increases.
   ii. The magnitude of the induced current increases.
   iii. The magnitude of the induced current decreases.

23. The near point of a person suffering from hypermetropia is 75 cm. Calculate the focal length and power of the lens required to enable him to read the newspaper which is kept at 25 cm from the eye. [3]

Ans :

Given,

$$u = -25 \text{ cm (For normal eye)}$$
$$v = -75 \text{ cm}$$

Now,
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-75} - \frac{1}{-25}$$
$$= \frac{-1+3}{75} = \frac{2}{75}$$

Thus, focal length of the lens,

$$f = \frac{75}{2} \text{ cm} = \frac{75}{2 \times 100} \text{ m} = \frac{3}{8} \text{ m}$$

Power of the lens, $P = \dfrac{1}{f \text{ (in m)}} = \dfrac{1}{3/8} = \dfrac{8}{3}$ D

$$= 2.67 \text{ D}$$

24. A student focussed the image of a candle flame on a white screen by placing the flame at distances from a convex lens. He noted his observation in the following table:

Distance of the flame from lens (cm)	Distance of the screen from lens (cm)
60	20
40	24
30	30
24	40
12	70

Analyse the above table and answer the following questions :
   i.   What is the focal length of convex lens?
   ii. Which set of observation is incorrect and why?
   iii. Draw the ray diagram to show the image formation for any correct set of observation. [3]

Ans :

   i.   From observation third, distance of object from

lens = distance of image from lens

So, radius of curvature, R = 30 cm

Thus, focal length, $f = \frac{R}{2} = \frac{30\,\text{cm}}{2} = 15$ cm

ii. Last observation is incorrect, because when object is placed less than 15 cm (focal length) from the convex lens will have virtual image, which cannot be taken on the screen.

iii. Ray diagram for image formation for third observation.
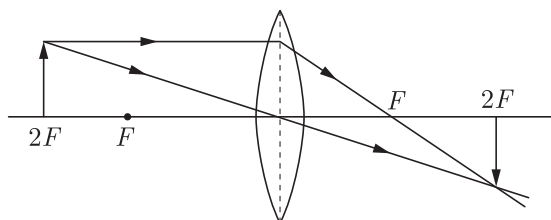
or

i. For the circuit shown in the diagram, calculate :
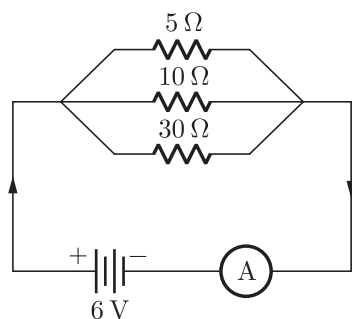
(a) Value of current through the 30 Ω resistor
(b) Total resistance of the circuit

ii. Give two advantages of connecting electrical devices in parallel with battery. [3]

Ans :

(i) (a) Value of current through the 30Ω resistor,

$$I = \frac{V}{R} = \frac{6}{30} = \frac{1}{5} = 0.2\,\text{A}$$

(b) In the circuit all resistor are connected in parallel combination. Hence it equivalent resistance, of the circuit is given by,

$$\frac{1}{R_{eq}} = \frac{1}{5} + \frac{1}{10} + \frac{1}{30} = \frac{6+3+1}{30}$$

$$= \frac{10}{30} = \frac{1}{3}$$

$$R_{eq} = 3\,\Omega$$

ii. Two advantages of connecting electrical devices in parallel with battery are:
(a) Each appliance can be operated by an independent switch.
(b) Each appliance with receive required amount of current at steady voltage.

Section C

**25.** An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

i. Where in the periodic table are elements X and Y placed?

ii. Classify X and Y as metal (s), non-metal(s) or metalloid(s).

iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.

iv. Draw the electron dot structure of the divalent halide. [5]

Ans :

i. X belongs to Group 17 and 3rd period.
   Y belongs to Group 2 and 4th period.

ii. X—Non-metal, Y—Metal

iii. Basic oxide; Ionic bonding

iv.
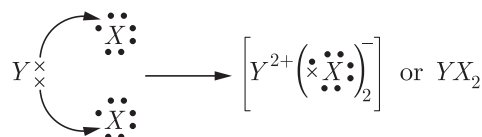
or

Write balanced chemical equation for the reactions taking place when :

i. Zinc carbonate is calcinated.
ii. Zinc sulphide is roasted.
iii. Zinc oxide is reduced in the zinc.
iv. Cinnabar is heated in the air
v. Manganese dioxide is heated with aluminium powder. [5]

Ans :

i. On calcination zinc carbonate decomposes to form its oxide.

$$\underset{\text{Zinc carbonate}}{\text{ZnCO}_3} \xrightarrow{\text{heat}} \underset{\text{Zinc oxide}}{\text{ZnO(s)}} + \underset{\substack{\text{Carbon}\\\text{dioxide}}}{\text{CO}_2(\text{g})}$$
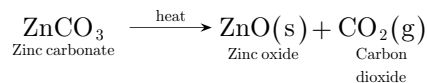
ii. On roasting zinc sulphide changes to its oxide.

$$\underset{\text{zinc sulphide}}{2\text{ZnS(s)}} + \underset{\text{Oxygen}}{3\text{O}_2(\text{g})} \longrightarrow \underset{\text{Zinc oxide}}{2\text{ZnO}} + \underset{\text{Sulphur dioxide}}{2\text{SO}_2(\text{g})}$$

iii. Zinc oxide is reduced in zinc.

$$\underset{\text{Zinc oxide}}{\text{ZnO(s)}} + \underset{\substack{\text{Carbon}\\\text{monoxide}}}{\text{CO(g)}} \longrightarrow \underset{\text{Zinc}}{\text{Zn}(l)} + \underset{\text{Carbon dioxide}}{\text{CO}_2(\text{g})}$$
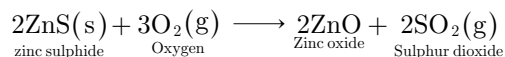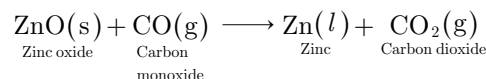
iv. Cinnabar (HgS) is heated in air to form metal mercury.

$$\underset{\substack{\text{Mercury (II)}\\\text{sulphide}}}{2\text{HgS(s)}} + \underset{\text{Oxygen}}{3\text{O}_2(\text{g})} \xrightarrow{\text{heat}} \underset{\substack{\text{Mercury (II)}\\\text{oxide}}}{2\text{HgO(s)}} + \underset{\text{Sulphur dioxide}}{2\text{SO}_2(\text{g})}$$

$$\underset{\text{Mercury (II) oxide}}{2\text{HgO(s)}} \xrightarrow{\text{heat}} \underset{\text{Mercury}}{2\text{Hg}(l)} + \underset{\text{Oxygen}}{\text{O}_2(\text{g})}$$
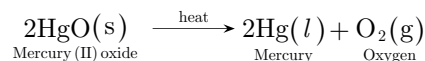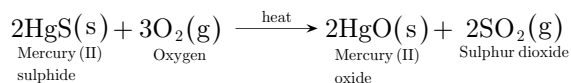
v. Manganese dioxide on heating with aluminium powder will form manganese metal.

$$\underset{\substack{\text{Manganese}\\\text{dioxide}}}{3\text{MnO}_2(\text{s})} + \underset{\text{Aluminimum}}{4\text{Al(s)}} \xrightarrow{\Delta} \underset{\text{Manganese}}{3\text{Mn}(l)} + \underset{\text{Aluminium oxide}}{2\text{Al}_2\text{O}_3}$$

$$+\,\text{Heat}$$
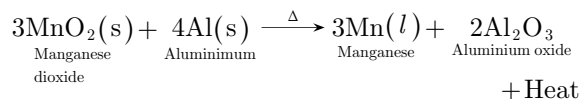
26. (i) Define the term 'isomer'.
(ii) Draw two possible isomers of the compound with molecular formula C_3H_6O and write their names.
(iii) Give the electron dot structure of the above two compound. [5]

Ans :

(i) Isomers are the compound with same molecular formula but different structural formula.

(ii)　Isomers of C_3H_6O: CH_3CH_2CHO − Propanal

CH_3COCH_3 − Propanone or acetone.

(iii) Propanal

$$H - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - \overset{\overset{H}{|}}{C} = O$$

Propanone

$$H - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - \overset{\overset{O}{\|}}{C} - \underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}} - H$$

27. i.　In the given figure name the parts marked 1 to 6 :

ii.　Differentiate between self pollination and cross pollination.　　　　[5]

Ans :

i.　1. Anther,　2. Filament,　3. Petal
　　4. Sepal,　　5. Stigma,　　6. Carpel

ii.

	Self Pollination	Cross Pollination
1.	Self pollination occurs within a flower or between two flowers of the same plant.	Cross pollination occurs between two flowers borne on different plants of the same species.
2.	Flowers are neither attractive, nor do they produce nectar.	Flowers attract insects by various means like coloured petals, nectar, etc.
3.	Pollen grains are produced in small number.	Pollen grains are produced in large number.
4.	No wastage of pollen grains occurs, thus economical.	Wastage of pollen grains occurs, hence uneconomical.

28. Name the main organs of the human digestive system in the order in which they are involved in the digestion of food. In what steps and how does digestion of carbohydrates and proteins take place in our body? [5]

Ans :

The various organs of the human digestive system beginning from mouth are as follows :
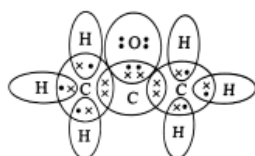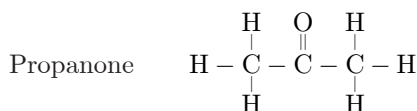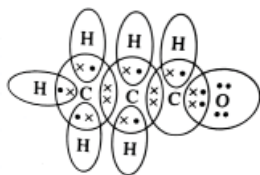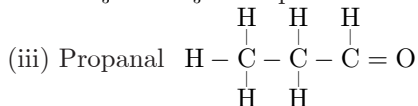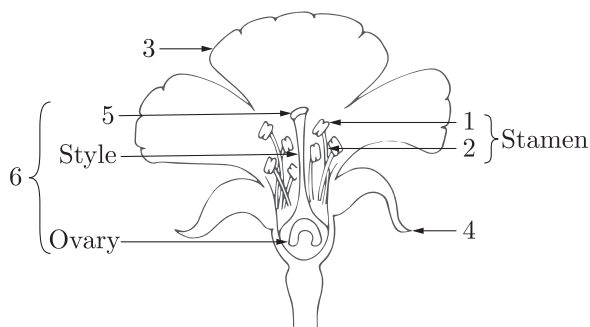Mouth → Oesophagus → Stomach → Small intestine (consisting of duodenum, jejunum and ileum) → Large intestine (consisting of caecum, colon and rectum).

There are three digestive glands associated with the alimentary canal. These are salivary glands, pancreas and liver.

Carbohydrate digestion begins in the buccal cavity itself as human saliva contains an enzyme ptyalin which digests starch into maltose.

Gastric juice in the stomach, contains protein digesting enzyme pepsin which breaks down protein into pep-tones.

The pancreatic juice in the duodenum contains trypsin for converting proteins into pep-tones and peptides. It also contains amylase for breaking starch into maltose.

The partially digested protein and carbohydrates with the help of succus entericus completes digestion. Amino acids and glucose are finally produced.

or

How do the guard cells regulate opening and closing of stomatal pores? Explain with the help of diagram. Also, indicate what happens to the rate of photosynthesis if stomata get blocked due to dust.　　　　[5]

Ans :

The opening and closing of the stomatal pore is a function of guard cells. Stomata act as turgor operated valves. The guard cells are thicker on the inner side and thinner on the outer side. The guard cells swell when water flow into them from the surrounding epidermal cells. They get curved out due to thick inner walls and produce a pore in between. Similarly, the pore closes when guard cells lose water to their surrounding cells and shrink back to their original position.
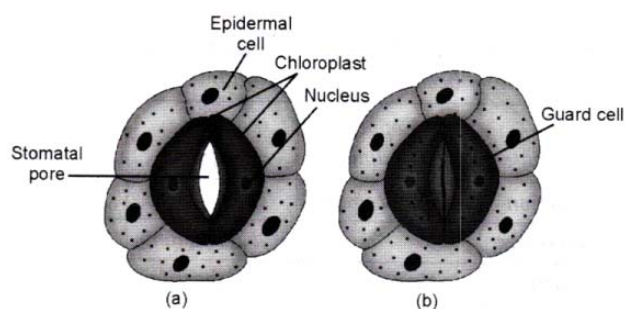
Plants takes carbon dioxide from stomata which is required for the process of photosynthesis. If stomata get blocked due to dust. The rate of photosynthesis will decrease due to deficiency of carbon dioxide.

29. i.　What do you understand by the term fuse in an electric circuit ?
ii.　State two properties of a material, which make it suitable for making a fuse wire.
iii.　Why is a fuse wire always placed in the live wire of an electric circuit ?
iv.　How does a fuse wire protect an electric circuit ?
v.　Two fuse wires A and B of the same length are rated 15 A and 5 A. Which amongst the A and B will be thicker and why ?　　　　[5]

Ans :

i. Fuse is the weakest link in an electric circuit, which melts when the circuit gets overloaded or short circuited.

ii. (a) The material of the fuse wire should have high electric resistance.
    (b) The material of the fuse wire should have low melting point.

iii. When the fuse wire melts in the live wire circuit due to overloading, it completely disconnects the given appliance from the circuit. Thus, the appliance is safe to touch with bare hands and is also saved from any electrical damage.

iv. When the circuit gets overloaded, more current flows through the fuse wire, which in turn melts it. This cuts off the current in the given circuit and hence, it is protected from any damage, such as electric fire.

v. The wire A with 15 A rating is thicker. It is because, thicker the wire, less is its resistance and hence it can carry more current.

30. (i) Explain the term refraction of light.
   (ii) Letters written on a paper when seen through a thick glass slab appear to be raised. Explain this phenomenon with the help of a ray diagram.
   (iii) Light enters from air into diamond which has refractive index, 2.42. The speed of light in air is $3 \times 10^8 \, \text{ms}^{-1}$. Calculate the speed of light in diamond. [5]

Ans :

(i) The phenomenon of bending of light rays, when it passes from an optically rarer medium to an optically denser medium or vice versa is termed as refraction.

(ii) Letters written on paper when seen through a thick glass slab appears to be raised from their actual position because of the phenomenon of refraction of light.

Consider two light rays coming from the printed letter below the glass slab.

These rays would be refracted on coming out of the glass slab. When these rays were to be extended backwards they will meet at a slightly raised position, giving us the illusion that letters are raised.
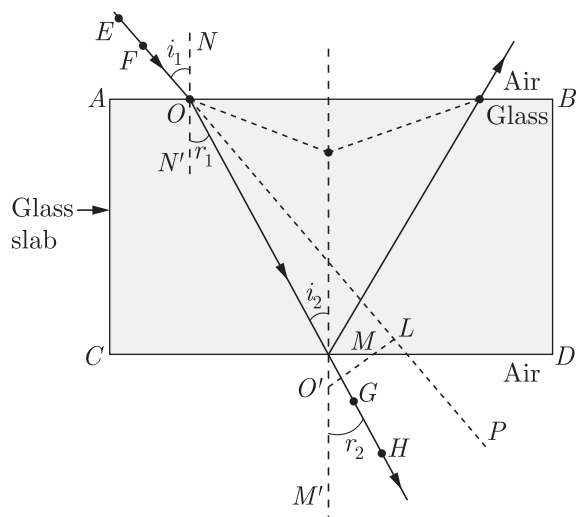
(iii) Refractive index of diamond, $n_d = 2.42$

Speed of light in air, $v_a = 3 \times 10^8 \, \text{ms}/$

We know, refractive index,

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}}$$

$$2.42 = \frac{3 \times 10^8 \, \text{ms}^{-1}}{2 \, \text{Speed of light in diamond}}$$

Speed of light in diamond,

$$v_d = \frac{3 \times 10^8 \, \text{ms}^{-1}}{2.42}$$

$$= 1.24 \times 10^8 \, \text{ms}^{-1}$$

CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-6

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　**Maximum Marks : 80**

General Instructions :

(i)　The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii)　All questions are compulsory.

(iii)Internal choice is given in each sections.

(iv)All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v)　All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi)All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii)This question paper consists of a total of 30 questions.

Section A

1. Name the Physicist who discovered the magnetic effect of the electric current. 　　　　[1]

Ans :

The name of Physicist is Oersted.

2. No two individuals are absolutely alike in a population. Why ? 　　　　[1]

Ans :

Due to variations the differences between the parents and children as individual of the species are occurred. So no two individuals are absolutely alike in a population.

