CLASS IX (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

DIRECTION : For question numbers 1 and 2, 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) Both A and R are false.

1. **Assertion (A) :** The particles of a solution are smaller than 1 nm (10^{-9} metre) in diameter [1]
Reason (R) : Solution can scatter a beam of light passing through it

Ans : (c) A is true but R is false.

2. **Assertion (A) :** In solids, molecules are tightly packed. [1]
Reason (R) : Force of attraction between molecules in solids is very weak.

Ans : (c) A is true but R is false.

3. Which soil is derived from basaltic rock ? [1]
(a) Red soil (b) Black soil
(c) Laterite soil (d) Both A and C

Ans : (b) Black soil.

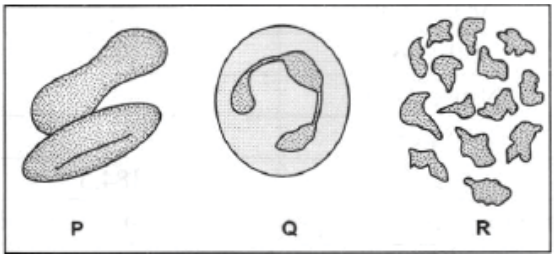
4. A ball is rolling down a slope at a steady speed. Which of the following statements is correct ? [1]
(a) Frictional force is greater than the forward force.
(b) There is an unbalanced force downwards.
(c) There are no forces acting on the ball.
(d) The forces acting on the ball are balanced.

Ans : (d) The forces acting on the ball are balanced.

5. What does the area of a velocity—time graph give ?[1]
(a) Distance (b) Acceleration
(c) Displacement (d) None of these

Ans : (c) Displacement

6. Which of the following is/are true about P, Q and R ?



(a) P-transports food, Q-develops immunity, R-clots blood.
(b) P-transports carbon dioxide, Q-produces antibodies, R-clots blood.
(c) P-transports bacteria, Q-eats foreign material, R-clots blood.
(d) P-transports oxygen, Q-kills bacteria, R-clots blood.

Ans : (d) P-transports oxygen, Q-kills bacteria, R-clots blood.

7. The electrons present in the outermost shell are called
(a) Valency electrons (b) Octet electrons
(c) Duplet electrons (d) Valence electrons

Ans : (d) Valence electrons

or

The nucleons are
(a) Protons and electrons
(b) Neutrons and electrons
(c) Protons and neutrons
(d) None of these

Ans : (c) Protons and neutrons

8. What is the alternate name for Apis cerana indica ?
(a) Indian bee (b) Indian buffalo
(c) Indian cow (d) None of these

Ans : (a) Indian bee

9. Which of the following is true for two bodies separated by some distance ? [1]

(a) When the distance between them is halved, gravitational force becomes 4 times.

(b) When one of the mass becomes halved, gravitational force becomes halved.

(c) When the distance between them is increased four times, gravitational force becomes 1/16 times.

(d) All of the above.

Ans : (d) All of the above.

or

First man who came up with idea of gravity was

(a) Henry Briggs (b) Isaac Newton

(c) John Napier (d) Jobst Burgi

Ans : (b) Isaac Newton

10. Name the disease that affects our lungs. [1]

(a) AIDS (b) Rabies

(c) Polio (d) Tuberculosis

Ans : (d) Tuberculosis

or

Penicillin is capable of one of the following. Which one ?

(a) Interfere in the biological pathway of bacteria.

(b) An antibiotic that can kill bacteria.

(c) Both A and B

(d) None of these

Ans : (c) Both A and B

11. Define one watt of power. [1]

Ans :

Power is the rate of doing work or the rate of utilising energy. The power of an agent may vary with time.
Power, P = W/T
The SI unit of power is Watt. 1 watt is the power of an agent, which does work at the rate of 1 joule per second.

12. 1 carat of diamond is equal to ..... [1]

Ans : 200 milligram

13. Questions 13.1-13.4 are based on the Table A and Table B. Study these tables related to boiling points of different substances and humidity and answer the following questions.

Table A : Boiling points of different substances

Substance	**Boiling point (°C)**
Methanol	64.7
Ethanol	78.4
Nitric Acid	83
Water	100
Iodine	184.3

Table B : Humidity percentage in three situations

	Humidity (%)
Situation A	>75
Situation B	50 – 75
Situation C	<50

13.1 Refer Table B and find out in which situation a bowl of water will evaporate away the fastest and in which situation the slowest. [1]

Ans : Fastest : Situation C

Slowest : Situation A

13.2 A bowl of water and a bowl of ethanol are kept inside a room. Which bowl will get empty first? [1]

Ans : Ethanol.

13.3 "Evaporation is a surface phenomenon." Explain. [1]

Ans : If the surface area increases, then the rate of evaporation will increase.

13.4 Refer Table A and Table B and find in which situation out of the following, the substance will evaporate the fastest. [1]

(a) Methanol in situation C

(b) Iodine in situation A

(c) Nitric acid in situation A

(d) Iodine in situation C

Ans : (a) Methanol in situation C

14. Read the passage and answer the following questions.
Rohan has a brother who is an athlete. One day Rohan had gone to see his brother in a racing competition. The race starts and after sometime, Rohan sees his brother in pain and not able to run properly. He sees that the doctor immediately applies ice on his knees.

14.1 Rohan is confused as to why the doctor is applying ice on his brother's knees. Can you clear his confusion by stating an appropriate reason ? [1]

Ans : These kinds of problems are common in athlete. Most probably Rohan's brother might have suffered from ligament tear. Ligament tear needs immediate treatment and that's the reason the doctor applies ice to control its swelling.

14.2 State one function of a skeletal connective tissue. [1]

Ans : It gives a definite shape to the body.

14.3 What is ligament? [1]

Ans : Ligament is a type of connective tissue. It helps in connecting bones with each other and is highly elastic and strong.

14.4 What values are shown by Rohan ? [1]

Ans : Rohan's behaviour shows that he is inquisitive and has a scientific approach towards a problem.

Section -B

15. A body starts from rest and moves with a uniform acceleration of 2 m/s^2- until it travels a distance of 625 m. Find its velocity. [3]

Ans :

Given,

$$\text{Initial velocity}, u = 0\,\text{m/s}$$
$$\text{Final velocity}, v = ?$$
$$\text{Acceleration} = 2\,\text{m/s}^2$$
$$\text{Distance} = s = 625\,\text{m}$$

By the third equation of motion

$$v^2 - u^2 = 2as$$
$$v^2 - 0 = 2 \times 2 \times 625$$
$$v^2 = 2500$$
$$v = 50\,\text{m/s}$$

Final velocity of the body is 50 m/s.

16. (a) The smell of hot sizzling food reaches you several meters away, but to smell the cold food you have to go close. Why?

(b) After rains, the rain drops dry away easily on a sunny day or on a cloudy day? Give reasons. [3]

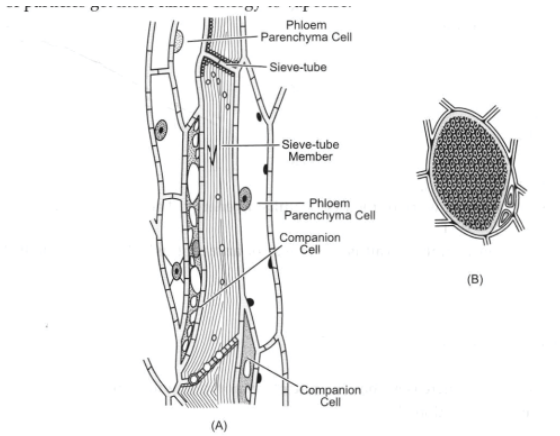
Ans :

(a) Particles of matter are continuously moving. They possess the kinetic energy. As the temperature rises, particles move faster. Thus, particles that carry smell of hot sizzling food move faster than the smell of the cold food. Therefore, the smell of hot sizzling food can reach us several meters away, but to get smell from a cold food you have to go close.

(b) After rains, rain drops will dry easily on a sunny day, as the temperature is higher in sunny day, evaporation increases. On a cloudy day temperature of the surrounding is low due to humidity evaporation decreases. With an increase of temperature, more number of particles get more kinetic energy to vaporise.

17. Draw a neat diagram of the section of the tissue that is responsible for the translocation of food from the leaves to the different parts of the plant. [3]

Ans :



(a) Sieve tubes along with companion cells and phloem parachyma cells in longitudinal section.

(b) The face view of sieve plate showing sieve pores represented by black area.

18. (a) Why does a passenger jumping out of a rapidly moving bus fall forward with his face downwards?

(b) Why is it difficult for a fireman to hose, which ejects large amount of water at a high velocity? [3]

Ans :

(a) A man getting down on road from a running bus falls forward with a his face downward because due to inertia of motion upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road.

(b) **Newton's third law of motion :** Every action has an equal and opposite reaction. When the fireman holds the hose, it has an opposite reaction according to the third law of motion. This backward and an equal reaction on the fireman makes him unstable and finds it difficult to hold the hose. Thus, due to the opposite reaction of the water with high velocity a fireman finds it difficult to hold the hose.

or

Which of the following has more inertia:

(a) A rubber or a stone of the same size?

(b) A bicycle or a train?

(c) A five-rupee coin or a one-rupee coin?

Ans :

Inertia is the measure of the mass of the body. The greater is the mass of the body, the greater is the inertia and vice-versa.

(a) Mass of a stone is more than the mass of a rubber ball for the same size. Hence, inertia of the stone is greater than that of a rubber ball.

(b) Mass of a train is more than that the mass of a bicycle. Hence, inertia of the train is greater than that of the bicycle.

(c) Mass of a five rupee coin is more than that of a one rupee coin. Hence, inertia of the five rupee coin is greater than that of the one rupee coin.

19. Name three basic scientific approaches for increasing the yield of a crop. [3]

Ans :

Three basic scientific approaches for increasing the yield of a crop are :

(a) **Crop production management :** It includes proper irrigation and nutrient management. It can be done by adding manure and fertilizers. Nutrient management can also be done by crop rotation, inter—cropping and mixed—cropping.

(b) **Crop protection management :** Plants need protection from weeds, insects, pests and pathogens. It can be done through mechanical methods, biological methods, chemical methods or cultural methods.

(c) **Crop variety management :** Crop variety can be improved by hybridisation or by transgenic measures. It can be done by obtaining desired plant characteristics.

20. What are the properties of a periodic table? [3]

Ans :

Atomic radius increases down a group because as we

move along a group the atomic number increases and the number of shells also increases and the distance of the nucleus from the outer most electron increases as it gets far away from the nucleus. Atomic radius decreases along a period because as we move from left to right along a period, the atomic number of an atom increases, and the positive charge nucleus and electrons are added to the same orbit and higher nuclear charge will increase the force of attraction of the electrons.

or

Define ionization energy and electron affinity.

Ans :

Ionization energy of an element is the amount of energy that must be supplied to one mole of the element in the gaseous state to obtain one mole of cations in the gaseous state. Electron affinity of an atom or molecule is defined as the amount of energy released or spent when an electron is added to a neutral atom or molecule in the gaseous state to form a negative ion.

21. (a) The mass of the body on earth is 60kg, what is its weight on the earth and on moon ? [3]

(b) How is the weight of an object related to its mass ?

Ans :

(a) Mass = 60 kg acceleration in earth $= 10\,m/s^2$ so, weight of the object in earth $= 60 \times 10 =$ 600N weight of the object in moon $= \left(\frac{1}{6}\right) \times 600$ $= 100\,N$

(b) Mass defines amount of particles or matter present in an object. The mass remains constant at all the places. Weight defines force of gravity acting on the object. The weight changes from one to another place. The object's weight is calculated by product of the object's mass and acceleration due to gravity at that place. The mass's unit is fundamental unit which is kilogram whereas weight is a derived unit which is Newton.

22. What is classification? What is the need for classification? What is the basis of classification ? [3]

Ans :

Classification is the process of grouping similar things into groups or categories on the basis of similarities and differences.

Need for classification : It is very difficult to study large number of organisms individually. So, organisms that have similar characteristics are grouped together and then studied easily.

Basis for classification : Cell structure, mode and source of the nutrition and body organisation.

or

Describe the general characteristics of gymnosperms.

Ans :

Characteristics of gymnosperms :

(a) The stem is erect, aerial and branched or unbranched.

(b) The leaves are usually dimorphic, i.e., presence of two types of leaves on a plant.

(c) These are naked seeded plants, i.e., their ovules are not enclosed in their ovaries.

(d) The microsporophyll (male reproductive organ) and megasporophyll (female reproductive organ) are compactly arranged around the central axis forming male cone and female cone respectively.

23. (a) What amount of energy in kWh is consumed in 10 h by a machine of power 500 W? [3]

(b) An archer stretches the string of his bow to shoot an arrow. Name :

(i) The type of energy he uses in the process.

(ii) The type of energy into which it is converted.

(iii) The energy transformation taking place when the arrow is shot.

(c) If a body is thrown vertically upward, its velocity goes on decreasing. What happens to its kinetic energy when it stops at the top and its velocity becomes zero ?

Ans :

(a) Energy consumed = Power × Time = 500 W × 10 h = 5000 Wh = 5kWh

(b) (i) Potential energy stored in string of the bow.

(ii) Kinetic energy of the arrow.

(iii) Potential energy of the stretched string into kinetic energy of the arrow.

(c) The whole of its kinetic energy gets converted into potential energy, mgh, where m is the mass of body and h is the height.

24. What are the main functional regions of a cell? Explain with the help of diagram. [3]

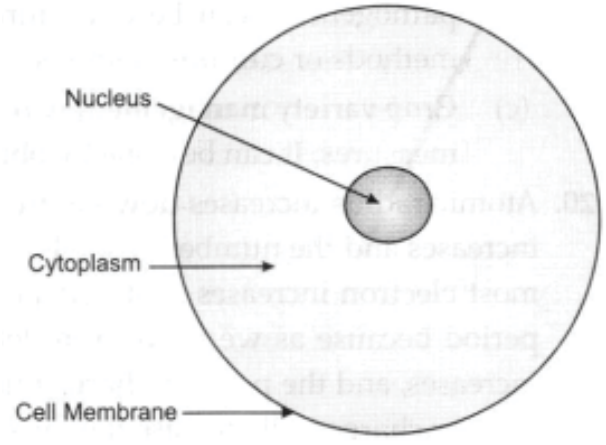
Ans :

There are three main functional regions of a cell, as shown in the diagram.

(a) **Plasma membrane (PM) :** It is flexible and made up of phospholipid bilayer that consists of proteins and lipids which surrounds the cell Nucleus and is semipermeable in nature.

(b) **Cytoplasm :** It is an amorphous and homogeneous colloidal ground substances present between the PM and nucleus.

(c) **Nucleus :** It is centrally located, spherical prominent organelle surrounded by two unit membranes which is responsible for controlling Cell Membrane all vital activities of a cell. It also contains the genetic material.



Section -C

25. (a) How can ultrasound be used to detect the defects in a metal block ? [5]
(b) What is reverberation and what is done to reduce it ?

Ans :

(a) Ultrasound are those waves which have frequency greater than 20 kHz. Now, metal blocks are subjected to ultrasound at one end and at the other end, detectors are placed. If the metal block does not contain any defect then ultrasound travels through the block and is detected by the detectors at the other end If the metal block has any defect then from that region ultrasounds are not detected and gets reflected back indicating the presence of defect in the block.
(b) The repeated reflection of sound that results in the persistence of sound is called as reverberation. We can reduce reverberation by:
(i) Covering roofs and walls of auditorium with sound absorbing materials.
(ii) Seat material is also selected on the basis of its sound absorbing property.

or

Sound requires a medium to travel. Justify experimentally.

Ans :

Sound requires a medium to travel and it can be proven by the following experiment.
(a) Take a bell jar and suspend an electric bell in it.
(b) The bell jar is connected to a vacuum pump. Till the air is in the bell jar, the sound of the electric bell is louder.
(c) Now with the help of vacuum pump, suck out the air from the jar gradually.
(d) As the air is getting pumped out, the sound of the bell gets fainter and fainter.
(e) When the bell jar is completely vacuumed, no sound can be heard.
(f) This shows that the air is required for the propagation of sound.

26. Describe an activity that rate of intermixing depends upon the forces of attraction between the particles.[5]

Ans :

Activity : To prove that the mixing speed depends on the attraction force between particles.
Procedure :
(a) Take two water-filled beakers.
(b) Place a drop of ink on the first beaker's sides.
(c) In the second beaker, place a drop of honey in the same manner.
(d) Leave them and record the observation without disturbance.

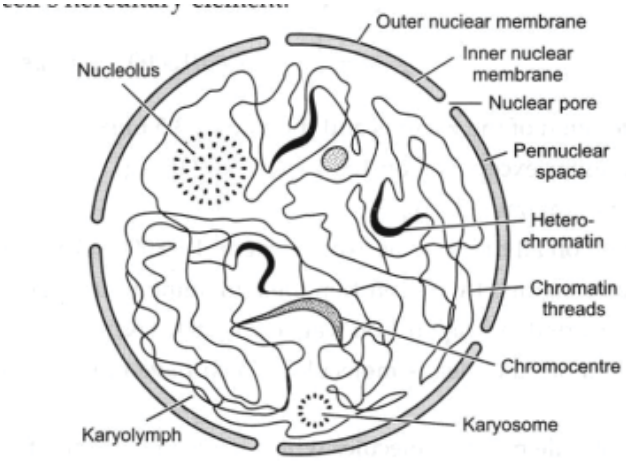
We are going to observe that the attraction forces between the ink particles are weak, sothey are quickly distributed evenly in water. on the other hand, the attraction forces between the honey particles are powerful and therefore they move slowly. As a consequence, it takes longer time for the honey particles to enter the water spaces

Conclusion : Particles of matter are moving continuously, but the intermixing rate depends on the attraction forces between them.

27. Explain in detail what do you know about the structure of nucleus. [5]

Ans :

The nucleolus fabricates subunits of ribosomal from proteins and RNA, which is also perceived as RNA. It then transfers the subunits out to the bottom of the cell where they merge into intact ribosomes. Ribosomes produce proteins hence; the nucleolus performs an important function in producing proteins in the cell. The principal function of the cell nucleus is to regulate gene appearance and reconcile the reproduction of DNA throughout the cell cycle. The nucleus is an organelle observed in eukaryotic cells. The internal part of the nuclear membrane comprises the majority of the cell's hereditary element.



Ultrastructure of Nucleus

or

What are lysosomes and centrosomes? Write their function.

Ans :

Lysosomes : Lysosomes are the main digestive compartment of the cell. As such, they contain a variety of enzymes capable of degrading different types of biological material including nucleic acids, lipids and proteins among others.
Function : The manner in which lysosomes function highly depends on the way the enzymes affect other materials outside and inside the cell. There are a number of processes through which lysosomes digest material.
Centrosomes : Centrosomes are organelles which serve as the main microtubule organising centers for animal cells. Centrosomes are made up from arrangement of two barrel shaped clusters of microtubules called "centrioles," and a complex of proteins that help additional microtubules to form. These proteins allow the centrosomes to start and stop the formation of microtubule proteins. This allows them to control the formation of mitotic spindle fibers and other structures that play important roles in cellular development.

Function : Centrosomes are sometimes referred to as the "MTOC," or "microtubule organising center" of the cell. They serve to direct the movements of microtubules and other cytoskeletal structures and proteins, ultimately allowing large changes to the shapes of animal cell membranes.

28. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg along with a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate : [5]

(a) The net accelerating force
(b) The acceleration of the train
(c) The force of wagon 1 on wagon 2.

Ans :

(a) Force exerted by the engine, $F = 40000$ N.
Frictional force offered by the track, $F_f = 5000$N
Net accelerating force, $F_a = F - F_f = 4000 - 5000 = 3500$ N.
Hence, the net accelerating force is 35000 N.

(b) Acceleration of the train = a.
The engine exerts a force of 40000 N on all the five wagons.
Net accelerating force on the wagons. $F_a = 35000$ N
Mass of the wagons,

m = mass of a wagon x number of wagons

Mass of a wagon = 2000 kg

Number of wagons = 5

Therefore, $m = 2000 \times 5 = 10000$ kg

Total mass, $M = m = 10000$ kg

From Newton's second law of motion:

$$F_a = Ma$$
$$a = \frac{F_a}{M}$$
$$= 35000/10000$$
$$= 3.5\,\text{ms}^{-2}$$

Hence, the acceleration of the wagons and the train is $3.5\,\text{m/s}^2$.

(c) Mass of all the wagons except wagon 1 is $4 \times 2000 = 8000$ kg.
Acceleration of the wagons $= 3.5\,\text{ms}^{-2}$.
Thus, force exerted on all the wagons except wagon 1= $8000 \times 3.5 = 28000$ N Therefore, the force exerted by wagon 1 on the remaining four wagons is 28000 N.
Hence, the force exerted by wagon 1 on wagon 2 is 28000 N.

29. (a) Explain with examples. [5]
(i) Mono atomic molecules
(ii) Diatomic molecules
(iii) Triatomic molecules
(iv) Polyatomic molecules

(b) What is formula unit of mass? How is it different from molecular mass ?

Ans :

(a) (i) Monoatomic molecule means molecules which have only 1 atom, for example; Na, K etc.
(ii) Diatomic molecule means molecules which have only 2 atom, for example; H_2, N.
(iii) The molecule formed by three atoms is called triatomic molecule, for example; CO_2 and H_2O.
(iv) Those molecule which are formed by more than three atoms is called polyatomic molecule, for example; S_8, H_2SO_4.

(b) The formula unit mass in chemistry is the empirical formula of any ionic or covalent network solid compound used as an independent entity for stoichiometry calculations. It is the lowest whole number ratio of ions represented in an ionic compound.
The key difference between molecular mass and formula mass is that the formula mass of a molecule of a compound is the sum of atomic weights of the atoms in its empirical formula while molar mass is the mass of 1 gram mole of substance.

or

Which has more number of atoms, 100 grams of sodium or 100 grams of iron (given, atomic mass of Na = 23 u, Fe = 56 u) ?

Ans :

In order to solve this problem, we should convert 100 grams of sodium into moles of sodium, and also 100 grams of iron into moles of iron. The element having more moles will have more atoms. Since the atomic mass of sodium is 23 u, the molar mass of sodium will be 23 g / mol. Similarly, since the atomic mass of iron is 56 u, the molar mass of iron will be 56 g / mol. We will now
calculate the moles of sodium atoms (Na) and iron atoms (Fe) one by one.

(a) $$\text{Mass of sodium} = \frac{\text{Mass of sodium}}{\text{Molar mass of sodium}}$$
$$= \frac{100}{23}$$
$$= 4.34$$

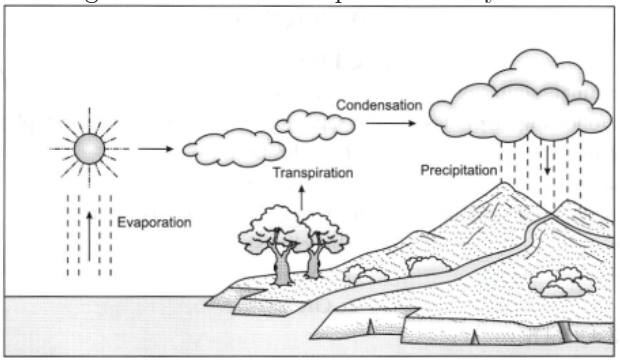
(b) $$\text{Moles of iron} = \frac{\text{Mass of iron}}{\text{Molar mass of iron}}$$
$$= 100/56$$
$$= 1.78$$

We find that 100 grams of sodium contain 4.34 moles of atom whereas 100 grams of iron contain 1.78 moles of atoms. Since 100 grams of sodium has more moles, it contains more atoms than 100 grams of iron

30. Describe the water cycle with the help of a diagram. [5]

Ans :

The stages involved in a complete water cycle are :



Stage I : Evaporation and Transpiration: The sunlight heats up the water bodies and leads to the evaporation of water. Water bodies might include rivers, lakes, oceans, swamps, etc. Plants and trees also lose water to the atmosphere through transpiration. All this vapour goes up with the rising air currents towards the sky.

Stage II : Condensation : As the vapours rise high, the cooler temperatures make them cool down and turn back into liquid condensation. Wind and air currents move the moisture around, leading to the formation of clouds.

Stage III : Precipitation : Wind movements cause the clouds particles to collide. As they become water laden, they develop into rain bearing clouds and fall back onto the earth's surface by the process known as precipitation. This may occur in the form of rain, hail, snow or sleet depending upon the temperature conditions.

Stage IV : Runoff and Infiltration : The precipitation either runs off into oceans, rivers and ground surface or is absorbed into the soil (infiltration).

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

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

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Section - A

1. When a body is stationary : [1]
(a) There is no force acting on it.
(b) The force acting on it is not in contact with it.
(c) The combination of forces acting on it balances each other.
(d) The body is in vacuum.

Ans : (c) The combination of forces acting on it balances each other.

or

A ball is rolling down a slope at a steady speed. Which of the following statements is correct?
(a) Frictional force is greater than the forward force.
(b) There is an unbalanced force downwards.
(c) There are no forces acting on the ball.
(d) The forces acting on the ball are balanced.

Ans : (d) The forces acting on the ball are balanced.

2. A 1 kg mass falls from a height of 10 m into a sand box. What is the speed of the mass just before hitting the sand box? If it travels a distance of 2 cm into the sand before coming to rest, what is the average retarding force? [1]
(a) 12 ms^{-1} and 3600 N (b) 14 ms^{-1} and 4900 N
(c) 16 ms^{-1} and 6400 N (d) 18 ms^{-1} and 8100 N

Ans : (b) 14 ms^{-1} and 4900 N

Since, $\frac{1}{2}mv^2 = mgh$

$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 10}$

$= 14\ \text{m/s}$

Now, $F.s = \frac{1}{2}mv^2$

$F = \frac{mv^2}{2s} = \frac{1 \times 196}{2 \times 2 \times 10^{-2}}$

$= 4900\ \text{N}$

3. What does the mass number of an atom represent?[1]
(a) Only the number of protons.
(b) The sum of protons and neutrons.
(c) The sum of protons and electrons.
(d) Only the number of neutrons.

Ans : (b) The sum of protons and neutrons.

4. If the distance between two bodies is increased by 25%, then the % change in the gravitational force is : [1]
(a) Decreases by 36% (b) Increases by 36%
(c) Increases by 64% (d) Decreases by 64%

Ans : (a) Decreases by 36%

5. Which one of the following is a liquid non-metal? [1]
(a) Gallium (b) Bromine
(c) Lead (d) Hydrogen

Ans : (b) Bromine

6. Which of the following are negative effects on the environment from the excessive use of fertilizers in a farm situated near a lake? [1]
(a) Decreased oxygen content in the water.
(b) Decreased light penetration in the water.
(c) Decreased population of aquatic organisms.
(d) All of these.

Ans : (d) All of these.

or

Which is a desirable characteristic in poultry?
(a) Low maintenance requirements.
(b) Reduced quality of chicken.
(c) Low tolerance to high temperature.
(d) Large size of the egg laying bird.

Ans : (a) Low maintenance requirements.

DIRECTION : For question numbers 7 and 8, 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 A.
(b) Both A and R are true but R is not the correct explanation of the A.

(c) A is true but R is false.

(d) Both A and R are false.

7. **Assertion (A) :** Plasma membrane is a selectively permeable membrane. [1]
Reason (R) : Plasma membrane allows entry and exit of substance from cell through the process of diffusion.

Ans : (c) A is true but R is false.

8. **Assertion (A) :** The growth of plants occurs only in certain specific regions. [1]
Reason (R) : Meristematic tissue is located only at certain points in a plant.

Ans : (a) Both A and R are true and R is correct explanation of the A.

9. The period of revolution of a certain planet in an orbit of radius R is T. Its period of revolution in an orbit of radius 4R will be : [1]

(a) 2 T (b) 22 $\sqrt{\text{T}}$

(c) 4 T (d) 8 T

Ans : (d) 8 T

Now, according to kepler's third low of planetary motion.

$$t \propto a^{3/2}$$

$$t^2 \propto a^3$$

For $a = 2R$

$t = T$

Then, for $a = 8R$

$t = ?$

$$\frac{T^2}{t^2} = \frac{(2R)^3}{(8R)^3}$$

$$\frac{T^2}{t^2} = \frac{8R^3}{512R^3}$$

$$t^2 = 64T^2$$

$$t = 8\,\text{T}$$

10. The HIV viruses spread from an infected person to a healthy person by ..... [1]

(a) Blood transfusion (b) Sexual intercourse

(c) Placental transfusion (d) All of the above

Ans : (d) All of the abvoe

or

HIV virus attacks one of the following cells in our body. Which one?

(a) Red blood cells (b) White blood cells

(c) Liver cell (d) None of the above

Ans : (b) White blood cells

11. What are the two laws of chemical combination? [1]

Ans :

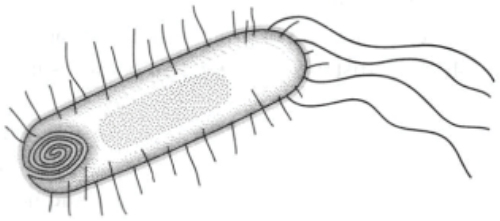
(a) Law of conservation of mass.
(b) Law of constant proportions.

