PRACTISE QUESTION PAPER PHYSICS - 1
CLASS - XII

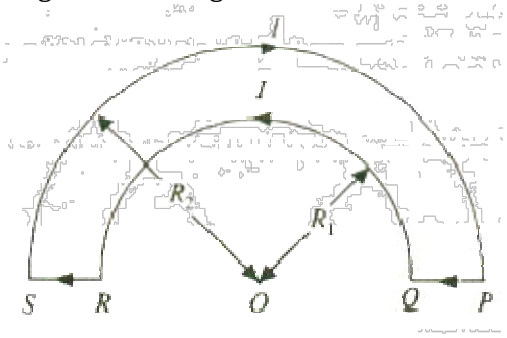
General Instructions

(1) There are 33 questions in all. All questions are compulsory.
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
(3) All the sections are compulsory.
(4) Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of **1** mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.
(5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.
(6) Use of calculators is not allowed.
(7) You may use the following values of physical constants where ever necessary

i. $c = 3 \times 10^8$ m/s
ii. $m_e = 9.1 \times 10^{-31}$ kg
iii. $m_p = 1.7 \times 10^{-27}$ kg
iv. $e = 1.6 \times 10^{-19}$C
v. $\mu_0 = 4\pi \times 10^{-7}$ T m$\mathbf{A^{-1}}$
vi. $h = 6.63 \times 10^{-34}$ J s
vii. $\varepsilon_0 = 8.854 \times 10^{-12}\mathbf{C^2N^{-1}m^{-2}}$
viii. Avogadro's number $= 6.023 \times \mathbf{10^{23}}$ per gram mole

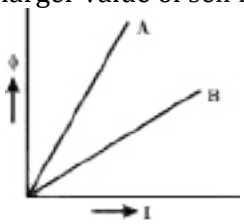
SECTION : A **(16×1 = 16)**

1. The electric field due to an electric dipole $(\pm q, 2a)$ at a point on equatorial line at distance ' r ' from centre of dipole $(a \ll r)$ is E. The electric field due to the dipole at distance ' 2r ' on axial line is
(a) 2 E (b) $\frac{E}{2}$ (c) $\frac{E}{4}$ (d) $\frac{E}{8}$
2. N identical drops each having a charge q and potential V coalesce to form a big drop. The charge and potential on big drop will be:
(a) Nq, NV respectively (b) Nq, $N^{1/3}$ V respectively
(c) Nq, $N^{2/3}$ V respectively (d) Nq, V/N respectively
3. A wire PQRS formed by joining two semicircular wires of radii R_1 and R_2 carries a current I as shown in figure. The magnitude of magnetic field at the centre O is :

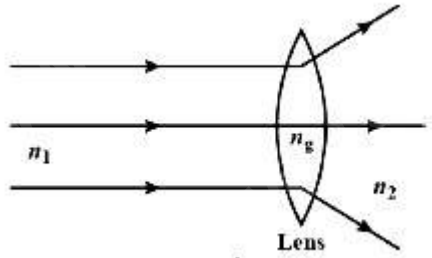


(a) $\frac{\mu_0 I}{4}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ (b) $\frac{\mu_0 I}{4\pi}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$
(c) $\frac{\mu_0 I}{2\pi}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ (d) $\frac{\mu_0 I}{4}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

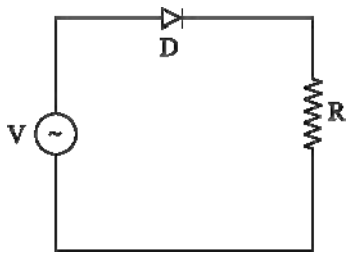
4. A bar magnet when placed at an angle of 30° to the direction of magnetic field induction of 5×10^{-2} T, experiences a moment of couple 25×10^{-6}Nm. If the length of the magnet is 5 cm , its pole strength is
   (a) 2×10^{-2}Am (b) 5×10^{-2}Am (c) 2 Am (d) 5 Am
5. A plot of magnetic flux (ϕ) versus current (I) is shown in figure for two inductors A and B. Which of the two has larger value of self inductance?