3. **Answer question numbers 3.1–3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

The human eye is like a camera. Its lens system forms an image on a light-sensitive screen called the retina. Light enters the eye through a thin membrane called the cornea. It forms the transparent bulge on the front surface of the eyeball as shown in the figure. The crystalline lens merely provides the finer adjustment of focal length required to focus objects at different distances on the retina. We find a structure called iris behind the cornea. Iris is a dark muscular diaphragm that controls the size of the pupil. The pupil regulates and controls the amount of light entering the eye.
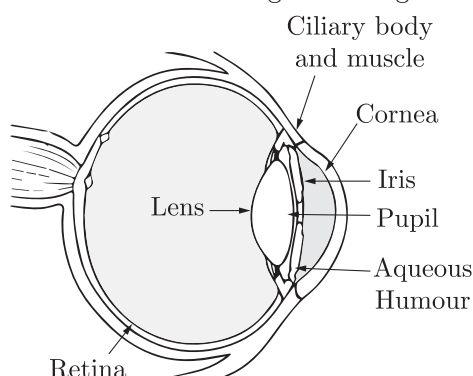
Fig: The Human Eye

There are mainly three common refractive defects of vision. These are (i) myopia or near-sightedness, (ii) hypermetropia or far-sightedness, and (iii) Presbyopia. These defects can be corrected by the use of suitable spherical lenses.

3.1 What is the function of pupil in the human eye? [1]

Ans : The pupil regulates and controls the amount of light.

3.2 What is the far point and near point of human eye with normal vision? 　　　　[1]

Ans : The far point is infinity and near point is about 25 cm of the normal human eye.

3.3 A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? 　　　　[1]

Ans : The student is suffering from short-sightedness or myopia.

3.4 What is the function of iris in human eye? 　　[1]

Ans : Iris is a dark muscular diaphragm that controls the size of the pupil.

4. Given table provides the resistivity of conductors, alloy and insulators. Study the table and answer the following questions.

	Material	Resistivity $(\Omega\,m)$
Conductors	Silver	1.60×10^{-8}
	Copper	1.62×10^{-8}
	Aluminium	2.63×10^{-8}
	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-8}
	Manganese	1.84×10^{-6}

	Material	Resistivity $(\Omega\,m)$
Alloys	Constantan (alloy of Cu and Ni)	49×10^{-6}
	Manganin (alloy of Cu, Mn and Ni)	44×10^{-6}
	Nichrome (alloy of Ni, Cr, Mn, and Fe)	100×10^{-6}
Insulators	Glass	$10^{10} - 10^{14}$
	Hard rubber	$10^{13} - 10^{16}$
	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Paper (dry)	10^{12}

4.1 Why among iron is a better conductor than mercury? [1]

Ans : Iron is a better conductor than mercury because the resistivity of iron $(= 10 \times 10^{-8}\,\Omega m)$ is less than the resistivity of mercury $(= 94 \times 10^{-8}\,\Omega\,m)$.

4.2 Which material is the best conductor? [1]

Ans : It can be observed from table that the resistivity of silver is the lowest among the listed materials. Hence, silver is the best conductor.

4.3 The copper and aluminium have [1]
(a) Low resistivity
(b) high resistivity
(c) zero resistivity
(d) high energy losses

Ans : (a) Low resistivity

4.4 Alloys are commonly used in electrical heating devices due to [1]
(a) Low resistivity as compare to all substance
(b) high resistivity as compare to metals
(c) Low resistivity as compare to metals
(d) None of these

Ans : (b) high resistivity as compare to metals

5. 2 ampere current is flowing through a conductor from a 10 volt emf source then resistance of conductor is [1]
(a) $20\,\Omega$ (b) $5\,\Omega$
(c) $12\,\Omega$ (d) $8\,\Omega$

Ans : (b) $5\,\Omega$

or

Three resistors of $4.0\,\Omega$, $6.0\,\Omega$ and $10.0\,\Omega$ are connected in series. What is their equivalent resistance [1]
(a) $20\,\Omega$ (b) $7.3\,\Omega$
(c) $6.0\,\Omega$ (d) $4.0\,\Omega$

Ans : (a) $20\,\Omega$

6. A student is to find the focal length of (i) a concave mirror (ii) convex lens by focussing the image of a distant object on a screen. He will observe that the screen is on the same side as that of the object in [1]
(a) both cases
(b) case (i) but not in case (ii)
(c) case (ii) but not in case
(d) neither case (i) nor in case (ii)

Ans : (b) case (i) but not in case (ii)

7. A student takes some zinc granules in a test tube and adds dil. HCl to it. He would observe that the colour of zinc granules changes to : [1]
(a) brown
(b) black
(c) yellow
(d) white

Ans : (b) black

8. Crystals of CH_3COOH, when dissolved in water will form : [1]
(a) weak acid
(b) weak base
(c) strong acid
(d) strong base

Ans : (a) weak acid

or

The pH value of a solution is in the range of 6 to 8. What is the colour developed when a student adds three drops of universal indicator in the solution? [1]
(a) Red (b) Blue
(c) Green (d) Orange

Ans : (c) Green

9. The part of the seed which is also known as embryonic leaf : [1]
(a) Embryo (b) Cotyledon
(c) Radicle (d) Plumule

Ans : (b) Cotyledon

10. Select the incorrect statement about budding : [1]
(a) A bud always arises from a particular region on a parent body
(b) A bud may arise from any part of the parent cell
(c) Before detaching from the parent body, a bud may form another bud
(d) A bud may separate from the parent body and develops into a new individual

Ans : (b) A bud may arise from any part of the parent cell

11. To show experimentally that zinc is more reactive than copper, the correct procedure is to : [1]
(a) prepare copper sulphate solution and dip zinc strip into it
(b) prepare zinc sulphate solution and dip copper in it
(c) heat zinc and copper strip
(d) add dilute nitric acid on both the strips

Ans : (a) prepare copper sulphate solution and dip zinc strip into it

12. The positions of four elements X, Y, Z and P in the modern periodic table are shown below. Which of the following is the correct order of increasing electro-negativity of the elements? [1]

(a) $X < Y < Z < P$ (b) $Y < X < Z < P$
(c) $P < Z < Y < X$ (d) $Z < P < Y < X$

Ans : (c) $P < Z < Y < X$

Electro-negativity increase across a period and decreases down a group. Therefore, the correct order of electro-negativity of the elements is $P < Z < Y < X$.

or

Consider the following statements about bases.
I. Bases have bitter taste and soapy touch,.
II. With carbon dioxide, they form salt and water.
III. The gas evolved with zinc metal extinguishes a lightning splinter. [1]
The correct statements (s) is/are:
(a) I and II   (b) II and III
(c) only I   (d) all of these

Ans : (a) I and II

Statement I and II are correct. Bases are better in taste and have a soapy touch.
Carbon dioxide is acidic in nature. So, it produces salt and water with the bases.
Hydrogen gas is evolved by the reaction of zinc with bases. This gas does not extinguish a lighting splinter.

(Q.no 13 to 14) In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.
(a) If assertion is true and reason is correct explanation of assertion.
(b) If assertion is true but reason is false.
(c) If assertion is false but reason is true.
(d) If both are false.

13. **Assertion :** Halides (chloride, bromide and iodide) of silver are kept in dark brown or black bottle.
    Reason : The halides of silver on absorbing sunlight decompose to form silver metal and halogen. [1]
    Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. **Assertion :** The use of iodised salt is advisable.
    Reason : Iodine is essential for the synthesis of thyroxine hormone in thyroid gland. [1]
    Ans : (a) Assertion is true and reason is correct explanation of assertion.

Section B

15. i. Name a metal for each case :
    (a) It does not react with cold as well as hot water but reacts with steam.
    (b) It does not react with any physical state of water.
    ii. When calcium metal is added to water the gas evolved does not catch fire but the same gas

evolved on adding sodium metal to water catches fire. Why is it so ? [3]
Ans :
i. (a) Iron (b) Copper
ii. The gas evolved in case of calcium or sodium is hydrogen. In case of calcium the metal sinks in water and the hydrogen gas bubbles out of water. Thus, the heat of the reaction is not sufficient for the combustion of hydrogen.
Sodium metal floats on the surface of water. The heat of the reaction is sufficient to ignite hydrogen and hence it catches fire.

16. The electronic configuration of an element 'X' is 2, 8, 8, 2. To which (a) period and (b) group of the modern periodic table does X' belong" ? State its valency. Justify your answer in each case. [3]
Ans :
Electronic configuration of X — 2, 8, 8, 2
i. As the atom X has 4 electron shells, thus, it belongs to the 4th period.
ii. As the atom X has 2 electrons in the outermost shell, therefore, it belongs to the 2nd group. As the atom X has 2 electrons in the outermost shell, so its valency is 2.

or

Four elements P, Q, R and S have atomic numbers 12, 13, 14, and 15 respectively. Answer the following questions giving reasons :
i. What is the valency of Q ?
ii. Classify these elements as metals and non-metals.
iii. Which of these elements will form the most basic oxide ? [3]
Ans :
Electronic configuration of given elements are shown below :
    P–2,8,2
    Q–2,8,3
    R–2,8,4
    S–2,8,5
i. As the atom Q has 3 electrons in its outermost shell, so its valency is 3.
ii. The elements which donate 1 to 3 electrons from their valence shell are metals. Elements. P and Q have 2 and 3 electrons in their valence shells respectively, so, these are metals. But elements which share or accept 4 to 1 electrons in their valence shell are non-metals R and S elements have 4 and 5 electrons in their valence shell respectively, so, these are non-metals.
iii. Element P will form the most basic oxide, because it has least electrons 2 in its valence shell among all the four elements.

17. A compound which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water. Identify the compound. Write the chemical equation for its preparation. For what purpose is it used in hospitals ? [3]
Ans :
The compound is Plaster of Paris.
Plaster of Paris is prepared from naturally occurring gypsum.

$$CaSO_4 \cdot 2H_2O(s) \xrightarrow[100°C]{heat} CaSO_4 \cdot \frac{1}{2}H_2O(s)$$
$$+ \frac{3}{2}H_2O(g)$$

Plaster of Paris is used in hospitals for plastering fractured bones to set them at the right place in fixed position.

18. Explain with the help of suitable examples why certain traits cannot be passed on to the next generation. What are such traits called ? [3]

Ans :

The traits which people acquire during their lives, like knowledge and skills due to some special efforts, use or disuse of organs and due to some environmental factors. These traits cannot be passed on to the next generations, called acquired traits. It can be understood with the help of some examples such as—

If a group of mice having tail will breed, their progeny will also have the same type of tail but if the tail of all the mice is removed by surgery in each generation, no tailless mouse will be produced even after a few generations. It is because the removal of tail is a physical change which could not make a change in the gene responsible for the presence of tail in mice.

or

A cross was carried out between a pure bred tall pea plant and a pure bred dwarf pea plant and F_1 progeny was obtained. Later, the F_1 progeny was selfed to obtain, F_2 progeny. Answer the following questions.
i. What is the phenotype of the F_1 progeny and why?
ii. Give the phenotype ratio of the F_2 progeny.
iii. Why is the F_2 progeny different from the F_1 progeny ? [3]

Ans :

i. The first generation of F_1 progeny formed are all tall due to dominant characters.
ii. The F_2 generation has tall pea plants and dwarf pea plants in the ratio of 3:1.
iii. The F_2, progeny of the F_1 tall plants are not all tall, some are dwarf. There were no plants with intermediate height in between tall and dwarf plants. Thus, the traits are inherited independently.

19. How are the fats digested in our bodies ? Where does this process take place ? [3]

Ans :

The small intestine is the site of the complete digestion of fats. It receives the secretions of the liver and pancreas for this purpose. Fats are present in the intestine in the form of large globules. Bile salts break them down into smaller globules increasing the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzyme lipase for breaking down emulsified fats. The wall of the small intestine contain glands which secrete intestinal juice. The enzyme present in it finally convert the fats into fatty acids and glycerol.

20. (i) Why fertilisation is only possible, if copulation takes place during the middle of menstrual cycle? Also, name the process which gets temporarily stopped, when a woman gets pregnant.
(ii) Prenatal sex-determination has been banned in India. Comment. [3]

Ans :

(i) As ovulation occurs on the 14th day of the menstrual cycle, sperms have greater chances during this period to fertilise the egg or ovum. After fertilisation, the process of menstruation does not occur as during pregnancy the thick uterine wall, which would get sloughed off during the menstrual cycle, is now being used for nourishment, growth and development of fertilised ovum.
(ii) The male-female sex ratio is rapidly declining in the Indian society due to the practise of female foeticide. Thus, to avoid this, prenatal sex-determination has been banned in India.

21. Calculate the amount of charge that would flow in one hour through the element of an electric iron drawing a current of 0.4 A. [3]

Ans :

Current, $(I) = 0.4$ A

Time $(t) = 1$ hour $= 3600$ s

Electric charge, $(Q) = I \times t = 0.4 \times 3600 = 1440$ C

22. i. What is the total resistance of n resistors each of resistance 'R' connected in: (a) series ? (b) parallel?
ii. Calculate the resultant resistance of 3 resistors $3\,\Omega, 4\,\Omega$ and $12\,\Omega$ connected in parallel. [3]

Ans :

i. In series combination
$$R_S = R_1 + R_2 + ...R_n$$
$$R_S = R + R.....n \text{ times}$$
$$R_S = nR$$
In parallel combination:
$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + ...\frac{1}{R_n}$$
$$\frac{1}{R_P} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} + ... + n \text{ times}$$
$$\frac{1}{R_P} = \frac{1 + 1 + ...n \text{ times}}{R}$$
$$\frac{1}{R_P} = \frac{n}{R}$$
$$R_P = \frac{R}{n}$$

ii. Given:
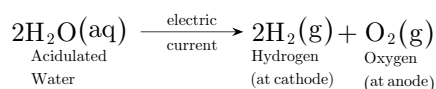$$R_1 = 3\,\Omega$$
$$R_2 = 4\,\Omega$$
$$R_3 = 12\,\Omega$$
$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3} + \frac{1}{4} + \frac{1}{12}$$
$$= \frac{4 + 3 + 1}{12}$$
$$R = \frac{12}{8}\,\Omega = \frac{3}{2}\,\Omega$$
$$= 1.5\,\Omega$$

23. Why does the pH of the mouth change after taking meals ? What harm is associated with it and how can it be overcome ?   [3]

Ans :

Normally the pH in the mouth is more than 7 as the saliva produced by the salivary glands is basic in nature. However, after meals some food particles continue sticking to the teeth and other parts of the mouth. These food particles rapidly decay due to bacterial action to produce acids and hence the pH within the mouth cavity decreases.

If the pH falls below 5.5 then the enamel on the teeth gets corroded, thereby, causing tooth cavities. The best way to avoid tooth cavities is to brush teeth with some toothpaste. All toothpastes contain some basic substances which neutralise acids.

24. An object placed on a metre scale at 8 cm mark was focused on a white screen placed at 92 cm mark, using a converging lens placed on the scale at 50 cm mark.   [3]
i.   Find the focal length of the converging lens.
ii.   Find the position of the image formed if the object is shifted towards the lens at a position. of 29.0 cm.
iii. State the nature of the image formed if the object is further shifted towards the lens.

Ans :

Given,   Position of object $= 8$ cm mark

Position of screen $= 92$ cm mark

Position of converging lens $= 50$ cm mark

$$u = (8 - 50) \text{ cm} = -42 \text{ cm}$$

$$v = 92 - 50 = 42 \text{ cm}$$

i.
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{42} - \left(-\frac{1}{42}\right)$$

$$= \frac{1}{42} + \frac{1}{42} = \frac{2}{42} = \frac{1}{21}$$

$$f = 21 \text{ cm}$$

Thus, focal length of converging lens $= 21$ cm
ii.   Now, position of object $= 29$ cm

$$u = (29 - 50) \text{ cm} = -21 \text{ cm}$$

$$f = 21 \text{ cm}$$

Again, $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{21} = \frac{1}{v} - \left(-\frac{1}{21}\right)$$

$$\frac{1}{v} = \frac{1}{21} - \frac{1}{21} = \frac{0}{21}$$

$$v = \frac{21}{0} = \infty$$

iii. The image formed on the same side as the object and is highly enlarged, virtual and erect.

or

When and where do we see a rainbow? How is a rainbow formed? Draw a labelled diagram to illustrate the formation of a rainbow   [3]

Ans :

Rainbow is always formed in the direction opposite to that of the sun, just after the rain. The rainbow is produced due to the raindrop dispersion of sunlight by tiny droplets of water suspended in air, just after rain.

The suspended tiny droplets of water act as innumerable small prisms. When the sunlight is incident on the side A of the tiny droplet of water, it gets refracted as well as dispersed. The dispersed rays on striking the surface B of the tiny water drop suffer total internal reflection, and hence, moves on towards surface A.

At the surface A, the rays further suffer refraction and emerge out as the band of colours in the form of a circular arc along the horizon. The red colour appears on the upper arc of rainbow and violet colour on the innermost arc.

You can also see rainbow on a bright sunny day, in the mist created by a waterfall or a water fountain.