12. Why do bicycles begin to slow down when we stop pedalling? [1]

Ans :

This is because of the frictional forces acting opposite to the direction of motion.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts. [1]
Mohan had a biology practical exam. The biology laboratory in his school had lots of microscopes of different precision. When he reached the laboratory, he found that many microscopes were already mounted with a slide. Just for fun, he went and looked at a slide through the microscope and found the above image. He wasn't able to identify the organism or type of organism, so he called his friend Shyam to look at the slide. Shyam found out immediately what kind of organism this was.



13.1 What is this organism? [1]

Ans : It is a prokaryotic cell.

13.2 How did Shyam find out the kind of organism? [1]

Ans : Shyam saw a poorly defined nuclear region due to the absence of a nuclear membrane. It is the characteristic of a prokaryotic cell.

13.3 Give two examples of such kind of organisms. [1]

Ans : E. Coli., and Bacteria.

13.4 What should a person ensure before looking at a slide through a microscope? [1]

Ans : A sample of a cell on the slide should always be dryed before being observed through a microscope.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table related to melting points and boiling points of different substances and answer the following questions. [1]

Table : A

Component name	**Boiling point (°C)**	**Melting point (°C)**
Carbon dioxide	-57	-78
Propane	-42	-188
Ethanol	78.4	-114
Water	100	0
Glycerol	290	17.8

14.1 Name the substances from Table A that we can find in liquid state at room temperature (25 °C) [1]

Ans : Water and glycerol.

14.2 We are heating a bowl of water and a bowl of ethanol separately. We start from the same temperature and heat them on a similar kind of flame. Which bowl will get empty first? [1]

Ans : Ethanol, because the boiling point of ethanol is lesser than the boiling point of water.

14.3 What does the melting point of a solid indicate? [1]

Ans : The melting point of a solid is an indication of the strength of the force of attraction between its particles.

14.4 Glycerol is heated from 0 °C to 50 °C. When the temperature reaches 17.8 °C, the temperature remains constant for a while and only after some time, it starts to increase again. Why? [1]

Ans : The melting point of glycerol is 17.8 °C. When the temperature reaches 290 °C, a change of state occurs from solid to liquid. The temperature remains constant because the heat supplied to the substance is used as latent heat of fusion.

Section - B

15. When a body covers equal distances in equal time intervals, its velocity can be variable. Explain giving an example. [3]

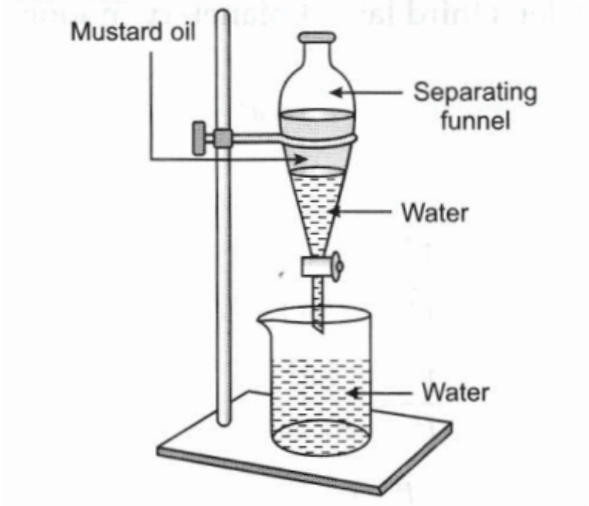
Ans :

In a uniform motion, the body may cover equal distance in equal time intervals. But the direction of motion of the body may change. Thus, its velocity can be variable. For example, if a cyclist turns around a curve on the road at uniform speed, his velocity changes on account of the change in the direction of motion.

16. Suresh's mother mixed oil and water in kitchen by mistake. Suresh told her that he can separate the mixture. Name the technique used by Suresh and explain how he will do. Draw the diagram and write the principle of this technique. [3]

Ans :

A mixture of two immiscible liquids (such as water and oil) can be separated by using a separating funnel. When the mixture of water and mustard oil is put in a separating funnel, it forms two layers. Water being heavier, forms the lower layer in the separating funnel whereas oil being lighter forms the upper layer. On opening the stop cock of separating funnel, the lower layer of water comes out first and collected in a beaker. When water layer has completely runoff, then stop cock is closed. the oil is left behind in the separating funnel. It can be removed in a separate beaker by opening the stop cock again.

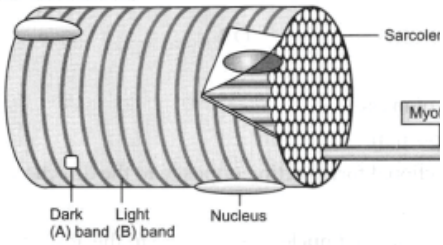


17. Draw well labelled diagrams of various types of muscles found in human body. [3]

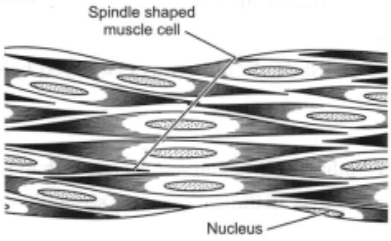
Ans :

Different types of muscle fibres :

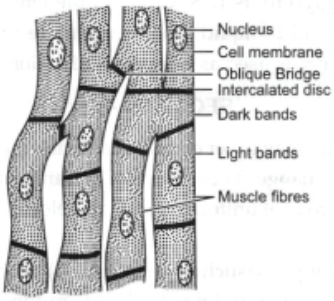
(a) Single striated muscle fibres.



(b) Smooth muscle fibres.



(c) Cardiac muscle.



18. (a) A body of mass 9 kg is lying on a surface of table. Calculate the net force acting on it. [3]

(b) Do all action and reaction forces produce acceleration of equal magnitudes in both objects? Why or why not?

(c) A balloon is inflated and released. Whv does it fly forward as air escapes out of it?

Ans :

(a) Net force acting on the body is zero as it is at rest.

(b) No, though action and reaction are equal in magnitude, they may not produce. acceleration of equal magnitudes because each force acts on different objects which have different mass.

(c) Air pushed out of the balloon exerts an equal reaction force acts on the balloon and it moves forward.

or

Explain the process of rocket propulsion in the light of Newton's third law of motion.

Ans :

The process of rocket propulsion is based on Newton's third law of motion. As the fuel burns, the gases are released with tremendous force in downward direction. Their reaction forces push the rocket in upward direction.

If a time t, mass of burnt fuel $= m$, velocity of burnt fuel $= v$ and mass of rocket $= M$, then, Velocity of rocket, $V = -mv/M$

19. List some adaptations of reptiles towards terrestrial mode of life. [3]

Ans :

The adaptations of reptiles towards terrestrial mode of life are:

(a) Skin is thick, dry and non-glandular to check the loss of water.
(b) Body is covered by an exoskeleton of epidermal scales which forms a waterproof coat.
(c) Excretion is uricotelic which requires minimum water loss.
(d) Main mode of respiration is pulmonary respiration.
(e) Embryo is protected by embryonic membranes, so reptiles have become first true terrestrial vertebrates.
(f) Fertilisation is internal as male has copulatory organs.

20. Define force. What are the various types of forces? Mention at least four. [3]

Ans :

Force is a push and pull that tends to produce a change in state of a body from rest or motion. The different types of forces are:

(a) Gravitational force
(b) Electrostatic force
(c) Electromagnetic force
(d) Nuclear force

or

Why does a block of wood released under water come up to the surface of water?

Ans :

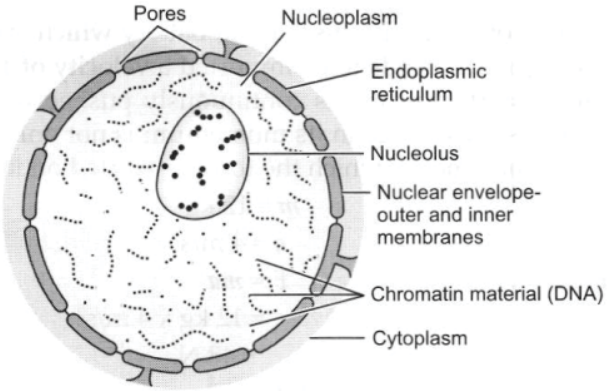
Buoyant force is the upward force experienced by an object when it is submerged inside a liquid. The magnitude of the force is equal to the weight of water displaced by that object. The density of wood is lesser than that of water so the water displaced by it will have more weight than its own weight. That is, the buoyant force is more than the weight of the wood. So the wood will come up to the surface of water and only that part of the wood will be submerged, when weight of displaced water is equal to the weight of wood.

21. Explain in details the structure of nucleus with the help of a diagram. [3]

Ans :

Robert Brown in 1831 discovered the nucleus in the cell. Nucleus is the largest cell structure. It is spherical or oval in shape and is a prominent structure. It is usually located in the center of the cell. Nucleus has the following important parts:

(a) **Nuclear membrane :** It is a doubled layered membrane, which separates nucleus from the cytoplasm.
(b) **Nucleoplasm :** It is a homogeneous and granular dense fluid present inside the nucleus, in which chromatin and nucleolus are suspended.
(c) **Chromatin material :** It consists of long, coiled network of thread-like structures.
(d) **Nucleolus :** It is more or less round structure found inside the nucleus.



Structure of Nucleus

22. Comment on the following statements: [3]

(a) Rate of evaporation of an aqueous solution decreases with increase in humidity.
(b) Evaporation produces cooling.
(c) Conversion of solid state to liquid state is called fusion. What is meant by latent heat of fusion?

Ans :

(a) If humidity is high, then air already has lot of water vapours, it will not take more water vapours easily. Therefore, the rate of evaporation will be slow.
(b) In evaporation, surface molecules take heat from surroundings and cause cooling effect.
(c) It is the amount of heat required to convert one kilogram of solid into liquid at one atmospheric pressure at its melting point. It is known as latent heat of fusion.

or

(a) Which gas is supplied to hospitals in cylinders for artificial respiration?
(b) What does the diffusion of gases tell us about their particles?
(c) Why do liquids easily flow?

Ans :

(a) The nitrous oxide is supplied in cylinders containing 450 to 18,000 L of gas. Nitrous oxide has a critical temperature above the room temperature. So, it is stored as a liquid in pressurised cylinders with nitrous oxide vapour present in the space above the liquid.
(b) Diffusion is the movement of particles from higher concentration to lower concentration. Diffusion in gases is quite faster than the liquids and solids which reveal that the particles in gas are not fixed. The intermolecular force of attraction is less which helps in easy escape.
(c) Liquids can flow easily because their particles can move over each other. When water is poured into a glass, the particles of water move over each other and into the corners of the glass. The particles keep on moving over each other as the water takes the shape of the glass.

23. A car travels at 54 km/h for first 20s, 36 km/h for next 30 s and finally 18 km/h for next 10 s. Find its average speed. [3]

Ans :

Speed: $v_1 = 54\,\text{km/h} = 15\,\text{m/s}$

$v_2 = 36\,\text{km/h} = 10\,\text{m/s}$

$v_3 = 18\,\text{km/h} = 5\,\text{m/s}$

Time: $t_1 = 20\,\text{s}$

$t_2 = 30\,\text{s}$

$t_3 = 10\,\text{S}$

Distance $s_1 = 15 \times 20 = 300\,\text{m}; s_2$

$s_2 = 10 \times 30 = 300\,\text{m}; s_3$

$s_3 = 5 \times 10 = 50\,\text{m}$

Total distance $s = s_1 + s_2 + s_3$

$= 300 + 300 + 50 = 650\,\text{m}$

Total time : $t = t_1 + t_2 + t_3 = 20\,\text{s} + 30\,\text{s} + 10\,\text{s}$

$= 60\,\text{s}$

Average speed $= 650/60 = 10.83\,\text{m/s}$

24. What are the main practices involved in keeping of animals or animal husbandry? [3]

Ans :

Main practices involved in animal husbandry are :

(a) **Breeding :** It is done to obtain animals with desired characters. Breeding can develop high milk-yielding and high meat-yielding animals.

(b) **Feeding :** It deals with the study of proper food called feed, mode and time of feeding for different animals.

(c) **Weeding :** It is the elimination of uneconomical animals.

(d) **Heeding :** It means the proper care and management of the animals.

Section - C

25. (a) Force necessary to change the momentum of an object depends on the time rate at which momentum is changed." Discuss with an example.

(b) What would be the force required to produce an acceleration of 4 m/s2 on a body of mass 12 kg? [5]

Ans :

(a) Consider an example of a car with discharged battery which is being pushed on a straight road. To start the engine, it needs to be imported a velocity of $1\,\text{ms}^{-1}$. When a sudden push is applied, it hardly starts. But if it is continuously pushed over sometime, it accelerates gradually. This means the change in its momentum is not only determined by magnitude of force, but also by the time for which the force is exerted on it.

(b) Mass of body, $m = 12\,\text{kg}$

Acceleration, $a = 4\,\text{m/s}^2$

We have Force, $F = ma = 12\,\text{kg} \times 4\,\text{m/s}^2$

$= 48\,\text{N}.$

or

State which of the following situations are possible and give an example for each of these.

(a) An object with acceleration but with zero velocity.

(b) An object moving in a certain direction with an acceleration in the perpendicular direction.

Ans :

(a) An object with constant acceleration can have zero velocity. For example, an object which is at rest on the surface of the earth will have zero velocity but still being acted upon by the gravitational force of earth with an acceleration of 9.81 m/s' towards the centre of the earth. Hence, when an object starts falling freely, at that particular moment, it can have acceleration but at zero velocity.

(b) When an athlete moves with a velocity of constant magnitude along the circular path, the only change in his velocity is due to the change in his direction. Here, the motion of the athlete along a circular path is an example of accelerated motion where acceleration is always perpendicular to the motion of the object at a given instance. Hence, it is possible when an object moves on a circular path.

26. (a) List any four properties of a colloid and mention any two properties in which colloids differ from suspension.

(b) Why does solution of sodium chloride not show tyndall effect whereas the mixture of water and milk shows?

(c) Write one difference between concentration and solubility? [5]

Ans :

(a) Four properties of a colloid :

(i) Their particles can be seen with powerful microscope.

(ii) They appear to be homogeneous but actually they are heterogeneous.

(iii) They show tyndall effect.

(iv) They can pass through filter paper.

(b) Particles of NaC1 solution, Na^+ and Cl^- are very small and can't scatter light due to honogenous mixture whereas particles of milk are bigger and can scatter light due to its heterogenous mixture.

(c) (i) Concentration is amount of solute dissolved in a unit quantity (mass or volume) of a solution. While solubility is the maximum amount of the solute that can be dissolved in a given amount of the solvent.

(ii) Concentration is expressed as percent by weight or volume, mole fraction, molarity etc. Solubility is the ability of a solute to dissolve in a solvent at given temperature and pressure. It is expressed as grams/ litre or moles/litre.

27. Why is mitochondria called 'powerhouse of cell'? Give three similarities and one difference between mitochondria and plastid. [5]

Ans :

Mitochondria is called the 'powerhouse of cell' because energy required by various chemical activities needed for life is released by mitochondria in the form of ATP. Body uses energy stored in ATP for making new

chemical compounds and for mechanical work.
Three similarities between mitochondria and plastids are:

(a) Both mitochondria and plastids have their own DNA and ribosomes.
(b) Both mitochondria and plastids have more than one membrane layer.
(c) External structure of mitochondria and plastids are same.

S. No	Mitochondria	Plastids
1	Found in all eukaryotic cells	Found in only plant cells

or

Correlate the structure and location with the function in case of:

(a) Simple squamous epithelium
(b) Columnar epithelium

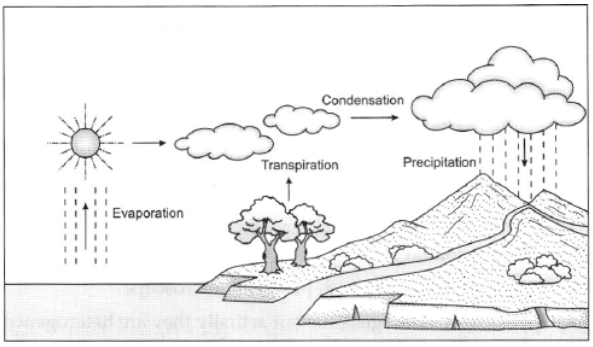
Ans :

(a) **Simple squamous epithelium :** It consists of extremely thin and flat cells forming a delicate lining, e.g. the oesophagus and the lining of the mouth. Skin epithelial pattern of layers, the epithelum is called stratified squamous epithelium.
(b) **Columnar epithelium :** It consists of tall cells which are pillar-1 i ke having elongated nuclei. It is found in the inner lining of the intestine where absorption and secretion occurs. This columnar epithelium facilitates movement across the epithelial barrier.

28. Describe the water cycle with the help of a diagram. [5]

Ans :

The stages involved in a complete water cycle are:



Stage I : Evaporation and Transpiration: The sunlight heats up the water bodies and leads to the evaporation of water. Water bodies might include rivers, lakes, oceans, swamps, etc. Plants and trees also lose water to the atmosphere through transpiration. All this vapour goes up with the rising air currents towards the sky.
Stage II : Condensation : As the vapours rise high, the cooler temperatures make them cool down and turn back into liquid—condensation. Wind and air currents move the moisture around, leading to the formation of clouds.
Stage III : Precipitation : Wind movements cause the clouds particles to collide. As they become water laden, they develop into rain bearing clouds and fall back onto the earth's surface by the process known as precipitation. This may occur in the form of rain, hail, snow or sleet depending upon the temperature conditions.
Stage IV : Runoff and Infiltration : The precipitation either runs off into oceans, rivers and ground surface or is absorbed into the soil (infiltration).

29. (a) What was missing in Thomson's model of the atom?
(b) Write any two observations of Rutherford's model of atom. [5]

Ans :

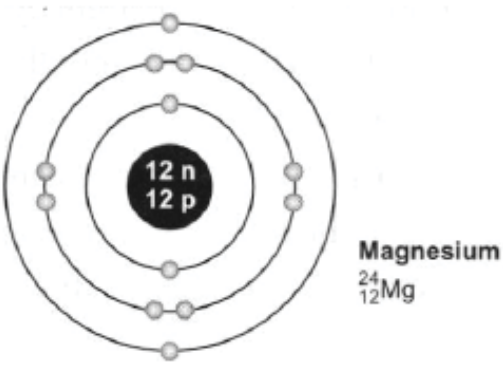
(a) In 1911, Rutherford showed that Thomson's model was "wrong": The distribution of positive and negative particles were not uniform. Rutherford showed that the atom contains a small, massive, positively charged nucleus. He also agreed with Nagaoka that the electrons move in circular orbits outside the nucleus.
(b) Two observations of Rutherford's model of atom are:
(i) Most of alpha-rays passed through gold foil undeviated.
(ii) Some alpha-rays deviated through larger angles.

or

(a) Why does an atom of argon have zero valency? Explain using the electronic configuration of argon.
(b) Define valency by taking the examples of magnesium (At. No. = 12) and oxygen (At. No. = 8).
(c) With the help of schematic representation of atomic structure of magnesium and sulphur, explain how electrons are distributed in different orbits.

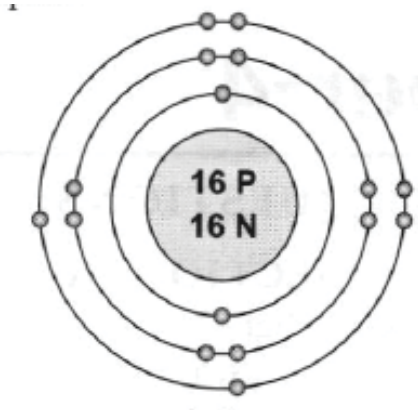
Ans :

(a) Argon has its octet complete (2, 8, 8). therefore, it cannot gain or loss or share electrons. So, its valency is equal to zero.
(b) Valency is defined as number of electrons lost or gained to become stable. Mg (12) has electronic configuration 2, 8, 2. It can lose two electrons to become stable; therefore, its valency is equal to 2.
(c) (i) Atomic structure of magnesium



K = 2, L = 8, M = 2

(ii) Atomic structure of sulphur



Sulfur $1s^2 2s^2 2p^6 2s^2 3p^4$
$\mathrm{K} = 2,\ \mathrm{L} = 8, \mathrm{M} = 6$

30. (a) A stone is allowed to fall from a tower of height 200 m and at the same time another stone is projected vertically upwards from the ground at a velocity of 20 m/s. Calculate when and where the stones will meet.

(b) The walls of your classroom are in motion but appear stationary. Explain [5]

Ans :

(a) Assume that the stones will meet after t seconds,
For the stone thrown downwards, $u = 0$
By second equation of motion

$$h = ut + \frac{1}{2}at^2 = 0 \times t + \frac{1}{2} \times 10 \times t^2$$

$$h = 5t^2$$

For the stone thrown upwards,

$$u' = 20\ \mathrm{m/s}$$

By second equation of motion,

$$h' = ut + \frac{1}{2}at^2$$

$$= 20 \times t - \frac{1}{2} \times 10 \times t^2$$

$$= 20t - 5t^2$$

$$h + h' = 100\ \mathrm{m}$$

$$5t^2 + 20t - 5t^2 = 100$$

$$20t = 100$$

$$t = 5 \text{ seconds}$$

Therefore,

$$h = 5t^2$$

$$h = 5t^2$$

$$h = 5 \times (5)^2$$

$$h = 125\ \mathrm{m}$$

The two stones will meet after a time of 5 seconds and a point 125 m from the top of the tower.

(b) The walls of classroom are at rest with respect to us because their relative position remains constant. But to a person in outer space they appear moving as the earth rotates.

CLASS IX (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. What is the ultimate source of energy in an ecosystem? [1]

Ans : Sunlight is an ultimate source of energy in an ecosystem.

2. Which of the following method is used to separate a mixture of salt and camphor? [1]

(a) Distillation (b) Filtration
(c) Sublimation (d) Centrifugation

Ans : (c) Sublimation

3. Which of the following organisms has tube feet as its locomotory organs? [1]

(a) Starfish (b) Jellyfish
(c) Cuttlefish (d) Silver fish

Ans : (a) Starfish

or

Pteridophyta do not have :

(a) Root (b) Stem
(c) Flowers (d) Leaves

Ans : (c) Flowers

4. Why can't solids be compressed? [1]

(a) The movement of the constituent particles are not restricted.
(b) The inter particle attractive forces are very weak.
(c) The constituent particles are closely packed.
(d) None of the above.

Ans : (c) The constituent particles are closely packed.

5. The valency of silicon is [1]

(a) 2 (b) 4
(c) 6 (d) 8

Ans : (b) 4

or

The isotope deuterium of hydrogen has :

(a) No neutrons and one proton
(b) One neutrons and two protons
(c) One electron and two neutron
(d) One proton and one neutron

Ans : (d) One proton and one neutron

6. Cell wall is mainly composed of [1]

(a) Glucose (b) Fructose
(c) Sucrose (d) Cellulose

Ans : (d) Cellulose

7. Which is not true with respect to cathode rays ? [1]

(a) A stream of electrons.
(b) Charged particles
(c) Move with same speed as that of light.
(d) Can be deflected by magnetic field

Ans : (c) Move with same speed as that of light.

8. Rohu and Catla are types of : [1]

(a) Marine water fish (b) Freshwater fish
(c) Both A and B (d) None of these

Ans : (b) Freshwater fish

9. Barometer is an instrument that is used to measure : [1]

(a) Velocity (b) Gaseous pressure
(c) Atmospheric Pressure (d) Temperature

Ans : (c) Atmospheric Pressure

or

Air shows the property of :

(a) N_2 (b) O_2
(c) Both (a) and (b) (d) None of these

Ans : (c) Both (a) and (b)

DIRECTION : For question numbers 10 and 11, 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

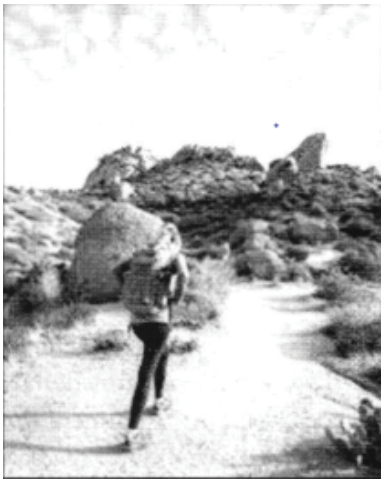
(a) Both A and R are true and R is correct explanation of the A.
(b) Both A and R are true but R is not the correct explanation of the A.
(c) A is true but R is false.
(d) Both A and R are false.

10. **Assertion (A) :** The value of acceleration due to gravity of earth does not depend upon mass of the body.
Reason (R) : Acceleration due to gravity is a constant quantity. [1]
Ans : (c) A is true but R is false.

11. **Assertion (A) :** The smell of incense can be felt in another room.
Reason (R) : With the increase in temperature of particles, their kinetic energy also increases. [1]
Ans :
Both A and R are true and R is correct explanation of the A.

12. Write the molecular formula for following compounds: [1]
(a) Hydrogen sulphide (b) Calcium hydroxide
Ans :
(a) H_2S
(b) $Ca(OH)_2$

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.
Sneha visited Egypt with her parents where she went on a tour of the Sahara desert. She didn't know that plants can grow also in the desert. She went and tore a leaf from one plant but they were very thick. When she was finally able to tear one small part, she found that the inside of the leaf was fresh and watery.



13.1 Why are the leaves of plants that grow in desert thick ? [1]
Ans : The desert plant leaves have a coating of thick waterproof wax on them, that does not allow the water to transpire, hence helps in storing a lot of water.

13.2 Sneha sees that there is a waxy coating on the epidermis of the leaf. What is the name of this coating and what is its function ? [1]
Ans : Cutin.

13.3 Define transpiration. [1]
Ans : The process by which the leaves lose water in the form of vapour to the environment is called transpiration.

13.4 Should Sneha be careful while touching a plant that grows in the deserts ? [1]
Ans : Sneha should be careful because we can find many thorns on most of the plants in deserts.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions :

Table A

Distance (m)	Height above the base of the mountain (m)	Uniform speed (m/s)
0-500	100	2
500-2000	250	3
2000-4000	450	1.5
4000-5000	500	0.5

Alok is travelling to Vaishnodevi on foot. He starts from the base of the mountain and the temple is at a distance of 5 km from the base and at a vertical height of 500 m. He also notes his uniform speed, distance and height from the base at regular intervals (shown in table). Alok weighs 50 kg.

14.1 Find the kinetic energy in the 500 − 2000 interval. [1]
Ans :
Kinetic energy in the 500 − 2000 interval
$$= \frac{1}{2}mv^2 = \frac{1}{2} \times 50 \times (3)^2$$
$$= 225\ \text{J}$$

14.2 Find his potential energy at the end of 2000-4000 interval. [1]
Ans :
Potential energy of Alok at the end of 2000-4000 interval = mgh
$$= 50 \times 10 \times 450$$
$$= 225000\ \text{J}$$

14.3 How much work has Alok done against the gravity when he reaches the summit? [1]
Ans :
Work done against the gravity $= F \cdot s$
Here, $F = -mg$
and s = height at the end = 500 m
Therefore,
$$\text{Work Done} = -mgh = -50 \times 10 \times 500$$
$$= -250000\ \text{J}$$

14.4 State the law of conservation of energy. [1]
Ans :
According to law of conservation of energy. Energy can neither be created nor destroyed, it can only be converted from one form to another form.

Section -B

15. (a) Why does a passenger jumping out of a rapidly moving bus fall forward with his face downwards ?
(b) Why is it difficult for a fireman to hose, which ejects large amount of water at a high velocity ?[3]

Ans :

(a) A man getting down a running bus falls forward because due to inertia of motion upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road.

(b) **Newton's third law of motion :** Every action has an equal and opposite reaction. When the fireman holds the hose, it has an opposite reaction on his body. This backward and an equal reaction on the fireman makes him unstable and finds it difficult to hold the hose. Thus, due to the opposite reaction of the water with high velocity a fireman finds it difficult to hold the hose.

16. Define isotopes and isobars and also give examples. [3]

Ans :

Isotopes : The atoms that possess same atomic number but different mass number are known as isotopes. **Example :** $_1H^1$–Hydrogen, $_1H^2$–Deuterium and $_1H^3$–Tritium

Isobars : The atoms with same mass number but different atomic number are known as isobars. **Example :** Calcium = Atomic No. = 20, Mass No. = 40, Argon = Atomic No. =18 and Mass No. = 40

17. Classify the kind of manures based on the kind of biological material used. [3]

Ans :

Based on the kind of biological material used, manure can be classified into following two categories :

(a) **Compost and vermi – compost :** Farm waste materials like livestock excreta, (cow dung etc.), vegetable waste, animal refuse, domestic waste, sewage weeds, etc. are decomposed in compost pits to form manure. These are known as compost pits and the manure is known as compost. Compost preparation is also hastened by introducing earthworms into plant and animal refuse. This is called vermi – compost.

(b) **Green Manure :** Prior to the sowing of the crop seeds, some plants like sun hemp or guar are grown and then mulched by ploughing them into the soil. These green plants thus turn into green manure which helps in enriching the soil in Nitrogen and Phosphorous.

