



INDIAN SCHOOL AL MAABELA
(ISO 9001:2015 CERTIFIED INSTITUTION)
QUESTION BANK 2019-202
PHYSICS / GRADE 12

ISAM//SEC/QB/042

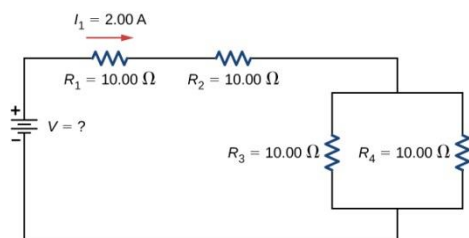
Directions (Q1-Q10) Select the most appropriate option from those given below each question

1. The property which differentiates the two kinds of charge is
 - a) amount of charge
 - b) polarity of charge
 - c) strength of charge
 - d) field of charge
2. A method of charging a conductor without bringing a charged object in contact is called
 - a) electrification
 - b) magnetization
 - c) induction
 - d) friction
3. Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately,
 - a) Sphere
 - b) paraboloid
 - c) planes
 - d) ellipsoid
4. If a copper wire is stretched to make it 0.1% longer, the percentage increase in resistance will be
 - a) 0.2
 - b) 2
 - c) 1
 - d) 0.1
5. As the frequency of an AC circuit increases, the current first increases and then decreases. What combination of circuit elements is most likely to comprise the circuit?
 - a) Inductor and capacitor.
 - b) Resistor and inductor.
 - c) Resistor and capacitor.
 - d) Resistor, inductor and capacitor.
6. A glass slab ($n = 1.5$) of thickness 9cm is placed over a written paper. What is the shift in letters?
 - a) 6 cm
 - b) 3cm
 - c) 2cm
 - d) 0cm
7. Which of the following characteristics of electron determines the current in a conductor?
 - a) Drift velocity alone
 - b) Thermal velocity
 - c) Both thermal velocity and drift velocity
 - d) None of these
8. The gyromagnetic ratio of an electron in hydrogen atom, according to Bohr model is
 - a) independent of which orbit it is in
 - b) negative
 - c) positive
 - d) increase with the quantum number
9. The sensitivity of moving coil galvanometer increases with the decrease in
 - a) number of turns
 - b) area of coil
 - c) magnetic field
 - d) torsional rigidity
10. Let the magnetic field on Earth be modelled by that of a point magnetic dipole at the center of Earth. The angle of dip at a point on the geographical equator
 - a) is always zero
 - b) can be zero at specific points
 - c) can be positive or negative
 - d) is bounded
11. Consider the diffraction pattern for a small pin hole. As the size of the hole is increased
 - a) Size and intensity increases
 - b) Size decreases, intensity increases
 - c) Size and intensity decreases
 - d) Size increases, intensity decreases

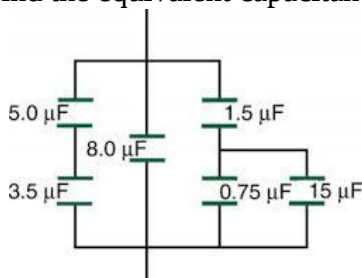
12. If we want to produce electromagnetic wave of wavelength 500km by an oscillating charge; the oscillating charge must be
- a) 600 Hz b. 500Hz c. 160Hz d. 15Hz
13. In a plane perpendicular to the magnetic meridian, the dip needle will be
- a) Vertical c) Inclined equal to the angle of dip at that place
- b) Horizontal d) Pointing in any direction
14. Lenz's law is essential for
- a) conservation of energy b) conservation of mass
- c) conservation of momentum d) conservation of charge
15. An e.m.f is produced in a coil, which is not connected to an external voltage source. This can be due to
- a) The coil being in a time varying magnetic field.
- b) The coil moving in a time varying magnetic field.
- c) The coil moving in a constant magnetic field.
- d) The coil is stationary in external spatially varying magnetic field, which does not change with time

Solving questions

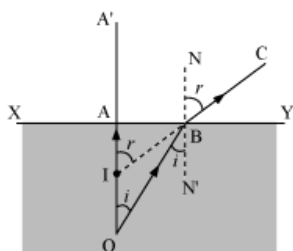
- Obtain the expression for the ratio of the De-Broglie wavelength associated with the electron orbiting in the second and third excited states of hydrogen atom
- When an inductor is connected to a 200V dc voltage, a current of 1A flows through it. When the same inductor is connected to a 200V, 50Hz ac source, only 0.5 A current flows. Explain why?
- A small town with a demand of 1200kw of electric power at 220V is situated 20km away from an electric plant generating power at 440V. The resistance of the two wire line carrying power is 0.5Ω per km. The town gets the power from the line through a 4000-220 V step down transformer.at a substation in the town. Explain the line power loss in the form of heat
- In the diffraction due to a single slit experiment, the aperture of the slit is 3mm. If monochromatic light of wavelength 620nm is incident normally on the slit, calculate the separation between the first order minima and third order maxima. The distance between the slit and screen is 1.5m
- In a given sample of two isotopes A and B are initially present in the ratio 1:2 . Their half- lives are 60 years and 30 years respectively. How long will it take so that the sample h as these isotopes in the ratio of 2: 1
- Find the value of the unknown voltage



7. Find the frequency of light which ejects electrons from a metal surface, fully stopped by a retarding potential of 3.3V. If photo electric emission begins in this metal at a frequency of 8×10^{14} Hz, calculate the work function for this metal.
8. In the case of a concave mirror of focal length f , when an object is kept between f and $2f$, show that its image is formed beyond $2f$.
9. Plot a graph to show the variation of stopping potential with frequency of incident radiation in relation to photoelectric effect
Using Einstein's photoelectric equation mark threshold frequency and Planck's constant
10. A 0.5 m long solenoid of 10 turns/ cm has area of cross section 1 cm^2 . Calculate the voltage induced across its ends if the current in the solenoid changed from 1A to 2A in 0.1 seconds
11. Find the equivalent capacitance