Section C

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.
i.   Where in the periodic table are elements X and Y placed ?
ii.   Classify X and Y as metal (s), non-metal(s) or metalloid(s)
iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.
iv.   Draw the electron dot structure of the divalent halide.   [5]

Ans :

i.   X belongs to Group 17 and 3rd period.
      Y belongs to Group 2 and 4th period.
ii.   X–Non-metal, Y–Metal
iii. Basic oxide; Ionic bonding
iv.

or

An organic compound 'X' on heating with conc. H_2SO_4 forms a compound 'Y' which on addition of one molecule of hydrogen in the presence of nickel forms a compound 'Z'. One molecule of compound 'Z' on combustion forms two molecules of CO2 and three molecules of H_2O. Identify giving reasons the compounds 'X', 'Y' and 'Z'. Write the chemical equations for all the chemical reactions involved.   [5]

Ans :

Since compound Z gives 2 molecules of CO_2 and 3 molecules of H_2O, it shows that it has the molecular formula C_2H_6 (ethane). Z is obtained by the addition of one molecule of hydrogen to compound Y so the molecular formula of Y should be C_2H_4 (ethene). Compound Y is obtained by heating compound X with concentrated H_2SO_4 which shows it to be an alcohol. So compound X could be C_2H_5OH (ethanol).

$$\underset{(X)}{C_2H_5OH} \xrightarrow{\text{Hot conc. } H_2SO_4} \underset{(Y)}{C_2H_4} + H_2O$$

$$\underset{(Y)}{C_2H_4} + H_2 \xrightarrow{Ni} \underset{(Z)}{C_2H_6}$$

$$\underset{(Z)}{2C_2H_6} + 7O_2 \longrightarrow 4CO_2 + 6H_2O + \text{heat and light}$$

26. i. State your observations when electric current is passed through acidulated water contained in a voltmeter, such that each electrode has been covered by a test tube containing water.
ii. How will you test the gas evolved?
iii. Write an electrochemical equation for the reaction. [5]

Ans :

i. (a) Tiny bubbles of a colourless gas is formed on each electrode.
(b) These bubbles of colourless gas rise up in the test tubes. They collect in the form of colourless gases and in doing so displaces the water in the downward direction.
(c) The volume of gas collected at cathode is twice the volume of gas collected at anode.

ii. The gas which collects at the cathode is hydrogen. It can be tested as follows:
(a) Light a candle. Lift the test tube in the inverted position from the cathode and bring its mouth near the flame of the candle. You will observe that the gas burns with a "pop" sound and the candle goes off. This is a test for hydrogen gas.
(b) Take a glowing wooden splint. Lift the test tube in inverted position from the anode and introduce the glowing splint in it. You will observe that the splint bursts into flame. This is a test for oxygen.

iii. The electrochemical reactions can be expressed as follows :

$$2H_2O(aq) \xrightarrow[\text{current}]{\text{electric}} 2H_2(g) + O_2(g)$$
$$\underset{\substack{\text{Acidulated} \\ \text{Water}}}{} \qquad \underset{\substack{\text{Hydrogen} \\ \text{(at cathode)}}}{} \underset{\substack{\text{Oxygen} \\ \text{(at anode)}}}{}$$

27. i. Draw a diagram of the Human Alimentary Canal and label on it:
Oesophagus, Gall bladder, Liver and Pancreas.
ii. Explain the statement, 'Bile does not contain any enzyme but it is essential for digestion.' [5]

Ans :

i.
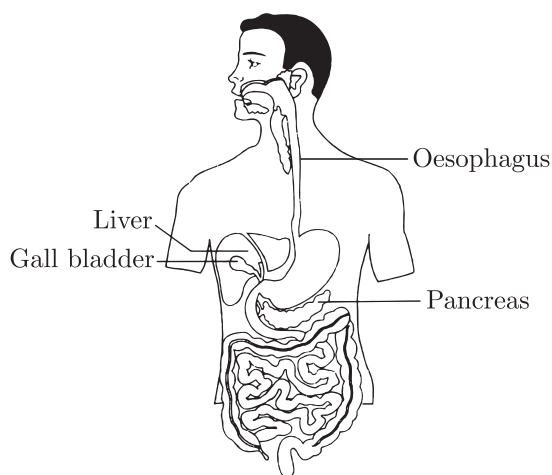
Human Alimentary canal

ii. (a) Bile does not contain any enzyme but it contains sodium salt and pigments.
(b) Bile emulsifies fats and makes it easy for the enzymes to act on it.
(c) Bile is alkaline and it makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.

28. What is pollination? How does it occur in plants? How does pollination lead to fertilization? Explain.[5]

Ans :

Pollination: Transfer of pollen grains from anther to stigma is called pollination. It is of two types.

i. **Self Pollination :** The transference of pollen grains from the anther of a flower to the stigma of the same flower or of another flower born on the same plant is called self pollination.

ii. **Cross pollination :** The transference of pollen grains from anther of a flower of one plant to the stigma a flower of another plant of the same species is called cross pollination. As the pollen grains are not capable of locomotion, they have to depend on various agents for transmission. These agents are wind, water or animals.
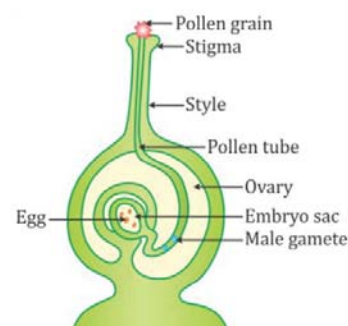
Then pollination leads to fertilisation. After the pollen grains are deposited on the stigma, the pollen grains absorb water and sugar from the surface of stigma and swell up. A tube grows out of the pollen grain and travel through the style to reach the ovary. The pollen tube carrying two male gametes which liberated inside the embryo sac. One male gamete fuses with the egg to form zygote. The other male gamete fuses with secondary nucleus to form the endosperm, which provides nourishment to the growing embroyo.

or

i. Name the parts labelled A, B, C , D and E.
ii. Where do the following functions occur ?
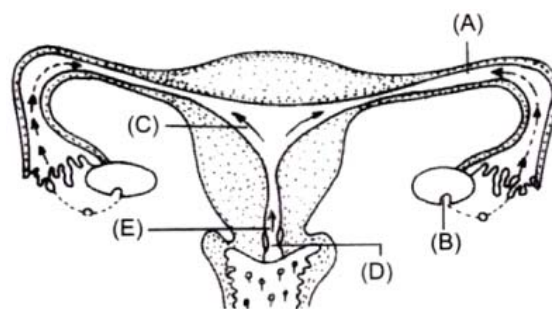
(a) Production of an egg
(b) Fertilisation
(c) Implantation of zygote

iii. What happens to the lining of uterus;
(a) before release of a fertilized egg ?
(b) if no fertilisation occur ? [5]

Ans :

i. A — Oviduct or fallopian tube
   B — Ovary
   C — Uterus

D — Cervix
E — Vagina
ii. (a) Ovary
(b) Fallopian tube
(c) Uterus
iii.
(a) In human female, before release of fertilised egg uterus prepares itself every month to receive and nurture the growing embryo. The lining of uterus thickens and is richly supplied with blood to nourish the growing embryo.
(b) If fertilisation does not occur, the lining is not required any more. Hence, the thickened lining of the uterus breaks down along with blood vessels. The degenerated part of uterus along with the blood moves out of the vagina in the form of bleeding, is called menstruation.

29. i. To construct a ray diagram we use two light rays which are so chosen that it is easy to know their directions after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use these two rays to locate the image of an object placed between infinity and the centre of curvature of a concave mirror
ii. Draw a ray diagram to show the formation of image of an object placed between the pole and principal focus of a concave mirror. How will the nature and size of the image formed change, if the mirror is replaced by a converging lens of same focal length ? [5]

Ans :

i. To construct a ray diagram we use two light rays:
(a) A ray of light parallel to principal axis of a concave mirror, after reflection it passes through the principal focus of the concave mirror.
(b) A ray of light which passes through the centre of curvature of a concave mirror, after reflection it retraces its path.
To locate the image of an object placed between infinity and the centre of curvature of a concave mirror:
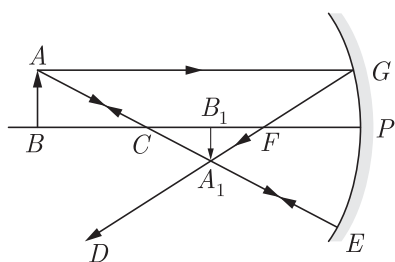
AB is an object situated between infinity and the centre of curvature of the concave mirror. A ray of light starting from point A, moving parallel to the principal axis of the concave mirror along AG after reflection passes through the point F and moves along GD. Another ray starting from the point A along AC, strikes the mirror at point E retraces its path. Thus, the divergent beams starting from point A, on striking the mirror at points G and E, after reflection, converge at point A1, thereby forming an image $A_1 B_1$. This image is between the centre of curvature (C) and

focal point (F), in front of concave mirror. The image is real, inverted and diminished.
ii. A ray diagram to show the formation of image of an object placed between the pole and principal focus of a concave mirror.
$A_1 B_1$ is the image of the object AB which is formed behind the concave mirror. The image is virtual, erect and magnified.
If the mirror is replaced by a converging lens of same focal length then image formed on the same side as the object. The image is virtual, erect and enlarged.

30. i. What is a solenoid ? Draw a sketch of the pattern of the field lines of the magnetic field through and around a current carrying solenoid.
ii. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop. [5]

Ans :

i. An insulated copper wire wound on some cylindrical cardboard or plastic tube, such that its length is greater than its diameter and it behaves like a magnet when a current is made to flow through it, is called a solenoid.
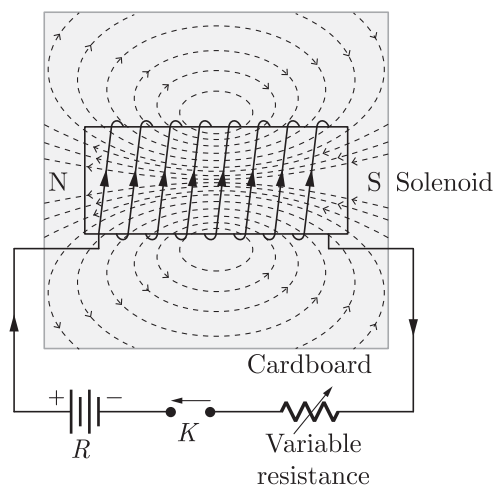
ii. The magnetic field inside the circular loop is perpendicular to the table top and goes in the downward direction.
The magnetic field outside the circular loop is perpendicular to the table and goes in the upward direction.
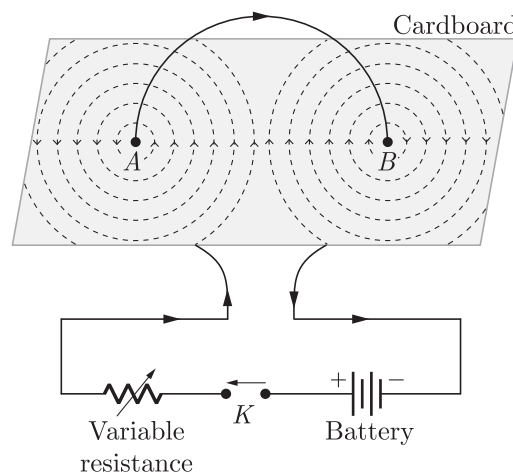
or

When two resistors of resistances R_1 and R_2 are connected in parallel, the net resistance is 3 Ω. When connected in series, its value is 16 Ω. Calculate the values of R_1 and R_2. [5]

Ans :

R_1 and R_2 are in parallel combination.

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{R_1 \times R_2}{R_1 + R_2} = 3 \qquad\qquad ...(1)$$

When R_1 and R_2 are in series combination.

$$R_s = R_1 + R_2 = 16\,\Omega$$

$$R_1 + R_2 = 16 \qquad\qquad ...(2)$$

After solving equation (1) and equation (2),We get

$$R_1^2 - 16R_1 + 48 = 0$$

$$(R_1 - 4)(R_1 - 12) = 0$$

$$R_1 = 4\,\Omega, 12\,\Omega$$

$$R_2 = 12\,\Omega \text{ or } 4\,\Omega$$

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CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-7

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii) This question paper consists of a total of 30 questions.

Section A

1. State your observations when a clean magnesium strip is held in a Bunsen flame for sometime. **[1]**

Ans :

i. Magnesium ribbon catches fire and burns with a dazzling white flame.

ii. A white powdery mass is formed as a product.

2. In the modern periodic table which are the metals amongst the first ten metals. **[1]**

Ans :

Lithium (Li) and beryllium (Be) are metals.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

While dealing with the reflection of light by spherical mirrors, we shall follow a set of sign conventions called the New Cartesian Sign Convention. In this convention, the pole (P) of the mirror is taken as the origin. The principal axis of the mirror is take as the x-axis of the coordinate system. In a spherical mirror, the distance of the object from its pole is called the object distance (u). The distance of the image from the pole of the mirror is called the image distance (v). Magnification produced by a spherical mirror gives the relative extent to which the image of an object is magnified with respect to the object size. It is expressed as the ratio of the height of the image to the height of the object. It is usually represented by the letter (m).
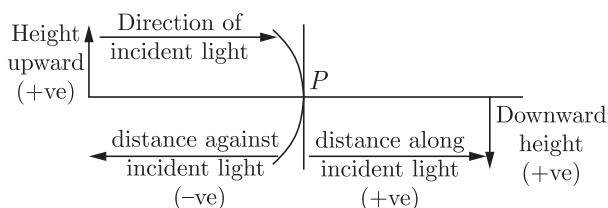
3.1 How can you calculate the magnification of a spherical mirror? **[1]**

Ans : If h is the height of the object and h' is the height of the image, then the magnification m produced by a spherical mirror is given by

$m =$Height of the image (h')/Height of the object (h)

$$m = \frac{h'}{h}$$

3.2 What does a negative sign in the value of magnification indicates? **[1]**

Ans : A negative sign in the value of the magnification indicates that the image is real.

3.3 Find the focal length of a convex mirror whose radius of curvature is 32 cm. **[1]**

Ans : Radius of curvature (R) of a convex mirror $= 32$ cm.

Radius of curvature $(R) = 2 \times$ Focal length (f).

So,   Focal length, $(f) = \frac{R}{2} = \frac{32}{2}$

$$f = 16$$

The focal length of a convex mirror will be 16 cm.

3.4 Why does the height of the object is taken to be positive? **[1]**

Ans : As the object is usually placed above the principal axis so the height of the object is taken to be positive.

4. **Question number 4.1-4.4 are based on the two tables given below. Study this table and answer the questions that follows.**

Table A : Normal Blood Pressure		
Systolic Pressure (mm Hg)	**Diastolic Pressure (mm Hg)**	**Pressure Range**
130	85	High Normal Blood Pressure
120	80	Normal Blood Pressure
110	75	Low Normal Blood Pressure

Table B : Approx. Ideal BP According to Age Chart		
Age	**Female**	**Male**
10	111/73	112/73

Table B : Approx. Ideal BP According to Age Chart		
Age	Female	Male
13	117/75	117/76
14	120/75	119/77
15	120/76	120/78
19-24	120/79	120/79
25-29	120/80	121/80
30-35	122/81	123/82
40-45	124/83	125/83
50-55	129/85	128/85
60+	134/84	135/88

4.1 Refer to Table B showing the blood pressure of male and female. Infer the disease which can be diagnosed in a boy of 14 years who have same blood pressure as a 60 year old man. [1]

Ans : Hypertension

4.2 Identify the hormone whose level in the blood is responsible for raise in blood pressure in certain situations. [1]

Ans : Adrenaline

4.3 Which of the following trend in blood pressure range is seen with advancement of age from teenage to old age? [1]
  (a) Increase
  (b) Remains same
  (c) Decrease
  (d) Fluctuates

Ans : (a) Increase

4.4 Which of the following is incorrect in case of high blood pressure? [1]
  (a) Increased resistance to blood flow.
  (b) Decreased resistance to blood flow
  (c) Rupture of an artery
  (d) Internal bleeding.

Ans : (b) Decreased resistance to blood flow

5. Your friend is performing an experiment on determining the focal length of the given convex lens by obtaining the image of a distant object on the screen. Out of the following clearly visible objects which one you suggest to use as the object for his experiment to get best results. [1]
  (a) A lighted candle kept at the other end of the laboratory table
  (b) Any distant tree
  (c) Window grill in the laboratory
  (d) A well illuminated distant tree

Ans : (d) A well illuminated distant tree

or

Which statement best describes the property of light waves illustrated in the diagram below? [1]
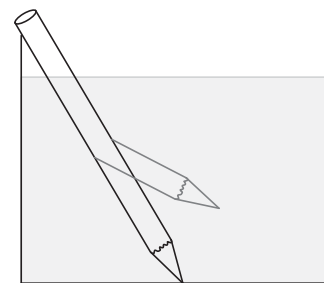
  (a) some materials absorb light waves.
  (b) Some materials refracted by some materials.
  (c) Light waves are refracted by some materials.
  (d) Light waves are emitted by some materials.

Ans : (c) Light waves are refracted by some materials.