   (a) A (b) B
   (c) Both have equal values (d) Value can not be determined
6. The correct option, if speeds of gamma rays, X-rays and microwave are Vg, Vx anVm respectively will be.
   (a) Vg >Vx >Vm (b) Vg <Vx <Vm (c) Vg >Vx >Vm (d) Vg = Vx = Vm
7. In electromagnetic waves the phase difference between electric and magnetic field vectors are
   (a) zero (b) $\pi/4$ (c) $\pi/2$ (d) π
8. An astronomical refractive telescope has an objective of focal length 20 m and an eyepiece of focal length 2 cm. Then
   (a) the magnification is 1000 (b) the length of the telescope tube is 20.02 m
   (c) the image formed of inverted (d) all of these
9. A concave mirror of focal length f_1 is placed at a distance d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens concave mirror combination returns to infinity. The distance d must equal to
   (a) $f_1 + f_2$ (b) $-f_1 + f_2$ (c) $2f_1 + f_2$ (d) $-2f_1 + f_2$
10. The ray diagram could be correct

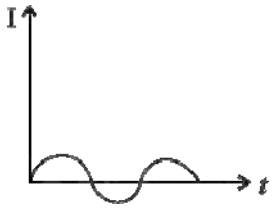


    (a) if $n_1 = n_2 = n_g$ (b) if $n_1 = n_2$ and $n_1 < n_g$
    (c) if $n_1 = n_2$ and $n_1 > n_g$ (d) under no circumstances
11. The largest wavelength in the ultraviolet region of the hydrogen spectrum is 122 nm . The smallest wavelength in the infrared region of the hydrogen spectrum (to the nearest integer) is
    (A) 802 nm (B) 823 nm (C) 1882 nm (D) 1648 nm .
12. A half wave rectifier circuit is constructed using a p-n function diode D, load resistance R and AC source as shown below:



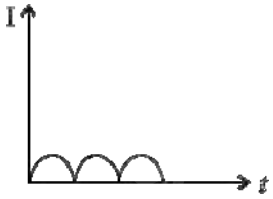
    The output current through R varies as—

(a)



(b)

(c)



(d)

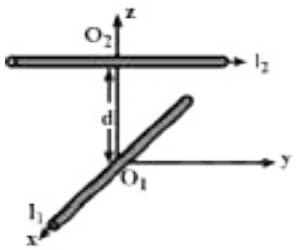
For Questions 13 to 16, two statements are given -one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.
A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
C. If Assertion is true but Reason is false.
D. If both Assertion and Reason are false.

Current Electricity

13. **Assertion :** When cells are connected in parallel to the external load, the effective e.m.f. increases.
Reason : All the cells will be sending the current to the external load in the same direction.
14. **Assertion :** In process of photoelectric emission, all emitted electrons do not have same kinetic energy.
Reason : If radiation falling on photosensitive surface of a metal consists of different wavelength then energy acquired by electrons absorbing photons of different wavelengths shall be different
15. **Assertion:** In Bohr model, the frequency of revolution of an electron in its orbit is not connected to the frequency of spectral line for smaller principal quantum number n.
Reason: For transitions between large quantum number the frequency of revolution of an electron in its orbit is connected to the frequency of spectral line
16. **Assertion :** The ratio for time taken for light emission from an atom to that for release of nuclear energy in fission is 1:100.
Reason : Time taken for the light emission from an atom is of the order of $10^{-8}s$.

[SECTION - B] **[5X2=10]**

17. Two wires X and Y have the same resistivity but their cross-sectional areas are in the ratio 2:3 and lengths in the ratio 1:2. They are connected in parallel to a d.c. source. Find out the ratio of the drift speeds of the electrons in the two wires for this case
18. Two long wires carrying current I_1 and I_2 are arranged as shown in Fig. The one carrying current I_1 is along is the x-axis. The other carrying current I_2 is along a line parallel to the y-axis given by x = 0 and z = d. Find the force exerted at O_2 because of the wire along the x-axis.