18. A mass of 10 kg is at a point A on the table. It is moved to a point B. If the line joining A and B is horizontal, what is the work done on the object by the gravitational force? Explain your answer. [3]

Ans :

The work done on the object by the gravitational force is zero. Since, the motion of object is in the horizontal direction whereas the gravitational force i.e., acting vertically downwards is at right angles to the direction of motion of object.

or

Ashish had a pain in his ear as he pricked it with a pin. He then goes to the doctor; the doctor advised we should take proper care of our ears and protect them from damage. Read the above passage and answer the following questions :

(a) Why we must not prick with hard and pointed things inside our ears ?

(b) What values you have learnt from the given passage?

Ans :

(a) We must not prick with hard and pointed things inside our ears, as they can tear the eardrum.

(b) From the given passage, I have learnt that proper care should be taken of delicate parts of our body.

19. Define : [3]

(a) Bilateral symmetry,

(b) Coelom, and

(c) Triptoblastic.

Ans :

(a) **Bilateral symmetry :** Body can be divided into two similar halves only by one plane that passes through the central or median axis e.g., tortoise, humans.

(b) **Coelom :** It is the body cavity which is lined externally as well as by regular layer of mesoderm.

(c) **Triploblastic :** When the body of an animal develops three germ layer – ectoderm, mesoderm and endoderm, it is called triploblastic.

20. (a) Birds and mammals share one common feature. Give details.

(b) Name the phylum in which animals has soft bodies covered with a hard shell.

(c) Ingestion of solid food occurs in which type of nutrition ? [3]

Ans :

(a) Both birds and mammals are warm-blooded in nature.

(b) Mollusca has animals that have soft bodies covered with a hard shell.

(c) Ingestion of solid food occurs in holozoic type of nutrition.

or

(a) Which structure is found in plant cells but absent in animal cell ?

(b) What is the functional segment of DNA ?

(c) Name the pigment that imparts red and yellow colour to flowers.

Ans :

(a) Plant cell have chloroplast and cellulose wall, which is absent in animal cell.

(b) Gene is segment of DNA, a unit of heredity that is transferred from a parent to offspring.

(c) Xanthophyll are coloured pigments just like chlorophyll. Chlorophyll imparts green colour to leaves and xanthophyll imparts red and yellow colour to flowers.

21. What are the differences between the mass of an object and its weight ? [3]

Ans :

S.No.	Mass	Weight
1.	Mass is a property of matter. The mass of an object is the everywhere.	Weight depends on the effect of gravity. Weight increases or decreases with higher or lower gravity.

S.No.	Mass	Weight
2.	Mass can never be zero.	Weight can be zero if no gravity acts upon an object, as in space.
3.	Mass does not change according to location.	Weight varies according to location.
4.	Mass is a scalar quantity. It has magnitude.	Weight is a vector quantity. It has magnitude and is directed toward the centre of the earth or other gravity well.
5.	Mass may be measured using an ordinary balance.	Weight is measured using a spring balance.
6.	Mass usually is measured in grams and kilograms.	Weight often is measured in Newton's, a unit of force.

22. (a) What is the combining capacity of an element called ?
(b) How many moles does 24 g of Mg contain ?
(c) What is the difference between sodium atom and sodium ion ? [3]

Ans :

(a) Valency is the combining capacity of an element
(b) 24g of Mg contain 1 mol. [Atomic mass of Mg = 24 u]
(c)

S. No.	Sodium Atom	Sodium ion
1.	Na has 11 electrons in its shells.	Na^+ has 10 electrons in its shells.
2.	Na is neutral.	Na^+ is a positively charged particle or cation.

or

Convert into mole :
(a) 20 g of water (Atomic masses of hydrogen and oxygen are 1 and 16 respectively).
(b) 22 g of carbon dioxide (Atomic masses of carbon and oxygen are 12 and 16 respectively).

Ans :

(a) Atomic mass of water $(H_2O) = 1 \times 2 + 16 = 18$ u
Number of moles in 20 g of water = 20/18 = 1.1.
(b) Atomic mass of carbon dioxide $(CO_2) = 12 + 2 \times 16 = 44$ u.
Number of moles in 22 g of carbon dioxide = 22/44 = 0.5 mol.

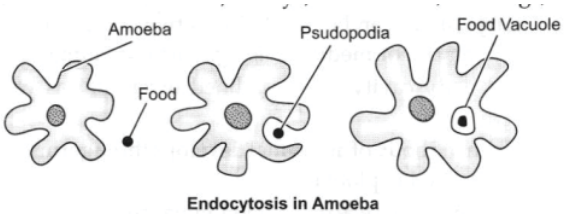
23. What is SONAR? Write two uses of SONAR technique. [3]

Ans :

The acronym SONAR stands for Sound Navigation And Ranging. SONAR is a device which uses ultrasonic waves to measure the distance, direction and speed of under water objects. Uses of SONAR technique are :
(a) It is used to determine the depth of the sea.
(b) It is used to locate under water hills, valleys, submarines, ice-bergs, sunken ships, etc.

24. Describe the way Amoeba consumes its food with the help of diagrams. [3]

Ans :



Endocytosis in Amoeba

Amoeba consumes its food by a process known as endocytosis.
(a) Initially the plasma membrane of the cell folds inward forming a cavity around the target particles.
(b) The pocket then pinches off with the help of specialized proteins, leaving the target particles trapped inside the cell.
(c) The target particles are trapped inside the cell forming a new food vacuole, which are further digested for nutritional purposes.

Section -C

25. (a) A. truck starts from rest and rolls down the hill with constant acceleration. It travels a distance of 500 m in 25 seconds. Find the force acting on it if its mass is 6 metric tons.
(b) State Kepler's law of planetary motion. [5]

Ans :

(a) According to the question
Initial velocity of truck $u = 0$
Distance, $s = 500$ m and time, $t = 25$ s
Mass of truck = 6 metric tons = 6000 kg

we have, $S = ut + \frac{1}{2}at^2$

$$500 = 0 \times 25 + \frac{1}{2}a \times (25)^2$$

$$500 \times 2 = a \times 25 \times 25$$

$$a = 1.6\ \text{m/s}^2$$

Therefore, $F = ma$

$$= 6000 \times 1.6$$

$$= 9600\ \text{N}$$

(b) Kepler derived three laws governing the planetary motion.
(i) The orbit of a planet is an ellipse with the sun at one of the foci.
(ii) The line joining the planet and the sun sweeps equal areas in equal intervals of time.
(iii) The cube of mean distance of a planet from the sun is directly proportional to square of

orbital period, i.e., r^3/T^2 = constant.

or

(a) (i) Seema buys few grains of gold at the poles as per the instruction of one of her friends. She hands over the same when she meets her at the equator. Will the friend agree with the weight of gold bought? If not, why ?

(ii) If the moon attracts the earth, why does the earth not move towards the moon ?

(b) Sound requires a medium to travel. Justify experimentally.

Ans :

(a) (i) No, her friend will not agree with the weight of gold bought because weight at poles is greater than the weight at equator.

(ii) We know that the gravitational force is always attractive; still the moon does not fall on the earth because the gravitational force between earth and the moon works as the necessary centripetal force for the moon to make it revolving around the earth.

(b) (i) Take a bell jar and suspend an electric bell in it.

(ii) The bell jar is connected to a vacuum pump.

(iii) Till the air is present inside the bell jar, the sound of the electric bell can be heard clear and loud.

(iv) Now, with the help of vacuum pump, suck out the air from the bell jar.

26. (a) What was Thomson's model of an atom ?

(b) Write any two observations of Rutherford's model of atom. [5]

Ans :

(a) **Thomson's model of an atom :**

(i) Atom consists of positive charge uniformly distributed.

(ii) Electrons are embedded in positively charged sphere like seeds in watermelon.

(iii) Atom is neutral.

(iv) Mass of atom is also uniformly distributed.

(b) (i) Most of alpha rays passed through gold foil undeviated.

(ii) Some alpha rays deviated through larger angles.

27. What are the different aspects of maintaining a good health ? [5]

Ans :

Different aspects of maintaining a good health are :

(a) **Community health :** It involves all the factors relating to personal health along with the service necessary for providing good health for the community.

(b) **Personal health (hygiene) :** It is the science of preserving and promoting health mainly through the active efforts of an individual. It is practiced through active, sanitary habits and healthy way of life.

(c) **Exercise, relaxation and sleep :** Regular exercise is very necessary to keep the body fit. Proper sleep of about 6-8 hours is essential. Relaxation is also very essential for good health.

(d) **Nutrition :** Optimum nutrition is essential for maintenance of good health. One should take sufficient and balanced food for maintaining good health.

or

What are the limitations in the approach of treating the infectious diseases ? Also mention the principles of prevention.

Ans :

There are three limitations in the treatment approach of an infectious disease.

(a) If someone has a disease, their body functions are damaged and may never recover completely.

(b) A treatment will take time, which means that someone suffering from a disease is likely to be bedridden for some time even if he is given proper treatment.

(c) The person suffering from an infectious disease can serve as the source from where the infection may spread to other people.

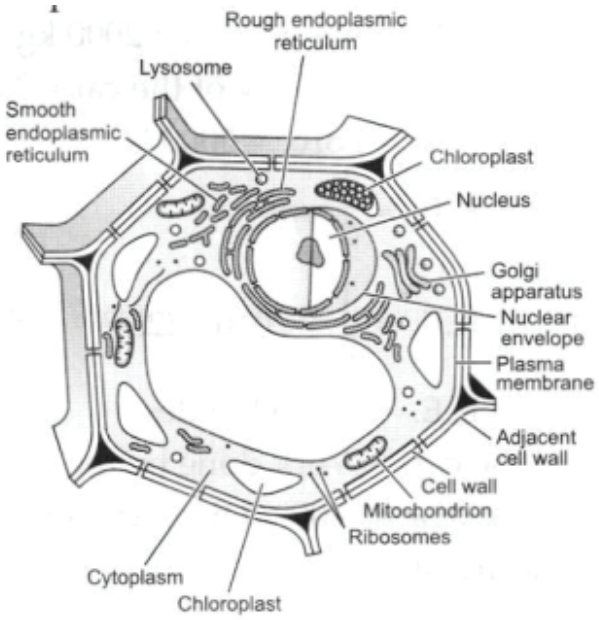
There are two ways to prevent a disease, one is general and one is specific to each disease.

(a) The general way of preventing a disease is to prevent our body's exposure to microbes. For example, we can prevent exposure to air borne microbes by providing living conditions that are not overcrowded. We can prevent exposure to water borne microbes by providing safe drinking water.

(b) The second principle is based on the strength of our immune system to fight the diseases. For a proper functioning immune system, availability of proper and sufficient food for everyone is very important.

28. Draw the diagram of a plant cell. Label all the important parts and write a short definition of each part. [5]

Ans :



(a) **Plasma membrane :** It acts as a semipermeable membrane and allows only selective substances to pass through it.

(b) **Chromosomes :** They carry hereditary characters

from parents to offspring, that is, from one generation to another.

(c) **Lysosomes :** They act as 'digestive bags' which fight against any infection inside the cell.

(d) **Ribosomes :** They help in protein synthesis.

(e) **Nucleus :** It controls all metabolic activities of the cell.

(f) **Mitochondria :** It is the power house of the cell which stores and releases energy in the form of ATP.

(g) **Chloroplast :** It carries out photosynthesis in plants and synthesizes food by trapping solar energy. They are also known as the 'kitchen of the cells'.

(h) **Cytoplasm :** Cytoplasm is a thick solution composed of water, salts and proteins that fills the cells. It is surrounded by cell membrane.

(i) **Rough endoplasmic reticulum :** Ribosomes are attached on RER. The proteins manufactured by them are distributed to the different sites through rough endoplasmic reticulum.

(j) **Smooth endoplasmic reticulum :** The SER helps in the manufacture and distribution of fat molecules and lipids to different sites inside the cell.

(k) **Golgi apparatus :** It helps in the formation of Lysosomes. It also helps in storing and distributing the material synthesized by Endoplasmic Reticulum.

29. Iron filings and sulphur were mixed together and divided into two parts, A and B. Part A was heated strongly while part B was not heated. Dilute hydrochloric acid was added to both the parts and evolution of gas was seen in both the cases. How will you identify the gases evolved? [5]

Ans :

As part 'A' is heated, a compound feS is formed lay the reaction between iron fillings and Sulphur. When dilute HCl is added to part A, FeS will react with dilute HCl to form H_2S gas which gas smell of rotten eggs and will turn lead acetate paper black

$$Fe(s) + S(s) \xrightarrow{\text{heat}} FeS(s)$$

$$FeS(s) + 2HCl(\text{dill}) \longrightarrow FeCl_2(aq) + H_2S \uparrow (g)$$

As part 'B' is not heated, so B is a mixtune of iron filings and sulphur powder. When dilute. HCl is added to it, iron filings react with dil. HCl to form H_2 (g) which burns with a 'pop'sound if burning match stick is brought near it.

$$Fe(s) + 2HCl \longrightarrow FeCl_2 + H_2 \uparrow$$

or

(a) While diluting a solution of salt in water, a student by mistake added acetone (boiling point 56°C).What technique can be employed to get back the acetone? Justify your choice.

(b) Rohit mixed starch with water, boiled the mixture well and stirred it. What did he observe ?

(c) What name is given to process of rusting of an article made up of iron and what type of change is it?

Ans :

(a) Acetone can be obtained back by simple distillation of the mixture because the difference in the boiling points of the two liquids is more than 25° C.

[Note : Boiling point of acetone = 56° C, Boiling point of water = 100°C]

(b) He observed that starch forms a translucent mixture (colloid).

(c) The process is called corrosion and it is a chemical change because rust is a chemical compound (hydrated iron oxide, $Fe_2O_3 \cdot x\,HeO$) totally different from element iron. The reaction is

$$4Fe + 3O_2 + x\,H_2O \longrightarrow 2Fe_2O_3 \cdot x\,H_2O \text{ (rust)}$$

30. A 2000 kg car is moving at 25 m/s when brakes are applied. If the average force exerted by the brakes is 5000 N, find the distance travelled by the car before it comes to rest? [5]

Ans :

Given, mass of car, $m = 2000$ kg

velocity of the car, $v = 25$ m/s

Force, $F = 5000$ N

$$\text{K.E.} = \frac{1}{2}mv^2$$

$$\text{K.E.} = \frac{1}{2} \times 2000 \times (25)^2$$

$$\text{K.E.} = 625000 \text{ Joules}$$

$$\text{Now, K.E. of the car} = \text{Work done by the car}$$

$$= \text{Forec} \times \text{Displacement}$$

$$625000 = 5000 \times \text{Displacement}$$

$$\text{Displacement} = 125\,\text{m}$$

CLASS IX (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. Which of the following solution scatter light ? [1]
(a) Suspension (b) Colloidal solution
(c) Both (a) and (b) (d) None of them

Ans : (c) Both (a) and (b)

DIRECTION : For question numbers 2 and 3, 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 A.
(b) Both A and R are true but R is not the correct explanation of the A.
(c) A is true but R is false.
(d) Both A and R are false.

2. Assertion (A) : A body thrown vertically up with a velocity u reaches the maximum height h after T seconds. At a time 2T seconds its velocity be u.
Reason (R) : A particle thrown vertically up with a velocity comes back to its initial position with same magnitude of velocity but in opposite direction. [1]

Ans : (a) Both A and R are true and R is correct explanation of the A.

3. Assertion (A) : The growth of plants occurs only in certain specific regions. [1]
Reason (R) : Meristematic tissue is located only at certain points in a plant.

Ans : (a) Both A and R are true and R is correct explanation of the A.

4. Oxygen is : [1]
(a) Monovalent (b) Bivalent
(c) Trivalent (d) None of these

Ans : (b) Bivalent

5. The SI unit of force is similar to the SI unit of : [1]
(a) Power (b) Mass
(c) Weight (d) Energy

Ans : (c) Weight.

6. What is the gravitational force between the two objects ? [1]
(a) Attractive at large distances only.
(b) Attractive at small distances only.
(c) Attractive at all distances.
(d) Attractive at large distances but repulsive at small distances.

Ans : (c) Attractive at all distances.

7. In a salt-water solution : [1]
(a) Water is solvent and salt is solute.
(b) Water is solute and salt is solvent.
(c) Water and salt both are solvent.
(d) Water and salt both are solute.

Ans : (a) Water is solvent and salt is solute.

or

Which one of the following methods would you use to separate cream from milk ?
(a) Fractional distillation (b) Distillation
(c) Centrifugation (d) Filtration

Ans : (c) Centrifugation

8. If a body is stored at a height h = 0 m, then the energy possessed by it is : [1]
(a) Kinetic energy (b) Potential energy
(c) Both (a) and (b) (d) None of these

Ans : (d) None of these

or

How are Joule (J) and ergs (erg) related ?
(a) 1 J $=10^7$ erg (b) 1 erg $=10^7$ J
(c) 1 J $=10^{-7}$ erg (d) None of these

Ans : (c) 1 J $=10^{-7}$ erg

9. The fertility of soil is lost due to : [1]
(a) Strip cropping (b) Afforestation
(c) Soil erosion (d) Crop rotation

Ans : (c) Soil erosion

10. What is the process of growing two or more crops in a definite pattern ? [1]
(a) Crop rotation (b) Inter-cropping

(c) Mixed cropping (d) Organic cropping

Ans : (b) Inter-cropping

or

Which of the following species is an Indian cow ?

(a) Bos indicus (b) Bos domestica

(c) Bos bubalis (d) Bos vulgaris

Ans : (a) Bos indicus

11. What is the audible range of the average human ear? [1]

Ans :

The average audible for human is 20 Hz to 20,000 Hz

12. Which division among plants has the simplest organisms ? [1]

Ans : Thallophyta

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Plant Cell

Ravi was travelling to his school to give his final exams. Today it was the science exam and he was nervous. The teacher had told that there will be a surprise element in the exam that he didn't know of. When he reached the school, he found out that there will be a viva-voce exam for each of the student. When his turn came, he was given a very small task. First he was shown the above two images.

13.1 Help Ravi to correlate between these two images. [1]

Ans : Mitochondria inside the plant cells are called the powerhouse of a cell.

13.2 What is the reason behind that correlation? [1]

Ans : Mitochondria are tiny organelles inside cells that are involved in releasing energy from food, that's why they are known as powerhouse of the cell.

13.3 Mark the solution to the above two questions in the given image. [1]

Ans :

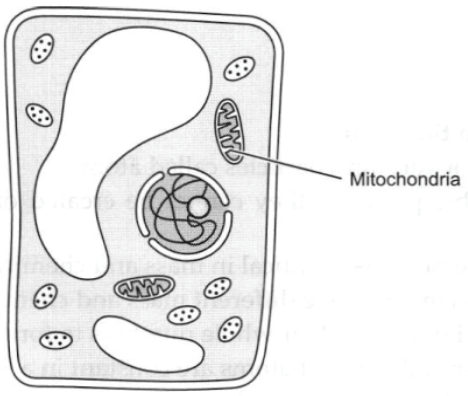


Fig: Plant cell

13.4 Name two other cell organelles in a plant cell. [1]

Ans : Golgi apparatus, Lysosomes.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions.

Table A : Atomic Number and Valency

Element	Atomic Number	Valency
Beryllium	4	2
Boron	5	3
Carbon	6	4
Nitrogen	7	3
Oxygen	8	2
Fluorine	9	1

14.1 In the Table A, find out which element's atom has to gain or lose the highest number of electrons to complete its octet ? [1]

Ans : Carbon

14.2 Nitrogen atom's outermost shell has 5 electrons. Then how is its valency 3, not 5? [1]

Ans : Nitrogen will gain 3 electrons to achieve its octet, therefore its valency is 3.

14.3 Which is more reactive among Oxygen and Fluorine? [1]

Ans : Oxygen, because its valency is higher.

14.4 In what ways can an atom achieve an octet? [1]

Ans : An atom can achieve an octet by sharing, gaining or losing electrons from its outermost shell.

SECTION - B

15. Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of 50 km/h. [3]

Ans :

Initial velocity of the car

$$(u) = 50\,\text{km/h}$$
$$= (50 \times 1000)/(60 \times 60)$$
$$= \frac{125}{9}\text{m/s}$$

Final velocity of the car

$$(v) = 0 \text{ (object has to be stopped)}$$

$$\text{Initial Kinetic energy} = \frac{1}{2} \times m \times v^2$$
$$= \frac{1}{2} \times 2000 \times (125/9)^2$$
$$= 192901.2\,\text{J}$$

$$\text{Final Kinetic energy} = \frac{1}{2} \times 2000 \times (0)^2 = 0$$

$$\text{Therefore,work done} = \text{Change in Kinetic energy}$$
$$= 192901.2 - 0 = 192901.2\,\text{J}$$

16. Draw the diagrams of the following cells

(a) Fat cell

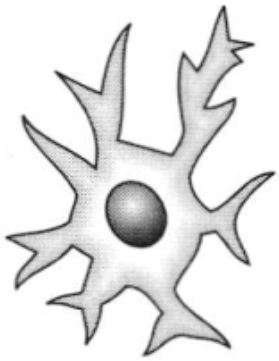
(b) Bone cell

(c) Smooth muscle cell. [3]

Ans :

(a) Fat cell

(b) Bone Cell



(c) Smooth muscle cell

17. Mention the postulates of Dalton theory of atomic model. [3]

Ans :

The postulates of Dalton theory are :

(a) All matter is made of very tiny particles called atom.
(b) Atoms are indivisible particles; they cannot be created or destroyed during a chemical reaction.
(c) Atoms of a given element are identical in mass and chemical properties.
(d) Atoms of different elements have different mass and chemical properties.
(e) Atom combines in the ratio of their whole numbers to form compounds.
(f) The relative number and kinds of atoms are constant in a compound.

18. Why is the weight of an object on moon 1/6th its weight on earth? [3]

Ans :

We know that weight of a body = mg. Now the mass of a body is constant irrespective of whether it is on earth or moon. But the acceleration due to gravity on moon is 1/6th the value of acceleration due to gravity on earth. Because of this, the weight of an object on moon is 1/6th its weight on earth.

or

Why will a sheet of paper fall slowly in comparison to one that is crumpled into a ball ?

Ans :

A greater surface area offers greater resistance and buoyancy. Same is true in the case of a sheet of paper that has a larger surface area as compared to a crumpled ball of paper. So a sheet of paper falls slower.

19. Name the two main types of plant tissues. [3]

Ans :

Plant tissues are mainly divided into two types:

(a) **Merismatic tissue** — It consists of undifferentiated actively dividing cells.
(b) **Permanent tissue** — It consists of differentiated cells which have lost the ability to divide.

20. How do biotic and abiotic factors affect crop production ? [3]

Ans :

The biotic factors include living organisms like honey bees and earthworms who help in better crop production while pests (insects and rodents) and microbes that produce bad effect on crop production.

The biotic factors are the climatic conditions and non-living natural resources like soil, water and air. They also affect crop production since favourable conditions of temperature; humidity and mineral nutrition improve crop production.

21. Differentiate between mass and weight. [3]

Ans :

S.No.	Mass	Weight
1.	It is the matter contained by a body.	It is the force which the body exerts on the ground.
2.	It always remains constant.	It changes with a change in acceleration due to gravity.
3.	It is always positive.	It can be positive and zero.
4.	It is a scalar quantity.	It is a vector quantity.
5.	Its S.I. unit is kg.	Its S.I. unit is Newton.

22. Give three examples of the range of variations that you see in life forms around you. [3]

Ans :

(a) **Number and type of cells :** Some organisms have

a prokaryotic cell like bacteria and that single cell performs all the required functions while others have eukaryotic cells organised into tissue, organ and even organ systems like human beings.

(b) **Mode of nutrition :** Some organisms are autotrophic, i.e., capable of making their own food, e.g. plants while other organisms are heterotrophic, i.e., they are dependent on other organisms for their food supply.

(c) **Life forms vary in their size :** Some organisms are too small and cannot be seen with naked eyes like micro organisms while others are too big like the biggest animal which is the blue whale.

or

Why do we classify organisms ?

Ans :

A large number of organisms exist on this earth. We cannot study such an enormous biodiversity one by one, i.e., studying the variety of life forms individually is an impossible task.

Hence, we make groups or categories of organisms depending upon their similarities and dissimilarities with other organisms. This allows an easier and systematic study of the life forms.

23. Define latent heat of vaporisation. What is the value of latent heat of vaporization for water ? [3]

Ans :

Latent heat of vaporisation is the amount of heat required to change 1 kg of a liquid completely to its gaseous state at atmospheric pressure. The latent heat of vaporisation of water is 2260 kJ/kg.

or

Write the steps you would use for making tea. Use the words solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.

Ans :

Take some amount of solvent (water) in a pan and after heating it add little amount of solute (sugar). Solute will dissolve completely in the solvent forming true solution. Now add tea leaves, that are insoluble along with the other solute milk. After boiling, allow filtration with a sieve. The filtrate you obtain is tea, while the residue have tea leaves that are thrown away.

24. How do you describe a motion ? [3]

Ans :

First of all, we describe the location of an object by specifying a reference point. Let us understand this by an example. Let us assume that a school in a village is 2 km north of the railway station. We have specified the position of the school with respect to the railway station. In this example, the railway station is the reference point. We could have also chosen other reference points according to our convenience. Therefore, to describe the position of an object we need to specify a reference point called the origin.

SECTION - C

25. Differentiate vertebrates and invertebrates. [5]

Ans :

S.No.	Vertebrates	Invertebrates
1.	Internal skeleton present.	Internal skeleton absent.
2.	Vertebral column (backbone) present.	Vertebral column (backbone) absent.
3.	Two pairs of limbs present.	Three or more pairs of limbs are present
4.	A tail is usually present.	A tail absent.
5.	Body is covered by hair.	Body is not covered by hair.
6.	Nerve cord is dorsally located.	Nerve cord is ventrally located.

26. Describe Bohr's atomic model. [5]

Ans :

Rutherford's atomic models had certain drawbacks. Bohr proposed his atomic model in 1912, that had some special features and also an explanation to the previous model's drawbacks. The special features of Bohr's atomic model are :

(a) An electron revolves in an orbit with a well defined energy. Only certain special orbits known as discrete orbits of electrons are allowed inside the atom.

(b) While revolving in discrete orbits the electrons do not radiate energy.

(c) Energy of orbits increases from inner shells to the outer shells, i.e., energy for orbit nearest to the nucleus is lowest.

(d) If energy is supplied to an electron, it moves from a lower orbit to a higher orbit and if an electron jumps from a higher orbit to a lower orbit, it radiates energy that is equal to the energy difference of those two particular orbits.

or

Explain with examples.

(a) Atomic number (b) Mass number

(c) Isotopes (d) Isobars

Give two uses of isotopes.

Ans :

(a) Atomic number is the number of protons inside the nucleus of an atom. It is represented by the letter Z. For example: Hydrogen Z = 1; this means that inside the nucleus of a hydrogen atom, one proton is present.

(b) Mass number is the total number of protons and neutrons inside the nucleus of an atom. It is represented by A = P + N. For example, mass number of carbon is 12 units because it has 6 protons and 6 neutrons.

(c) **Isotopes:** They are the elements that have the same atomic number but different mass number. For example: carbon 12 and carbon 14. Both have the same number of protons, 6 but carbon 12 has 6 neutrons and carbon 14 has 8 neutrons.

Two uses of isotopes :

(i) An isotope of uranium is used in nuclear reactors.

(ii) An isotope of cobalt is used in treatment of cancer.

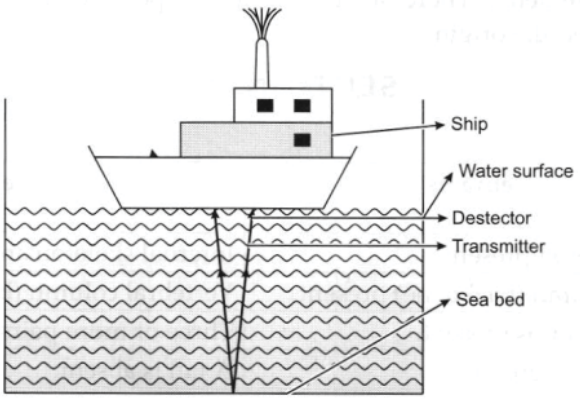
(d) **Isobars:** They are the elements that have the same mass number but different atomic number. Basically they are two different elements. For example: calcium, Z = 20 and argon, Z = 18, but the mass number of both the elements is 40. It means that calcium has 20 neutrons while argon has 22 neutrons.