6. A student connects a circuit to study Ohm's law using a resistor of 3 Ohms and a battery eliminator of 6 V. Which of the ammeter should be chosen to read the value of current for this circuit, if the ammeters available in the laboratory have the following ranges? [1]
  (a) 0 – 200 mA   (b) 0 – 100 mA
  (c) 0 – 1A   (d) 0 – 2A

Ans : (d) 0 – 2A

7. When sodium sulphate solution and barium chloride solution are mixed together, the colour of precipitate formed is : [1]
  (a) yellow   (b) green
  (c) white   (d) red

Ans : (c) white

8. A colourless solution is kept in a test tube. This solution could be : [1]
  (a) ferrous sulphate
  (b) copper sulphate
  (c) aluminium sulphate
  (d) potassium permanganate

Ans : (c) aluminium sulphate

or

The function of KOH in the experimental set-up to show that CO_2 is released during respiration is [1]
  (a) to enhance respiration
  (b) to release oxygen for respiration
  (c) to absorb carbon dioxide released by germinating seeds
  (d) to remove water vapour from the flask

Ans : (c) to absorb carbon dioxide released by germinating seeds

9. A student observed that when he applied to soap to cloth made wet with a given sample of water, scum's were formed. He discusses his observation with his four friends. Their opinion is that soap forms a scum in : [1]
  (A) hard water
  (B) soft water
  (C) distilled water
  (D) potable water
Correct opinion is of :

(a) A   (b) B
(c) C   (d) D

Ans : (a) A

10. In the binary fission method of multiplication :   [1]
    (a) only one parent is involved
    (b) no gametes are formed
    (c) fertilisation does not take place
    (d) all the above statements are true

    Ans : (d) all the above statements are true

11. To prepare a good temporary mount of leaf peel showing many stomata, a student should take the peel from the   [1]
    (a) petiole
    (b) midrib
    (c) lower surface of the leaf
    (d) upper surface of the leaf

    Ans : (c) lower surface of the leaf

12. Which is the first enzyme to mix with food in the digestive tract?   [1]
    (a) Pepsin   (b) Cellulose
    (c) Amylase   (d) Trypsin

    Ans : (c) Amylase

                              or

    Choose the incorrect statement about insulin   [1]
    (a) It is produced from pancreas
    (b) It regulates growth and development of the body.
    (c) It regulates blood sugar level
    (d) Insufficient secretion of insulin will cause diabetes.

    Ans : (b) It regulates growth and development of the body.

    (Q.no 13 to 14) In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.
    (a) If assertion is true and reason is correct explanation of assertion.
    (b) If assertion is true but reason is false.
    (c) If assertion is false but reason is true.
    (d) If both are false.

13. **Assertion :** Carbon and its compound are used as fuels for most applications.
    Reason : Carbon and its compounds can easily burn in air at a moderate rate, produce large amount of heat energy and pollute the atmosphere marginally   [1]

    Ans : (a) If assertion is true and reason is correct explanation of assertion.

14. **Assertion :** Offspring formed by asexual reproduction exhibit remarkable similarity.
    Reason : In asexual reproduction, the younger ones are genetically identical to the parents and another young ones as they possess exact copies of DNA.   [1]

    Ans : (a) If assertion is true and reason is correct explanation of assertion.

Section B

15. Given below are some elements of the modern periodic table: $_4$Be, $_9$F, $_{14}$Si, $_{19}$K, $_{20}$Ca

    i. Select the element that has one electron in the outermost shell and write its electronic configuration.
    ii. Select two elements that belong to the same group. Give reason for your answer.
    iii. Select two elements that belong to the same period. Which one of the two has bigger atomic size ?   [3]

    Ans :

    The electronic configurations of given elements are shown below.
    $$_4\text{Be} \rightarrow 2,2, \ _9\text{F} \rightarrow 2,7, \ _{14}\text{Se} \rightarrow 2,8,4$$
    $$_{19}\text{K} \rightarrow 2,8,8,1, \ _{20}\text{Ca} \rightarrow 2,8,8,2$$
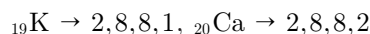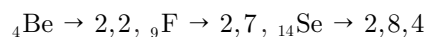
    i $_{19}$K has one electron in the outermost shell and its electronic configuration is 2, 8, 8, 1.
    ii As $_4$Be and $_{20}$Ca has same number of electrons 2 in their valence shells, so they belong to group 2 of the periodic table.
    iii. As $_{19}$K and $_{20}$Ca has same number of shells 4, so they belong to period 4 of the periodic table. In these two elements $_{19}$K has bigger atomic size.

16. Write ionic equations to show the presence of ions in aqueous solutions of :
    (i)   Sodium hydroxide,
    (ii) Barium hydroxide,
    (iii) Ammonium hydroxide.   [3]

    Ans :

    $$\text{NaOH} \xrightleftharpoons{\text{H}_2\text{O}} \text{Na}^+(\text{aq}) + \text{OH}^-(\text{aq})$$
    $$\text{Ba(OH)}_2 \xrightleftharpoons{\text{H}_2\text{O}} \text{Ba}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq})$$
    $$\text{NH}_4\text{OH} \xrightleftharpoons{\text{H}_2\text{O}} \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$$
                              or
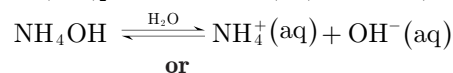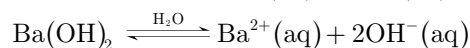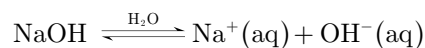
    Arrange the following salts as acidic, basic and neutral. $\text{NaCl}, \text{K}_2\text{CO}_3, \text{Na}_2\text{SO}_3, \text{Cu(NO}_3)_2, \text{MgCl}_2$ and K_2SO_4

    Ans :

    Acidic : $\text{Cu(NO}_3)_2$ and MgCl_2

    Basic : K_2CO_3 and Na_2SO_3

    Neutral : NaCl and K_2SO_4

17. i. Differentiate between alkanes and alkenes. Name and draw the structure of one member of each.
    ii. Alkanes generally burn with clean flame. Why ? [3]

    Ans :

    i. Alkanes are saturated hydrocarbons, in which valencies of carbon atoms are satisfied by single covalent bonds. Their general formula is $\text{C}_n\text{H}_{2n+2}$. While alkenes are unsaturated hydrocarbons, characterised by the presence of double covalent bond $(-\text{C} = \text{C}-)$ in the straight chain of carbon atoms. Their general formula is C_nH_{2n}.
        Structures of alkane and alkene are shown below:

$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-H \qquad H-\underset{\underset{H}{|}}{C}=\underset{\underset{H}{|}}{C}-H$$

Alkane (Methane)   Alkene (Ethene)
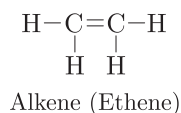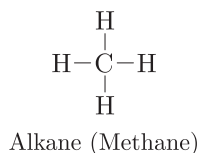
ii. Alkanes generally give clean and a non-luminous flame because of the complete combustion of carbon atoms in them.

18. Tabulate two distinguishing features between acquired traits and inherited traits with one example of each. [3]

Ans :

Differences between Acquired and Inherited Traits :

	Acquired Traits	**Inherited Traits**
1.	These are somatic variations.	These are genetic variations.
2.	Acquired traits develop due to the effects of environmental factors, use and disuse of organs and special (conscious) efforts.	Inherited traits develop due to reshuffling of genetic material and mutations.
3.	These traits develop throughout the lifetime of an individual, and die with the death of that individual.	These traits are transferred (inherited) by the parents to their offspring. They do not die and are passed on to the next generation.
4.	Example-Learning of dance, music, etc., and muscular body of a wrestler.	Example — Attached or free earlobe and curly hair.

or

Write two examples each of sexually transmitted diseases caused by virus, (ii) bacteria. Explain how the transmission of such diseases be prevented ?   [3]

Ans :

Sexually transmitted diseases caused by
(i) Virus– (a) HIV—AIDS (b) Warts
(ii) Bacteria– (a) Gonorrhoea (b) Syphilis.

These diseases can be prevented by using a covering by the males called condom.

19. During Tsunami (a kind of natural disaster) at Japan, the nuclear reactors were damaged and the hazardous radiations affected the large area.
Answer the following questions based on above information
i. What would be the reason for this damage?   [1]
ii. How did it affect the people and environment? [2]

Ans :

i. Enormous heat evolved during nuclear fission.
ii. Following are some effects on people and environment :
  (a) Severely damage to property and life.
  (b) Genetical disorder
  (c) Infertile soil

20. What is 'phototropism'? How does it occur in plants ?

Describe an activity to demonstrate phototropism. [3]

Ans :

Movement of a plant or its parts in response to light is called phototropism. Shoots generally grow towards light and said to be positively phototropic while roots grow away from light and are said to be negatively phototropic. This growth is controlled by the auxin hormone of plants.

The concentration of auxin stimulates the cells to grow longer on the side of the shoot (stem and branches) which is away from light. Thus, the plant appears to bend towards light.

Activity to Demonstrate Phototropism

Keep a potted plant in an enclosed box open from one side. Place the pot in a room with the open side of the box facing the window. You will see that the plant bends and starts growing towards light.
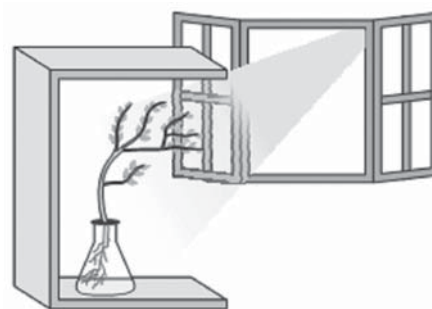
21. Explain the process of break down of glucose in a cell (i) in the presence of oxygen (ii) in the absence of oxygen.   [3]

Ans :

i. **In the presence of oxygen :**
In all the pathways, the first step is break down of glucose, a six carbon molecule, into a three carbon molecule called pyruvate. This process occurs in the cytoplasm of the cell.
In aerobic respiration break down of pyruvate using oxygen takes place in mitochondria. It breaks up the three carbon pyruvate molecule to give three molecules of carbon dioxide, water and lots of energy as compared to anaerobic respiration
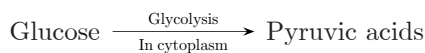
Glucose $\xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}}$ Pyruvic acids

$\xrightarrow[\substack{\text{In mitochondria O}_2\\ \text{is required}}]{\text{Kreb's cycle}}$ $CO_2 + H_2O$ +energy

ii. **In the absence of oxygen :**
In the absence of oxygen pyruvate may be converted into ethanol and carbon dioxide which is referred to as fermentation that takes place in yeast.

Glucose $\xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}}$ Pyruvic acids

$\xrightarrow[\substack{\text{in the absence}\\ \text{of oxygen}}]{\text{In yeast}}$ $C_2H_5OH + CO$ +energy

Sometime anaerobic respiration also occurs in our muscle cells, when there is lack of oxygen, i.e., during vigorous muscular activities. At that time pyruvate is converted into lactic acid which is also a three carbon molecule. This build-up of lactic acid in our muscles causes fatigue or

muscular cramps.

Glucose $\xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}}$ Pyruvic acids

$\xrightarrow[\text{Inn the absence of oxygen}]{\text{In muscles}}$ Lactic acid+energy

22. What is meant by "electrical resistance" of a conductor? State how resistance of a conductor is affected when
   i. a low current passes through it for a short duration;
   ii. a heavy current passes through it for about 30 seconds. [3]

   Ans :

   Electrical resistance is the property of a conductor by virtue of which it opposes the flow of current through it. It is equal to the ratio of the potential difference applied across its ends to the current flowing through it.

   $$R = \frac{V}{I}$$

   i. When a low current is passed for a short duration, through a conductor, heat produced is almost negligible and hence no appreciable change in its resistance.
   ii. When heavy current is passed through the conductor for 30 s. Conductor may be get heated and its resistance and resistivity change.

23. An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s. [3]

   Ans :

   Power of the electric iron,
   $$P = I^2 \times R = (5)^2 \times 20$$
   $$= 500 \text{ W}$$
   Heat developed in 30 s,
   $$H = P \times t = 500 \text{ W} \times 20 \text{ s}$$
   $$= 10000 \text{ J}$$

24. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10cm. Use lens formula to determine the position, size and nature of the image if the distance of the object from the lens is 20 cm. [3]

   Ans :

   Given, Height of the object $(h_0) = 5$ cm

   Focal length of the concave lens, $f = -10$ cm
   Distance of the object from concave lens
   $$(u) = -20 \text{ cm}$$
   Applying the lens formula.
   $$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{-10} = \frac{1}{v} - \left(\frac{1}{-20}\right)$$
   $$\frac{1}{v} = -\frac{1}{10} - \frac{1}{20} = -\frac{3}{20}$$
   $$v = -\frac{20}{3} \text{ cm} = -6.67 \text{ cm}$$
   Also, $\frac{h_i}{h_0} = \frac{v}{u} \Rightarrow h_i = \frac{v}{u} \times h_0$
   $$= \frac{-20}{3 \times -20} \times 5 = \frac{1}{3} \times 5$$
   $$= 1.67 \text{ cm}$$

Thus, the image is erect and formed in front of concave lens at a distance of 6.67 cm from the lens and measures 1.67 cm.
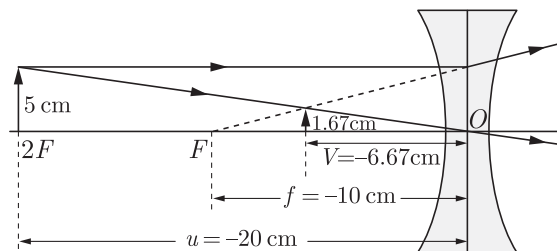
The ray diagram is shown.

or

Mention the types of mirrors used as (i) rear view mirrors, (ii) shaving mirrors. List two reasons to justify your answers in each case. [3]

Ans :

i. Convex mirror is used as rear view mirror in automobiles because–
   (a) It can cover a very wide field behind the driver and hence enables to see the traffic behind him without turning his head.
   (b) It forms an erect image of an object, hence object become easily identified.
ii. Concave mirror is used as a shaving mirror. The reason being that —
   (a) When the face of a person is between pole and focus of concave mirror, an erect, enlarged and virtual image is formed behind the mirror.
   (b) It forms enlarged erect image, so it becomes helpful for shaving.

Section C

25. K; Na; Ca; Mg; Al; Zn; Fe; Sn; Pb; Cu; Hg; Ag; Au constitute the metal reactivity series.
Answer the following questions and write chemical equations :
   i. Name the metal which on heating reacts with steam, but the reaction is reversible.
   ii. Name a metal which burns with a yellow flame and reacts with cold water
   iii. Name a metal which does not react with water or steam, but reacts with hydrochloric acid.
   iv. Name a metal which does not react with cold water, but reacts with boiling hot water
   v. Name a metal which does not react with water or HC1. [5]

   Ans :

   i. Iron metal : $3Fe + 4H_2O \rightleftharpoons Fe_3O_4 + 4H_2(g)$
   ii. Sodium metal : $2Na + 2H_2O \longrightarrow 2NaOH + H_2(g)$
   iii. Tin metal : $Sn + 2HCl \longrightarrow SnCl_2 + H_2(g)$
   iv. Magnesium metal :
      $Mg + 2H_2O \xrightarrow[100°C]{\text{heat}} Mg(OH)_2 + H_2$
   v. Copper metal : No reaction takes place.

   or

   i. What happens chemically when quicklime is added to water ?

ii.   Balance the following chemical equation
      $MnO_2 + HCl \longrightarrow MnCl_2 + Cl + H_2O$
iii. What is decomposition reaction? Explain it with
      suitable example.   [5]

Ans :

i.   Quicklime reacts vigorously with water to form
      calcium hydroxide (slaked lime), with the release
      of energy.

$$\underset{\text{Quickime}}{CaO(s)} + H_2O(l) \longrightarrow \underset{\text{Slaked lime}}{Ca(OH)_2(aq)} + \Delta$$

ii. $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$
iii. When a chemical compound decomposes on
      heating or absorbing some kind of energy, so
      as to form two or more substances (elements or
      compounds), then the chemical reaction that
      takes place is called a chemical decomposition
      reaction or a chemical de-combination reaction.

$$\underset{\text{Compound}}{AB} \longrightarrow \underset{(A \text{ and } B \text{ could be elements or compounds})}{A + B}$$
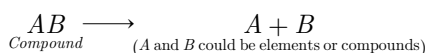
      Example:
      In this reaction a single reactant (ferrous sulphate
      crystals), breaks down to three products as
      illustrated by the equation below.

26.   i.   Define the term 'isomers'.
      ii.   Draw two possible isomers of the compound with
            molecular formula C_3H_{60} and write their names.
      iii. Give the electron dot structures of the above two
            compounds.   [5]

Ans :

i.   **Isomers :** Organic compound having the same
      molecular formula but different structural
      formulae, and hence, different physical and
      chemical properties, are called isomers.
ii.   Two possible isomers of the compound with
      molecular formula C_3H_6O
      (a) Propanal

$$\overset{\displaystyle \quad\quad\quad O}{\underset{\displaystyle}{CH_3 - CH_2 - \overset{||}{C} - H}}$$

      (b) Propanone

$$CH_3 - \overset{O}{\overset{||}{C}} - CH_3$$
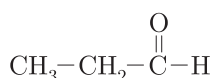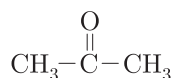
iii. Electron dot structures of propanal and propanone.
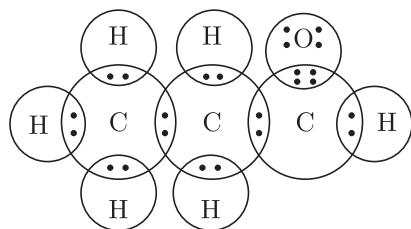
Propanal
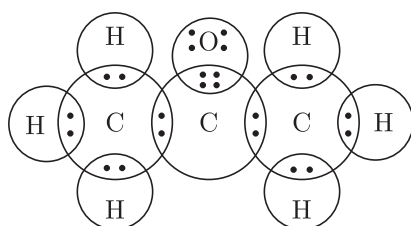
Propanone

27.   What are fossils ? How are they formed? Describe in
      brief two methods of determining the age of fossils.
      State any one role of fossils in the study of the process
      of evolution.   [5]

Ans :

Fossils are preserved remains or impressions of pre-
historic organisms in the different strata of the earth's
crust.