19. Light of wavelength 3500 Å is incident on two metals A and B. Which metal will yield more photoelectrons if their work functions are 5 eV and 2 eV respectively?

OR

19 An electron and alpha particle have the same de-Broglie wavelength associated with them. How are their kinetic energies related to each other?

20. Find out the minimum magnetic moment of electron in hydrogen atom.
21. Thin prism of angle 60 gives a deviation of 30 . What is the refractive index of material of the prism?

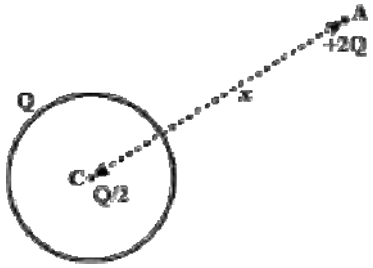
[SECTION - C] **(07x3=21 marks)**

22. A potential difference V is applied across a conductor of length L and diameter D . How are the electric field E and the resistance R of the conductor affected when (i) V is halved (ii) L is halved (iii) D is doubled. Justify your answer.

OR

22

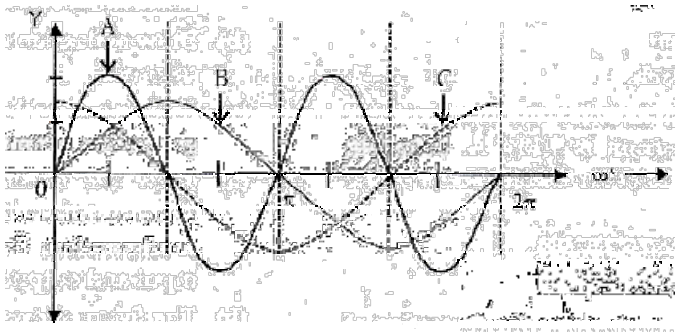
A thin metallic spherical shell of radius R carries a charge Q on its surface. A point charge $\frac{Q}{2}$ is placed at the centre C and another charge +2Q is placed outside the shell at A at a distance x from the centre as shown in the figure.



(i) Find the electric flux through the shell.
(ii) State the law used.
(iii) Find the force on the charges at the centre C of the shell and at the point A.

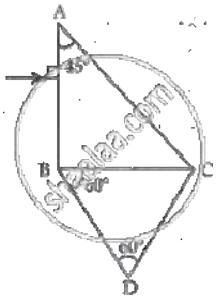
23. (a) Two point charges $+Q_1$ and $-Q_2$ are placed L distance apart, obtain an expression for work done in bringing a third charge Q_3 from infinity to the mid point of line joining two charges.
(b) At what distance from charge Q_1 on the line joining two charges will this work done be zero?

24. A device ' X ' is connected to an ac source $V = V_0 \sin \omega t$. The variation of voltage, current and power in one cycle is shown in the following graph :



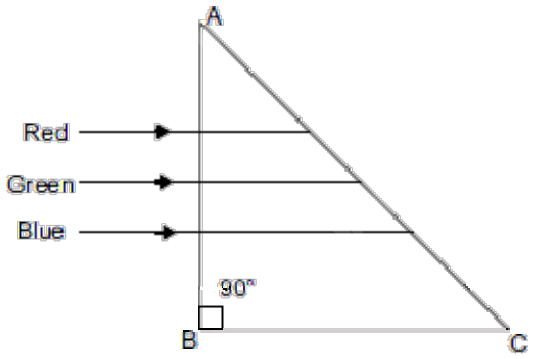
(a) Identify the device ' X '.
(b) Which of the curves A, B and C represent the voltage, current and the power consumed in the circuit? Justify your answer.
(c) How does its impedance vary with frequency of the ac source? Show graphically.
(d) Obtain an expression for the current in the circuit and its phase relation with ac voltage.

25. (a) Write two necessary conditions for total internal reflection.
(b) Two prisms ABC and DBC are arranged as shown in figure.