27. Explain SONAR and its working with the help of a diagram. [5]

Ans :

SONAR stands for Sound Navigation and Ranging. It runs on ultrasonic waves. It consists of a transmitter which produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the sea bed gets reflected back and are sensed by detector. The waves are then converted to electrical signals by detector. The time taken by the wave to reach the detector is recorded. Now, the distance of that object from the ship is calculated by the relation

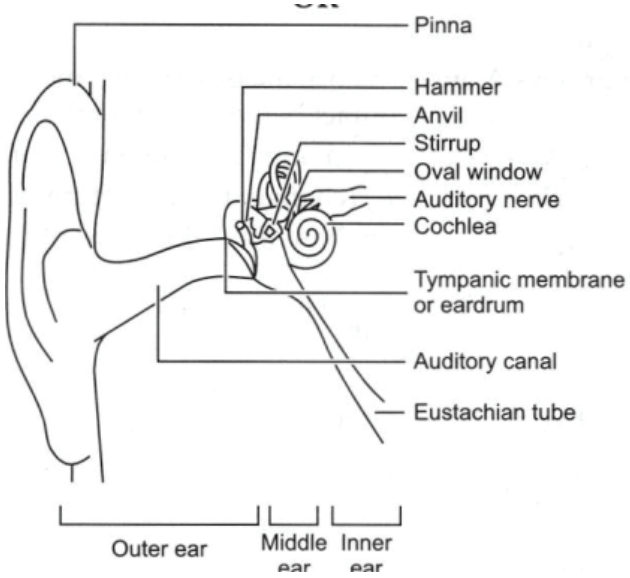
$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$



or

Describe the structure and working of the human ear with the help of a rough diagram.

Ans :



Outer ear is called pinna, followed by an auditory canal which ends in a tympanic membrane. The tympanic membrane is then connected to three bones, hammer, anvil and stirrup. Then there is cochlea connected to an auditory nerve.

Working of human ear : The pinna collects the sound and the collected sound passes through the auditory canal and reaches the auditory nerve. After that it reaches the eardrum (tympanic membrane), which vibrates. The vibrations are then amplified by the Three bones; hammer, anvil and stirrup and the pressure variations reach the inner ear where cochlea converts them to electrical signal. The auditory nerve carries the electrical signal to brain and the brain interprets them as sound.

28. (a) How does the factories around Taj Mahal affect it ? [5]

(b) Can you justify why dust is called as pollutant ?

Ans :

(a) The refineries releases acidic gases like sulphur dioxide and nitrogen dioxide into the air. Sulphur dioxide combines with the moisture present in the air and forms sulphuric acid and nitrogen oxide forms nitric acid. These acids reach the earth surface with rain water, which is also known as acid rain. These acids dissolve and corrode the white marbles of Taj Mahal.

(b) Dust consists of suspended particles. Inhalation of dust causes lots of discomfort including allergic asthma, bronchitis, cold or cough. Dust particles settle over leaf and can block stomata and reduce gaseous exchange in plants.

or

(a) Why cultivation of legumes improve soil fertility ?

(b) How living organisms assist in erosion of rocks ?

Ans :

(a) Leguminous plants bear nodules in their roots. These nodules contain nitrogen fixing bacteria, which converts atmospheric nitrogen into soluble form and adds it into the soil and thus, increases the soil fertility.

(b) Living organisms like lichens grow on rock surfaces and release certain substances that cause the rock surface to powder down and hence break rocks into fine particles.

29. Define chromatography. Underline the basic principle involved and mention its different applications. [5]

Ans :

Chromatography is a technique used for separation of those components whose solubility in the same solvent is different.

The basic principle in chromatography is based on the difference in movement of individual components of a mixture through stationary phase under the influence of a mobile phase.

Its various applications are:

(a) It is used to separate different colors in dye.

(b) It is used to separate pigments from natural colours.

(c) It is used to separate drugs from blood

30. (a) State the law of conservation of momentum. Write its mathematical derivation.

(b) Two objects of masses 50 g and 100 g are moving along the same line and direction with velocities of 5 m/s and 10 m/s respectively. They collide and after the collision, the second object moves at a velocity of 8 m/s. Determine the velocity of the first object. [5]

Ans :

(a) For two or more bodies in an isolated system acting upon each other, their total momentum remains constant unless an external force is applied. Therefore, momentum can neither be created nor destroyed.

Equation:

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

Derivation of the equation:

Consider two colliding particles A and B whose masses are mi and m_2 with initial velocities and final velocities as v_1 and v_2. The time of contact between two particles is given as t.

$$A = m_1(v_1 - u_1)$$

(change in momentum of particle A)

$$B = m_2(v_2 - u_2)$$

(change in momentum of particle B)

$$F_{BA} = -F_{AB}$$

(from Newton's third law of motion)

$$F_{BA} = m_2 \times a_2 \frac{(v_2 - u_2)}{t}$$

$$F_{BA} = m_1 \times a_1 = m_1\frac{(v_1 - u_1)}{t}$$

$$m_2\frac{(v_2 - u_2)}{t} = -m_1\frac{(v_1 - u_1)}{t}$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

(b) Given,

$$m_1 = 50\,\text{g} = 0.05\,\text{kg}$$

$$m_2 = 100\,\text{g} = 0.1\,\text{kg}$$

Velocity of the first object

$$v_1 = 5\,\text{m/s}$$

Velocity of the first object

$$v_2 = 10\,\text{m/s}$$

Momentum before the collision

$$= 0.05 \times 5 + 0.1 \times 10$$

$$= 1.25\,\text{kgm/s}$$

Since velocity of the second object after cellision $= 8\,\text{m/s}$

If we assume the velocity of first object after collision is v,

According to law of conservation of momentum,

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$$1.25 = 0.05 \times v + 0.1 \times 8$$

$$0.05 \times v_1 = 1.25 - 0.8$$

$$v_1 = 9\,\text{m/s}$$

CLASS IX (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

DIRECTION : For question numbers 1 and 2, 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) Both A and R are false.

1. Assertion (A) : If we push a massive truck parked along the roadside, it will not move.
Reason (R) : Two opposite and equal forces acted on two bodies in contact cancel each other. [1]

Ans : (b) Both A and R are true but R is not correct explanation of A.

2. Assertion (A) : Molecular mass of water (H_2O) is 18 g.
Reason (R) : Atomic mass of a hydrogen atom is 2 g and atomic mass of an oxygen atom is 14 g. [1]

Ans : (c) A is true but R is false.

3. Which of the following micro-organisms is present in the root nodules of leguminous plants ? [1]
(a) Azotobacter (b) Nitrosomonas
(c) Rhizobium (d) Pseudomonas

Ans : (c) Rhizobium

or

The two forms of oxygen found in the atmosphere are :
(a) Ozone and carbon dioxide
(b) Oxygen and carbon dioxide
(c) Ozone and oxygen
(d) Water and oxygen

Ans : (c) Ozone and oxygen

4. What is the S.I. unit of momentum ? [1]
(a) kgms (b) $mskg^{-1}$
(c) $kgms^{-1}$ (d) $kg(ms)^{-1}$

Ans : (c) $kgms^{-1}$

5. Which of the following is not a perfectly in elastic collision ? [1]
(a) Capture of an electron by proton.
(b) Man jumping on to a moving cart.
(c) Collision between glass balls.
(d) A bullet fired into a block of wood such that it is embedded in the wood.

Ans : (c) Collision between glass balls.

6. Who is known as Father of Taxonomy ? [1]
(a) Linnaeus (b) Darwin
(c) Mendel (d) Watson

Ans : (a) Linnaeus

7. If the temperature of a place is increasing, then the rate of evaporation at that place [1]
(a) Decreases (b) Increases
(c) Remains same (d) None of the above

Ans : (b) Increases

8. If you live in an over crowded and poorly ventilated house, it is possible that you may suffer from one of the following diseases. Which one ? [1]
(a) Cancer (b) AIDS
(c) Air borne disease (d) Cholera

Ans : (c) Air borne disease

9. If the force applied on the body displaces it in the opposite direction of applied force, then the work done is : [1]
(a) Positive (b) Negative
(c) Zero (d) Data is inadequate

Ans : (b) Negative

or

Which Newton's law is applicable in the case of swimming ? [1]

(a) Law of gravitation (b) Newton's first law
(c) Newton's second law (d) Newton's third law

Ans : (b) Newton's first law

10. A long tree has several branches. The tissue that helps in the sideways conduction of water in the branches is [1]
(a) Collenchyma (b) Xylem parenchyma
(c) Parenchyma (d) Xylem vessels

Ans : (d) Xylem vessels

or

The tissue present in the lining of kidney tubules and ducts of salivary glands is
(a) Squamous epithelium tissue
(b) Glandular epithelium tissue
(c) Cuboidal epithelium tissue
(d) Columnar epithelium tissue

Ans : (c) Cuboidal epithelium tissue

11. What was the limitation of J. J. Thomson's atomic model ? [1]

Ans :

It didn't explain the arrangement of electrons in an atom.

12. In what direction does the buoyant force on an object fully immersed in a liquid act ? [1]

Ans :

The drection of bouyanet force on an object is upwards.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Michael was having dinner with his family on the occasion of Christmas. When it was the time for dessert, Michael became curious. When he saw that the dessert was plum pudding, he became happy because he had learned about a similar term in his chemistry class on that day.

13.1 Correlate the plum pudding with hat Michael studied in his chemistry class. [1]

Ans : The model proposed by J. J. Thomson was called as plum pudding model.

13.2 Why did the name "plum pudding" originate? [1]

Ans : The electrons in a sphere of positive charge were like currants (dry fruits) in a spherical Christmas pudding.

13.3 Give the postulates of the model discussed here.[1]

Ans : Postulates of J. J. Thomson's atomic model :

(i) An atom consists of a positively charged sphere and the electrons are embedded in it.
(ii) The negative and positive charges are equal in magnitude. So, the atom as a whole is electrically neutral.

13.4 Give one drawback of the atomic model discussed here. [1]

Ans : Thomson's atomic model failed to explain how the positive charge holds on the electrons inside the atom, therefore it failed to explain an atom's stability.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions.

Table A : 6 person and their serum osmolality levels

Person	Serum Osmolality (mmol/kg)
A	260
B	243
C	220
D	280
E	276
F	315
G	342

Table B : Range for normal and dangerous levels of serums osmolali of a person's blood

Situation	Serum osmolality (mmol/kg)
Should visit the doctor	<275
Normal range	275–295
Should visit the doctor	>295

Osmolality can be used to measure the amount of solute dissolved in a solution.If the level of solute of a solution is higher than the concentration of solute inside of the cell, water will flow out of the cell during osmosis. If the level of solute outside the cell is lower than the levels of solute inside of the cell, water will flow into the cell.

14.1 If we place a red blood cell (osmolality is 280 mmol/kg) in the serum of person F, will the plasma flow into the cell or out of the cell ? [1]

Ans : As the osmolality of the cell is lesser than the serum, plasma will flow out of the red blood cell.

14.2 Which person (refer A and B) should visit the doctor ? [1]

Ans : A, B, C, F and G.

14.3 Define osmosis. [1]

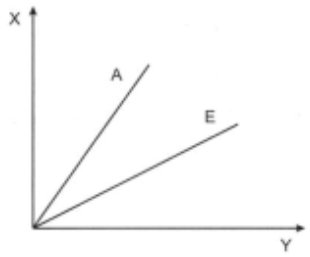
Ans : Osmosis is the movement of water from a region of higher concentration to a region of lower concentration through a selectively permeable membrane.

14.4 What is the difference between diffusion and osmosis ? [1]

Ans : No selectively permeable membrane is involved.

SECTION - B

15. The velocity, time graph of two bodies A and B travelling along the $+x$ direction are given in the figure. [3]



(a) Are the bodies moving with uniform acceleration ?

(b) Which body is moving with greater acceleration ? Give reasons.

Ans :

(a) Yes, the bodies are moving with uniform acceleration because the graph of velocity time graph is linear or a straight line.

(b) The body A is moving with a greater acceleration than body B because the graph of A has a larger slope than the graph of B.

16. Give any two uses of isotopes. [3]

Ans :

Two uses of isotopes are as follows :

(a) An isotope of uranium is used as a fuel in nuclear reactors.

(b) An isotope of cobalt is used in the treatment of cancer.

17. Why are manures and fertilisers used in the fields? [3]

Ans :

Manure helps in enriching soil with nutrients and organic matter and increasing the soil fertility. The bulk of organic matter in manure helps in improving the soil structure.

Fertilisers are used to ensure good vegetative growth (leaves, branches and flowers), giving rise to healthy plants by providing specific nutrients like nitrogen, phosphorous and potassium.

or

How do storage grain losses occur ?

Ans :

There are various biotic and abiotic factors responsible for the storage grain losses such as :

(a) **Biotic factors:** insects, rodents, bacteria, fungi, etc. feed on the grains

(b) **Abiotic factors:** Unfavorable conditions of humidity, temperature, wind, etc.

18. State Newton's third law of motion and also tell how it explains the walking of a man on the ground. [3]

Ans :

According to Newton's third law of motion, if a body A exerts a force F on the body B, then the body B exerts a force (F) on the body A and the forces act along the same line.

When a person walks on the ground, he pushes the ground with his feet, i.e., he applies a force on the ground. By Newton's third law, the ground applies a similar magnitude of force on the man but in the opposite direction. This force from the ground pushes him forward and helps him in walking.

19. What would happen if the plasma membrane ruptures or breaks down? [3]

Ans :

The rupture or breakdown of cell's plasma membrane indicates that cell is damaged and in such condition the lysosomes of the damaged cells may burst and the digestive enzymes present inside those lysosomes would digest their own cell. This will result into death of the cell.

20. A person holds a bundle of hay over his head and walks for 20 minutes and gets tired. Has he done some work for holding the bundle or not? Justify your answer. [3]

Ans :

When a person holds a bundle of hay over his head and walks for 20 minutes and gets tired he applies force in the upward direction and displacement of the bundle of hay is in forward direction which is perpendicular to the direction of the force applied on it.

We have, $W = F\,s\cos\theta$

$\theta = 90^\circ$

Therefore, $W = F \times s \times 0$

$W = 0$

or

Define average power.

Ans :

An agent may not be always able to perform same amount of work in a given period of time. In other words power of that agent may vary with time. Hence we can take average power in such situations. Average power is defined as average amount of work done by a body per unit time (i.e. total energy consumed divided by total time).

21. Which organisms are called primitive and how are they different from the so called advanced organisms? [3]

Ans :

Organisms that possess quite a simple structure and body design also hasn't changed much from their ancient predecessors even after a long period of evolution on Earth are called as primitive organisms. For example; bacteria and prokaryotes.

Advanced organisms have a complex body design, for example, trees and human beings.

22. What is crystallisation? Where is it used? Why is this better than simple evaporation technique? [3]

Ans :

Crystallisation is a process that separates a pure solid in the form of crystals from its solution. It is used to purify solids. For example; salt from sea water is purified using crystallization. It is a better technique than simple evaporation because:

(a) Some solids may decompose or get charred on heating in dryness during evaporation.
(b) On evaporation, some of the impurities still remained dissolved in the solution.

23. Explain how bats use ultrasonic waves to catch prey. [3]

Ans :

Bats search out prey and fly in dark night by emitting and detecting reflections of ultrasonic waves. The high pitched ultrasonic squeaks of the bat are reflected from the obstacles or prey and trapped by the bat's ears. The nature of reflection tells the bat where the obstacle or prey and how does it look like.

or

How is ultrasound used for cleaning ?

Ans :

Ultrasound is generally used to clean parts located in hard to reach places. For example; spiral tubes, odd shaped parts, electronic components, etc. Objects to be cleaned are placed in a cleaning solution and ultrasonic waves are sent into the solution. Due to the high frequency, the particles of dust, grease and dirt gets detached and drops out. The objects thus get thoroughly cleaned.

24. (a) Why is epidermis important for the plants ?
(b) Draw a rough diagram of collenchyma tissue and label it properly. [3]

Ans :

(a) Outer protective covering of the plants is called epidermis.
  (i) It is covered with a waterproof coating or layer called cuticle which reduces loss of water.
  (ii) It also consists of small pores called stomata which helps in the exchange of gases.

(b)

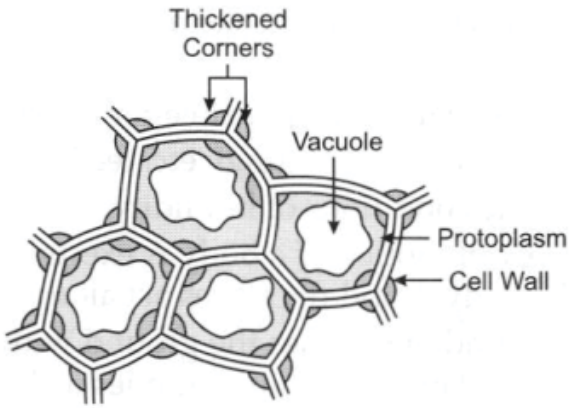


Fig: Collenchyma Tissue

SECTION - C

25. What is the importance of universal law of gravitation ? [5]

Ans :

The universal law of gravitation is important due to the following reasons:

(a) The law explains the force that binds us to the earth.
(b) This law describes the motion of the planet around the sun.
(c) This law justifies the formation of tides on earth due to moon and sun.
(d) This law gives reason for movement of moon around earth.

or

State the factors on which acceleration due to gravity depends.

Ans :

Acceleration due to gravity depends upon :

(a) **Height 'h' above the Earth :** The acceleration due to gravity decreases as we go higher because

$$g = \frac{GM}{R^2}$$

When, $R = R + h$

$$g = \frac{GM}{(R+h)^2}$$

So g will bw lesser.

(b) **Rotation of earth :** Since the earth rotates about its polar axis; the radius of the circle decreases as we move from the equator to the poles, acceleration due to gravity increases as we move from equator to poles.

(c) **Shape of earth :** The radius of the earth is more at the equator and less at poles so acceleration due to gravity increases as we move from equator to poles.

26. Describe the J. J. Thomson's model of atom. Also state the drawback of his model. [5]

Ans :

Thomson proposed the model of an atom to be similar to that of a Christmas pudding. The electrons in a sphere of positive charge were like currants (dry fruits) in a spherical Christmas pudding. We can also think of a watermelon, the positive charge in the atom is spread all over like the red edible part of the watermelon, while the electrons are studded in the positively charged sphere, like the seeds in the watermelon.

Thomson proposed that :

(a) An atom consists of a positively charged sphere and the electrons are embedded in it.
(b) The negative and positive charges are equal in magnitude. So, the atom as a whole is electrically neutral.

Drawbacks of Thomson's model :

(a) Thomson's atomic model failed to explain how the positive charge holds on the electrons inside the atom.
(b) It also failed to explain an atom's stability.
(c) The theory did not mention anything about the nucleus of an atom.
(d) It was unable to explain the scattering experiment of Rutherford.

27. Write the characteristics of kingdom Animalia. [5]

Ans :

(a) Animals are multicellular, eukaryotic organisms.

(b) Animal nutrition is heterotrophic. They lack in photosynthetic pigments.
(c) Animals don't have cell walls.
(d) Animals possess the power of locomotion.
(e) Most animals have a nervous system which is used to coordinate their body actions and response.
(f) In sexual reproduction, animals produce haploid male gametes (sperm) and female gametes.

or

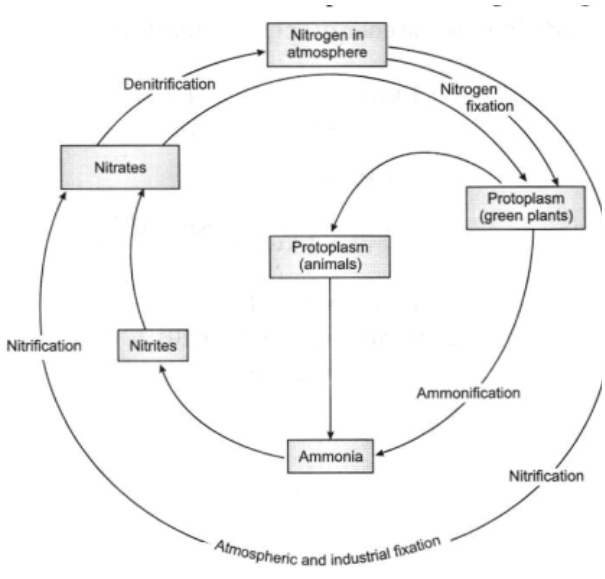
(a) Name the group of plants known as "Amphibians of plant world". Mention their four important characteristics.
(b) Give three points on how birds have adapted themselves to an aerial mode of life.

Ans :

(a) Bryophytes are the plants that live on land and in water so they are called amphibians of plant kingdom. These plants show the following character.
  (i) The plant body is either thallus like (thalloid) or leaf like (foliose).
  (ii) Truleaves and root sarelacking; the plants are anchored to the soil by means of filamentous rhizoids.
  (iii) Plant body is green and autotrophic.
  (iv) The vascular tissues are absent.
(b) Adaptations of birds to aerial mode of life :
  (i) Their body is covered with feathers.
  (ii) Forelimbs are modified into wings.
  (iii) They have hollow bones which helps them during the flight.

28. Describe the nitrogen cycle with appropriate diagrams. [5]

Ans :



Nitrogen is an essential nutrient for the survival of living beings. It is found in proteins like DNA and RNA. Nitrogen cannot be used directly from the atmosphere and have to be converted into nitrates and nitrites by certain Nitrogen fixing bacteria. These bacteria are found in the root nodules of legumes (plants that give us pulses).

Another method through which the nitrogen in the environment can be converted into nitrates or nitrates is the physical process of lightning. The high pressure and temperature during the lightning creates the nitrogen into oxides of nitrogen. These oxides then dissolve in water bodies, thus forming nitrous and nitric acids. Once nitrogen is converted into the useful form of nitrates and nitrites, they can be used further. Plants use them to produce amino acids, which are then used to make proteins. Other complex compounds that require nitrogen are also made by the plants through some complex biochemical process. These proteins and complex compounds are subsequently consumed by the animals. Once these plants and animals die and get buried in the soil, bacteria convert these proteins back to nitrates and nitrites. A certain kind of bacteria converts the proteins to elemental nitrogen, thus, completing a complete nitrogen cycle.

29. Differentiate between mixture and compounds by giving appropriate examples. [5]

Ans :

S. No.	Mixtures	Compounds
1.	Elements or compounds are mixed together to form a mixture	Elements chemically react to form new compounds.
2.	It has a variable composition	It has a fixed composition.
3.	It shows the properties of the constituent substances	The new substance has totally a new and different property
4.	The constituent particles can be separated by physical methods.	The constituents can be separated by chemical or electrochemical reactions.
5.	Example : Air, blood	Example : H_2S, $Ca(OH)_2$

or

What are colloids? What are its various properties ?

Ans :

Colloids are the heterogeneous mixture of substances in which the particle size is too small and cannot be seen by naked eyes.
(a) It is heterogeneous mixture, but appears homogeneous.
(b) The size of the particles is too small to be individually seen by naked eyes.
(c) They scatter a beam of light passing through it and makes its path visible.
(d) The particles of a colloid do not settle down when left undisturbed.

30. What do you understand by the units of electrical energy? How many joules of energy is consumed if the electrical meter shows 200 units of energy ? [5]

Ans :

Unit of electrical energy is defined as the energy spent (or used) by electrical appliance at the rate of 1 kw

for t hour.

$$1 \text{ kwh} = 1000 \text{ W} \times 3600 \text{ seconds}$$
$$= 3.6 \times 10^6 \text{ Ws}$$
$$1 \text{ W} = \frac{1 \text{ Joule}}{1 \text{ Second}}$$
$$1 \text{ Unit} = 1 \text{ kwh} = \frac{3.6 \times 10^6 \text{J} \times \text{s}}{\text{S}}$$
$$1 \text{ Unit} = 3.6 \times 10^6 \text{ J}$$

for 200 units,

$$200 \text{ Units} = 200 \times 3.6 \times 10^6 \text{ J}$$
$$= 72 \times 10^7 \text{ J}$$

CLASS IX (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. A person is sitting in a travelling train and facing the engine. He tosses up a coin and the coin falls behind him. It can be concluded that the train is : [1]
(a) Moving forward and gaining speed.
(b) Moving forward and losing speed.
(c) Moving forward with uniform speed.
(d) Moving backward with uniform.

Ans : (a) Moving forward and gaining speed.

2. Ms. Shukla, a science teacher gave different mixtures to four groups of students to separate their components. Which group was not following the correct method? [1]
(a) Group 1 was separating a mixture of ethyl alcohol and water by using separating funnel.
(b) Group 3 was separating a mixture of iron pins and sand by using a magnet.
(c) Group 2 was separating a mixture of ammonium chloride and sodium chloride using sublimation.
(d) Group 4 was separating mud particles suspended in water using sedimentation and decantation.

Ans : (a) Group 1 was separating a mixture of ethyl alcohol and water by using separating funnel.

or

What happens when graphite is burnt?
(a) There will be remaining residue.
(b) There will be no residue.
(c) It will not catch fire.
(d) It will turn into diamond.

Ans : (b) There will be no residue.

DIRECTION : For question numbers 3 and 4, 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 A.
(b) Both A and R are true but R is not the correct explanation of the A.
(c) A is true but R is false.
(d) Both A and R are false.

3. Assertion (A) : Electron microscope uses very high voltage electricity. [1]
Reason (R) : An electron microscope uses electromagnets instead of glass lenses and beam of electrons instead of light.

Ans : (a) Both A and R are true and R is correct explanation of the A.

4. Assertion (A) : If we push a massive truck parked along the roadside, it will not move. [1]
Reason (R): Two opposite and equal forces acted on two bodies in contact cancel each other.

Ans : (c) A is true but R is false.

5. Calculate the number of moles 23.3 g of zinc. [1]
(a) 0.37 moles (b) 0.36 moles
(c) 0.5 moles (d) 0.53 moles

Ans : (b) 0.36 moles

or

What is the full form of IUPAC?
(a) International Union Power of Applied Chemistry.
(b) International Union of Pure and Applied Chemistry.
(c) Internal Union of Pure Applied Chemistry.
(d) International Universal Pure and Applied Chemistry.

Ans : (b) International Union of Pure and Applied Chemistry.

6. The phenomenon of increase in concentration of non-biodegradable organic compounds with each trophic level in a food chain is called : [1]
(a) Biological evolution (b) Biological fixation
(c) Bioenlargement (d) Biomagnification

Ans : (d) Biomagnification.

7. The electronic configuration of elements A, B, C and D are (2, 8, 4), (2, 8, 5), (2, 8, 6) and (2, 8, 7) respectively. Which of them can make an ion with two

negative charges? [1]

(a) A (b) B

(c) C (d) D

Ans : (c) C

8. Select the incorrect match of disease and its vector/ carrier. [1]

(a) Cholera - Housefly

(b) Sleeping sickness - Tsetse fly

(c) Typhus fever - Body louse

(d) Chikungunya - Sandfly

Ans : (d) Chikungunya - Sandfly

9. If the change in the value of g at a height h above the surface of earth is same as at a depth d below it, then (both d and h being much smaller than the radius of the earth). [1]

(a) $d = h/2$ (b) $d = h$

(c) $d = 2h$ (d) $d = h^2$

Ans : (c) $d = 2h$

or

A sphere of mass 40 kg is attached by another of mass 15 kg when their centers are 0.2 m apart, with a force of 9.8×10^{-7}N. Calculate the constant of gravitation.

(a) $9.2 \times 10^{-7}\text{Nm}^0\text{kg}^{-2}$ (b) $6.13 \times 10^{-11}\,\text{Nm}^2\text{kg}^{-2}$

(c) $6.53 \times 10^{-18}\,\text{Nm}^2\text{kg}^{-2}$ (d) $6.53 \times 10^{-11}\,\text{Nm}^2\text{kg}^{-2}$

Ans : (d) $6.53 \times 10^{-11}\,\text{Nm}^2\text{kg}^{-2}$

10. What happens to collagen when boiled in water at normal pressure and temperature? [1]

(a) Changes into gelatin (b) Changes into fibrine

(c) Changes into elastin (d) No changes

Ans : (a) Changes into gelatin

11. An atom has mass number A and atomic number Z [1]

(a) How many protons are present in the nucleus?

(b) How many electrons revolve around the nucleus?

(c) How many neutrons are present in the nucleus?

Ans :

An atom has mass number A and atomic number Z :

(a) No. of protons = Z

(b) No. of electrons = No. of protons = Z.

(c) No. of neutrons = A − Z.

12. If wavelength of a sound wave in a medium is reduced by 50%, then what is the percentage change in its frequency? [1]

Ans :

We know, $u = \gamma\nu$

As T is reduced by 50%. Then, frequency is proportional to wavelength inversely $\frac{v_1}{v_2} = \frac{v_1}{\lambda_2}$

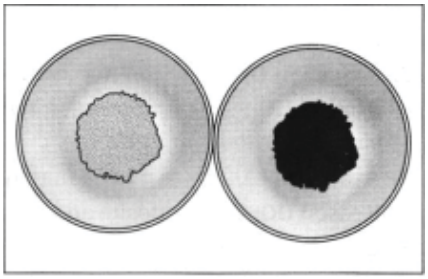
$$\frac{v_2}{v} = \frac{\lambda}{0.5\lambda}$$

$$v_2 = 2\,\text{v}$$

So, frequency will also increased by 100%.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Aaron went to the chemical laboratory in his school to do an experiment on iron filings and sulphur. First he took 3 g of sulphur powder and 5 g of iron filings. He put them on a china dish and heated it till the mixture became red hot. Then he let the mixture cool and weighed the mixture. The quantity seemed less to the naked eyes, but after he saw the weight he was surprised.