      Fossils are dead remains of animals and plants
from remote past.

      Fossils are formed when dead organisms are not
completely decomposed. The organisms may get
trapped in resins of tree, lava of volcanoes or hot mud
which when hardens, retains the animal's parts thus,
forming fossils.

Two methods of determining the age of fossils :
i.   Relative method: By estimating the age of the
      layer of earth's crust where the fossil is found.
      Fossils near the surface are recent and those in the
      deeper layers are more ancient.
ii.   Radio-carbon dating method: By detecting the
      ratios of different isotopes of carbon in the fossils.
            Fossils help in determining the connecting
      links between various groups and their origin from
      their primitive ones, e.g., archaeopteryx.

28.   i.   Write the function of placenta in human females.
      ii.   List four ways of preventing pregnancy. State two
            advantages of using such preventive methods. [5]

Ans :

i.   The organ by which the embryo is attached to
      the wall of the uterus is called placenta. The
      nutritional, respiratory and excretory needs of
      developing foetus are met by the placenta. The
      placenta contains villi on the embryo's side of
      the tissue. The blood spaces are on the mother's
      side which surround the villi. This provides a
      large surface area for glucose and oxygen to
      pass from the mother to embryo. The waste
      substances generated by embryo can be removed
      by transferring them into the mother's blood
      through the placenta.
ii.   The following are four methods of contraception
      used by hum
      (a) Mechanical barrier method includes condoms,
          femidom and diaphragm.
      (b) Foam tablets, jellies, creams and spermicides
          are common chemicals used by females.
      (c) Ovulation and fertilization can be prevented
          by changing hormonal balance of the body
          by taking oral pills.
      (d) Surgical methods include vasectomy and
          tubectomy. It prevents the sperms from
          coming out in first case and in second case it
          prevents the egg to enter the fallopian tube.
          These methods have been developed to
          prevent and regulate child birth. This has
          greatly improved the health of women in rural
          areas. Contraception methods keep spacing
          between successive birth and prevention of
          unwanted pregnancies. Increasing population
          makes it harder to improve everybody's
          standard of living. Population control

involves by which fertilization is prevented.

or
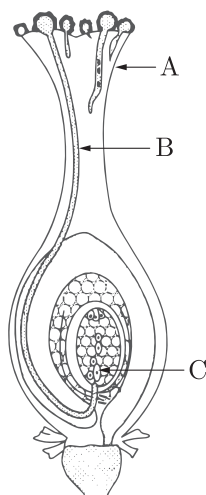
i.   Identify A, B and C in the given diagram and write their functions.

ii. Mention the role of gamete and zygote in sexually reproducing organisms.   [5]

Ans :

i.   In given diagram A is stigma. Stigma may be knob-like or flattened, sticky or feathery, adapted to receive the pollen grain, the middle elongated part style which support stigma connects it to the ovary. After the pollen grains are deposited on the stigma, the pollen grains absorb water and sugar from the surface of stigma and swell up. The pollen grains produce a fine tube called pollen tube.

In given diagram B is pollen tube. The pollen tube carrying two male gametes enters the ovule and embryo sac through the micropile and its tip dissolves. Inside the ovule, the pollen tube releases two male gametes into the embryo sac.

In the given diagram C is female germ-cell (egg cell). In female egg-cell one male gamete fuses with egg to form zygote. The other male gamete fuses with the secondary nucleus to form the endosperm, which provides nourishment to the growing embryo.

ii. Two male gametes are liberated inside the embryo sac. One male gametes fuses with the egg to form zygote which grows into an embryo and finally into a new plant. The other male gamete fuses with secondary nucleus (two polar nuclei) to form the endosperm which provides nourishment to the growing embryo. The fusion male gamete with the female gamete is called syngamy.

29. How will you infer with the help of an experiment that the same current flows through every part of the circuit containing three resistances in series connected to a battery ?   [5]

Ans :

i.   Take three resistors r_1, r_2 and r_3 of resistances $1\Omega, 2\Omega$ and 3Ω, respectively, and connect them in series with a battery, a plug key, and an ammeter as shown in Figure. Connect a voltmeter in parallel in between points P and S.

ii. Insert the key in the plug and record the current

flowing in the circuit from the ammeter and potential difference from voltmeter.

iii. Now disconnect ammeter from position X and reconnect it in series anywhere between the resistors r_1, r_2, and r_3. Record the current in circuit. You will observe that current remains same irrespective of the position where the ammeter is connected.

iv. Having recorded the potential difference from the voltmeter in between points P and S, connect it in between points:
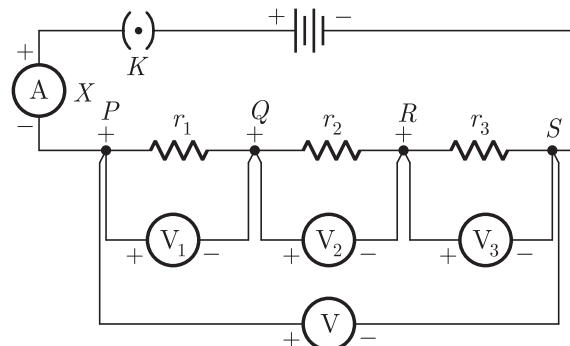
(a) P and Q, (b) Q and R, (c) R and S, and record the potential difference in each case. Let the potential difference between points:

(a) P and S is V (b) P and Q is V_1 (c) Q and R is V_2 (d) R and S is V_3

You will notice that:

$$V = V_1 + V_2 + V_3$$

30. State Snell's law of refraction of light. Write an expression to relate refractive index of a medium with speed of light in vacuum.

The refractive index of a medium 'a' with respect to medium 'b' is 2/3 and the refractive index of medium 'b' with respect to medium 'c' is 4/3. Find the refractive index of medium 'c' with respect to medium 'a'.   [5]

Ans :

Snell's law of refraction of light :

i.   The incident ray, the refracted ray and the normal to the surface of the separation of two media at the point of incidence, all lie in the same plane.

ii. The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of given colour for the given pair of media.

Refractive index of a medium and speed of light in vacuum.

Light has a constant speed of $3 \times 10^8 \, \mathrm{ms}^{-1}$ for all colours or the wavelengths in vacuum. However, if the light travels through any other optical medium, it is slowed down. The extent of slowing down depends upon:

(a) The optical density of the medium.

(b) The colour or wavelength of the light.

It is this slowing down of light, which is responsible for the phenomenon of refraction. It has been found experimentally that the refractive index of a given optical material is the ratio between the speed of light in vacuum and speed of light in a given optical medium.

Thus,

$$\mu = \frac{\text{Speed of light in vacuum } (c)}{\text{Speed of light in a given optical medium } (v)}$$

The refractive index of a medium 'a' with respect to medium 'b' $({}^{b}\mu_{a}) = \frac{2}{3}$

The refractive index of a medium 'b' with respect to medium 'c' $({}^{c}\mu_{b}) = \frac{4}{3}$

Then, ${}^{b}\mu_{a} \times {}^{c}\mu_{b} = \frac{2}{3} \times \frac{4}{3} \Rightarrow {}^{c}\mu_{a} = \frac{8}{9}$

Thus, ${}^{a}\mu_{c} = \frac{1}{{}^{c}\mu_{a}} = \frac{1}{\frac{8}{9}} = \frac{9}{8}$

The refractive index of a medium 'c' with respect to medium 'a' $= \frac{9}{8}$.

or

i.   Define real image of an object.
ii.   Name the mirror that
   (a) can give real as well as virtual image of an object.
   (b) will always give virtual image of same size of an object.
   (c) will always give virtual and diminished image of an object.
   (d) is used by a doctor in examining teeth.
iii.   With the help of a ray diagram explain the use of concave mirror as solar concentrators.   [5]

Ans :

i.   Real image of an object is the image formed due to actual intersection of light rays coming from object through an optical device. It can always be taken on screen.
ii.   (a) concave mirror
   (b) plane mirror
   (c) convex mirror
   (d) concave mirror
iii.   Concave mirrors can concentrate parallel light rays (from distant object e.g. sun) at focus. This property of the concave mirror is used in solar concentrators as high concentration of the sun rays generate high amount of heat farther can be used as a heat source. This diagram below shows the concentration of sun ray.
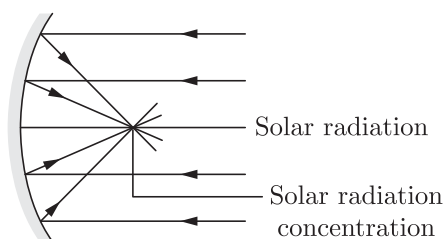
Solar radiation
Solar radiation concentration

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CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-8

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii) This question paper consists of a total of 30 questions.

Section A

1. What is the minimum distance between an object and its real image in case of concave mirror?   [1]

Ans :

Zero, when object is at centre of curvature, its real image is also formed at the same point.

2. Name the two ways in which glucose is oxidised to provide energy in various organisms.   [1]

Ans :

i.   Aerobic respiration

ii. Anaerobic respiration

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

A number of different energy sources are used every day. Where does this energy come form? Burning of fossil fuel is a main energy source. Sources other than this fossil fuel are known as alternative energy sources and there are several of them being used every day.

Windmills work in the same manner as a waterwheel. For many years, windmills were usually used mainly for milling grain, pumping water, or both. Today, though, all of that has changed. Windmills are used as wind turbines that can generate electricity. As the wind propels the blades, energy is created and stored to be used to perform work. As long as there is movement, energy can be produced, and the wind is an excellent alternative energy source. In many parts of the Midwest where there is an abundance of wind, energy is produced for homes and businesses.

The internal heat of the earth is another energy source. The interior of the earth is very hot as is evidenced by hot water or steam coming out of the ground in certain places on the Earth. The earth's internal heat is called geothermal energy. Geothermal energy can be used to heat homes and produce electricity. There are homes in Boise, Idaho that have been heated solely by hot springs since the 1890's. Also at the Geysers in California, steam drives turbines that generate electricity. This steam comes from underground water that is heated by geothermal energy.

Every day the sun provides energy. Solar energy is often thought to just be sunlight. Sunlight is full of energy. It is the sunlight that gives water the energy to evaporate and rise into the atmosphere. People are finding new ways to harness the power of sunlight. One major way is to trap or concentrate sunlight with the use of solar panels. This trapped sunlight can be used to heat homes and water. Also solar cells are devices that convert sunlight into electric energy.

3.1 What are sources of energy other than fossil fuel called?   [1]

Ans : Alternate energy sources

3.2 What is the earth's internal heat called?   [1]

Ans : Geothermal energy.

3.3 Which device converts sunlight into electric energy?   [1]

Ans : Solar cell

3.4 Which is the tool used to trap or concentrate sunlight to be used for energy?   [1]

Ans : Solar panel.

4. **Question numbers 4.1-4.4 are based on two table given below. Study this table and answer the questions that follow:**

Conductors	Substance	$\rho(\Omega - m)$
Metals:	Silver	1.47×10^{-8}
	Copper	1.72×10^{-8}
	Gold	2.44×10^{-8}
	Aluminium	2.75×10^{-8}
	Tungsten	5.25×10^{-8}
	Steel	20×10^{-8}
	Lead	22×10^{-8}
	Mercury	95×10^{-8}

Conductors	Substance	$\rho(\Omega\text{-m})$
Alloys:	Manganin (Cu 84%, Mn 12%, Ni 4%)	44×10^{-8}
	Constantan (Cu 60%, Ni 40%)	49×10^{-8}
	Nichrome	100×10^{-8}
	Pure carbon (graphite)	3.5×10^{-5}
	Pure germanium	0.60
	Pure silicon	2300
Insulators:	Amber	5×10^{14}
	Glass	$10^{10} - 10^{14}$
	Lucite	$> 10^{13}$
	Quartz (fused)	$10^{15} - 10^{16}$
	Sulphur	10^{15}
	Teflon	$> 10^{13}$
	Wood	$10^{8} - 10^{11}$

4.1 Mention two reasons why tungsten is used for making filament of electric lamps. [1]

Ans : (i) High resistivity, (ii) High melting point

4.2 State the difference between a wire used in the element of electric heater and in fuse wire. [1]

Ans : The wire used in the elements of an electric heater has high resistance whereas a fuse wire has low resistance.

4.3 Which among the following is a better conductor? [1]
(i) Copper (ii) Glass
(iii) Sulphur (iv) Aluminium

Ans : (i) Copper

4.4 Which among the following is a better insulator? [1]
(i) Teflon (ii) Wood
(iii) Quartz (iv) Glass

Ans : (iii) Quartz

5. Two conducting wires of same material with equal lengths and equal diameters are first connected in series and then parallel in an electric circuit. The ratio of heat produced in series and parallel combination would be : [1]
(a) 1 : 2 (b) 2 : 1
(c) 1 : 4 (d) 4 : I

Ans : (c) 1 : 4

or

A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R', then the ratio R/R' is [1]
(a) 1/25 (b) 1/5
(c) 5 (d) 25

Ans : (d) 25

6. A student is asked to add a teaspoonful of solid sodium bicarbonate to a test tube containing approximately 3 ml of acetic acid. He observed that the solid sodium

bicarbonate : [1]
(a) floats on the surface of acetic acid
(b) remains suspended in the acetic acid
(c) settles down in the test tube
(d) reacts with acetic acid and a clear solution is obtained

Ans : (d) reacts with acetic acid and a clear solution is obtained

7. Having observed and studied the prepared slides of Amoeba and yeast for asexual reproduction, students made following conclusions. The correct conclusion is: [1]
(a) both reproduce by binary fission
(b) both reproduce by budding
(c) Amoeba reproduces by budding and yeast by binary fission
(d) Amoeba reproduces by binary fission and yeast by budding

Ans : (d) Amoeba reproduces by binary fission and yeast by budding

8. A colourless and odourless gas is liberated when hydrochloric acid is added to a solution of washing soda. The name of the gas is [1]
(a) carbon dioxide (b) nitrogen dioxide
(c) sulphur dioxide (d) sulphur trioxide

Ans : (a) carbon dioxide

or

Reddish brown deposit observed on iron nails, when these are kept in aqueous solution of $CuSO_4$, is that of [1]
(a) Cu_2O (b) CuO
(c) Cu (d) CuS

Ans : (c) Cu

9. The mature embryo of dicotyledonous seed has two cotyledons, the radical and the plumule. Which one of these tissue is not produced from the embryonic mass ? [1]
(a) plumule (b) hypocotyl
(c) root tip (d) cotyledons

Ans : (d) cotyledons

10. The image of a distant object is obtained on a screen by using a concave mirror. The focal length of the mirror can be determined by measuring the distance between : [1]
(a) the object and the mirror
(b) the object and the screen
(c) the mirror and the screen
(d) the mirror and the screen as well as that between the object and the screen
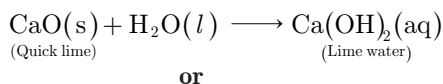
Ans : (c) the mirror and the screen

11. When we observe the slide of epidermal leaf peel we find that the inner walls of guard cells in contact with the stomata pore are : [1]
(a) very thick (b) moderately thick
(c) moderately thin (d) thin

Ans : (b) moderately thick

12. Quick lime reacts with water to give   [1]
(a) $Ca(OH)_2$ (b) $CaCl_2$
(c) $CaOCl_2$ (d) CaO

Ans : (a) $Ca(OH)_2$

$$\underset{\text{(Quick lime)}}{CaO(s)} + H_2O(l) \longrightarrow \underset{\text{(Lime water)}}{Ca(OH)_2(aq)}$$

or

In the give reaction,
$Na_2CO_3 + x\,HCl \longrightarrow 2NaCl + CO_2 + H_2O$, the value of x is   [1]
(a) 4   (b) 2
(c) 3   (d) 1

Ans : (b) 2
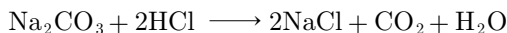
$$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$$

(Q.no 13 to 14)In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.
(a) If assertion is true and reason is correct explanation of assertion.
(b) If assertion is true but reason is false.
(c) If assertion is false but reason is true.
(d) If both are false.

13. Assertion : Acids do not show acidic behaviour in the absence of water.
Reason : All acids in pure state are covalent compounds which do not contain H^+ (aq.) ions.   [1]

Ans : (a) If assertion is true and reason is correct explanation of assertion.

14. Assertion : Gold is not alloyed.
Reason : Pure gold has a high melting point and is very soft. Thus, the ornaments made from it do not keep their shape.   [1]

Ans : (c) If assertion is false but reason is true.