12. Derive an expression for refractive index using the diagram given below



13. In a meter bridge experiment null point is obtained at 20 cm from one end of the wire, when resistance X is balanced against another resistance Y. If $X < Y$, then where will be the new position of null point from the same end if X is replaced by $4X$
14. A compound microscope uses an objective lens of focal length 4 cm and eye piece lens of focal length 10cm. An object is placed 6 cm from the objective lens, calculate the magnifying power of the compound microscope
15. Electromagnetic waves travelling in a medium has speed $2 \times 10^8 \text{ m/s}$. If the relative permeability is 1 find the relative permittivity of the medium

Short answer questions

1. State two properties of electromagnetic waves. How can we show that e.m waves carry momentum
2. For paraxial rays, show that the focal length of a spherical mirror is one half of its radius of curvature

- When two objects just resolved? How the resolving power of a compound microscope be increased?
- Write Einstein's photoelectric equation and point out any two characteristic properties of photons on which this equation is based
- Write two important limitations of Rutherford's nuclear model of the atom
- State three properties of nuclear forces
Why do stable nuclei never have more protons than neutrons?
- Write down the differences between intrinsic semiconductor and extrinsic semiconductor
- Write the expression for Lorentz's magnetic force on a particle of charge 'q' moving with velocity v in a magnetic field B. Show that no work is done by this force
- Why the electrostatic field lines do not form closed loops?
- State De-Broglie's hypothesis

Long answer questions (3marks)

- Two charges of value 2 milliColoumb and -50 milli Coloumb are placed at 80cm apart. Calculate the distance of the point from the smaller charge where the intensity is zero
- Define an equipotential surface. Draw equipotential surfaces in the case of a single point Charge.
Can electric field exist tangential to the equipotential surface? Explain your answer
- State Kirchhoff's laws. Explain on what basis they are justified.
Draw condition of balance of Wheatstone bridge
- In what way is Gauss's law in magnetism different from that used in electrostatics?
Explain briefly
- How is galvanometer is converted in to voltmeter and ammeter? Draw the relevant diagrams and find the resistance of the arrangement in each case.
- Define self -inductance of a coil. Show that the magnetic energy required to build up the current I in a coil of self -inductance L is given by $\frac{1}{2} LI^2$
- Show that the current leads the voltage in phase by $\pi/2$ in an circuit containing an ideal capacitor
- How are electromagnetic waves produced? What is the source of energy of these waves?
Write mathematical expressions for electric and magnetic fields of an electromagnetic waves propagating along the z-axis
- Derive an expression for the magnification of a compound microscope
- What is total internal reflection? Draw a labelled diagram of an optical fiber and show that how light propagates through the optical fibers
- Write down differences between diffraction and interference
- Explain briefly the reason why wave theory of light is not able to explain the observed features of photo electric effect
- Give an explanation for alpha, beta and gamma decay
- State the law of radioactive decay. Derive the term activity of a radioactive substance.
Give a plot of activity of radioactive species versus time
- Draw the necessary energy band diagram to distinguish between conductors, insulators and semiconductors. How does the change in temperature effect the behavior of these materials

Long answer questions(5marks)

- State and prove Gauss's law in electrostatics
- Find an expression for the force and torque on an electric dipole kept in a uniform electric field

3. Briefly explain the principle of a capacitor. Derive an expression for the capacitance of a parallel plate capacitor.
4. Derive an expression for the equivalent capacitance of 3 capacitors connected in a) series and b) parallel.
5. State with the help of a suitable diagram, the principle on which the working of a meter bridge is based.
6. Derive Ohm's law using the concept of drift velocity.
7. Using Ampere's circuital law, derive an expression for the magnetic field along the axis of a toroidal solenoid.
8. With the help of a labelled diagram, state the underlying principle of a cyclotron. Explain clearly how it works to accelerate the charged particles.
9. Show diagrammatically the behavior of magnetic field lines in the presence of a) paramagnetic and b) diamagnetic substances. How does one explain this distinguishing feature?
10. What are eddy currents? How are they produced? How can they be minimized? Give 2 applications of eddy current.
11. With the help of a diagram, explain the principle of a device which changes a low voltage into high voltage. Give the reasons why the device may not be 100% efficient.
12. A series LCR circuit is connected to an AC source having voltage $V_0 \sin \omega t$. Derive an expression for the impedance and resonance frequency.
13. Derive mirror formula.
Draw the image formation by a concave mirror when the object is kept between its focus and the pole.
14. Draw a graph to show the angle of deviation d with the variation of angle of incidence i for a monochromatic ray of light passing through a prism of refracting angle A . Deduce the equation for n .
15. Use Huygens' principle to explain the formation of a diffraction pattern due to a single slit illuminated by a monochromatic source of light.
Describe how the change in width affects the size and intensity of the central diffraction band?
16. Describe Davisson and Germer's experiment to demonstrate the wave nature of electrons.
17. Draw a schematic arrangement of the Geiger-Marsden experiment for studying alpha particle scattering by a thin foil of gold.
18. How can this study be used to estimate the size of the nucleus?
19. Define the term binding energy.
Draw the graph showing the variation of binding energy per nucleon with the mass number. Explain the stability of nucleons with the help of this diagram.
20. State and explain the formation of a p-n junction diode.
Using the help of a circuit diagram, show how the V-I characteristics of a p-n junction are obtained in forward biasing and reverse biasing.