13.1 How much did the mixture weight at the end? [1]

Ans : 8 g.

13.2 Which law is applicable here? [1]

Ans : Law of conservation of mass : Mass can neither be created nor destroyed.

13.3 State one property of a compound. [1]

Ans : The property of a compound is totally different than the properties of the individual elements it is formed from.

13.4 What is the name of the compound formed? [1]

Ans : The compound formed here is FeS (ferrous sulphide)

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions.

Table A: Cell size and number of chromosomes

Cells	Size (pm)	Number of chromosomes
Cell A	5	3
Cell B	26	2
Cell C	12	4
Cell D	2	1
Cell E	45	6

14.1 Can you find any discrepancy in the above given (Table A) table? [1]

Ans : Cell A's size is 5 pm, which means it is a prokaryotic cell but it has more than one number of chromosome which is a characteristic of an eukaryotic cell.

14.2 Find out the eukaryotic cells from the given table. [1]

Ans : Cell B, C and E (cell size is between 5 -100 pm) are eukaryotic cells.

14.3 State two differences between prokaryotic cell and eukaryotic cell. [1]

Ans :

(i) Nuclear region is not well defined in prokaryotes while in eukaryotes it is properly defined. The nuclear region is surrounded by a nuclear membrane in the prokaryotes.

(ii) Membrane bounded cell organelles are absent in prokaryotic cell.

14.4 Give two examples of an eukaryote. [1]

Ans : Human beings, reptiles.

SECTION B

15. (a) A bat can hear sound at frequency upto 120 kHz. Determine the wavelength of sound in air at this frequency. Take speed of sound as 344 m/s.
(b) How are the wavelength and frequency of a sound wave related to its speed?
(c) How does sonic boom occur? [3]

Ans :

(a) Frequency,

$$\upsilon = 120 \times 1000\,\text{Hz}$$

Initial velocity, $u = 344\,\text{m/s}$

Wavelength, $\lambda = \frac{u}{\upsilon} = \frac{344}{120 \times 1000}$

$$\lambda = 2.86 \times 10^{-3}$$

(b) Speed of sound wave = wavelength x frequency
(c) When an aircraft travels at a greater speed than that of sound, it is said to have supersonic speed. This produces shock waves with large energy in the surroundings. This is called sonic boom.

16. With the help of an activity show that gases are more easily compressible than liquids and solids. [3]

Ans :

Material Required : Three 10ml syringes, cork, water.
Procedure:

1. Take three 10 ml syringes and close their nozzle by inserting them in a rubber cork.
2. Remove the piston from all the syringes.
3. Allow the common salt to fill space inside the first syringe.
4. Fill the second syringes with water.
5. Third Syringe with air.
6. Now insert the pistons back into the syringes after applying a little of vaseline for smooth movement.
7. Now try to compress by applying pressure on the piston of each syringe and record observations.

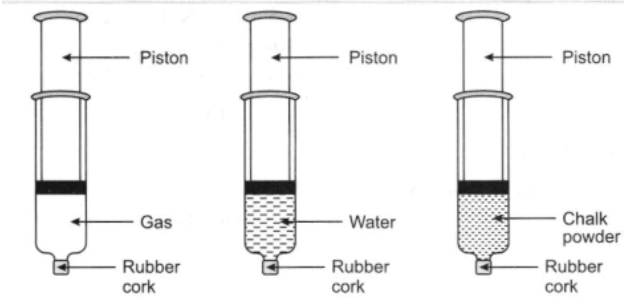
Observations:

The piston moves easily in third syringe in which air is filled as shown in Figure.

The piston does not move easily in second syringe in which water is filled. The piston moves very slowly in the first syringe in which solid common salt is filled.

Inference

Gases are more easily compressed as compared to liquids and liquids are compressed more easily than solids.



17. (a) Why mitochondria are able to make some of their own proteins?
(b) For what reason do we need to stain bacteria?[3]

Ans :

(a) The mitochondrion is a double membrane bound organelle that is found in most eukaryotic organisms. Some cells in some multicellular organisms may however lack them. They are able to make their own proteins because they have their own ribosomes and DNA and ribosomes synthesizes proteins. Mitochondria has their own DNA and Ribosomes, thus it has its own proteins too.
(b) The purpose of staining bacteria is to see, for example, how thick of a layer of peptidogly can their cell wall has. In the gram stain, gram-negative bacteria will stain red or pink because the rinse took out the primary dye and the Safrinin (secondary dye) took over the coloring as the counter-stain.

or

Explain your observation in the following with reason involved in the process.
(a) Salt is applied to raw mango pieces.
(b) Dried raisins are kept in water for a few hours.

Ans :

(a) Mango pieces will shrink due to exosmosis in which more water molecules will exit the cell.
(b) Raisins will swell up because the medium surrounding them has a higher concentration of water than the cell. Raisins gain water due to osmosis (endosmosis).

18. (a) What should be the mass of a man if he has to do 2500 joules of work in climbing a tree 5 m tall? ($g = 10\,\text{m/s}^2$)
(b) List two conditions which need to be satisfied for the work to be done on an object.
(c) If energy of universe is constant, why are we facing energy crisis? [3]

Ans :

(a) Given,

$$W = 2500 = 5\,\text{m}$$
$$g = 10\,\text{m/s}^2$$
$$m = ?$$

We know, $W = mgh$

$$m = \frac{W}{gh}$$

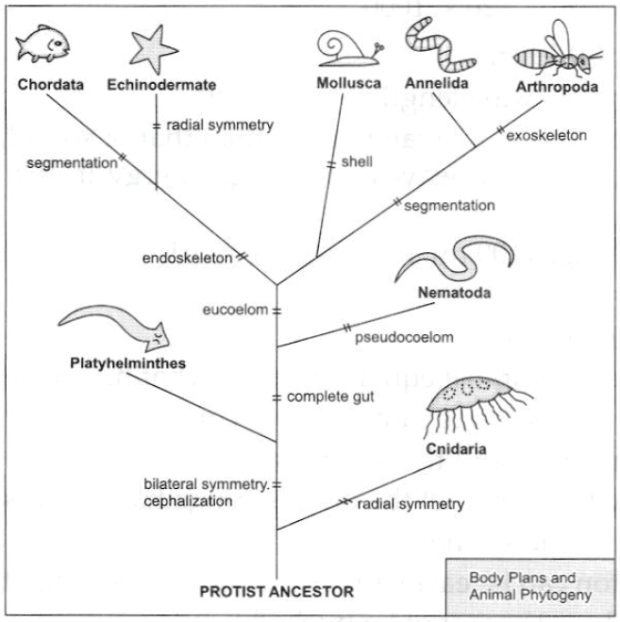
$$m = \frac{2500}{10 \times 5}$$

$$= 50\,\text{kg}$$

(b) (i) There should be a displacement in the object.
(ii) A force should act on the object.
(c) We are facing energy crisis because we are converting the energy available in the form of fuels into non-usable forms. Since we cannot make use of that energy, we are facing energy crisis. The fossil fuels are heading towards exhaustion and cannot be replenished back.

19. Draw a phylogenetic tree to show the natural relationship among various animal phyla. [3]

Ans :

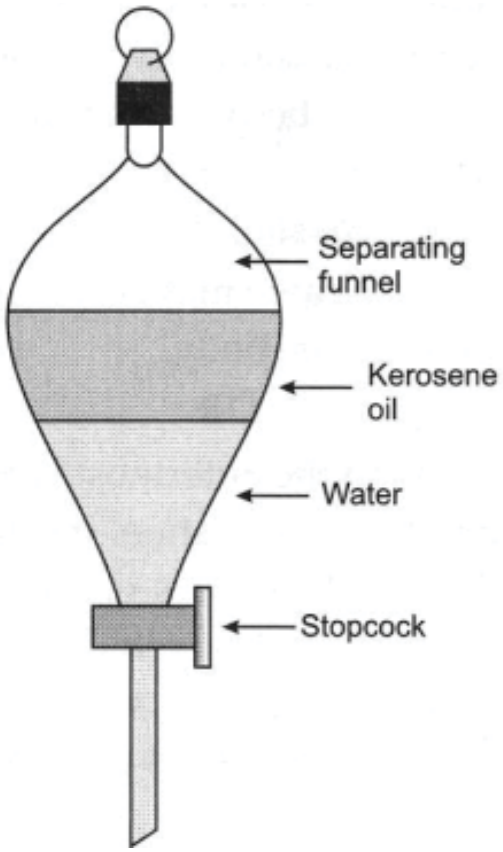


20. (a) Name the principle used to separate kerosene and water. Draw a neat and labelled diagram of the apparatus used in this separation.

(b) Can physical and chemical changes happen at the same time? Support your answer with illustrative example. [3]

Ans :

(a) Kerosene oil and water differ in their densities; therefore, can be separated by separating funnel.



(b) Yes, both can take place simultaneously breaking of chocolate in mouth is physical change.
Its digestion is a chemical change.

or

(a) Why did Rutherford select a gold foil in his alpha scattering experiments?

(b) Mention any two drawbacks of Rutherford's model.

Ans :

(a) Rutherford used gold for his scattering experiment because gold is the most malleable metal and he wanted the thinnest layer as possible. The gold sheet used was around 1000 atoms thick. Therefore, Rutherford selected a gold foil in his alpha scattering experiment.

(b) **Drawbacks of Rutherford's model of atom :** Rutherford proposed that electrons revolve at a high speed in circular orbits around the positively charged nucleus. When a charged particle i.e., electron revolves around positively charge nucleus, it needs to be accelerated so as to keep it moving in circular orbits. However, according to electromagnetic theory, whenever a charged particle such as an electron is accelerated around another charged centre (nucleus) which are under force of attraction, there will be continuous radiation of energy. This loss of energy would slow down the speed of the electron. This would reduce the radius of the electron orbit. Eventually, the electron would fall into the nucleus. The result would be that the atom would collapse. But this does not happen. Thus,Rutherford's atom could not explain the stability of the atom. Failure of Rutherford's model i.e., reduction of radius of orbit is shown below. Rutherford proposed that electrons revolve around the nucleus in the fixed orbits. However, he did not specify the orbits and the number of electrons in each orbit.

21. (a) Describe an activity to demonstrate balanced forces.

(b) Why is it advised to wear a seat belt in a moving car? [3]

Ans :

(a) Consider some children pushing a heavy box on a rough surface with some force.

(i) The box does not move due to the friction between the surface and the box, which balances the applied force.

(ii) The applied force is still increased but the friction again balances with the applied force.

(iii) When the box is pushed with still a greater force, the applied force becomes greater than the frictional force. The force acting on box is unbalanced and the box moves.

(b) It is advice to wear a seat belt while driving or while sitting in a moving car because as car is in motion so due to inertia our body is also in motion and if car stops then due to inertia of motion of body our body pushed forward and the person become injured. So to prevent injuries it is advice to wear a seat belt.

22. Given below are the names of some connective tissues. Mention the composition and function of each of them: Blood, cartilage and bone. [3]

Ans :

Blood : It is a fluid (liquid) connectivity tissue. In this tissue, the cells move in a fluid matrix or medium called blood plasma. The blood plasma contains cells called blood corpuscles which include red blood corpuscles (RBCs), white blood corpuscles (WBCs) and platelets. RBCs and WBCs are living while plasma and platelets are non-living components.

Cartilage : The cartilage is a specialised connective tissue which is compact and less vascular. It provides support and flexibility to the body parts and also smoothens bone surfaces at joints. Cartilage has widely spaced cells and is present in the nose, ear and larynx.

Bone : Bone is very strong and non-flexible tissue embedded in a hard matrix made up of both organic matter (protein) and inorganic matter (calcium and phosphorous compounds). It provides shape and skeletal support to the body.

or

(a) Write a note on the protective tissue in plant.
(b) What is differentiation plant tissue?

Ans :

(a) The protective tissue is present in the outermost layer of the plant such as roots, stem and leaves. Protective tissue prevents desiccation, mechanical injury and infection in plants. They form a protective barrier which does not allow the entry of the pathogen into the plant. Cork cells are highly thick and secrete a chemical called suberin that protects the inner tissue of the plant. The epidermis is the outer layer of the plant which secretes a waxy chemical, which is water resistant and prevents loss of water also protect them from infection and injury.

(b) Differentiation in plants refers to the processes by which distinct cell types arise from precursor cells and become different from each other. Plant tissue systems fall into one of two general types: meristematic tissue and permanent (or non-meristematic) tissue.

23. State the universal law of gravitation. Derive its expression. [3]

Ans :

The force of gravitation between two objects in the universe is directly proportional to product of their masses and inversely proportional to square of distance between their centres. For objects of masses m_1 and m_2 separated by a distance r,

$$F \propto m_1 m_2$$

$$F \propto \frac{1}{r^2}$$

or

$$F \propto \frac{m_1 m_2}{r^2}$$

When we add a constant G,

$$F = G\frac{m_1 m_2}{r^2}$$

Where, $G = 6.67 \times 10^{-11}\,\text{Nm}^2/\text{kg}^2 =$ gravitational constant.

24. What are the desirable characters of bee varieties suitable for honey production? [3]

Ans :

The desirable characters of bee varieties suitable for honey production are:

(a) High honey collection capacity.
(b) They must sting comparatively less.
(c) They should stay in the given beehives for a longer period and breed properly.

SECTION - C

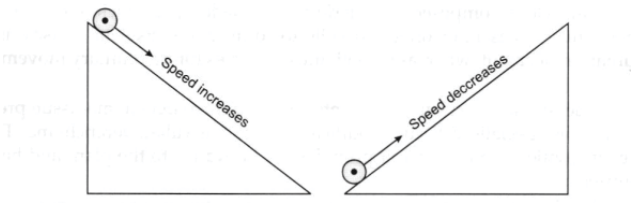
25. Describe Galileo's experiment to demonstrate motion of objects on an inclined plane. [5]

Ans :

Galileo deduced that objects move with constant speed when no force acts on them by observing the motion of objects on inclined planes. Galileo studied the motion of marbles on an inclined plane in his first experiment.

(a) He observed that when a marble rolls down an inclined plane, its velocity increases.
(b) Here the marbles falls under the unbalanced force of gravity.
(c) The velocity of the marbles decreases when it rolls up the inclined plane (against the force of gravity).

From the observations, Galileo argued that the velocity of a marble rolling on flat horizontal surface should remain constant.



Motion of a marble (a) down the inclined plane and (b) up the inclined plane.

or

Explain the following briefly:

(a) A greater force is required to impart greater velocity to an object.
(b) An applied unbalanced force causes a change in momentum.
(c) A cricket ball causes much severe injury than a tennis ball on hitting a spectator.

Ans :

(a) In order to change the velocity of the object you have to apply force. Because according to Newton first law of motion acceleration is directly proportional to the force and in order to change the acceleration you have to change the force. So, that's mean you are changing the velocity too in order to create the acceleration as we know that the acceleration is produced by the change of velocity. This is why changing force mean changing the velocity too, greater the force greater will be the velocity.

(b) When two or more forces which are unequal in magnitude are acting in the opposite direction

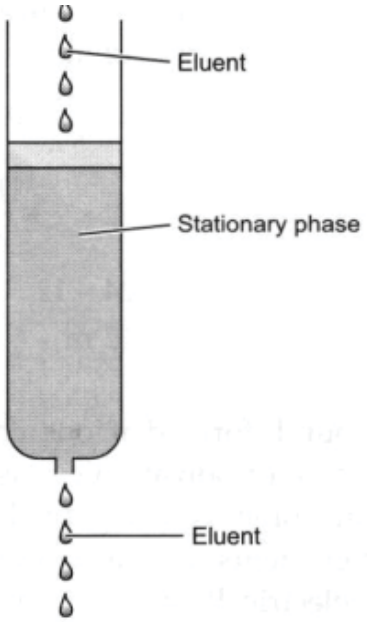
of an object, which causes change in the state of motion are called as unbalanced forces. Unbalanced forces causes acceleration. If unbalanced forces are acting on an object, then the velocity of an object increases and hence its momentum also. Because momentum is defined as product of mass and velocity.

(c) A cricket ball has more mass than the tennis ball, so the momentum possessed by the Cricket ball will be more than tennis ball. As the momentum is more, change in momentum will be also more, so when the cricket ball hits the spectator, the final momentum becomes zero and hence the impact force of the cricket ball is more on hitting a spectator than tennis ball.

26. What is chromatography? State its principle with the help of a diagram. [5]

Ans :

"Chromatography is an analytical technique wherein a sample mixture under test is separated into different components." This is both a qualitative and quantitative method. The sample gets separated under the influence of a mobile phase (moving phase) over a stationary phase. These separated components are later identified and also quantified. Chromatography is based on the principle of separation of compounds into different bands (color graphs) and the identification of those bands. The preferential separation is done due to differential affinities of compounds towards stationary and mobile phase. After separation of the compounds, they are identified by suitable detection methods.



27. (a) In what way smooth muscles are different from striated muscles with respect to the number of nuclei?

(b) Water hyacinth floats on water surface. Explain.

(c) Why is epidermis present as a thick waxy coating of cutin in desert plants? [5]

Ans :

(a) Striated muscle is composed of muscle fibers, made up of thick and thin filaments, but smooth muscle has interconnected cells to form layers. Skeletal muscle is involved in voluntary movement, whereas smooth muscle serves for involuntary movement inside the body.

(b) Water hyacinth floats on surface of water because the parenchyma tissue present in water hyacinth has specialised tissue modification which is called aerenchyma. This tissue has large air cavities due to which it provides the buoyancy to the plant and helps to float in the water.

(c) The main adaptation of desert plants is to minimise the water loss. Hence, layer of cutin is present on epidermis, which is a thick waxy coating. This waxy coating helps in minimising water loss by transpiration.

or

What are simple permanent tissues of plants? Explain in detail (also give differences in them).

Ans :

	Character-istic	Paren-chyma	Collen-chyma	Sclerenchyma
1.	Type of cells	Living cell isodia-metric shape.	Living cells with thick comers	Dead cells, long and narrow
2.	Cell wall	Thin walls.	Thickened at comers	Thick due to deposition of pectin.
3.	Cytoplasmic content	Distinct nucleus with large central vacuole.	Distinct uncleus and dense cytoplasm.	No nucleus and no cytoplasm.
4.	Function	Stores food and forms packing tissue.	Gives mechanical support and carry out photosynthesis.	Provides strength to the plants.
5.	Location	In all soft parts, i.e., stems, roots, leaves, flowers and fruits.	Present below the epidermis in stems and leaves.	Present in xylem and phloem, shells of nuts, in hard seeds and pulp of pear.

28. The brakes applied to a car produce an acceleration of 6m/s. in opposite direction to the motion. If the car takes 2 second to stop after the application of break, calculate the distance its travel during this time? [5]

Ans :

Given, Acceleration, $a = -6\,\text{m/s}^2$

Time $= 2s$

Final velocity $v = 0\,\text{m/s}$

Let initial velocity be u

Let distance be s,

we have, $v = u + at$

So, $0 = u + (-6) \times 2$

So, $u = 12\,\text{m/s}$

Now, $s = ut + \frac{1}{2}at^2$

$s = 12 \times 2 + \frac{1}{2}(-6)2^2$

$s = 24 - 12$

$s = 12\,\text{m}$

Thus, distance travelled is 12 m

29. (a) What are ionic and molecular compounds? Give examples.

(b) Calculate the number of moles of magnesium present ribbon weighing 14 g. Molar atomic mass of magnesium is 24 gmol^{-1}. [5]

Ans :

(a) Ionic compounds are compounds formed of ions, charged particles that form when an atom (or group of atoms, in the case of polyatomic ions) gains or loses electrons. A cation is a positively charged ion. An anion is a negatively charged ion. Covalent or molecular compounds develop when elements share electrons in a covalent bond to create molecules. Molecular compounds are electrically neutral. Ionic compounds are (normally) produced when a metal reacts with a non metal (or a polyatomic ion). Covalent compounds are formed when two non metals react with each other.

(b) Given, 1 mole of Mg $= 24\,\text{g}$

$24\,\text{g of Mg} = 1\,\text{mol}$

$14\,\text{g of Mg} = \frac{1}{24} \times 14 = 0.58\,\text{mol}.$

or

How will you prove experimentally the law of conservation of mass?

Ans :

(a) Take copper sulphate solution and dissolve it in water in a conical flask.

(b) Now take solution of sodium carbonate in the ignition tube and hang it carefully so that the two do not get mixed. Put a cork on the flask.

(c) Weigh the flask with its contents carefully.

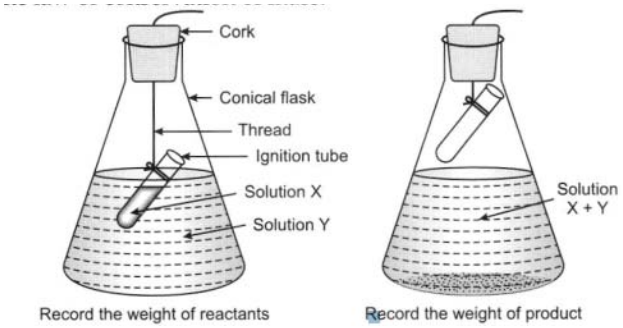
(d) Now tilt and shake the flask so that the solutions of copper sulphate and sodium carbonate get mixed.

(e) Weigh again.

(f) The chemical reaction takes place in flask.

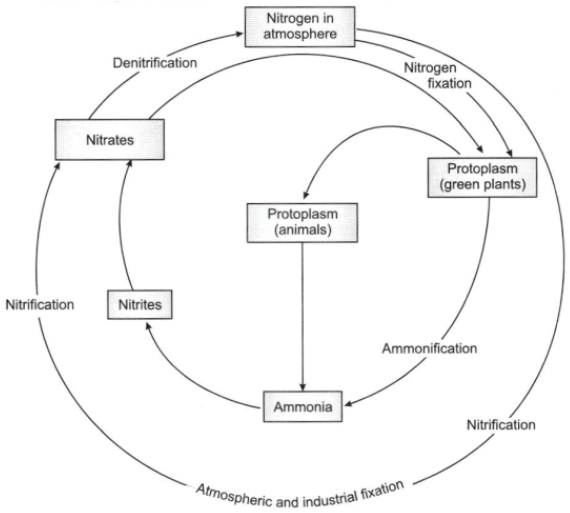
(g) Put cork on the mouth of the flask so that reactants and products do not spill out of flask.

(h) The mass of flask and its contents remain the same before as well as after the reaction that proves the law of conservation of mass.



30. Describe the nitrogen cycle with appropriate diagrams. [5]

Ans :



Nitrogen is an essential nutrient for the survival of living beings. It is found in proteins like DNA and RNA. Nitrogen cannot be used directly from the atmosphere and have to be converted into nitrates and nitrites by certain Nitrogen fixing bacteria. These bacteria are found in the root nodules of legumes (plants that give us pulses).

Another method through which the nitrogen in the environment can be converted into nitrates or nitrates is the physical process of lightning. The high pressure and temperature during the lightning creates the nitrogen into oxides of nitrogen. These oxides then dissolve in water bodies, thus forming nitrous and nitric acids.

Once nitrogen is converted into the useful form of nitrates and nitrites, they can be used further. Plants use them to produce amino acids, which are then used to make proteins. Other complex compounds that require nitrogen are also made by the plants through some complex biochemical process. These proteins and complex compounds are subsequently consumed by the animals. Once these plants and animals die and get buried in the soil, bacteria convert these proteins back to nitrates and nitrites. A certain kind of bacteria converts the proteins to elemental nitrogen, thus completing a complete nitrogen cycle.

CLASS IX (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. Which of the following actions a force can do? [1]
(a) Can move a stationary object.
(b) Can stop a moving object.
(c) Can change the speed of a moving object.
(d) All of the above.

Ans : (d) All of the above

2. Ozone layer protects us from which one of the following? [1]
(a) X- rays. (b) UV rays.
(c) Beta rays. (d) Gamma rays.

Ans : (b) UV rays.

3. The slope of kinetic energy-displacement curve of a particle in motion is [1]
(a) Equal to the acceleration of the particle.
(b) Inversely proportional to the acceleration.
(c) Directly proportional to the acceleration.
(d) None of these.

Ans : (c) Directly proportional to the acceleration.

4. Law of gravitation gives the gravitational force between : [1]
(a) The earth and a point mass only.
(b) The earth and sun only.
(c) Any two bodies having some mass.
(d) Two charged bodies only.

Ans : (c) Any two bodies having some mass.

or

A body freely falling under gravity will have uniform :
(a) Speed (b) Velocity
(c) Momentum (d) Acceleration

Ans : (d) Acceleration

5. Light is a : [1]
(a) Longitudinal wave (b) Transverse wave
(c) Both (a) and (b) (d) None of these

Ans : (b) Transverse wave

6. Who proposed the fluid mosaic model of protoplasm? [1]
(a) Singer and Nicolson (b) Watson and Crick
(c) Robert Hook (d) Robert Brown

Ans : (a) Singer and Nicolson.

or

Which of the following are complex tissues?
(a) Xylem and Phloem
(b) Collenchyma and Sclerenchyma
(c) Parenchyma and Collenchyma
(d) Xylem and Parenchyma

Ans : (a) Xylem and Phloem

7. Leghorn is related to [1]
(a) Apiculture (b) Dairy Farming
(c) Pisciculture (d) Poultry

Ans : (d) Poultry

or

Which of the following is cultured for pearls?
(a) Prawns (b) Oysters
(c) Mullets (d) Bhetki

Ans : (b) Oysters

8. What is classification? [1]
(a) Grouping things together on the basis of the features they have in common.
(b) Grouping things together on the basis of how they respire.
(c) Grouping things together on the basis of how they feed.
(d) Grouping things together on the basis of how they survive.

Ans : (a) Grouping things together on the basis of the features they have in common.

DIRECTION : For question numbers 9 and 10, 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 A.
(b) Both A and R are true but R is not the correct

explanation of the A.

(c) A is true but R is false.

(d) Both A and R are false.

9. **Assertion (A) :** The specific charge of anode ray particles depends on nature of the gas taken in the discharge tube.
Reason (R) : The particles in anode rays carry positive charge. [1]

Ans : (b) Both A and R are true but R is not the correct explanation of the A.

10. **Assertion (A):** Solid CO_2 changes its state when exposed to air. [1]
Reason (R) : CO_2 undergoes sublimation.

Ans : (a) Both A and R are true and R is correct explanation of the A.

11. What does odometer of an automobile measure? [1]

Ans :

Odometer is a type of device that will help you to measure the distance that has been travelled by an automobile

12. Helium atom has 2 electrons in its valence shell but its valency is not 2. Explain. [1]

Ans :

It valency is zero because its first shell is the outermost shell whose octet is complete. It cannot lose or gain or share electrons.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Aarti went on a trip organised by her school to the botanical gardens in Delhi. She was very excited to use the knowledge she had learned in her class to relate it with the flora and fauna in the gardens. When Aarti was looking at all different kind of plants, she spotted some leaves with yellowish colour. She had studied that leaves were green in colour so she was confused. Aarti took one piece of that leaf to her school laboratory, boiled it and then mounted it on a slide to observe under microscope. She then poured a strong sugar solution over it and observed the slide through the microscope.

13.1 Which pigment gives green colour to the leaves? [1]

Ans : Chlorophyll.

13.2 What is the function of the above mentioned pigment? [1]

Ans : Chlorophyll help leaves to trap the sunlight in the process of photosynthesis.

13.3 What did Aarti observe when she poursed sugar solution over the slide? [1]

Ans : Dead cells cannot absorb water.

13.4 Define plasmolysis. [1]

Ans : Plasmolysis is the process of shrinkage or contraction of protoplasm of a plant cell as a result of loss of water from the cell.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table related to boiling points of different compounds and answer the following questions.

Table A: Boiling points

Compound	**Boiling point (°C)**
Ethane	-89
Butane	0
Methanol	64.7
Hexane	69
Pentadecane	270
Heptadecane	302

14.1 A mixture of pentadecane and heptadecane can be separated by ..... [1]

Ans : Distillation

14.2 When is the fractional distillation preferred over distillation? [1]

Ans : When the difference between boiling points of two compounds is less than 25 K, then fractional distillation is used.

14.3 A mixture of methanol and hexane can be separated by ..... [1]

Ans : Fractional Distillation.

14.4 Which of the following pair of compounds are the easiest to separate? [1]

(i) Ethane and Pentadecane

(ii) Ethane and Heptadecane

(iii) Butane and Hexane

(iv) Butane and Heptadecane

Ans : (ii) Ethane and Heptadecane

Section - B

15. The kinetic energy of an object of mass m, moving with a velocity of 10 m/s is 25 J. What will be its kinetic energy when its velocity is halved? What will be its kinetic energy when its velocity is increased by 5 times? [3]

Ans :

We know that,

$$\text{K.E. of the object} = \frac{1}{2}m(10)^2$$

$$25 = \frac{1}{2} \times m \times 100$$

$$m = 0.5\,\text{kg}$$

If velocity is halved

$$\text{K.E.} = \frac{1}{2} \times m \times (v/2)^2$$

$$\text{K.E.} = \frac{1}{2} \times 0.5 \times (5)^2$$

$$\text{K.E.} = 6.25\,\text{J}$$

If velocity is increased by 5 times

$$\text{K.E.} = \frac{1}{2} \times m \times (5v)^2$$

$$\text{K.E.} = \frac{1}{2} \times 0.5 \times (50)^2$$

$$\text{K.E.} = 625\,\text{J}$$

16. (a) What are cork cells and their functions? [3]
(b) Which substance is present in the adipocytes? How does it help?
(c) What is xylem? Name the four elements of xylem.