Section B

15. Why are decomposition reactions called opposite of combination reactions? Write equations for these reactions.   [3]

Ans :

During decomposition reaction a single chemical compound breaks down into two or more different elements or compounds, whereas during chemical combination reaction two or more elements or compounds react to form a single chemical compound. Thus, we can say that chemical decomposition reaction is opposite of chemical combination reaction. Following examples will illustrate the point.
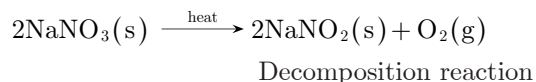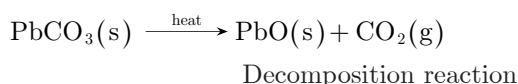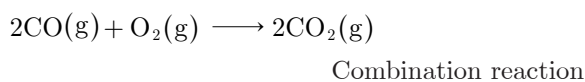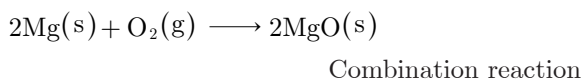
$$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$$

Combination reaction

$$2CO(g) + O_2(g) \longrightarrow 2CO_2(g)$$

Combination reaction

$$PbCO_3(s) \xrightarrow{\text{heat}} PbO(s) + CO_2(g)$$

Decomposition reaction

$$2NaNO_3(s) \xrightarrow{\text{heat}} 2NaNO_2(s) + O_2(g)$$

Decomposition reaction

16. What is ethanol ? Draw the structure of ethanol molecule. How does ethanol behave with the following:
i. Sodium
ii. Excess of conc. sulphuric acid at 443 K ?
Write chemical equation for each reaction.   [3]
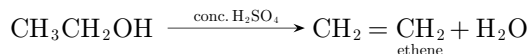
Ans :

Ethanol is the second member of the homologous series of alcohols.

$$H-\overset{\displaystyle H}{\underset{\displaystyle H}{C}}-\overset{\displaystyle H}{\underset{\displaystyle H}{C}}-OH$$

i. Ethanol reacts with sodium to liberate hydrogen gas.

$$2CH_3CH_2OH + 2Na \longrightarrow \underset{\text{Sodium ethoxide}}{2CH_3CH_2ONa} + H_2$$

ii. Concentrated hydrochloric acid dehydrates ethanol to ethane.

$$CH_3CH_2OH \xrightarrow{\text{conc. } H_2SO_4} \underset{\text{ethene}}{CH_2 = CH_2} + H_2O$$

or
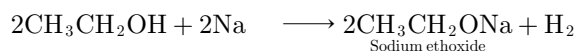
Three elements A, B and C have atomic number 7, 8 and 9 respectively.
i. What would be their positions in the Modern Periodic Table (Mention group and period both)?
ii. Arrange A, B and C in the decreasing order of their size.
iii. Which one of the three elements is most reactive and why ?   [3]

Ans :

i. A, B and C occupy 2nd period of periodic table and 15, 16 and 17 groups respectively.
ii. A > B > C because atomic size decreases as we move from left to right across a period.
iii. C has electronic configuration 2, 7. It needs only one electron to complete its outermost shell. So it is more reactive.

17. What is 'Baking Powder' ? How does it make cakes soft and spongy ?   [3]
Ans :

Baking powder is a dry mixture of sodium hydrogen carbonate (baking soda) and tartaric acid.
        When baking powder is added to the dough, the chemicals on coming in contact with water react to form sodium tartrate, carbon dioxide gas and water. The carbon dioxide gets trapped in the dough. When dough is baked, the carbon dioxide in it expands. This in turn raises the cake and makes it soft and spongy.

18. State the role of following parts of human respiratory system (i) Nasal cavity (ii) Diaphragm (iii) Alveoli [3]
Ans :

i. **Nasal Cavity :**
   (a) Filtration of inhaled air.
   (b) Removal of germs and dust.
   (c) Moistening the inhaled air.
   (d) Air conditioning of inhaled air, etc.

ii. **Diaphragm :** Increasing and decreasing the size of thoracic cavity in vertical direction for inhalation and exhalation of air during breathing.

iii. **Alveoli :** The wall of alveoli are extremely thin and covered by blood capillaries. These walls have rich supply of blood for gaseous exchange i.e., passage of oxygen from alveolar air to blood and passage of carbon dioxide from blood of alveolar air.

or

List the functions of testosterone and estrogen. [3]

Ans :

Testosterone : These hormones are secreted by the testes. They regulate male accessory sex organs and secondary sexual characters like moustache, beard and voice.

Estrogen : Estrogen is secreted by the ovary. It regulates the female accessory sex organs and secondary sexual characters like mammary gland, hair pattern and voice.

19. Acquired characters are not inherited. Justify, the statement with an example. The wings of bat and the wings of insects are considered analogous organs Why? [3]

Ans :

The acquired changes during a lifetime are not inherited by the progeny. It can be understood with the help of some examples such as –

If a group of mice having tail will breed, their progeny will also have the same type of tail but if the tail of all the mice is removed by surgery in each generation, no tailless mouse will be produced even after a few generations. It is because the removal of tail is a physical change which could not make a change in the gene responsible for the presence of tail in mice.

The wings of birds and the wings of insects are considered as analogous organs because they have different structures but perform the same function.

20. How has the method of artificial selection by humans helped in the evolution of different vegetables ? Explain in brief giving an example. [3]

Ans :

Humans have developed different varieties of vegetables from a single wild cabbage by artificial selection, some of these are as follows –

i. Some farmers wanted to have very short distances between the leaves and developed the present day cabbage.

ii. Some farmers selected immature green flowers and developed the broccoli.

iii. Some have selected the sterile flowers and developed the cauliflowers.

iv. Some farmers selected the swollen part of the wild cabbage and developed the kohlrabi.

v. Some of them have selected the larger leaves and developed Kale.

So all these vegetables are descended from a common ancestor.

21. Design an activity to show that CO_2 is produced during breathing. [3]

Ans :

Materials Required:

Two test tubes, a cork with two holes, two glass tubes bent at right angle, syringe, lime water $Ca(OH)_2$.

Procedure :

a. Take some freshly prepared lime water, $Ca(OH)_2$ in two test tubes,

b. Fit cork with two holes in test tubes A and B.

c. Fix two glass tubes in this cork of test tube A as shown in the figure.

d. Exhale air into the tube and record your observations.

e. Pass air by the syringe through the lime water contained in test tube B and record your observations.
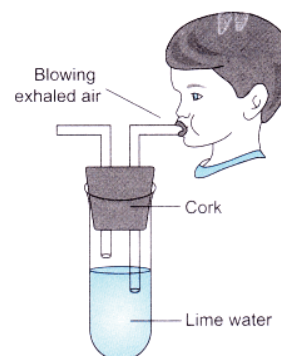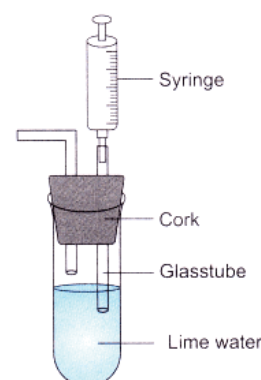

Fig: (A) Air being exhaled into lime water

Fig: (B) Air being passed into lime water with a syringe

Observation:

Lime water turns milky sooner in test tube A than in test tube B.

Conclusion

a. The exhaled air contains lot of CO_2 which turns lime water milky.

b. This proves that CO_2 gas is exhaled out by humans during respiration.

22. A convex lens forms a real image 4 times magnified at a distance of 60 cm from the lens. Calculate the focal length and the power of the lens. [3]

Ans :

Given, $v = 60$ cm

$$m = -4 \text{ (For real image)}$$

$$\frac{v}{u} = -4 \Rightarrow u = \frac{v}{-4}$$

$$= -\frac{60}{4} = -15 \text{ cm}$$

Now, $\qquad \frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{60} - \frac{1}{-15} = \frac{1+4}{60}$

$$= \frac{5}{60} = \frac{1}{12}$$

Focal length, $\quad f = 12 \text{ cm} = \frac{12}{100} \text{m}$

The power of lens $= \frac{1}{f \, (\text{in m})} = \frac{1}{\frac{12}{100} \text{m}} = \frac{100}{12} \text{D}$

$$= 8.33 \text{ D}$$

23. What is meant by scattering of light? Use this phenomenon to explain why the clear sky appears blue or the sun appears reddish at sunrise. [3]

Ans :

i. Scattering of light is phenomenon by which beam of light is spreaded in many direction when it interacts with particle of matter. When sunlight strikes molecules in atmosphere, the light is redirected in many direction.

ii. Scattering of blue colour is most due to shorter wavelength, where as scattering of red colour is least. All colours scattered in the sky and red colour light reaches to earth, due to this sun appears reddish.

24. i. How does the resistance of the following change with the rise in temperature?
   (a) Pure metals;
   (b) German silver;
   (c) Carbon.

ii. Name three substances whose resistance changes very little with the rise in temperature. [3]

Ans :

i. (a) The resistance of pure metals increases with the rise in temperature.
   (b) The resistance of German silver practically remains the same with the rise in temperature.
   (c) The resistance of carbon decreases with the rise in temperature.

ii. (a) Constant-an; (b) Eureka; (c) German silver

or

i. Explain why a conductor offers resistance to the flow of current.

ii. Differentiate between conductor, resistor and resistance. [3]

Ans :

i. When a current is passed through a conductor, the atoms or molecule of the conductor produce an hindrance in the path of flow of electron. This hindrance in the path of flow of charge is called resistance of the conductor.

ii. **Conductor :** A substance which allow to pass the charges through them easily is called a conductor.
   Resistor : A conductor having some value of resistance is called a resistor.
   Resistance : It is the property of any conductor by virtue of which it opposes the flow of charge through it.

Section C

25. State the reactions, if any of the following metals react with lead nitrate solution. In case the reaction takes place, support it by a chemical equation.

i. Silver,
ii. Zinc,
iii. Copper, and
iv. Iron. [5]

Ans :

i. Silver does not react with lead nitrate solution.

ii. Zinc reacts with lead nitrate solution and displaces lead metal.
$$\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{Zn}(\text{s}) \longrightarrow \text{Zn}(\text{NO}_3)_2(\text{aq}) + \text{Pb}(\text{s})$$

iii. Copper does not react with lead nitrate solution.

iv. Iron reacts with lead nitrate solution and displaces lead metal.
$$\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{Fe}(\text{s}) \longrightarrow \text{Fe}(\text{NO}_3)_2(\text{aq}) + \text{Pb}(\text{s})$$

or

State the reason why ?

i. carbon is not used to reduce the oxides of sodium or aluminium.

ii. an iron strip is dipped in a blue copper sulphate solution turns the blue solution pale green.

iii. metals replace hydrogen from acids whereas non-metals do not.

iv. calcium does not occur free in nature.

v. zinc is used in the galvanisation of iron and not the copper. [5]

Ans :

i. Sodium or aluminium have a great affinity for oxygen and therefore cannot be reduced by carbon. Hence, carbon is not used to reduce the oxides of sodium or aluminium.

ii. When an iron strip is dipped in a blue copper sulphate solution, iron metal reacts with copper sulphate solution and displaces copper from copper sulphate solution. Hence, the colour of the solution gradually changes to pale green.

iii. The ionisation energy of metals is higher than hydrogen, so they can replace hydrogen from metals whereas ionisation energy of non-metals is lower than that of hydrogen, hence, they cannot displace hydrogen from acids.

iv. Calcium is very reactive and combine with oxygen or water vapour present in air to form compounds. Hence, these metals are not found in the free state in nature.

v. Zinc is used in the galvanising of iron because zinc being a more active metal than iron will get oxidised first as it is coated over the surface of iron. Thus, iron escapes rusting. Copper is less reactive than iron hence, it will not react with iron and does not form any oxide layer it.

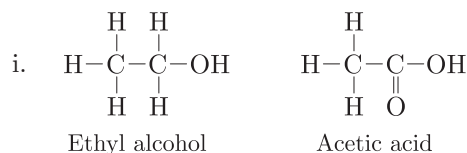**26.** i. The structural formula of an ester is :
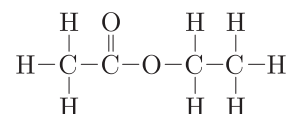
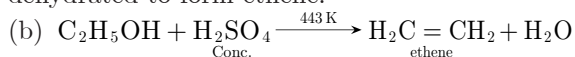   Write the structural formulae of the corresponding alcohol and the acid.

ii.
   (a) Mention the experimental conditions involved in obtaining ethne from ethanol.
   (b) Write the chemical equation for the above reaction.
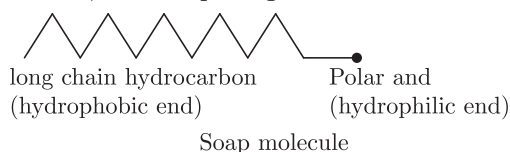
iii. Explain the cleansing action of soap. [5]

Ans :

i.

$$\begin{array}{cc}
\overset{\displaystyle H \quad H}{\underset{\displaystyle H \quad H}{H-C-C-OH}} & \overset{\displaystyle H}{\underset{\displaystyle H \quad O}{H-C-C-OH}} \\
\text{Ethyl alcohol} & \text{Acetic acid}
\end{array}$$

ii. (a) When ethanol is heated with excess of concentrated sulphuric acid at 443 K, it gets dehydrated to form ethene.

(b) $C_2H_5OH + \underset{\text{Conc.}}{H_2SO_4} \xrightarrow{443\,K} \underset{\text{ethene}}{H_2C = CH_2} + H_2O$

iii. A molecule of soap is made up of two parts:
(a) An ionic part which is hydrophilic, i.e., water soluble.
(b) A hydrocarbon chain which is hydrophobic i.e., water-repelling and oil soluble.

long chain hydrocarbon　　　Polar and
(hydrophobic end)　　　　　(hydrophilic end)
Soap molecule

When soap is at the surface of water, the hydrophobic tail protrudes out of water while the ionic end remains inside water. Inside water, the molecules form clusters with the hydrophobic tails in the interior of the cluster and the ionic ends on the surface of the cluster. This formation is called a micelle. Soap, in the form of micelle collects the oily dirt in the centre of the micelle. The micelles stay in solution as a colloid and do not precipitate due to ion-ion repulsion. Thus, the dirt suspended in water is washed away during rinsing.

27. i. Differentiate between germination and fertilisation.
ii. State in brief the functions of the following parts of the human male reproductive system:
(a) Scrotum (b) Testes (c) Vas deferens [5]

Ans :

i.

	Fertilisation	Germination
1.	It is the fusion of male and female gametes.	In it the food reserves present in a seed are broken down and the embryo start to grow.
2.	It occurs in plants and animals of various types.	It occurs only in seed plants.
3.	It actually brings about fusion of gametes.	During it, seeds convert into seedling.
4.	Fertilisation occurs only after pollination when the pollen grain has germinated and sent the male gametes to the ovule.	It begins when a seed starts to absorb water.

ii.
(a) **Scrotum :** It contains and supports the testes. It is situated outside the body cavity and allow sperm to develop at the optimum temperature, which is slightly lower than body temperature.
(b) **Testes :** The formation of male germ cells or sperms take place in it. Leydig cells of testes secrete hormone testosterone which brings about changes in appearance seen in boys at the time of puberty.
(c) **Vas deferens :** It ascends into the abdomen, passes over the urinary bladder and receives duct from the seminal vesicles behind the urinary bladder to form the ejaculatory duct.

28. The sexual act always has the potential to result in pregnancy'. What approach would you use to prevent pregnancies? [5]

or

What would result if fertilisation takes place in humans? Also, incorporate the post-fertilisation changes. [5]

Ans :

The prevention of pregnancy is called contraception or birth control. The methods of contraception are summarised in the following table.

Methods of Birth Control

Method	Example	Detail
Barrier	Condom	Rubber sheath worn over the penis to stop sperms from entering the vagina. Prevents transmission of Sexually Transmitted Diseases (STDs) and has no side effect.
	Diaphragm	Rubber cup that is placed in the vagina over the cervix.
	Intrauterine	Copper-T placed in the uterus by a doctor.
	Contraceptive	Used to prevent pregnancy.
	Device (IUCD)	Can cause side effects due to the irritation of uterus.

Method	Example	Detail
Hormonal	Oral Contraceptive pills	Contain hormones, which prevent the release of ovum, so that fertilisation cannot occur. These disturb the hormonal balance of the body.
Chemical	Spermicide	Applied in vagina Kills sperms Can only be used with condoms or diaphragm.
Surgical	Vasectomy	Small portion of the sperm duct is cut or tied properly. Prevents sperms from coming out. An irreversible process.
	Tubectomy	Small portion of oviduct is cut or tied properly. Prevents the egg meeting the sperms. An irreversible process.

or

What would result if fertilisation takes place in humans? Also, incorporate the post-fertilisation changes. [5]

Ans :

The fusion of the nucleus of the sperm (male gamete) is known as fertilisation. This process occurs only when both the sperm and an egg is present in the oviduct at the same time.

The sperms enters into the vagina by the process of copulation or mating. The sperms are highly active and motile. They swim into the uterus through cervix and then pass into the oviduct. When a sperm reaches the egg it penetrates the ovum. Syngamy or fusion of male and female nuclei occurs to form a zygote. The zygote undergoes many cycles of cell division to form an embryo.

The embryo sinks down and reaches into the soft and thick lining of the uterus. The embedding of the embryo in the thick lining of the uterus is known as implantation.

During pregnancy, the placenta grows into a disc between the uterine wall and the embryo. Placenta forms finger-like projections called villi towards embryo, which provides a large surface area for the exchange of nutrients and waste products between the mother and the developing embryo.

29. Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed :
i. between optical centre and principal focus of a convex lens
ii. between F and 2F of a concave lens
iii. At 2F of a convex lens
What can you say about sign and value of linear magnification ratio in, (a) and (b) above. [5]

Ans :

(i)

(ii)

iii.
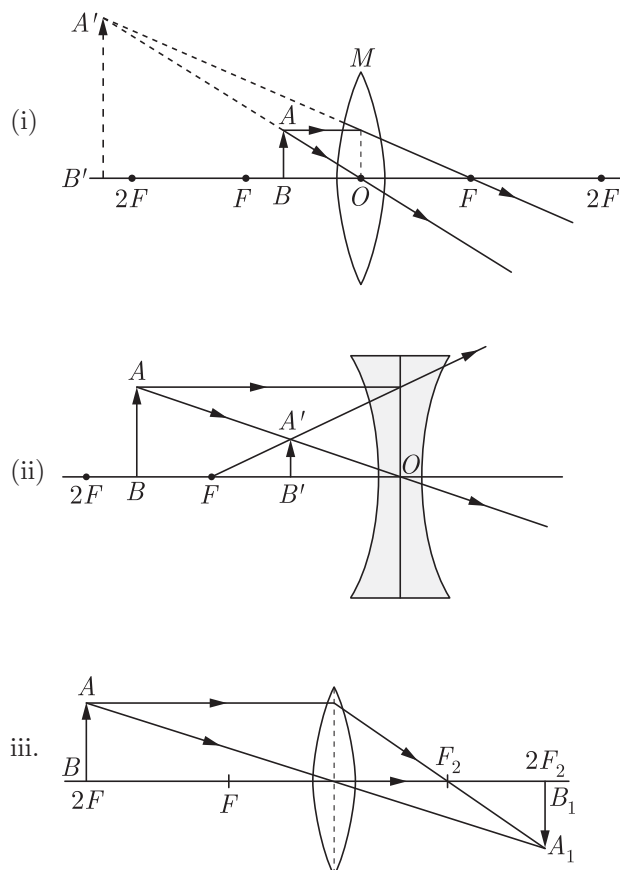
Sign and value of linear magnification ratio in
(a) Positive and > 1 (b) Positive and < 1

30. What is meant by resistance of a conductor? Name and define its SI unit. List the factors on which the resistance of a conductor depends. How is the resistance of a wire affected if:
i. its length is doubled,
ii. its radius is doubled ? [5]

Ans :

Property of any conductor by virtue of which it opposes the flow of current in the conductor is called its resistance.

SI unit of resistance is Ohm. If by applying a potential difference of 1 volt the current in the conductor is 1 A. Then the resistance of the conductor is said to be 1 ohm.
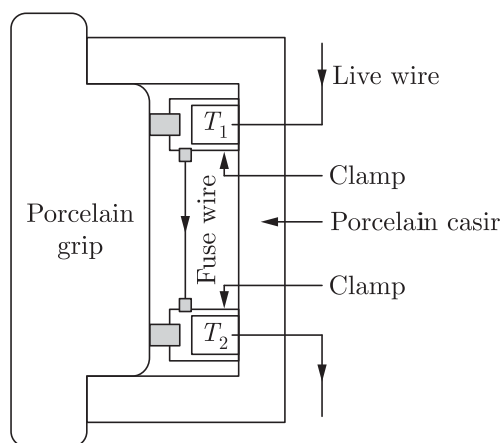
Factor affecting resistances:
i. If length is double then resistance also becomes doubled.
ii. If radius is doubled then area $A = \pi(2r)^2$ becomes 4 times, then the resistance becomes 1/4.

or

i. Draw a neat diagram of a fuse wire connected in a fuse socket and label it.
ii. State two properties of the material of the fuse wire.
iii. Why is a fuse wire, always placed in a live wire ? [5]

Ans :

i.

ii.   (a) It has a low melting point.
       (b) It has high resistivity.
iii. It is because, when the circuit gets overloaded or short circuit takes place, then the power should not flow to the appliance. This is possible only, if the fuse wire is placed in the live wire, such that when the fuse melts the appliance is completely cut off from the electric power.

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CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-9

Time : 3 Hours

Maximum Marks : 80

General Instructions :

(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii) This question paper consists of a total of 30 questions.

Section A

1. Name the part of the human eye that helps in changing the focal length of the eye lens. [1]

Ans : Ciliary muscles.

2. Identify the type of reaction in the following example : [1]
$$Na_2SO_4(aq.) + BaCl_2(aq.) \longrightarrow BaSO_4(s) + 2NaCl(aq.)$$
Ans : Double displacement reaction.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

Another traditional source of energy was the kinetic energy of flowing water or the potential energy of water at a height. Hydro-power plants convert the potential energy of falling water into electricity. Since there are very few waterfalls, which could be used as a source of potential energy, hydro-power plants are associated with dams. In the last century, a large number of dams were built all over the world. Hydro-power plants meet a quarter (25%) of our energy requirement in India.

In order to produce hydroelectricity, high-rise dams are constructed on the river to obstruct the flow of water and thereby collect water in larger reservoirs. The water level rises and in this process the kinetic energy of flowing water gets transformed into potential energy. The water from the high level in the dam is carried through pipes, to the turbine, at the bottom of the dam. Since the water in the reservoir would be refilled each time it rains (hydro power is a renewable source of energy) we would not have to worry about hydroelectricity sources getting used up the way fossil fuels would get finished on day. But, constructions of big dams have certain problems associated with it. The dams can be constructed only in a limited number of places, preferably in hilly terrains. Large areas of agricultural land and human habitation are to be sacrificed as they get submerged. Large eco-systems are destroyed when submerged under the water in dams. The vegetation which is submerged rots under anaerobic conditions and gives rise to large amounts

of methane which is also a green-house gas. It creates the problem of satisfactory rehabilitation of displaced people. Opposition to the construction of Tehri Dam on the river Ganga and Sardar Sarovar project on the river Narmada are due to such problems.

3.1 What percentage of our energy requirements is met by hydroelectric power ? [1]

Ans : 25%

3.2 What sort of transformation in energy occurs in a hydroelectric plant ? [1]

Ans : The kinetic energy of running water is converted into electrical energy.

3.3 What problems are associated with construction of dams ? [1]

Ans : The dams can be constructed only in a limited number of places, preferably in hilly terrains. Large areas of agricultural land and human habitation are to be sacrificed as they get submerged. Large ecosystems are destroyed when submerged under the water in dams.

3.4 What type of energy is hydro power ? [1]

Ans : Renewable.

4. **Answer question numbers 4.1-4.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

Is there a relationship between the radius of curvature R, and focal length f, of a spherical mirror ? For spherical mirrors of small apertures, the radius of curvature is found to be equal to twice the focal length. We put this as $R = 2f$. This implies that the principal focus of a spherical mirror lies midway between the pole and centre of curvature.

4.1 Write relation between radius of curvature and focal length. [1]

Ans : $R = 2f$

4.2 For which type of mirrors above relation is verified? [1]

Ans : Spherical

4.3 The size of the aperture should be? [1]
(a) small

(b) large

(c) neither small nor large

(d) None of these

Ans : (a) small

4.4 Principal focus of a spherical mirror is lies   [1]

(a) midway between the pole and centre of curvature

(b) near the pole

(c) near the centre of curvature

(d) None of these

Ans : (a) midway between the pole and centre of curvature

5. Where should an object be placed in front of a convex lens to get a real image of the same size of the object ?   [1]

(a) At the principal focus of the lens

(b) At twice the focal length

(c) At infinity

(d) Between the optical centre of the lens and its principal focus.

Ans : (b) At twice the focal length

6. What is the current through a 5.0 ohm resistor if the voltage across it is 10 V   [1]

(a) zero   (b) 0.5 A

(c) 2.0 A   (d) 5.0 A

Ans : (c) 2.0 A

7. The image formed by a concave mirror is observed to be virtual, erect and larger than object.   [1]

The position of the object should be

(a) between the principal focus and the centre of curvature

(b) at the centre of curvature

(c) beyond the centre of curvature

(d) between the pole of the mirror and its principal focus.

Ans : (d) between the pole of the mirror and its principal focus.

8. In the experiment to show that CO_2 is given out during respiration, the student uses :   [1]

(a) lime water   (b) alcohol

(c) KOH solution   (d) iodine solution

Ans : (c) KOH solution

or

Samir observed that when he washed his clothes a sample of water, scum is formed. Those scum's are :[1]

(a) calcium salts of long chain of carboxylic acid

(b) magnesium salts of long chain of carboxylic acid

(c) lead salt of long chain of carboxylic acid

(d) either (a) or (b)

Ans : (d) either (a) or (b)

9. A student strongly heats hydrated ferrous sulphate salt in a dry test tube. He would observe a :   [1]

(a) yellow residue   (b) brown residue

(c) light green residue   (d) white residue

Ans : (b) brown residue

10. To prepare a temporary mount of a leaf peel for observing stomata, the chemicals used for staining and mounting respectively are :   [1]

(a) safranin and iodine

(b) safranin and glycerine

(c) iodine and safranin

(d) glycerine and iodine

Ans : (b) safranin and glycerine

11. A student observes binary fission in Amoeba. On the basis of his observation he may conclude that the binary fission in Amoeba starts with the :   [1]

(a) constriction of its cell membrane

(b) elongation of its nucleus

(c) bulb like projection in the parent body

(d) two Amoeba coming closer to each other

Ans : (b) elongation of its nucleus

12. A salt reacts with ethanoic acid with a lot of effervescence and liberation of colourless gas which turns lime water milky. This salt could be :   [1]

(a) sodium ethanoate

(b) sodium chloride

(c) sodium hydrogen carbonate

(d) sodium hydroxide

Ans : (c) sodium hydrogen carbonate

or

A thin plate of zinc metal is placed in a beaker containing aqueous ferrous sulphate solution. The zinc plate is taken out after 15 minutes. The colour of the solution changes to :   [1]

(a) deep yellow   (b) deep green

(c) light blue   (d) colourless

Ans : (d) colourless

(Q.no 13 to 14)In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.

(a) If assertion is true and reason is correct explanation of assertion.

(b) If assertion is true but reason is false.

(c) If assertion is false but reason is true.

(d) If both are false.

13. **Assertion :** A lemon kept in water in a glass tumbler appears to be bigger than its actual size.

Reason : When a ray of light passes from denser medium to rarer medium then it bends away from the normal.   [1]

Ans : (a) If assertion is true and reason is correct explanation of assertion.

14. **Assertion :** Clear sky appears blue.

Reason : Blue colour of light has smaller wavelength, so it scatters more in upper layer of atmosphere in comparison to the other layers.   [1]
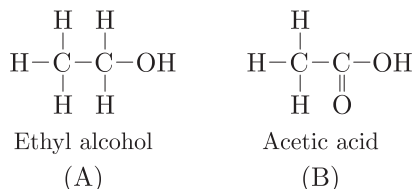
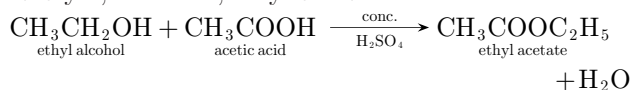**Ans :** (b) If assertion is true but reason is false.

Section B

15. An organic compound 'A' is an essential constituent of wine and beer. Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction. [3]

Ans :

Ethyl alcohol is an essential constituent of wine and beer. Therefore, A is ethyl alcohol. Oxidation of ethyl alcohol gives acetic acid. Vinegar contains acetic acid. Therefore, B is acetic acid.

$$
\begin{array}{cc}
\underset{\substack{H \; H \\ | \; | \\ H-C-C-OH \\ | \; | \\ H \; H}}{} & \underset{\substack{H \\ | \\ H-C-C-OH \\ | \; \| \\ H \; O}}{} \\
\text{Ethyl alcohol} & \text{Acetic acid} \\
(A) & (B)
\end{array}
$$

When A and B react in the presence of an acid catalyst, the ester, ethyl acetate is formed.

$$\underset{\text{ethyl alcohol}}{CH_3CH_2OH} + \underset{\text{acetic acid}}{CH_3COOH} \xrightarrow[\text{H}_2\text{SO}_4]{\text{conc.}} \underset{\text{ethyl acetate}}{CH_3COOC_2H_5}$$
$$+ H_2O$$

16. State the reactions, if any of the following metals react with lead nitrate solution. In case a reaction takes place, support it by a chemical equation.
(i) Silver (ii) Zinc, (iii) Copper, and (iv) Iron. [3]

Ans :

i. Silver does not react with lead nitrate solution.
ii. Zinc reacts with lead nitrate solution and displaces lead metal.
$$Pb(NO_3)_2(aq) + Zn(s) \longrightarrow Zn(NO_3)_2(aq) + Pb(s)$$
iii. Copper does not react with lead nitrate solution.
iv. Iron reacts with lead nitrate solution and displaces lead metal.
$$Pb(NO_3)_2(aq) + Fe(s) \longrightarrow Fe(NO_3)_2(aq) + Pb(s)$$
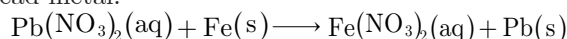
or

Write fully balanced equations for the following reactions.
i. Copper (II) oxide and dil. nitric acid
ii. Aluminium hydroxide and dil. sulphuric acid,
iii. Magnesium hydrogen carbonate and dil. hydrochloric acid. [3]

Ans :

i. $$CuO(s) + 2HNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + H_2O(l)$$

ii. $$2Al(OH)_3(s) + 3H_2SO_4(aq) \longrightarrow Al_2(SO_4)_3(aq)$$
$$+ 6H_2O(l)$$

iii. $$Mg(HCO_3)_2(aq) + 2HCl(aq) \longrightarrow MgCl_2(aq)$$
$$+ 2H_2O(l) + 2CO_2(g)$$

17. i. Distinguish between esterification and Saponification reactions of organic compounds.
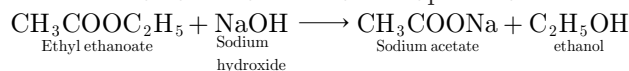ii. With a labelled diagram describe an activity to show the formation of an ester. [3]

Ans :

i. A chemical reaction in which an alcohol reacts with alkanoic acid to form a sweet smelling compound (ester) is called esterification.
$$\underset{\text{Ethanoic}}{CH_3COOH} + \underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[\text{Warming}]{\text{Conc. H}_2\text{SO}_4} \underset{\text{Ethyl ethanoate(ester)}}{CH_3COOC_2H_5}$$

$$+ H_2O$$

A chemical reaction in which an ester gets hydrolysed in the presence of sodium hydroxide to form the constituent alcohol and sodium salt of the alkanoic acid is called saponification.

$$\underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + \underset{\substack{\text{Sodium} \\ \text{hydroxide}}}{NaOH} \longrightarrow \underset{\text{Sodium acetate}}{CH_3COONa} + \underset{\text{ethanol}}{C_2H_5OH}$$

ii.
(a) Pour 1 ml of ethanol (absolute alcohol in a test tube).
(b) Pour 1 ml of glacial acetic acid in the alcohol and then a few drops of conc. sulphuric acid.
(c) Warm the contents of the test tube in a hot water bath for 10 minutes.
(d) Pour the contents of the test tube in another beaker containing 20 ml of water.
(e) Smell the contents of the beaker. You will find a sweet fruity smell. This smell is due to the formation of the ester, ethyl ethanoate.
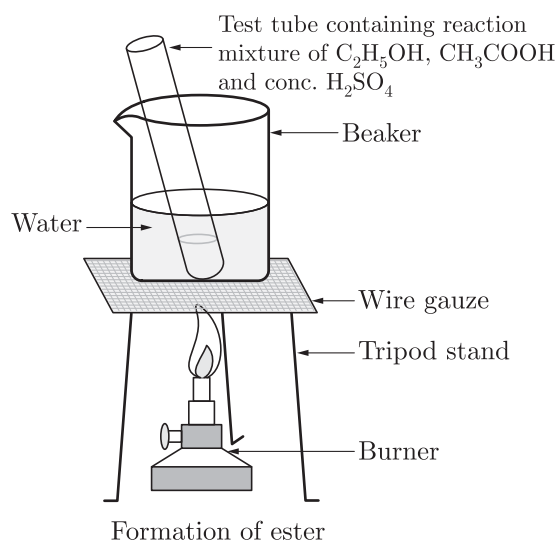
Formation of ester

18. List and describe in brief any three ways devised to avoid pregnancy [3]

Ans :

i. Foam tablets, jellies, creams and spermicides are common chemicals used by females. These are placed in vagina.
ii. Ovulation and fertilisation can be prevented by changing hormonal balance of the body. It can be done by taking oral pills.
iii. Intrauterine Contraceptive Device (IUCD) such as the loop or the copper-T are placed in the uterus to prevent pregnancy. The drawbacks with these devices are bleeding and discomfort.

or

What are sexually transmitted diseases ? Name four such diseases. Which one of them damages the immune system of human body ? [3]

Ans :

The diseases which are spread by sexual contact from an infected person to a healthy person, are called sexually transmitted diseases or STDs.
i. AIDS (Acquired Immune Deficiency Syndrome)
ii. Gonorrhoea
iii. Syphilis

iv. Genital herpes
'AIDS' – damages the immune system of human body.