Ans :

(a) The cork cells are the dead tissues, present at the periphery of stem and root. Their main function is to prevent loss of water from plants and they also act as a protective layer.
(b) Adipocytes are filled with fat globules. They keep visceral organs in position of forming shock absorbing cushions around them. Storage of fat also acts as an insulator.
(c) Xylem is a complex permanent tissue which conducts water and mineral salts upward from roots to leaves. The four elements are: Tracheids, vessels, xylem parenchyma and xylem fibers.

17. (a) Classify the following compounds as diatomic, triatomic and polyatomic molecules. HCl, H_2, H_2O and NH_3.

(b) Define the term atomicity. [3]

Ans :

(a) Diatomic : HCl, H_2
Triatomic : H_2O
Polyatomic : NH_3
(b) Atomicity is the total number of atoms present in one molecule of a compound or a substance.

18. (a) What causes the phenomenon of sunrise, sunset and change of seasons? How do we perceive this cause?
(b) Is it possible that the train in which you are sitting appears to move while it is at rest? [3]

Ans :

(a) The motion of earth around the sun causes change of seasons. We perceive the motion of earth by observing the change in positions of stars, moon, planets etc. located in outer space.
(b) The train in which we are sitting appears to move when the relative position of a point on adjacent train changes. This happens when we are at rest and adjacent train on next track starts moving.

or

(a) In what situation the velocity-time graph a straight line with negative slope?
(b) Why is the motion of a train starting from one station and stopping at the other is non-uniform?

Ans :

(a) A straight line v-t graph with negative slope indicates uniform retardation, i.e. the velocity of the body decreases by equal magnitude in equal intervals of time, however small the interval may be.
(b) When the train starts from rest from a station, it accelerates to attain a maximum velocity. Thereafter, on reaching the next station, brakes are applied and it retards before it finally comes to rest. Thus, the motion of the train is non-uniform.

19. Give a scientific reason for the following: [3]
(a) Mitochondria are able to make some of their proteins.
(b) A cell having equal water concentration to its surrounding medium.
(c) Inner membrane of mitochondria is deeply folded.

Ans :

(a) Mitochondria have their own DNA and ribosomes and hence can make their own protein.
(b) A cell having equal water concentration to its surrounding medium will neither gain nor lose water to the external medium.
(c) The fold creates a large surface area for ATP generating chemical reactions.

20. (a) Birds and mammals share one common feature. Give details.
(b) Name the phylum in which animals has soft bodies covered with a hard shell.
(c) Ingestion of solid food occurs in which type of nutrition ? [3]

Ans :

(a) Both birds and mammals are warm-blooded in nature.
(b) Mollusca has animals that have soft bodies covered with a hard shell.
(c) Ingestion of solid food occurs in holozoic type of nutrition.

or

(a) Which structure is found in plant cells but absent in animal cell ?
(b) What is the functional segment of DNA ?
(c) Name the pigment that imparts red and yellow colour to flowers.

Ans :

(a) Plant cell have chloroplast and cellulose wall, which is absent in animal cell.
(b) Gene is segment of DNA, a unit of heredity that is transferred from a parent to offspring.
(c) Xanthophyll are coloured pigments just like chlorophyll. Chlorophyll imparts green colour to leaves and xanthophyll imparts red and yellow colour to flowers.

21. A person with mass 10 kg weighs 100 N on earth. What will be his corresponding mass and weight on moon? [3]

Ans :

Given,

Mass of the person, $m = 10\,\text{kg}$
Weight of the person on earth

$$w = mg$$
$$100 = 10 \times g$$
Therefore, $$g = 10\,\text{m/s}^2$$

Now at moon, the acceleration due to gravity is $1/6^{\text{th}}$ of the acceleration due to gravity in earth Therefore, acceleration due to gravity on moon

$$g' = (1/6) \times g$$
$$g' = (1/6) \times 10$$
$$g' = 1.66\,\text{m/s}^2$$

Mass of the person will be the same on moon as that on earth $= m = 10\,\text{kg}$

Weight of the person on Moon'

$$w' = 10 \times 1.66$$
$$w' = 16.6\,\text{N}$$

22. (a) Most mature plant cells have a large central vacuole. Why?

(b) Which type of vacuoles are found in plant cells and animal cells? [3]

Ans :

(a) Plant cell has a large central vacuole full of cell sap to provide turgidity and rigidity to the cell. Many substances of importance in the life of plant cells such as amino acids, sugars, various organic acids and some proteins are stored in these vacuoles.

(b) In plant cell, the vacuole is single and prominent whereas in animal cell numerous small vacuoles are scattered in cytoplasm.

or

(a) How bacterial cell different from an onion peel cell?

(b) Why are lysosomes also known as "scavengers of the cells"?

Ans :

(a) Bacterial cell is a prokaryote whereas onion peel cell is a plant cell: a eukaryote.

(b) Lysosomes remove the debris of the cell consisting of dead and worn out cell of organelles by digesting them.

23. A certain particle has a weight of 20 N at a place where the acceleration due to gravity is 10 m/s^2.

(a) What are its mass and weight at a place where acceleration due to gravity is 5 m/s^2?

(b) What will be its mass and weight at a place where acceleration due to gravity is zero? [3]

Ans :

Given, Weight of particle $= 20\,\text{N}$

Acceleration due to gravity $= 10\,\text{m/s}^2$

Mass of particle $= m$

(a) Weight of particle $w = mg$

$$20 = m \times 10$$
Therefore, $$m = 2\,\text{kg}$$

Mass of the particle at a place where acceleration due to gravity $= 5\,\text{m/s}^2$ will be same, that is, 2 kg.

Weight of the particle at a place where acceleration due to gravity $= 5\,\text{m/s}^2$ will be

$$w = mg$$
$$w = 2 \times 5$$
$$w = 0\,\text{N}$$

24. (a) What is the term used for the scientific management of livestock?

(b) What do you understand by composite fish culture? Describe in detail with advantages and disadvantages. [3]

Ans :

(a) Animal husbandry is the scientific management of animal livestock. It includes various aspects such as feeding, breeding and disease control.

(b) Composite fish culture system is adopted for intensive fishing. Characteristics of composite fish culture are :

(i) Both local as well as imported fish species can be used in such systems.

(ii) A combination of five or six fish species is used in a single fish pond.

Advantages :

(i) All the food available in the pond is utilised. There is no competition for food.

(ii) There is increase in the fish yield from the pond.

Disadvantage of composite fish culture:

(i) Lack of availability of good quality fish seeds

Section - C

25. (a) Identify the type of inertia in each case and give one more example for the following:

(i) A ball thrown upwards by a child in a train returns to his hands.

(ii) Mudguards are provided in bikes and cars.

(b) A stone released from the top of a tower of height 19.6 m. Calculate its first velocity just before touching the ground. [5]

Ans :

(a) (i) Inertia of motion is possessed by the ball. Another example is falling of passengers in forward direction if a moving bus comes to a sudden stop.

(ii) Inertia of direction because mud flies off tangentially with the wheels and is collected by mudguards. Another example is rotating a disc before releasing it and it moves along the tangent 't' its path of rotation.

(b) Given, $u = 0$

$$s = 19.6\,\text{m}$$
$$g = 9.8\,\text{ms}^{-2}$$
$$v^2 = u^2 + 2as = 0 + 2 \times 9.8 \times 19.6$$
$$v = \sqrt{(19.6)^2} = 19.6\,\text{ms}^{-1}$$

or

(a) Define inertia and list its type. Give two examples to describe each type.

(b) Define momentum. State its SI unit.

Ans :

(a) The property of a body by virtue of which it tends to remain in its state of rest or motion is

called inertia.

Inertia of rest : The body tends to resist any change in its state of rest, e.g. a boy sitting in car at rest, falls backwards when the car starts moving.

Inertia of motion : The body resists any change in its state of motion, e.g. a body falls forward when a car suddenly stops.

Inertia of direction : The body resists any change in its direction of motion, e.g. when a car takes a steep turn, people tends to fall outwards.

(b) The product of mass and velocity of a body is called momentum. S.I. unit of momentum is kg ms^{-1}

26. Describe the model of atom proposed by Rutherford with his observations and conclusions. Discuss also the drawbacks in his model. [5]

Ans :

Rutherford designed an experiment where fast moving alpha particles were made to fall on thin gold foil.

Setup :

(a) Rutherford selected a gold foil because he want as thin layer as possible. The gold foil here was about 1000 atoms thick.

(b) Alpha particles are doubly charged helium ions. They have a considerable amount of energy inside them.

(c) Rutherford expected these alpha particles to undergo small deflections by the protons present in the gold foil.

Observations : The results that were obtained were totally unexpected.

(a) Most of the alpha particles passed straight through the gold foil.

(b) Some of the alpha particles were deflected by small angles.

(c) One out of every 12000 alpha particles appeared to rebound from the gold foil.

Conclusions :

(a) Most of the space inside the atom is empty because most of the alpha particles passed through the foil without getting deflected.

(b) As very few alpha particles were deflected, it concludes that positive charge occupies a very small space inside an atom.

(c) A very small number of alpha particles were completely rebounded, which means that the amount of positive charge is high and concentrated within a small volume inside the atom.

Features of the model :

(a) Every atom has a positively charged center known as nucleus.

(b) The electrons revolve around the nucleus in circular paths.

(c) The size of the nucleus is very small compared to the actual size of the atom.

Drawback of the proposed model :

(a) The electrons revolving around the nucleus should not be stable.

(b) They undergo circular acceleration and while doing so, keep radiating energy and then finally fall into the nucleus. By such logic, the atom should cease to exist. We know that atoms are quite stable.

27. (a) A person takes concentrated solution of salt, after sometime, he starts vomiting. What is the phenomenon responsible for such situation? Explain.

(b) Bacteria do not have chloroplast but some bacteria are photoautotrophic in nature and perform photosynthesis. Which part of bacterial cell performs this?

(c) Which cell organelle controls most of the activities of the cell? [5]

Ans :

(a) The concentrated salt solution causes irritation and excessive dehydration in the stomach due to exosmosis. This makes the person uncomfortable causing reverse movements and thus vomiting.

(b) Photoautotrophic bacteria possess photosynthetic pigments inside small vesicles associated with plasma membrane.

(c) Nucleus controls the metabolism and most of the activities of cell.

or

In brief state what happens when

(a) Rheo leaves are boiled in water first and then a drop of sugar syrup is put on it?

(b) Dry apricots are left for some time in pure water and later transferred to sugar solution?

(c) A red blood cell is kept in concentrated saline solution?

(d) Golgi apparatus is removed from the cell?

Ans :

(a) The cell gets killed on boiling so no change will be observed.

(b) First it swells due to endosmosis and then it shrinks due to exosmosis.

(c) It will lose water and shrink.

(d) All sorts of vesicle and lysosome formation stops.

28. A stone is thrown upwards with a velocity of 30 m/s.

(a) At what height will its kinetic energy be half of its potential energy?

(b) Calculate the potential energy of the body if it's mass = 5 kg. [5]

Ans :

Given,

Initial velocity, $\upsilon = 0\,\text{m/s}$

Final velocity, $v = 30\,\text{m/s}$

m = mass of the body

(a) Kinetic Energy, $\text{K.E} = \frac{1}{2}mv^2$

Potential Energy = P.E. $= mgh$

Given, $\text{K.E.} = \frac{1}{2}\,\text{P.E.}$

$$\frac{1}{2}mv^2 = \frac{1}{2}mgh$$

$$v^2 = gh$$

$$30 \times 30 = 10 \times h$$

$$H = 90\,\text{m}$$

(b) $\text{P.E.} = mgh$

$$= 5 \times 10 \times 90 = 4500\,\text{J}$$

29. (a) Describe the process of diffusion of O_2 and CO_2 through the cell membranes.
(b) Define osmosis. [5]

Ans :

(a) CO_2 is a cellular waste which accumulates in high concentrations inside the cell and needs to be excreted out. In the cell's external environment, the concentration of CO_2 is low as compared to inside of the cell. As soon as there is a difference in concentration of CO_2 inside and outside the cell, CO_2 tends to move out of it from a region of higher concentration to a region of lower concentration by the process of diffusion. Similarly, O_2 enters the cell by the process of diffusion when the level or concentration of O_2 inside the cell decreases with respect to the outside. Thus, diffusion plays an important role in gaseous exchange between the cells as well as the cell and its external environment.

(b) Osmosis is a process that is similar to diffusion, but the only difference between them is that Osmosis happens through a selectively permeable membrane. For example; the passage of water from a region of high water concentration through a selectively permeable membrane to a region of low water concentration till equilibrium is reached, is called Osmosis.

or

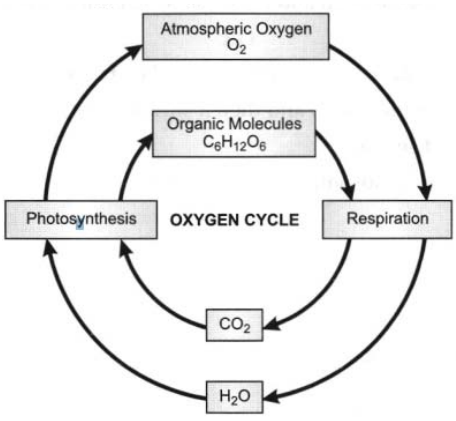
You are provided with a mixture containing sand, iron filing, ammonium chloride and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture?

Ans :

(a) Remove iron filings with the help of magnet.
(b) Sand and ammonium chloride can be separated by sublimation. Ammonium chloride will get vapourised and change into vapours and on condensation will form $NH_4Cl(s)$, sand and sodium chloride will be left in china dish.
(c) Dissolve the sand and sodium chloride in water. Sodium chloride will dissolve. Filter the sodium. Sand will be left as residue.
(d) Evaporate the filtrate to dryness to get sodium chloride back or use crystallisation.

30. Describe the oxygen cycle with appropriate diagrams. [5]

Ans :



After nitrogen, oxygen is one of the most abundant elements on earth. About 21% of our air is composed of oxygen. It is also an atom in the molecule of water (H_2O). Oxide compounds, such as CO_2 also contain oxygen.

As we are aware oxygen is absolutely essential for all living organisms to survive. It is the main component in respiration. It is also the element that allows and assists combustion of any kind. Through photosynthesis, the replenishment of oxygen in the atmosphere is done, where oxygen is one of the by products. In fact, photosynthesis and respiration are interdependent mechanisms that perform a unique and amazing balancing.

The steps involved in the oxygen cycle are :

Stage-1 : All green plants during the process of photosynthesis, release oxygen back into the atmosphere as a by-product.

Stage-2 : All aerobic organisms use free oxygen for respiration.

Stage-3 : Animals exhale carbon dioxide back into the atmosphere which is again used by the plants during photosynthesis. Now oxygen is balanced within the atmosphere.

CLASS IX (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.
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(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. If a body starts from rest, what can be said about the acceleration of the body ? [1]
(a) Positively accelerated
(b) Negatively accelerated
(c) Uniformly accelerated
(d) None of the above

Ans : (a) Positively accelerated

2. Which of the following represents the correct increasing order of the densities of given substances? [1]
(a) Cotton < Exhaust from chimneys > Honey < Iron < Air.
(b) Air < Exhaust from chimneys < Cotton < Honey < Iron.
(c) Air < Cotton < Exhaust from chimneys < Iron < Honey.
(d) Cotton < Air < Exhaust from chimneys < Iron < Honey.

Ans : (b) Air < Exhaust from chimneys < Cotton < Honey < Iron.

or

Which of the following is incorrect about plasma ? [1]
(a) Fluorescent tube and neon sign bulbs consist of plasma.
(b) The gas gets ionised when electrical energy flows through it.
(c) It consists of super energetic and super excited particles.
(d) The plasma glows with colour which does not depend upon nature of gas.

Ans : (d) The plasma glows with colour which does not depend upon nature of gas

3. The white fibre of connective tissue is made up of which one of the following ? [1]
(a) Lignin (b) Keratin
(c) Collagen (d) Elastin

Ans : (c) Collagen

or

Active division takes place in which one of the following cells?
(a) Cambium (b) Phleom
(c) Parenchyma (d) Xylem

Ans : (a) Cambium

4. A motorcycle and a car are moving on a horizontal road with the same velocity. If they are brought to rest by the application of brakes which provided equal retardation, then : [1]
(a) Motorcycle will stop at shorter distance.
(b) Car will stop at a shorter distance.
(c) Both will stop at the same distance.
(d) Nothing can be predicted.

Ans : (c) Both will stop at the same distance.

5. Nanometer is an : [1]
(a) Instrument used for measuring micro distance.
(b) Instrument used for measuring macro distance.
(c) Unit for measuring micro distance.
(d) Unit for measuring macro distance.

Ans : (c) Unit for measuring micro distance.

or

Heating of iron fillings and sulphur powder for formation of iron sulphide should be done in a
(a) Petri dish
(b) Watch glass
(c) Copper dish
(d) China dish

Ans : (d) China dish

6. Which body part is not composed of nervous tissue ? [1]
(a) Brain
(b) Muscles which connect eyes to brain
(c) Spinal cord
(d) Nerves

Ans : (b) Muscles which connect eyes to brain

DIRECTION : For question numbers 7 and 8, 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 A.

(b) Both A and R are true but R is not the correct explanation of the A.

(c) A is true but R is false.

(d) Both A and R are false.

7. **Assertion (A) :** Nucleus of an atom is Positively charged.
Reason (R) : Nucleus of atom consists of protons and neutrons. [1]

Ans : (b) Both A and R are true but R is not the correct explanation of the A.

8. **Assertion (A) :** Atom is not the smallest particle in the universe.
Reason (R) : An atom consists of proton, neutron and electron. [1]

Ans : (a) Both A and R are true and R is correct explanation of the A.

9. The distance between two bodies becomes 6 times more than the usual distance, so the F becomes ..... [1]

(a) 36 times (b) 6 times

(c) 12 times (d) 1/36 times

Ans : (d) 1/36 times

10. A student carries a bag weighing 5 kg from the ground floor to his class on the first floor that is 2 m high. The work done by the boy is ..... [1]

Ans : 100 Joules.

11. Name the bio-indicator which is highly sensitive to SO_2 pollutions ? [1]

Ans : Lichens.

12. What is the alternate name for Apis cerana indica? [1]

(a) Indian bee (b) Indian buffalo

(c) Indian cow (d) None of these

Ans : (a) Indian bee.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Bharat went to Kerala with his parents for a nature trip. The family landed in Kochi in the morning from where they had plans for going to Alapuzzha at night. Bharat knew that Kochi is famous for its Bharat Petroleum Oil Refinery and coerced his father to take him there. Bharat had studied separation techniques at his school and wanted to see the same in the refinery in reality.

13.1 What separation technique did Bharat expect to see at the oil refinery ? [1]

Ans : Fractional distillation.

13.2 What is the most important condition for this particular technique to be implemented ? [1]

Ans : To separate a mixture of two or more miscible liquids for which the difference in boiling points is less than 25 K, fractional distillation process is used.

13.3 Give two examples of components that are separated in an oil refinery. [1]

Ans : Crude oil is subjected to fractional distillation to obtain components like Diesel, Petrol, etc.

13.4 What is the ideal location of an oil refinery in a city ? [1]

Ans : An oil refinery should be situated at the outskirts of a city, because it generates a lot of polluting gases and acquires large space to layout plant.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table and answer the following questions.

Days	Jar 1 (cm)	Jar 2 (cm)
Day 1	1	1
Day 2	1.3	1.4
Day 3	1.7	0.8
Day 4	2.1	0.8
Day 5	2.5	0.8

Two glass jars filled with water are taken. Two onion bulbs are taken and placed in each of the jars. Observe the growth of roots in both the jars. Measure the length of the roots daily. On Day 3 cut the root tips of the onion in Jar 2 by 1 cm and measure their lengths each day for 2 to 3 more days. By this activity, the Table A was constructed.

14.1 Does the root of onion in Jar 2 continue growing even after its tip is removed ? [1]

Ans : No it doesn't, as observed from the readings in the table.

14.2 Why does it stop growing after the root tip is removed ? [1]

Ans : The growth of plants occurs only in certain regions. A root tip when cut cannot grow back because its apical meristem is lost.

14.3 What is apical meristem ? [1]

Ans : Apical meristem is present at the growing tips of stems and roots and increases the length of the stem and the root.

14.4 What happens to the cells formed by meristematic tissue ? [1]

Ans : Meristematic tissues take up a specific role and lose the ability to divide.

Section - B

15. Derive the first equation of motion mathematically. [3]

Ans :

Acceleration is defined the rate of change of velocity.
Let v = final velocity and u = initial velocity
t = time and a = acceleration
So by definition of acceleration,

$$a = \frac{v-u}{t}$$
$$at = v-u$$
$$v = u+at$$ Hence derived.

16. (a) Camphor disappears without leaving any residue. Explain.
(b) Why do we feel cool when we touch a piece of ice ? [3]

Ans :

(a) Camphor disappears after some time as its surface gains kinetic energy and directly gets converted into gas. The process of converting directly into gaseous form and not in a liquid state is termed as sublimation. Hence, when camphor is given fire, it gets converted into gas and disappears without leaving any residue.
(b) Ice is the solid state of water. When we touch a piece of ice, we fool cool for the following reasons:
(i) When we touch a piece of ice, first transfer of heat takes place from our body to ice as there is temperature difference.
(ii) Ice will start melting that is solid state of ice will be converted to liquid state of ice by absorbing heat energy from our body.
(iii) Latent heat of fusion of ice = 80 cal/gm.
(iv) For 1 gm of ice to get converted 80 cal of heat is absorbed.
(v) As heat energy is absorbed from our body we feel cool.

17. (a) How are simple tissues different from complex tissues ?
(b) What happens to the plants if their tips are removed ? [3]

Ans :

(a) Simple tissues are made up of only one type of cells which look like each other. On the other hand, complex tissues are made up of more than one type of cells. Parenchyma, collenchyma and schlerenchyma are the examples of simple plant tissue whereas xylem and phloem are complex tissue.
(b) Xylem is a water conducting tissue in plants. It transports water from the roots to the different parts of the plant. If the xylem of the plant is removed, upward movement of water will stop leading to wilting of leaves and ultimately causes the death of a plant. In the absence of water, the plant will not be able to prepare food and also perform other essential activities.

18. Why is the weight of an object on moon 1/6th its weight on earth? [3]

Ans :

We know that weight of a body = mg. Now the mass of a body is constant irrespective of whether it is on earth or moon. But the acceleration due to gravity on moon is 1/6th the value of acceleration due to gravity on earth. Because of this, the weight of an object on moon is 1/6th its weight on earth.

or

Why will a sheet of paper fall slowly in comparison to one that is crumpled into a ball ?

Ans :

A greater surface area offers greater resistance and buoyancy. Same is true in the case of a sheet of paper that has a larger surface area as compared to a crumpled ball of paper. So a sheet of paper falls slower.

19. What are the advantages of composite fish culture ?[3]

Ans :

Composite fish culture has the following advantages :
(a) Both local and imported fish species can be used in such systems.
(b) Due to non—competitive nature of selected fishes, food is available in all the parts of the reservoir.
(c) It also results in increase in the fish yield from the water reservoir.

20. Write the postulates of Bohr's theory. [3]

Ans :

Postulates of Bohr's theory are :
(a) Electrons move around the nucleus in definite circular path called orbits.
(b) Each orbit is associated with a fixed amount of energy.
(c) The larger the radius of the orbit, the greater is the energy of the electrons in them.
(d) Electrons can move from one orbit to another by gaining or losing a fixed amount of energy.

or

Why is atomic number more important than atomic weight in predicting the chemical properties of elements ?

Ans :

Atomic number is the number of protons in an atom and during a chemical reaction, the no. of protons remains unchanged. Atomic no. also gives number of electrons. Electrons are present in shell which participate in chemical reactions and decides chemical properties. Whereas atomic weight is the sum of no. of protons and no. of neutrons, so atomic number is more important than atomic weight in predicting the chemical properties of elements.

21. (a) The mass of the body on earth is 60 kg, what is its weight on the earth and on moon ?
(b) How is the weight of an object related to its mass ? [3]

Ans :

(a) Given, Mass = 60 kg gravitational

Acceleration in earth $= 10\ \text{m/s}^2$

So, weight of the object in earth,

$$w = mg = 60 \times 10 = 600\ \text{N}$$

Weight of the object in moon,

$$w_m = \frac{w}{6} = \frac{1}{6} \times 600 = 100\ \text{N}$$

(b) Mass defines amount of particles or matter present in an object. The mass remains constant at all the places. Weight defines force of gravity acting on the object. The weight changes from one to another place. The object's weight is calculated by product of the object's mass and acceleration due to gravity at that place. The unit of mass is fundamental unit which is kilogram whereas weight is a derived unit which is Newton.

22. Write the main characteristics of mammalia. [3]

Ans :

Characteristics of mamalia :

(a) Mostly terrestrial but found in all types of habitats.
(b) Body is of varied shape divisible into head, neck, trunk and tail.
(c) Skin covered with hair and has sweat glands.
(d) They possess mammary glands that produce milk to nourish the young ones.
(e) Respiratory organs are lungs only.
(f) The heart is four chambered.

or

Write some characteristics of angiosperms.

Ans :

Characteristics of angiospems :

(a) The angiosperms are the dominant group among the land plants. These are the most common flowering plants.
(b) The angiosperms are seed bearing plants and the seeds are enclosed inside the fruit formed from ovary.
(c) Carpel is similar to as megasporophyll is to gymnosperms, but it differentiated ovary, style and stigma.
(d) The pollen grain is received by the stigma causing pollination.
(e) Ovary develops into fruits and ovules into seeds after the act of fertilisation

23. Explain the following :

(a) An object increases its energy when raised through a height.
(b) Why is the work done by a body said to be negative ?
(c) When we push the wall, the wall does not move and no work is done. [3]

Ans :

(a) The potential energy of body increases with height. As potential energy = mgh. As m (mass) and g (gravity) are constant we can say that potential energy is directly proportional to height Hence with increase in height it also increases.
(b) Work done is said to be negative when the displacement produced in the body is in opposite direction to the force applied.
(c) Doing work is a path function and is always done if the body travels some distance. Expanding energy is different term. You should not get confused between work and energy. Work and heat both are forms of energy. If there is no work in a process but still there is energy expanding, then obviously there must be heat output. This is in fact an in depth topic of thermodynamics. While pushing the wall there is no work done as displacement is zero, but there will be heat output. And tiredness comes because of the internal stress created causing the muscles to react to the action of pushing and fatigue.

24. (a) In brief state what happens when

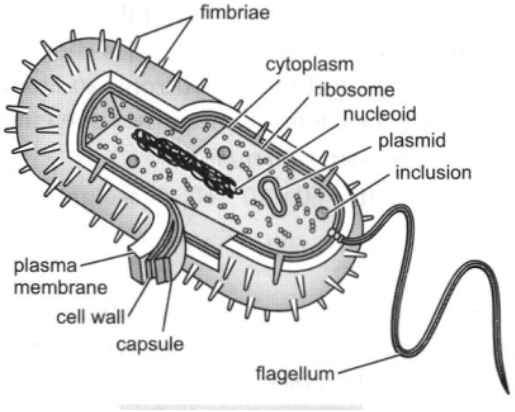
(i) Dry apricot are left for sometimes in pure water and later transferred to sugar solution.
(ii) Rheo leaves are boiled in water first and then a drop of sugar syrup is put on it.
(iii) Golgi apparatus removed from the cell.

(b) Draw a neat and well labelled diagram of a typical prokaryotic cell. [3]

Ans :

(a) (i) Dry apricot will swell up due to endosmosis and when it transferred to sugar solution, they shrink due to exosmosis.
(ii) Cells of Rheo leaves are killed due to boiling so they do not undergo plasmolysis.
(iii) Formation of lysosome, secretory vesicles will stop and biosynthesis of proteins and lipids does not occur.

(b)



Section -C

25. Sound waves of wavelength A travel from a medium in which its velocity is υ m/s into another medium in which velocity is 3υ m/s. What is the wavelength of the sound in the second medium ? [5]

Ans :

Since, Velocity = Wavelength × Frequency

$$v = \lambda \times f$$

$$f = \frac{v}{\lambda}$$

Now, when waves moves from one medium to another, the frequency remains the same.

Now, when velocity in first medium $= v$ m/s

And velocity in the second medium $= 3v$ m/s

$$\frac{v}{\lambda_1} = \frac{3v}{\lambda_2}$$

$$\lambda_2 = 3\lambda_1$$

The wavelength of the sound in the second medium is three times of the wavelength in the first medium.

or

What are wavelength, frequency, time period and amplitude of a wave ?

Ans :

Wavelength : For a sound wave, the combined length of a compression and an adjacent rarefaction is called its wavelength. Even the distance between centres of two consecutive compressions or two consecutive rarefactions is also equal to wavelength.