19. What important properties of aluminium are responsible for its great demand in the industry? [3]

Ans :

i. It is a light weight metal which does not corrode in moist air.
ii. It can form light weight alloys which are as strong as steel.
iii. It is a very good conductor of heat and electricity.
iv. It is highly malleable and ductile.

20. Name the functions of some phytohormones. [3]

Ans :

Some of the plant functions regulated by phytohormones are -
i. growth of root, stem and leaf.
ii. movement of plants and plant parts in response to light, gravity, etc.
iii. flowering.
iv. ripening of fruits.
v. leaf and fruit fall.
vi. opening and closing of stomata.
vii. seed dormancy, etc.

21. Which is the main thinking part of the brain? State how it functions. [3]

Ans :

i. The fore-brain is the main thinking part of the brain having thinking tissues.
ii. It has regions which receive sensory impulses from various receptors such as skin, eyes, ear, tongue, nose.
iii. Separate areas of association where this sensory information is interpreted by putting it together with information from other receptors as well as with information that is already stored in the brain. Based on this, a decision is made about how to respond.

22. Resistivity of two elements A and B are $= 1.62 \times 10^{-8}\,\Omega m$ and $520 \times 10^{-8}\,\Omega m$ respectively. Out of these two, name the element that can be used to make: [3]
a. filament of electric bulb.
b. wires for electrical transmission lines. Justify your answer in each case.

Ans :

Given: $\rho_A = 1.62 \times 10^{-8}\,\Omega m$

$\rho_B = 520 \times 10^{-8}\,\Omega m$

a. For filament of electric bulb resistivity must be higher i.e. $520 \times 10^{-8}\,\Omega m$. So element B is used for filament.
b. For electric transmission resistivity must be lower which is of element A.

23. i. What is the function of an electric switch in an electric circuit ?
ii. Why is the switch placed in the live wire, which is connected to an appliance ?
iii. What consequences will follow, if the switch is placed in the neutral wire ? [3]

Ans :

i. The electric switch can close or open an electric circuit.
ii. When a switch is placed in the live wire, on opening the switch, the appliance is completely cut off from the live wire. Thus, if the appliance is touched with bare hands, there is no likelihood of getting an electric shock.
iii. In such a situation the appliance will not work in an open circuit, but it will remain connected with the live wire. Thus, if the appliance is touched with bare hands, one is likely to get a severe electric shock.

24. A 5.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. By calculation determine (i) the position and (ii) the size of the image formed. [3]

Ans :

Given, $h_o = 5$ cm

$f = 20$ cm

$u = -30$ cm

$v = ?$ (To be calculated)

$h_i = ?$ (To be calculated)

(i) From lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{20} + \frac{1}{-30}$$

$$\frac{1}{v} = \frac{3-2}{60} = \frac{1}{60} \text{ or } v = 60 \text{ cm}$$

(ii) Applying, $\frac{h_i}{h_o} = \frac{v}{u} \Rightarrow \frac{h_i}{5} = \frac{60}{-30}$

$$h_i = \frac{-60 \times 5}{30} = -10 \text{ cm}$$

or

An object is 2 m away from a lens, which forms an erect image one-fourth the size of the object. Determine the focal length of the lens. What type of lens is this ? [3]

Ans :

Given, $u = -2$ m

$m = \frac{v}{u} \Rightarrow \frac{1}{4} = \frac{v}{u}$

$v = \frac{u}{4} = -\frac{2}{4}\text{m} = -0.5$ m

As image is erect and also $\frac{1}{4}$th the size of the object, so, lens is concave lens.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{f} = \frac{1}{-0.5} - \frac{1}{-2}$$

$$\frac{1}{f} = \frac{-4+1}{2} = -\frac{3}{2}$$

Thus, focal length, $f = -\frac{2}{3}\text{m} = -0.67 \text{ m} = -67$ cm

Section C

25. State the limitations of a balanced chemical

equation.   [5]

Ans :

i.   It does not give information about the physical state of reactants and products.

ii. It does not tell whether a chemical reaction will come to completion or not.

iii. It does not tell about the speed of a chemical reaction .

iv. It does not tell about the physical conditions which bring about the chemical reaction, such as pressure, catalyst, etc.

v.   It does not tell about the changes such as precipitation, change in colour, evolution of heat, light, sound, etc.

or

i.   Distinguish between 'roasting' and 'calcination'. Which of these two is used for sulphide ores and why ?

ii. Write a chemical equation to illustrate the use of aluminium for joining cracked railway lines.

iii. Name the anode, the cathode and the electrolyte used in the electrolytic refining of impure copper. [5]

Ans :

i.   Roasting is the heating of a metallic ore (generally sulphides) to about 1000°C in the presence of air. Calcination is the heating of a metallic ore (generally carbonates or oxides) to about 1000°C in the absence of air.

The sulphide ore is subjected to roasting. In doing so the sulphide ore is oxidised to the oxide ore. We convert sulphide ore to the oxide ore, because it is very easy to reduce metals from it by using conventional reducing agents such as coke, carbon monoxide, etc.

$$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2 \text{ (Roasting)}$$

$$ZnO + C \longrightarrow Zn + CO$$
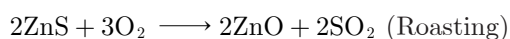
ii. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$

(Thermite reaction)

iii. **Anode :** Impure copper

Cathode : Thin rod or sheet of pure copper

Electrolyte : Copper sulphate solution acidified with sulphuric acid.

26. Atoms of seven elements A, B, C, D, E, F and G have a different number of electronic shells but have the same number of electrons in their outermost shells. The elements A and C combine with chlorine to form an acid and common salt respectively. The oxide of element A is a liquid at room temperature and is a neutral substance, while the oxides of the remaining six elements are basic in nature. Based on the above information answer the following questions.
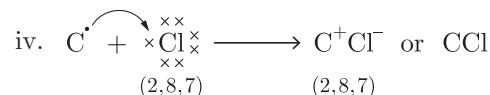
i.   What could the element A be ?

ii. Will elements A to G belong to the same period or same group of the periodic table ?

iii. Write the formula of the compound formed by the reaction of element A with oxygen.

iv. Show the formation of the compound by a combination of element C with chlorine with the help of an electronic structure.

v.   What would be the ratio of the number of combining atoms in a compound formed by the combination of element A with carbon ?

vi. Which one of the given elements is likely to have the smallest atomic radius ?   [5]

Ans :

i.   Hydrogen

ii. Elements A to G belong to the same group of the periodic table since they contain the same number of electrons in their outermost shells.

iii. $2H_2 + O_2 \longrightarrow 2H_2O$ (Since A is hydrogen)

iv. $C^{\cdot} + \times\overset{\times\times}{\underset{\times\times}{Cl}}\times \longrightarrow C^+Cl^-$ or CCl

     (2,8,7)   (2,8,7)

v.   Ratio = 4 : 1

vi. Hydrogen (represented by A) is likely to have the smallest atomic radius amongst all the elements in a group. This is because the atomic radius increases while moving down the group.

27. Draw a neat diagram of the human male reproductive system and label the parts performing the following functions :
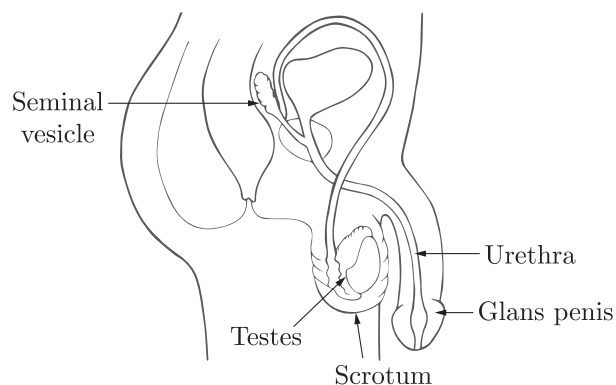
i.   Production of sperms

ii. Gland which provides fluid

iii. Provides low temperature for the formation of sperms

iv. Common passage for sperms and urine.

Name a sexually transmitted disease and a method to avoid it.   [5]

Ans :

i.   Testes

ii. Seminal vesicle
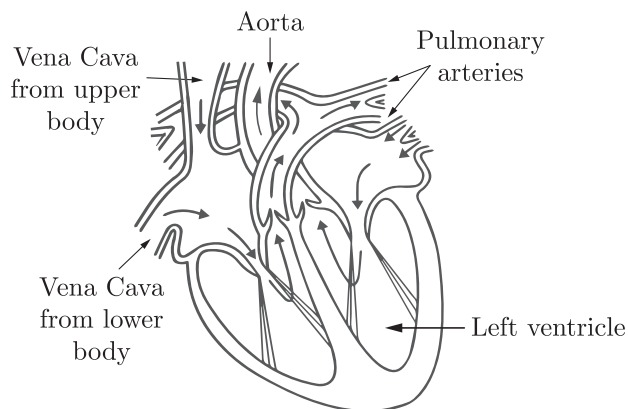
iii. Scrotum

iv. Urethra

AIDS (Acquired Immuno Deficiency Syndrome) is a sexually transmitted disease. Using condom helps in preventing the transmission of these diseases (STDs).

28. i.   Draw a sectional view of the human heart and label on it Aorta, Pulmonary arteries, Vena cava, Left ventricle.

     ii. Why is double circulation of blood necessary in human beings ?   [5]

Ans :

i.

ii. During double circulation, the blood flows twice through the heart. The circulation of blood from the right ventricle to the lungs, and from the lungs to the left auricle is called pulmonary circulation. The circulation of blood from the left ventricle to the body parts and from the body parts to the right auricle is called system circulation.

Double circulation of blood is necessary for constant and efficient supply of oxygen to the body which is needed for high energy needs of our body and to maintain the body temperature.

or

i. Explain the process of nutrition in Amoeba with suitable diagram.

ii. During one cycle how many times blood goes to heart of fish and why ? [5]

Ans :

i. **Nutrition in Amoeba** (Holozoic nutrition)
   (a) The entire body surface is capable of intake of food.
   (b) It can form temporary finger-like extensions (Pseudopodia) of the cell surface which fuse over the food particle forming a food vacuole.
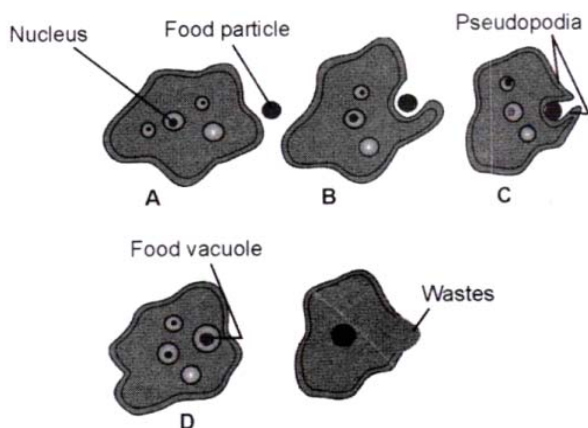
   (c) The complex substances are broken down into simpler ones by using digestive enzymes inside the food vacuole. These substances then diffuse into the cytoplasm.
   (d) The undigested material remaining in the food vacuole is moved to the cell surface and thrown out.

ii. Blood passes only once through the heart in the fish during one cycle of passage through the body. Fishes have two chambered heart, the blood pumped to the gills, is oxygenated there and passes directly to the rest of body.

29. i. Define 1 dioptre of power. Find the focal length of a lens of power – 2.0 D.

ii. Why does a lemon kept in water in a glass tumbler appear to be bigger than its actual size ?

iii. Study the table given below and state the medium in which light ray will travel fastest. Why ? [5]

Medium	A	B	C
Refractive Index	1.33	1.5	2.4

Ans :

i. One dioptre is the power of a lens of focal length 1 m.

Focal length, $f = \dfrac{1}{P} = \dfrac{1}{-2.0} = -0.5$ m

$$= -50 \text{ cm}$$

ii. It is because of refraction from denser medium to rarer medium.

iii. Light ray will travel fastest in medium A due to its least refractive index.

30. Explain the underlying principle and working of an electric generator by drawing a labelled diagram. What is the function of brushes ? [5]

Ans :

i. Electric generator is based on the principle of electromagnetic induction, according to which when a closed coil is moved rapidly in a magnetic field, an induced current is produced in it.

ii. Working of AC Generator : Suppose the generator coil ABCD is in the horizontal position and the coil is rotated in the clockwise direction within the poles of a magnet.
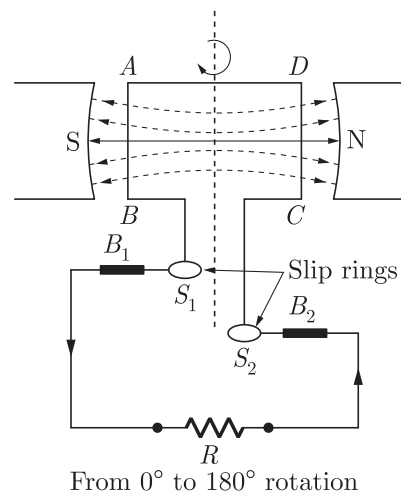

From 0° to 180° rotation

Figure-1

iii. As the coil rotates in the clockwise direction, the side AB of the coil moves up in the plane of paper and side CD moves down into the plane of paper. In doing so AB and CD cut the magnetic lines of force, due to which an induced current is produced in AB and CD. On applying Fleming right hand rule, we find that the direction of current in AB is from B to A and in CD from D to C respectively. The effective direction of current in the complete circuit is along DCRBA. Also, the direction of current in the external circuit is along B_1 RB_2, such that brush B_1 acts as positive and brush B_2 as negative.

iv. After half rotation, the sides AB and CD interchange their positions (Fig. 2). Now the side AB move down into the plane of paper and side CD moves upward out of the plane of paper. Thus, the current in AB flows from A to B and the current in CD flows from C to D. The effective direction of current in the complete circuit is along ABRCD.
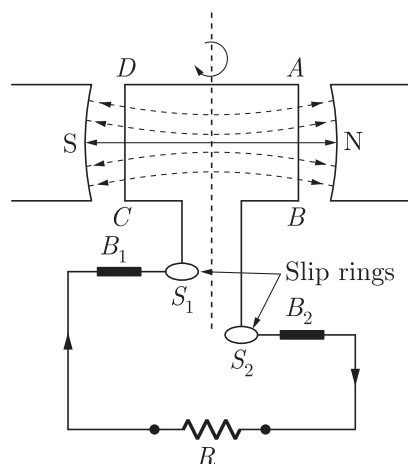
From 180° to 360° rotation

Figure-2

This is exactly opposite of the direction of current in the first half of rotation. Also the direction of current in the external circuit is magnet along $B_2 RB_1$, such that brush B_1 acts as negative and brush B_2 as positive.

Thus, to sum up, in one complete rotation of the coil, the direction of the current changes twice.

v. Brushes continuously remove the induced current from the slip rings of the rotating coil and pass it in the external circuit.

or

Find out the following in the electric circuit given in Figure.

i. Effective resistance of two 8Ω resistors in the combination.
ii. Current flowing through 4Ω resistor.
iii. Potential difference across 4Ω resistor.
iv. Power dissipated in 4Ω resistor.
v. Difference in ammeter readings, if any.   [5]

Ans :
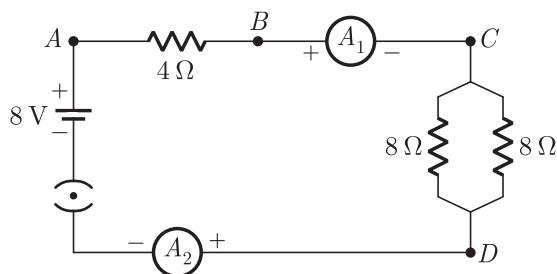
i. Two 8Ω resistors are connected in parallel
Effective resistance of this combination

$$= \frac{8 \times 8}{8 + 8} = \frac{64}{16}$$

$$= 4\,\Omega$$

ii. Equivalent resistance of the circuit

$$= 4\Omega + 4\Omega = 8\Omega$$

Current flowing through the 4 Ω resistance,

$$I = \frac{V}{R} = \frac{8\,\text{V}}{8\,\Omega}$$

$$= 1\,\text{A}$$

iii. Potential difference across 4 Ω resistor,

$$V = IR = 1\text{A} \times 4\,\Omega$$

$$= 4\,\text{V}$$

iv. Power dissipated in 4 Ω resistor

$$= I^2 R = (1)^2 \times 4$$

$$= 4\,\text{W}$$

v. Both ammeter has same reading. So there is no difference in ammeter readings.