Frequency : The number of vibrations or oscillations per second is called frequency, i.e. it is the number of complete waves or cycles produced in one second.

Time period : The time taken to complete one vibration/oscillation/complete wave is called time period. It is measured in seconds.

Amplitude : It is the maximum displacement of the particles of the medium from their mean/ original position at rest.

26. Describe an activity to determine the boiling point of water and melting point of ice. [5]

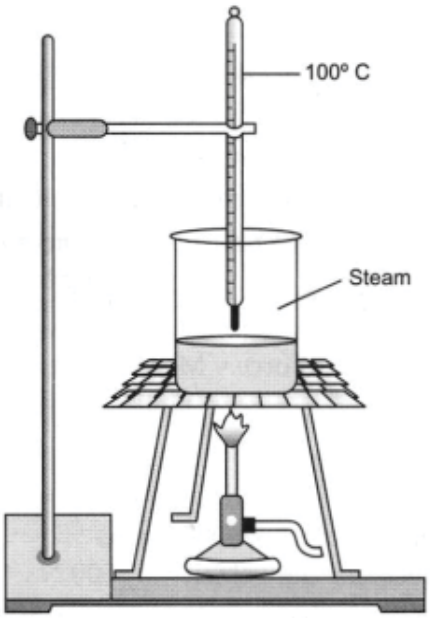
Ans :

Determination of boiling point of water :

In a beaker take some water and insert a thermometer in it with the help of a clamp. Put the beaker on a tripod stand and heat the apparatus with the help of kerosene burner slowly. Observe what happens to water. You will observe a steady stream of bubbles. This temperature is the boiling point of water.

Determination of melting point of ice :

Take crushed ice in a beaker and insert a thermometer in the beaker by hanging it from the clamp of the stand in such a way that the bulb of the thermometer is completely inside the ice. Wait for some time and keep recording the temperature after small intervals of time. Note down the temperature when ice just starts melting. Let the bulb of the thermometer remain in mixture of ice and water for some more time and keep recording the temperature. This temperature is the melting point of ice.



27. (a) Mention the role of atmosphere in climate control.

(b) How does the air move to become a wind ? [5]

Ans :

(a) The atmosphere covers the earth like a blanket. Since air is a bad conductor of heat, and atmosphere mostly consists of air, it prevents the heat from escaping into the space. The atmosphere keeps the average temperature of the Earth fairly steady during the day and even during the course of the whole year. The atmosphere prevents the sudden increase in temperature during the daylight hours. During the night, it slows down the escape of heat into outer space.

(b) Water vapour is formed due to the heating of water bodies and the activities of living organisms. The atmosphere can be heated by the radiation that is reflected back or re-radiated by the land or water bodies. On being heated, convection currents are set up in the air. The air over land gets heated faster than the air over water bodies. During the day, the air above land gets heated and starts rising. As this air rises, a pressure of low region is formed over the land, and the air over the sea moves to this region of low pressure. This movement of air from one region to the other is the creation of wind.

or

Differentiate between acute and chronic diseases and outline their effects on our health.

Ans :

(a) **Acute diseases :** Diseases that last for only a short period of time are called acute diseases. For example, we know that common cold lasts for only few days.

Effects on our health :

Any disease that causes poor functioning of some part of the body will affect our health. This is because all functions of the body are necessary for being healthy. An acute disease won't have time to have any major effect on our organs. For example, cough or common cold lasts for a week and doesn't have any major effect on our health.

(b) **Chronic diseases :** Diseases that last for a very long time and sometimes even for the complete lifetime are called chronic diseases. For example, an infection causing elephantiasis.

Effects on our health :

A chronic disease has a very major effect on the organ or organs that it has been infected upon. Tuberculosis affects the lungs and makes the body weak, which results in weight loss and other kinds of weaknesses.

28. A motorcar of mass 1200 kg is moving along a straight line with a uniform velocity of 90 km/h. Its velocity is slowed down to 18 km/h in 4 s by an unbalanced external force. Calculate the acceleration and change in momentum. Also calculate the magnitude of the force required. [5]

Ans :

Given, Mass of the motor,

$$m = 1200\,\text{kg}$$

Initial velocity of the motor car,

$$u = 90\,\text{km/h} = 25\,\text{m/s}$$

Final velocity of the motor car,

$$v = 18\,\text{km/h} = 5\,\text{m/s}$$

Time takes, $t = 4\,\text{s}$

According to first equation of motion

$$v = u + at$$
$$5 = 25 + a(4)$$
$$a = -5\,\text{m/s}^2$$

Negative sign indicates that it's a retarding motion, i.e., velocity is decreasing.

Change in momentum

$$= mv - mu = m(v - u)$$
$$1200\,(5 - 25) = -24000\frac{\text{kgm}}{\text{s}}$$

Since, Force = Mass × Acceleration

$$= 1200 \times (-5) = -6000\,\text{N}$$

Acceleration of the motor

$$= -5\frac{m}{s^2}$$

Change in momentum of the motor car = —24000 kg ms^{-1}

Hence, the force required to decrease the velocity is 6000 N.

(Negative sign indicates retardation, decrease in momentum and retarding force)

29. What is the relationship between mole, avogadro number and mass ? [5]

Ans :

The mole allows scientists to calculate the number of elementary entities (usually atoms or molecules) in a certain mass of a given substance. Avogadro's number is an absolute number: there are 6.022x1023 elementary entities in 1 mole. This can also be written as 6.022x1023 mo1-1. The mass of one mole of a substance is equal to that substance's molecular weight. For example, the mean molecular weight of water is 18.015 atomic mass units (amu), so one mole of water weight 18.015 grams. The chemical changes observed in any reaction involve the rearrangement of billions of atoms. It is impractical to try to count or visualize all these atoms, but scientists need some way to refer to the entire quantity. They also need a way to compare these numbers and relate them to the weights of the substances, which they can measure and observe. The solution is the concept of the mole, which is very important in quantitative chemistry.

or

(a) Define the term valency. What is the valency for magnesium and copper ?

(b) What is atomicity? What is the atomicity of phosphorus and nitrogen ?

(c) Calculate the number of molecules of sulphur (S_8) present in 16 g of solid sulphur.

Ans :

(a) The combining capacity of an element is called it valency. Valency of magnesium is 2. Valency of copper is 1.

(b) The number of atoms in a molecule of a single element is known as the atomicity. Atomicity of Phosphorous is 4 as it exists as P_4 and that of nitrogen is 2 as it is N_2.

(c) The molecules formula of sulphur is given to be S_8 (it Contains 8 atoms of sulphur). So, the molecular mass of sulphur molecule is 32 × 8 = 256 u. This means that 1 mole of sulphur molecules is equal to 256 grams.

Now, 256 g of sulphur = 1 mole of sulphur molecules

$$\text{So, 16 g of sulphur} = \frac{1}{256} \times 16$$

mole of sulphur molecules

$$= 0.0625 \text{ mole of sulphur molecules}$$

Also, 1 mole of sulphur molecules

$$= 6.023 \times 10^{23} \text{ molecules}$$

So 0.0625 mole of sulphur molecules

$$= 6.025 \times 10^{23} \times 0.0625 \text{molecules}$$
$$= 3.76 \times 10^{22} \text{ molecules.}$$

30. Differentiate between vertebrates and invertebrates. [5]

Ans :

S. No	Vertebrates	Invertebrates
1.	Internal skeleton is present.	Internal skeleton is absent.
2.	Vertebral column (backbone) is present.	Vertebral column (backbone) is absent.
3.	Two pairs of limbs are present.	Three or more pairs of limbs are present.
4.	A tail is usually present.	A tail is absent.
5.	Body is covered by hair.	Hair is not present.
6.	Nerve cord is dorsally located.	Nerve cord is ventrally located.

CLASS IX (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

DIRECTION : For question numbers 1 and 2, 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) Both A and R are false.

1. Assertion (A) : If a light body and a heavy body possess the same momentum, the lighter body will possess more kinetic energy. [1]
Reason (R) : The kinetic energy of a body varies as the square of its velocity.

Ans : (b) Both A and R are true but R is not the correct explanation of the assertion.

2. Assertion (A) : All molecules in a gas travel in same speed.
Reason (R) : Gas contain molecules of different shape and size. [1]

Ans : (d) Both A and R are false.

3. Nitrogen, hosphorous and otassium are examples of : [1]
(a) Macro–nutrients (b) Fertilizers
(c) Both (a) and (b) (d) None of these

Ans : (a) Macro-nutrients

4. A rider on a horseback falls back when horse starts running all of a sudden because of : [1]
(a) Pressure (b) Gravitational force
(c) Inertia (d) None of the above

Ans : (c) Inertia

or

Newton's law of gravitation applies to .....
(a) Small bodies only
(b) Plants only
(c) All bodies irrespective of their size
(d) For solar system

Ans : (c) All bodies irrespective of their size

5. The components of the water can be separated by : [1]
(a) Physical methods
(b) Chemical methods
(c) Both (a) and (b)
(d) They can't be separated

Ans : (b) Chemical methods

or

Brass is a solution of molten copper in :
(a) Solid zinc (b) Molten zinc
(c) Gaseous zinc (d) Molten tin

Ans : (b) Molten zinc

6. Cartilage and bone are the types of : [1]
(a) Muscular tissue (b) Connective tissue
(c) Meristematic tissue (d) Epithelial tissue

Ans : (b) Connective tissue

7. Which of the following pairs are isotopes ? [1]
(a) H and O (b) O and N
(c) H and deuterium (d) Ice and steam

Ans : (c) H and deuterium

8. Where do we found areola connective tissue in our body? [1]
(a) Cortex (b) Skin and Muscles
(c) Blood Vessel (d) Muscles

Ans : (b) Skin and Muscles

or

Ribosomes are the site of :
(a) Photosynthesis (b) Respiration
(c) Protein synthesis (d) Absorption

Ans : (c) Protein synthesis

9. A stone is dropped into a lake from a tower 500 m high. The sound of the splash will be heard by a man on the tower after a time of (velocity of sound in air = 350 m/s) [1]
(a) 21 s (b) 10 s
(c) 11.4 s (d) 1 s

Ans : (c) 11.4 s

t_1 = Time for the stone to reach the lake

t_2 = Time taken for the sound of splash to each the man

t = Total time = $t_1 + t_2$

From second equation of motion

$$s = ut + \frac{1}{2}at^2$$

$$560\,\text{s} = 0 + \frac{1}{2} \times 10 \times (t_2)^2$$

$$t_2 = 10\,\text{s}$$

Let t_2 be the time taken sound to reach the surface

$$t_2 = \frac{h}{v} = \frac{500}{350} = 1.43\,\text{s} \backsimeq 1\,\text{s}$$

$$\text{Total time} = t_1 + t_2 = 10 + 1.45 = 11.45 \approx 11.4\,\text{s}$$

10. What does the slope of velocity–time graph give? [1]

(a) Acceleration (b) S peed

(c) Displacement (d) Distance

Ans : (a) Acceleration.

11. What are the characteristics of a sound wave? [1]

Ans :

Sound wave can be described by its :

(a) Frequency,
(b) Amplitude, and
(c) Speed.

12. Common fungi used in preparing the bread are ..... [1]

Ans : Yeast.

13. Questions 13.1 to 13.4 are based on the Table A and B. Study this table and answer the following questions.[1]

Table A : Thickness of epidermis

Plant	Thickness of epidermis (mm)
A	0.05
B	2.3
C	0.02
D	1.9
E	2.7
F	0.1

Table B : Terrains and thickness of the epidermis of the plants found in that terrain

Terrains	Thickness of epidermis (mm)
Desert	> 2.0
Grasslands	$1.0 > x > 0.5$
Forests	< 0.5

13.1 Which plants (from Table A) can be found in desert ? [1]

Ans : B and E.

13.2 What is the reason they have a thicker epidermis than the plants found in grasslands or forests ? [1]

Ans : Due to the scarcity of water in deserts, the plants need to hold enough amount of water inside their leaves. To avoid the transpiration of this water, they have a thicker epidermis in their leaves.

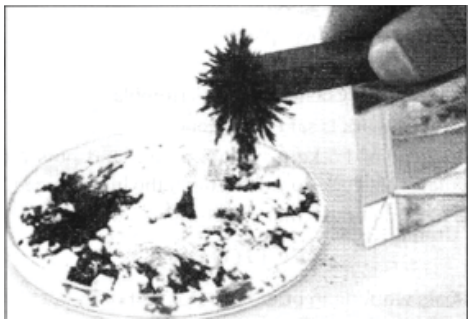
13.3 What is the name of the thick waxy coating found on the leaves of the plants found in desert ? [1]

Ans : Cutin.

13.4 Give one example of a desert plant. [1]

Ans : Cactus.

14. Answer question numbers 14.1 to 14.4 on the basis of your understanding of the following paragraph and the related studied concepts.



Keith and his friends visit the chemical laboratory in their school to know the difference between elements and compounds. They asked the lab assistant about the same but the assistant did not respond to them directly but instead told them to do an experiment. The lab assistant divided them in two groups, A and B. Both the groups were told to take 5 g of iron filings and 3 g of Sulphur powder in a china dish. Group A has to mix and crush the iron filings and sulphur. Group B has to do the same and then heat the china dish till the mixture becomes red hot and then remove from flame and let it cool. To one part of both the mixtures, they added carbon disulphide and stirred well and filtered. To another part, they added dilute sulphuric acid.

14.1 What gas is obtained by Group A ? [1]

Ans : Hydrogen.

14.2 What gas is obtained by Group B and how is it identified ? [1]

Ans : Hydrogen sulphide; it can be identified by its smell of rotten eggs.

14.3 What is the difference between material obtained by Group A and Group B ? [1]

Ans : The material obtained by group A is a mixture, while the material obtained by group B is a compound.

14.4 Give one property of mixtures. [1]

Ans : The properties of a mixture are the same as the properties of constituents.

SECTION -B

15. Derive the second equation of motion numerically. [3]

Ans :

Let u be initial velocity at time $t = 0$
Let v be final velocity at time $t = t$
Let s be the distance travelled in time t

Total distance travelled = Average velocity $\times$ time

$$\text{Average velocity} = \frac{\text{Initial velocity} + \text{Final velocity}}{2}$$

$$= \frac{v+u}{2}$$

$$\text{Total distance}, s = \frac{v+u}{2} \times t$$

$$2s = (v+u) \times t \quad \text{...(i)}$$

From first equation of motion

$$v = u + at \quad \text{...(ii)}$$

Substitute the value of v from (ii) into (i) equation

$$2s = (u + at + u) \times t$$

$$2s = (2u + at)\, t$$

$$2s = 2ut + at^2$$

$$s = ut + \frac{1}{2}at^2$$

16. (a) How can you show that evaporation causes cooling ?
(b) What are heterogeneous mixtures ? [3]

Ans :

(a) Evaporation is the process of conversion of water (liquid) to the water vapor (gaseous state). When liquid changes to gaseous state it absorbed some heat or energy from surrounding that decrease the temperature of surrounding and causes cooling effect. One of the live example is sweating. In hot summer days, sweat evaporates causes cooling effect that balance the temperature of body. Hence, evaporation is effective processes that balance our body temperature in hot sunny days.

(b) A heterogeneous mixture is a mixture having a non-uniform composition. The composition varies from one region to another with at least two phases that remain separate from each other, with clearly identifiable properties. If you examine a sample of a heterogeneous mixture, you can see the separate components.

17. (a) How are simple tissues different from complex tissues ?
(b) What happens to the plants if their tips are removed ? [3]

Ans :

(a) Simple tissues are made up of only one type of cells, which look like each other. On the other hand, complex tissues are made up of more than one type of cells. Parenchyma, collenchyma and schlerenchyma are the examples of simple plant tissue whereas xylem and phloem are complex tissue.

(b) Xylem is a water conducting tissue in plants. It transports water from the roots to the different parts of the plant. If the xylem of the plant is removed, upward movement of water will stop leading to wilting of leaves and ultimately causes the death of a plant. In the absence of water, the plant will not be able to prepare food and also perform other essential activities.

18. "According Newton's Third law of motion, For every action force there is an equal and opposite reaction force." Keeping this law in mind, explain how a horse pulls a cart. [3]

Ans :

According Newton's third law of motion, for every action force there is an equal and opposite reaction force.

Action = –Reaction.

Action force is exerted by horse on cart when horse pulls the cart. Reaction force which will be equal and opposite force will be exerted by the cart on the horse. If we have a look at forces acting on horses, horse will exert action force on the ground by its feet whereas reaction force exerted by ground on horse makes the horse move forward. Here frictional force plays a very important role. Frictional force should be more than action force.

Let F be the force applied by horse.

f = frictional force. than

$$F_{net} = F - f \quad \text{...(i)}$$

From Newton's second law

$$F_{net} = ma \quad \text{...(ii)}$$

From equation

so, $$ma = F - f$$

So acceleration will be produced. This makes the cart move.

or

Take two eggs, a raw egg and a hard boiled egg. Try to spin both the eggs with the same force on the same surface. Which one will spin for more time? You can see that the hardboiled egg spins for more time than the raw egg. What made the boiled egg spin for more time? Can you explain?

Ans :

When we spin two eggs, one raw and the other a hardly boiled egg, with the same force on the same surface, we observe that the hard-boiled egg spins for more time than the raw egg. The reason is as follows : The hard boiled egg spins more because the egg white and egg yolk are in solid state, just. That is, the hard boiled egg is totally in a solid state. So they spin together. The inertia of motion keeps the hard-boiled egg spinning longer until an external force is applied on it, or resistance of the table or air against the egg, stops it. The raw egg spins for less time because inside the raw egg, the state of egg-white and the egg-yolk are different from the outside solid shell. Since liquids have more inertial drag than that of a solid. So, inside the raw egg it is liquid and moves very little when compared to the outside solid shell. The shell is forced to stop spinning because of the motion of the liquid inertia inside (egg-white or egg-yolk).

19. What are the main practices involved in keeping of animals or animal husbandry ? [3]

Ans :

Main practices involved in animal husbandry are:

(a) **Breeding :** It is done to obtain animals with desired characters. Breeding can develop high milk yielding and high meat yielding animals.

(b) **Feeding :** It deals with the study of proper food (called feed), mode and time of feeding for different animals.
(c) **Weeding :** It is the elimination of uneconomical animals.
(d) **Heeding :** It means the proper care and management of the animals.

20. A student weighs 30 kg. Suppose his body is entirely made up of electrons. How many electrons are there in his/her body. (Mass of an electron is 9.1×10^{-31} Kg) [3]

Ans :

Given, Mass of electron $= 9.1 \times 10^{-31}$ kg

Number of electron in the body of student

$$= \text{total mass/mass of each electrons}$$
$$= 30\,\text{kg}/9.1 \times 10^{-31}\,\text{kg}$$

Therefore, the student is made up of approximately 3.29×10^{31} electrons

Suppose, the population of a country is considered as 100 Crore.

$$(3.29 \times 10^{31})/10^{9} = 3.29 \times 10^{22}$$

So, the number of electrons in the body of the student is 3.29×10^{22} times the population of that particular country.

or

(a) How would you confirm that a colorless liquid given to you is pure water ?
(b) What is meant by a substance ?

Ans :

(a) If we allow the given liquid to evaporate by heating it as in a china dish, then
  (i) Any residue remaining in the china dish will indicate that the water is not pure but contains impurities.
  (ii) No residue in the china dish will indicate that water is pure.
(b) Substance can be defined as that kind of matter where constituent particles cannot be separated from each other by any physical process since they all are similar in chemical properties.

21. A car falls of a ledge and drops to the ground in 0.5s. Let $g = 10\text{ms}^{-2}$

(a) What is its speed on touching the ground ?
(b) What is its average speed during 0.5 s ?
(c) How high is the ledge from the ground ? [3]

Ans :

Given, initial velocity, $u = 0$

time, $t = 0.5\,\text{s}$

(a) As we know that, $v = u + gt$

$$v = 0 + 10 \times 0.5$$
$$v = 5\,\text{ms}^{-1}$$

(b) Average speed = total distance /total time

So, $$s = ut + \frac{1}{2}gt^2$$

$$s = 0 \times 1.25 + \frac{1}{2}10\,(0.5)^2$$

$$s = 1.25\,\text{m}$$

So, average speed $= \frac{1.25}{0.5} = 2.5\,\text{ms}^{-1}$

(c) Height $= 2.5\,\text{m}$

22. Differentiate between monocot and dicot plants. [3]

Ans :

S. No.	Character	Monocots (Monocotyle-don)	Dicots (Dicotyledon)
1.	Seed-cotyledons	One	Two
2.	Seed-germination	Hypogeal	Epigeal or hypogeal
3.	Root	Primary root short lived, adventitious fibrous root system present	Primary root present (forming tap root system)
4.	Leaf	Isobilateral–Parallel ventilation	Dorsiventral-Reticulate venation
5.	Stem–cambium	Absent	Present

or

Define (a) Bilateral symmetry, (b) Coelom and (c) Triptoblastic.

Ans :

(a) **Bilateral symmetry :** Body can be divided into two similar halves only by one plane that passes through the central or median axis e.g., tortoise, humans.
(b) **Coelom :** It is the body cavity which is lined externally as well as by regular layer of mesoderm.
(c) **Triploblastic :** When the body of an animal develops three germ layers: ectoderm, mesoderm and endoderm, it is called triploblastic.

23. (a) Under what conditions work is said to be done ?
(b) A porter lifts a luggage of 1.5 kg from the ground and puts it on his head 1.5 m above the ground. Calculate the work done by him on the luggage.[3]

Ans :

(a) (i) Force should be applied.
  (ii) Body should move in the line of action of force.
  (iii) Angle between force and displacement should not be 90 degree.
(b) Mass of luggage, m =15 kg and displacement, s = 1.5 m

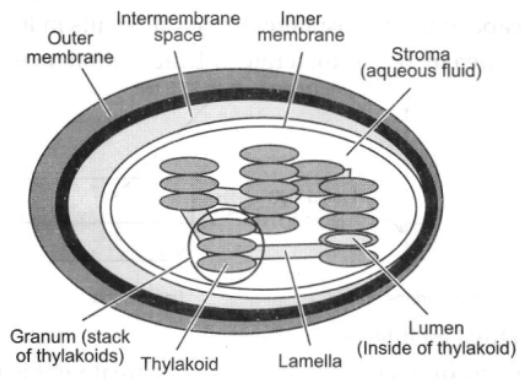
Work done, $W = F \cdot s$

$$= mg \times s = 15 \times 10 \times 1.5$$
$$= 225\,\text{J}.$$

24. Which type of plastids help in photosynthesis? Draw its diagram. [3]

Ans :

The type of plastids which help in photosynthesis is called chloroplasts. The plastic which helps in photosynthesis is called as chloroplasts. It is one of the most known of the plastids found in leaves of plants. Chloroplasts are responsible for the photosynthesis process and they are mainly filled with thylakoids. Thylakoids are the place of photosynthesis. So we can say that they are the place for the pigments to be stored and synthesized in the plant.



SECTION -C

25. What is SONAR? Write its working in brief. [5]

Ans :

SONAR stands for Sound Navigation and Ranging. It uses ultrasonic waves. Working it consists of a transmitter which produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the sea bed, get reflected back and are sensed by a detector. The waves are then converted to electrical signals by detector. The time taken by wave to reach detector is recorded. Now, distance of the object from the ship is calculated by the following formula.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

or

(a) Define frequency and amplitude of a wave.
(b) Define wavelength and time period of a wave

Ans :

(a) (i) **Frequency :** The number of vibrations or oscillations per second is called frequency, i.e. it is the number of complete waves or cycles produced in one second.
(ii) **Amplitude :** It is the maximum displacement of the particleof the medium from their mean/ original position at rest.

(b) (i) **Wavelength :** For a sound wave, the combined length of a compression and an adjacent rarefaction is called its wavelength. Even the distance between centers of two consecutive compressions or two consecutive rarefactions is also equal to wavelength.
(ii) **Time period :** The time taken to complete one vibration/oscillation/complete wave is called time period. It is measured in seconds.

26. (a) What temperature in Kelvin scale is equal to 50°C ?
(b) Describe an activity to show that rate of evaporation increases with surface area (with a diagram). [5]

Ans :

$$T_k = 273^\circ + t^\circ\text{C}$$

Temperature on $K = 273 +$ temperature on Celsius

$$T_k = 273 + 50^\circ\,\text{C}$$

$$= 323\,\text{K}$$

So, $50^\circ\,\text{C} = 323\,\text{K}$

(b) **Aim :** To prove that rate of evaporation increases with increase in surface area.

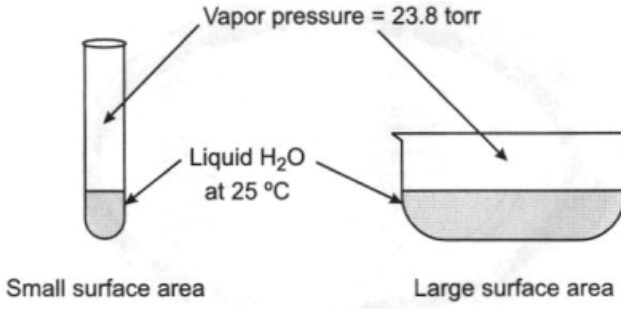
Apparatus required : Any liquid (water), Petridish and test tube.

Procedure :
(i) Take 10 ml of water in petridish and test tube and keep them under the fan.
(ii) Note down the time taken for evaporation in both the cases.

Observation :
(i) We observe that more amount of water is evaporated in case of petridish if a particular time is considered.
(ii) It takes more time for the water in test tube to evaporate than the water in petri dish, even though the quantity is same.

Since evaporation is a surface phenomenon, during evaporation process the particles escape from the surface of liquid. The increase in the surface area provides more scope for particles from the surface to escape to the atmosphere. Hence, it results in increase in rate of evaporation.

Conclusion : If surface area increases then rate of Evaporation increases.



27. What are the two principles of treatment? Why is making anti-viral medicines harder than making anti-bacterial medicines? [5]

Ans :

There are two ways to treat an infectious disease :

(a) **To reduce the effects of disease :** In other words, treatment is provided for the symptoms that are arising due to that particular disease. The symptoms are usually because of inflammation. For example, we can take medicines that bring down fever, reduce pain or loose motions. We can take bed rest so that we can conserve our energy. This will enable us to have more of it available to focus on healing. One problem that arises here is the type of treatment that will not cure by itself. For that we need to kill the microbes.

(b) **To kill the cause of the disease :** That is, we have to kill the disease causing microbes. One way to kill them is by using medicines. Microbes are also classified into different categories like virus, bacteria and protozoa. Each of these groups of organisms will have some essential biochemical life process which is peculiar to that group and not shared with the other groups. These processes may be pathways for the synthesis of

new substances or respiration.

One reason why making anti viral medicines is harder than making anti-bacterial medicines is that viruses have few biochemical mechanisms of their own. They enter our cells and use our machinery for our life processes. This means that there are relatively very few targets to attack. Despite this limitation, there are now effective anti viral drugs, for example, the drugs that keep HIV under control.

or

Explain how clouds are formed and result in rain.

Ans :

(a) When water bodies are heated during the day, a large amount of water evaporates and goes into the air.
(b) Some amount of water vapour also gets into the atmosphere because of various biological activities. This air also gets heated.
(c) The hot air rises up carrying the water vapour with it. As the air rises, it expands and cools.
(d) The cooling causes the water vapour in the air to condense in the form of tiny droplets.
(e) This condensation of water is facilitated if some particles could act as the 'nucleus' for these drops to form around. Normally dust and other suspended particles in the air perform this function.
(f) Once the water droplets are formed, they grow bigger by the condensation of these water droplets.
(g) When the drops become big and heavy they fall down in the form of rain.
(h) Sometimes when the temperature is low enough, precipitation may occur in the form of snow, sleet or hail.

28. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate: [5]

(a) The net accelerating force
(b) The acceleration of the train; and
(c) The force of wagon 1 on wagon 2.

Ans :

(a) Force exerted by the engine,

$$F = 40000\,\text{N}$$

Frictional force offered by the track,

$$F_1 = 5000\,\text{N}$$

Net accelerating force,

$$F_a = F - F_f = 40000 - 5000$$
$$= 35000\,\text{N}$$

Hence, the net accelerating force is 35000 N.

(b) Acceleration of the train $= a$

The engine exerts a force of 40000 N on all the five wagons.

Net accelerating force on the wagons,

$$F_a = 35000\,\text{N}$$

Mass of the wagons,

m = mass of a wagon × number of wagons

Mass of wagon $= 2000\,\text{kg}$

Number of wagons $= 5$

Therefore, $m = 2000 \times 5 = 10000\,\text{kg}$

Total mass, $M = m = 10000\,\text{kg}$]

From Newton's second law of motion:

$$F_a = M \times a$$
$$a = \frac{F_a}{M} = \frac{35000}{10000} = 3.5\,\text{ms}^{-2}$$

Hence, the acceleration of the wagons and the train is $3.5\,\text{m/s}^2$

(c) Mass of all the wagons except wagon 1 is $4 \times 2000 = 8000$ kg

Acceleration of the wagons = 3.5 m/s^2

Thus, force exerted on all the wagons except wagon 1 = $8000 \times 3.5 = 28000$ N

Therefore, the force exerted by wagon 1 on the remaining four wagons is 28000 N.

Hence, the force exerted by wagon 1 on wagon 2 is 28000 N.

29. State the following laws with examples.

(a) Law of conservation of mass.
(b) Law of constant proportion. [5]

Ans :

(a) The law of conservation of mass states that mass in an isolated system is neither. created nor destroyed by chemical reactions or physical transformations. According to this law, the mass of the products in a chemical reaction must equal the mass of the reactants. The law of conservation of mass is useful for a number of calculations and can be used to solve for unknown masses, such as the amount of gas consumed or produced during a reaction. Example : one common example you'll come across is the image of a bonfire or campfire. A molecule of water will always have two hydrogen atoms and one oxygen atom, meaning that in a bottle of pure water the hydrogen to oxygen atom ratio will always be 2 : 1. This seems very logical to us today.

(b) Law of constant proportions says that a chemical molecule will always contains the same elements in the same proportion.

There are two parts to the law of constant proportions:

(i) There will always be the same elements that make up a compound
(ii) The mass of these compounds will always be in the same proportion.

Example : In a compound such as water the ratio of mass of hydrogen to the mass of oxygen is always 1 : 8. Thus, if 9 grams of water is decomposed 1 gram of hydrogen and 8 grams of oxygen are always obtained

or

What is chromatography? What are its various applications and underline the basic principle involved.

Ans :

Chromatography is a technique used for separation of those components whose solubility in the same solvent is different. Its various applications are:

(a) It is used to separate different colors in dye.
(b) It is used to separate pigments from natural colors.
(c) It is used to separate drugs from blood.

Principle behind chromatography :

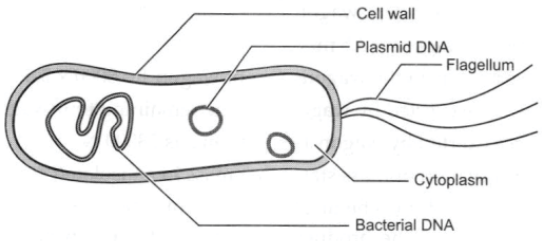
The preferential separation of the compounds is based on their different affinities towards stationary and mobile phase. After separation of the compounds, they are identified by suitable detection methods. The difference in affinity arises due to relative adsorption or partition coefficient between compounds towards both phases.

30. (a) Name the group of plants known as "Amphibians of plant world". Mention their four important characteristics.
(b) Give three points on how birds have adapted themselves to an aerial mode of life.
(c) Draw a labeled diagram of a bacteria. [5]

Ans :

(a) Bryophytes are the plants that live on land and in water so they are called amphibians of plant kingdom. These plants show the following character :
  (i) The plant body is either thallus like (thalloid) or leaf like (foliose).
  (ii) True leaves and roots are lacking; the plants are anchored to the soil by means of filamentous rhizoids.
  (iii) Plant body is green and autotrophic.
  (iv) The vascular tissues are absent.

(b) Adaptations of birds to aerial mode of life:
  (i) Their body is covered with feathers.
  (ii) Forelimbs are modified into wings.
  (iii) They have hollow bones which helps them during the flight .



Bacteria

CLASS IX (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-10

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 phenomenon by which protoplast of a cell shrinks from the wall is [1]
(a) Osmosis (b) Plasmolysis
(c) Diffusion (d) Glycolysis

Ans : (b) Plasmolysis

2. What could be the diameters of the molecules of matter? [1]
(a) 10^{-7} m (b) 10^{-11} m
(c) 10^{-9} m (d) 10^{-15} m

Ans : (c) 10^{-9} m

DIRECTION : For question numbers 3 and 4, 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 A.
(b) Both A and R are true but R is not the correct explanation of the A.
(c) A is true but R is false.
(d) Both A and R are false.

3. **Assertion (A) :** Turtles lay eggs outside the water.
Reason (R) : Turtles are amphibians. [1]

Ans : (c) A is true but R is false.

4. **Assertion (A) :** Plasma membrane is a selectively permeable membrane. [1]
Reason (R) : Plasma membrane allows entry and exit of substance from cell through the process of diffusion.

Ans : (c) A is true but R is false.

5. Diamond is lustrous because : [1]
(a) It is colourless.
(b) It is hard.
(c) It is pure.
(d) Its refractive index is high.

Ans : (d) Its refractive index is high.

6. The tissue present in the lining of kidney tubules and ducts of salivary glands is : [1]
(a) Squamous epithelium tissue
(b) Glandular epithelium tissue
(c) Cuboidal epithelium tissue
(d) Columar epithelium tissue

Ans : (c) Cuboidal epithelium tissue.

or

Parenchyma is a type of : [1]
(a) Complex tissue (b) Organ
(c) Simple tissue (d) Organelle

Ans : (c) Simple tissue

7. Plasmodium is an example of [1]
(a) Virus (b) Bacteria
(c) Protozoa (d) Worm

Ans : (b) Bacteria

8. If proton (P^+) number of an element change : [1]
(a) It becomes an isotope.
(b) It becomes another element.
(c) It will sublimate immediately.
(d) It will be an electrolyte.

Ans : (b) It becomes another element.

or

The atomic number of sodium is 11 and its mass number is 23. It has :
(a) 11 neutrons and 12 protons
(b) 12 protons and 11 electrons
(c) 11 electrons and 12 neutrons
(d) 12 electrons and 11 neutrons

Ans : (c) 11 electrons and 12 neutrons

9. Which irrigation system is more useful in the areas where canal flow is insufficient or irregular? [1]
(a) Canal system (b) Tanks
(c) Wells (d) River lift system

Ans : (d) River lift system

10. The earth attracts the moon with a gravitational force of 1020 N. The moon attracts the earth with a gravitational force of [1]

(a) Less than 10^{20} N (b) 10^{20} N

(c) Greater than 10^{20} N (d) 10^{-20} N

Ans : (b) 10^{20} N

or

The gravitational force causes

(a) Tides (b) Motion of moon

(c) Revolution of earth (d) Both (a) and (b)

Ans : (d) Both (a) and (b)

11. What is the role of "International Code of Binomial Nomenclature"? [1]

Ans :

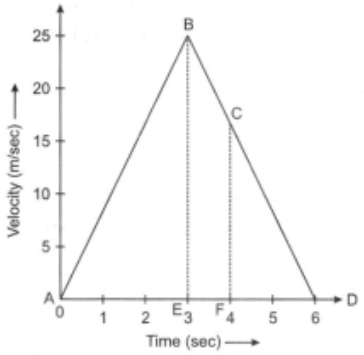
It sets the rules and guidelines for the binomial nomenclature.

12. Calculate the mass of one atom of oxygen. [1]

Ans :

Mass of one oxygen atom = 2 × 8 =16 amu
Because the atomic mass of oxygen = 16 amu

13. Answer the question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts. Study the given velocity-time graph and calculate the following :



Mohan bought a new car and wanted to test it on highways. He thought he will find out the acceleration of his car at different velocities in the first 6 seconds. He called his friend Shyam and told him to sit alongside him and note down the different speeds. Shyam prepared the following (graph 1) graph. Mohan's son, who studied in 9th class wanted to do an experiment with the car. He had recently learned a peculiar thing about circular motion and coerced his father to take the car to a circular track and drive at constant speed.

13.1 Find out the car's acceleration from A to B. [1]

Ans :

$$a = \frac{\Delta v}{\Delta t} = \frac{25-0}{3-0} = 8.33\ \text{m/s}^2$$

13.2 Find out the car's acceleration from B to C. [1]

Ans :

$$a = \frac{\Delta v}{\Delta t} = \frac{17.5-25}{4-3}$$

$$= \frac{-7.5}{1} = -7.5\ \text{m/s}^2$$

Here, minus sign indicates retardation; velocity is decreasing.

13.3 What peculiar thing had Mohan's son learned about circular motion in his class that he wanted to test in the track? [1]

Ans : In a circular motion, the speed of an object remains same but the velocity is non - uniform. Mohan's son wanted to understand what this means.

13.4 What did Mohan and their son notice when they drove their car in the circular track? [1]

Ans : Mohan and his son felt an outward force away from the center of the track. This is the centrifugal force.

14. Question 14.1 to 14.4 are based on the Table A. Study the table and answer the following question given below :

Table A

S. No.	Processes
1.	Conversion of solid into liquid.
2.	Conversion of liquid into gases.
3.	Conversion of solid into gases.
4.	Conversion of gases into liquid.
5.	Conversion of liquid into solid.

14.1 Give the name of the process that is involved in conversion of solid into liquid. [1]

Ans : The conversion of solid into liquid is known as the fusion.

14.2 Give the conditions for conversion of gases into liquid. [1]

Ans : Low pressure and high temperature favors the conversion of gases into liquid.

14.3 Name the process for conversion of solid into gases. [1]

Ans : The conversion of solid into gases is known as sublimation.

14.4 Give the conditions for conversion of liquid into gases. [1]

Ans : High temperature favors the conversion of liquids into gases

SECTION B

15. When will you say a body is in

(a) Uniform acceleration.

(b) Non–uniform acceleration. [3]

Ans :

(a) When an object travels in a straight line and its velocity changes by equal amount in equal intervals of time is said to have uniform acceleration.

(b) It is also called variable acceleration. When the velocity of an object changes by unequal amounts in equal intervals of time, it is said to have non-uniform acceleration.

16. The element whose atomic number is 10 and the one whose atomic number is 11? [3]

Ans :

Element with atomic number 11 is more reactive than the one with atomic number 10 because electronic configuration of atomic number 11 will be 2, 8, 1. To attain a stable electronic configuration, it will try to lose an electron from its outermost shell. The electronic configuration of the element with atomic number 10 is 2, 8, so it is already stable. Therefore, the atomic number 11 will be more reactive.

17. Name and give the function of each cell of xylem and phloem. Draw a labelled diagram of each tissue. [3]

Ans :

Xylem contains four types of cells, such as xylem parenchyma, xylem fibres, tracheids and vessels.

(a) **Xylem parenchyma :** Store metabolites produced from metabolism of plant. Also help in short distance transport.

(b) **Xylem fibres :** Provide mechanical support. The walls of xylem fibres are lignified and protoplasm is absent.

(c) **Xylem tracheids :** Transport of water and mineral salts.

(d) **Xylem vessels :** Conduction of water and mineral. These cells are dead.

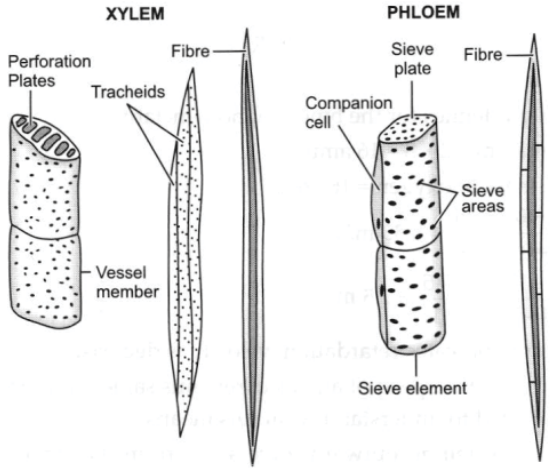
Phloem also contains four types of cells such as phloem parenchyma, phloem fibres, companion cells and sieve tubes.

(a) **Phloem parenchyma :** Transport of nutrients and storage of organic food.

(b) **Phloem fibres :** They are non-living component of phloem. They provide mechanical support.

(c) **Companion cells :** Provide ATP and nutrients to carry out cellular functions.

(d) **Sieve tubes :** Transport of carbohydrates especially sucrose.



18. A car of mass 400 kg travelling at 72 km/h crashes into a truck of mass 4000 kg and travelling at 9 km/h in same direction. The car bounces back at a speed of 18 km/h. Find the speed of the truck after the impact. [3]

Ans :

Given, $m_1 = 400\,\text{kg}$

$u_1 = 72\,\text{km/h} = 20\,\text{m/s}$

$m_2 = 4000\,\text{kg}$

$u_2 = 9\,\text{km/h} = 2.5\,\text{m/s}$

$v_1 = -18\,\text{km/h} = -5\,\text{m/s}$

$v_2 = ?$

By law of conservation of linear momentum,

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$$400 \times 20 + 4000 \times 2.5 = 400 \times (-5) + 4000 \times v_2$$

$$4000v_2 = 8000 + 10000 + 2000$$

$$v_2 = \frac{20000}{4000}$$

$$v_2 = 5\,\text{m/s} = 18\,\text{km/h}$$

or

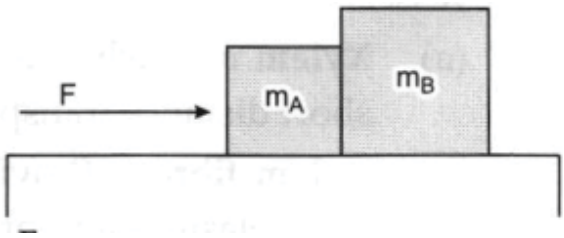
Two blocks A and B of mA mass and mi, respectively are kept in contact on a frictionless table. The experimenter pushes the block A from behind so that the blocks accelerate. If the block A exerts a force F on the block B. What is the force exerted by the experimenter on A?

Ans :

Let F_1 be the force with which experimenter pushes the block A. Consider the two masses as a system. Let the net force on the system :

$$F_1 = (m_A + m_B)\,a$$

$$a = F_1/(m_A + m_B)$$



Let F_{AB} be the force exerted by the block A on block $B = F$

$$F_{AB} = F = m_B$$

$$a = m_B\,\frac{F_1}{(m_A + m_B)}$$

$$F_1 = F\left(\frac{m_A + m_B}{m_B}\right) = F\left(\frac{m_A}{m_B} + 1\right)$$

19. (a) What are secretory proteins? Give an example of secretory protein.

(b) What is membrane biogenesis? How is plasma membrane formed during this process? [3]

Ans :

(a) Proteins which are synthesized by the cell and then released into outer medium of the cell are

called secretory proteins. Examples of secretory proteins include mucus, digestive enzymes and hormones.

(b) The process of plasma membrane formation is called membrane biogenesis. Following organelles are involved in this process. The proteins and lipids are first synthesized in rough endoplasmic reticulum and the smooth endoplasmic reticulum, respectively. These are then transported to the Golgi complex for their modification. After modification, these are transported to the cell surface through vesicles which bud off from Golgi complex to fuse with cell membrane and form a part of the membrane.

20. (a) On a hot sunny day, why do people sprinkle water on the roof or open ground?

(b) Cotton is solid but it floats on water. Why? [3]

Ans :

(a) The specific heat capacity of water is high. This means that the heat energy required to increase the water temperature by 1°C (degree Celsius) is very high. Thus, on a very hot and sunny day, the sprinkling of water on roofs and gates is helpful in cooling the surface. The heat from the surface of the roofs and gates is used up by the water to heat up and evaporate which in turn cools the surface it was sprinkled on.

(b) According the laws of physics, the difference if the density of a solid is less than the density of a liquid, the solid will float on the liquid. Cotton is a material that has a porous structure, and the pores trap air inside themselves. As a result, the overall density of cotton is less than water, that is why it floats on water.

or

Explain giving examples the various factors on which rate of evaporation depends.

Ans :

(a) It depends on the temperature of the surroundings.
(b) It depends on atmospheric pressure.
(c) It depends on specific heat of the liquid.
(d) It depends on the surface area of the liquid.

21. State universal law of gravitation? [3]

Ans :

Universal law of gravitation states :

(a) Every object in the universe attracts every other object with a force which is directly proportional to the product of their masses.

(b) Every object in the universe attracts every other object with a force which is inversely proportional to the square of the distance between their centers. The direction of the force is alone the line joining the center's of two objects.

Derivation universal law of gravition :

Suppose there are two objects, A and B with masses, ml and m, respectively and 'r' is the distance between them.

According to the first point of Newton's law of gravitation: $F \propto m_1 \times m_2$ ...(i)

According to second point of Newton's law of gravitation: $F \propto \frac{1}{r^2}$ ...(ii)

Combining (i) and (ii),

$$F \propto \frac{m_1 m_2}{r^2}$$

$$F = G\frac{m_1 m_2}{r^2}$$

Where, G = Universal gravitational constat.

22. (a) Explain the basis for grouping organisms into the five kingdoms.

(b) How would you choose between two characteristics to be used for developing a hierarchy in classification? [3]

Ans :

(a) Following is the basis for grouping organisms into the five kingdoms :

(i) If the organisms are made of prokaryotic or eukaryotic cells.

(ii) The organism has a single cell in its body or is a multicellular life form.

(iii) The organism prepares its own food or is dependent on other on food.

(b) We would choose the characteristic related to their structure and function that will help developing a hierarchy from one level to the next level. Like arthropods are organisms with jointed appendages but among arthropods insects and spiders make to separate groups having peculiar characteristics to define them. Hence, we can make the hierarchy in classification by selecting general to specific characteristics.

or

How do annelids animal differ from arthropods?

Ans :

S. No.	Annelids	Arthropods
1.	Body cavity is true columns	Body cavity is haemocoel like in cockroach.
2.	Body is segmented and segments are known as annuli.	Body is segmented into head, mesothorax, and metathorax.
3.	Legs are absent.	Three pairs of legs are present.
4.	Closed circulatory system is present	Open circulatory system is present.

23. Show that when a body is dropped from a certain height, the sum of its kinetic energy at any instant during its fall is constant. [3]

Ans :

The mechanical energy (kinetic energy + potential energy) of a freely falling object remainsconstant.

It may be shown by calculation as follows :

Suppose a body of mass m falls from point A, which is at height 'h' from the surface of earth.

Initially at point A, kinetic energy is zero and the body has only potential energy.

Total energy of body at point A = Kinetic energy + Potential energy

$$= 0 + mgh = mgh$$

Suppose during fall, the body is at position b. The body has fallen at a distance x from its initial position. If velocity of body at B is v, then from formula

$$v^2 - u^2 = 2as$$

$$v^2 = 0 + 2gx = 2gx$$

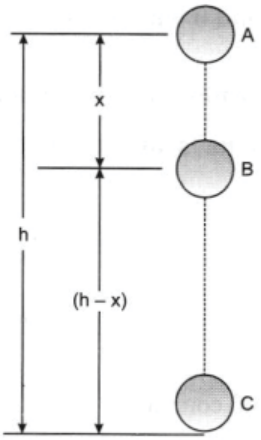
Kinetic energy of body at point

$$B = \frac{1}{2}mv^2$$

$$= \frac{1}{2}m \times 2gx = mgx$$

Potential energy of body at point

$$B = mg(h - x) = mgh$$



24. What are the desirable characters of bee varieties suitable for honey production? [3]

Ans :

The desirable characters of bee varieties suitable for honey production are:

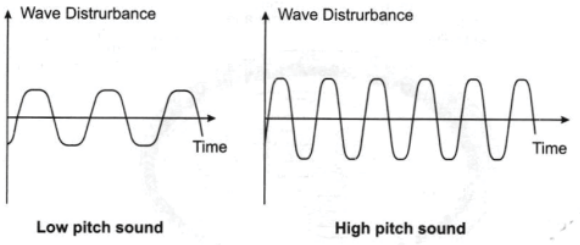
(a) High honey collection capacity.
(b) They must sting comparatively less.
(c) They should stay in the given beehives for a longer period, and breed properly.

SECTION -C

25. (a) What do you understand by low pitch and high pitch sound? Draw appropriate diagrams to support your answer.
(b) How is ultrasound used for cleaning? [5]

Ans :

(a) High pitch sounds are those which have a higher frequency that is, in 1 second, they complete a large number of oscillations. Low pitch sounds are those which have lesser frequency i.e., in 1 second, they complete less number of vibrations.



(b) Ultrasound is generally used to clean parts located in hard to reach places. For example, spiral tubes, odd shaped parts, electronic components, etc. Objects to be cleaned are placed in a cleaning solution and ultrasonic waves are sent into the solution. Due to the high frequency, the particles of dust, grease and dirt get detached from the object and drop out. The object thus gets thoroughly cleaned.

26. (a) What temperature in Kelvin scale is equal to 50°C?
(b) Describe an activity to show that rate of evaporation increases with surface area. [5]

Ans :

(a) As we know that, $T_k = 273^\circ + t^\circ\text{C}$

Temperature on Kelvin = 273 + temperature on Celsius

$$T_k = 273 + 50^\circ\text{C}$$

$$= 323\,\text{K}$$

$$50^\circ\text{C} = 323\,\text{K}$$

(b) **Aim :** To prove that rate of evaporation increases with increase in surface area.

Apparatus required : Any liquid (water), Petridish and test tube.

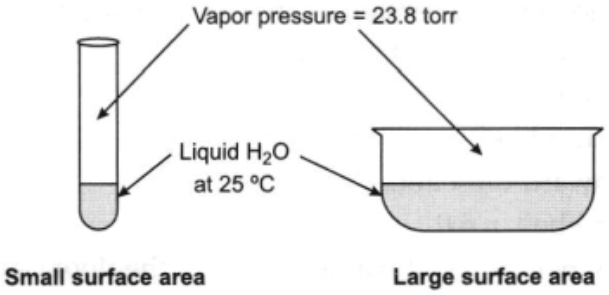
Procedure :

(i) Take 10m1 of water in petridish and test tube and keep them under the fan.
(ii) Note down the time taken for evaporation in both the cases.

Observation :

(i) We observe that more amount of water is evaporated in case of petridish. Since evaporation is a surface phenomenon. During evaporation process the particles escape from the surface of liquid.
(ii) The increase in the surface are provides more scope for particles from the surface. Hence increases rate of evaporation

Conclusion : If surface area increases then rate of evaporation increases.

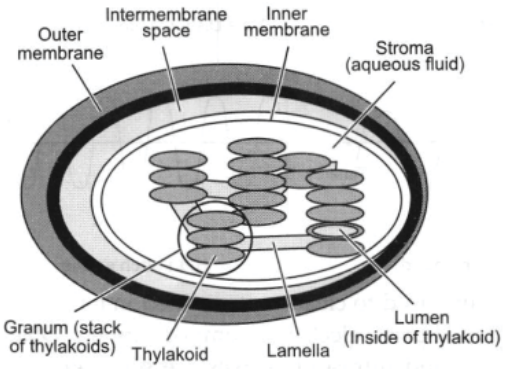


27. (a) Write the name of different plant parts in which chromoplast, chloroplast and leucoplast are present.
(b) Which type of plastids help in photosynthesis? Draw its diagram. [5]

Ans :

(a) (i) Flower and fruit : Chromoplast
(ii) Leaves of the plant : Chloroplast
(iii) Root of the plant : Leucoplast

(b) The type of plastids which help in photosynthesis is called chloroplasts. The plastid which helps in photosynthesis is called as chloroplasts. It is one of the most known of the plastids found in leaves of plants. Chloroplasts are responsible for the photosynthesis process and they are mainly filled with thylakoids. Thylakoids are the place of photosynthesis. So, we can say that they are the place for the pigments to be stored and synthesized in the plant.

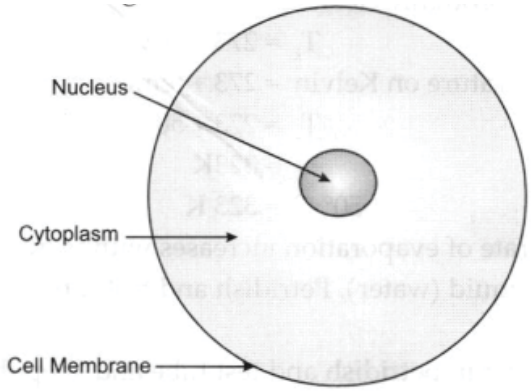


or

What are the main functional regions of a cell? Explain with the help of diagram.

Ans :

There are three main functional regions of a cell, as shown in the diagram.



(a) **Plasma membrane (PM) :** It is flexible and made up of phospholipid bilayer that consists of proteins and lipids which surrounds the cell and is semipermeable in nature.

(b) **Cytoplasm :** It is an amorphous and homogeneous colloidal ground substances present between the PM and nucleus.

(c) **Nucleus :** It is centrally located, spherical prominent organelle surrounded by two unit membranes, which is responsible for controlling all vital activities of a cell. It also contains the genetic material.

28. (a) State the law of conservation of momentum.

(b) How much momentum will a dumb bell of mass 10 kg transfer to the floor if it falls from a height of 80 cm. Take its downward acceleration to be 10 ms^{-2}. [5]

Ans :

(a) According to law of conservation of momentum when two or more bodies acts upon each other, their total momentum remains constant provided no external forces are acting. Momentum can neither be created nor destroyed .

(b) Mass of the dumb bell, $m = 10$ kg Distance covered by the dumbbell, $s = 80$ cm $= 0.8$ m Acceleration in the downward direction, $a = 10$ m/s^2 .

Initial velocity of the dumbbell, $u = 0$.

Final velocity of the dumbbell (when it was about to hit the floor) $= v$

According to the third equation of motion :

$$v^2 = u^2 + 2as$$
$$v^2 = 0 + 2 \times 10 \times 0.8$$
$$v = 4\,\text{m/s}$$

Hence the momentum with which the dumbbell hits the floor is

$$= mv = 10 \times 4 = 40\,\text{kgms}^{-1}$$

or

(a) Why is it advised to tie a rope on the luggage while you travel by the bus?

(b) Why does an athlete take a longer jump if he comes running from a distance than when he jumps suddenly from the take-off line?

(c) A motorcar of mass 1200 kg is moving along a straight line with a uniform velocity of 90 km/h. Its velocity is slowed down to 18 km/h in 4 s by an unbalanced external force. Calculate the acceleration and change in momentum. Also calculate the magnitude of the force required.

Ans :

(a) This is because when the driver applies the brake suddenly, the luggage on the rooftop experiences inertia and may fall off the roof. So, it's advisable to tie the luggage with a rope.

(b) An athlete runs before jumping to gain momentum. Because it helps in jumping higher and longer because of inertia of motion gained due to the motion. When the athletes jump they already have a forward motion that would be greater than that of a jump made from standing in one spot.

(c) Mass of the motor, $m = 1200\,\text{kg}$

Initial velocity of the motor car,

$$u = 90\,\text{km/h} = 25\,\text{m/s}$$

Final velocity of the motor car,

$$v = 18\,\text{km/h} = 5\,\text{m/s}$$

Time $t = 4\,\text{s}$

According to first equation of motion

$$v = u + at$$
$$5 = 25 + a(4)$$
$$a = -5\,\text{m/s}^2$$

Negative sign indicates that it's a retarding motion, i.e., velocity is decreasing.

$$\text{Change in momentum} = mv - mu = m(v - u)$$
$$1200\,(5 - 25) = -2400\,\text{kgms}^{-1}$$
$$\text{Force} = \text{Mass} \times \text{Acceleration}$$
$$= 1200 \times (-5)$$
$$= -6000\,\text{N}$$

Acceleration of the motor $= 5\,\text{ms}^{-2}$

Change in momentum of the motor car

$$= -\,24000\,\text{kgms}^{-1}$$

Hence, the force required to decrease the velocity is 6000 N.

(Negative sign indicates retardation, decrease in momentum and retarding force)

29. How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25°C), which are miscible with each other? [5]

Ans :

A technique known as simple distillation can be used to separate the mixture of miscible liquids, where the difference in boiling point is more than 25°C, for example; kerosene and petrol. The whole concept is established on the volatility property of substances. The following are the various steps in the process of simple distillation:

(a) In a distillation flask, take the mixture.
(b) Treat the mixture with heat while a thermometer is affix.
(c) We observe evaporation of petrol as it has a low boiling point.
(d) As the vapours advance towards the condenser, a dip in the temperature causes conden-sation of the vapours into liquid which can be accumulated in a flask.
(e) We notice that kerosene tends to remain in the flask in a liquid state due to comparatively higher boiling point.
(f) Consequently, the liquids are separated.

or

To make a saturated solution, 30 g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature.

Ans :

Given, Mass of solute $(NaCl) = 30\,\text{g}$

Mass of solvent $(H_2O) = 100\,\text{g}$

So, Mass of solution $(NaCl + H_2O) = 130\,\text{g}$

$$\text{Concentration} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

$$\text{Concentration} = \frac{30}{130} \times 100 = 23.07\%$$

Hence, the concentration of the solution is 23.07%

30. What are the limitations in the approach of treating the infectious diseases? Also mention the principles of prevention. [5]

Ans :

There are three limitations in the treatment approach of an infectious disease :

(a) If someone has a disease, their body functions are damaged and may never recover completely.
(b) A treatment will take time, which means that someone suffering from a disease is likely to be bedridden for some time even if he is given proper treatment.
(c) The person suffering from an infectious disease can serve as the souzrce from where the infection may spread to other people.

There are two ways to prevent a disease, one is general and one is specific to each disease :

(a) The general way of preventing a disease is to prevent our body's exposure to microbes. For example, we can prevent exposure to air borne microbes by providing living conditions that are not overcrowded. We can prevent exposure to water borne microbes by providing safe drinking water.
(b) The second principle is based on the strength of our immune system to fight the diseases. For a proper functioning immune system, availability of proper and sufficient food for everyone is very important.