The critical angles for the two prisms with respect to air are 41.1° and 45° respectively. Trace the path of the ray through the combination.

26. In the figure given below, light rays of blue, green, red wavelengths are incident on an isosceles right-angled prism. (i) Explain with reason, which ray of light will be transmitted through the face AC.
(ii) The refractive index of the prism for red, green, blue light are 1.39, 1.424, 1.476 respectively.

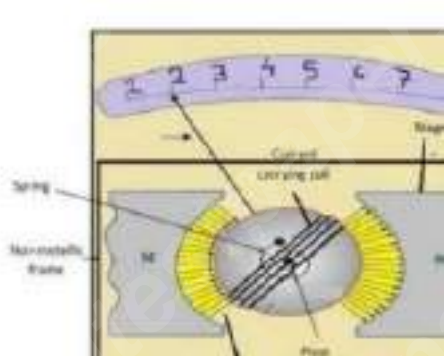


27. (i)Why are Si and GaAs preferred materials for solar cells?
(ii)Describe briefly with the help of a necessary circuit diagram, the working principle of a solar cell.

28. (i) With the help of circuit diagrams, distinguish between forward biasing and reverse biasing of p-n junction diode.
(ii)Draw V-I characteristics of a p-n junction diode in
(a)forward bias.
(b)reverse bias.

[SECTION D] **[02X4=8]**

29. The galvanometer is a device used to detect the current flowing in a circuit or a small potential difference applied to it. It consists of a coil with many turns, free to rotate about a fixed axis, in a uniform radial magnetic field formed by using concave pole pieces of a magnet. When a current flows through the coil, a torque acts on it.



1. What is the principle of moving coil galvanometer?
(a) Torque acting on a current carrying coil placed in a uniform magnetic field.
(b) Torque acting on a current carrying coil placed in a non-uniform magnetic field.
(c) Potential difference developed in the current carrying coil.
(d) Mutual Induction.

2. If the field is radial, then the angle between magnetic moment of galvanometer Coil and the magnetic field will be
(a) 0° (b) 30° (c) 60° (d) 90°

3. Why are the pole pieces made concave in the moving coil galvanometer?
(a) To make the magnetic field radial. (b) To make the magnetic field uniform.
(c) To make the magnetic field non-uniform. (d) To make torque = 0.

4. What is the function of radial field in the moving coil galvanometer?
(a) To make the torque acting on the coil maximum. (b) To make the magnetic field strong.
(c) To make the current scale linear.
(d) All the above.

OR

If the rectangular coil used in the moving coil galvanometer is made circular, then what will be the effect on the maximum torque acting on the coil in magnetic field for the same area of the coil?
(a) remains the same
(b) becomes less in circular coil
(c) becomes greater in circular coil
(d) depends on the orientation of the coil

30. Neutrons and protons are identical particle in the sense that their masses are nearly the same and the force, called nuclear force, does into distinguish them. Nuclear force is the strongest force. Stability of nucleus is determined by the neutron proton ratio or mass defect or packing fraction. Shape of nucleus is calculated by quadrupole moment and spin of nucleus depends on even and odd mass number. Volume of nucleus depends on the mass number. Whole mass of the atom (nearly 99%) is centred at the nucleus.

(i) The correct statements about the nuclear force is/are
(a) charge independent (b) short range force
(c) non-conservative force (d) all of these.

(ii) The range of nuclear force is the order of
(a) 2×10^{-10} m (b) 1.5×10^{-20} m

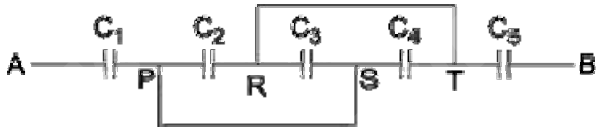
(c) 1.2×10^{-4} m (d) 1.4×10^{-15} m

(iii) A force between two protons is same as the force between proton and neutron. The nature of the force is
(a) electrical force (b) weak nuclear force
(c) gravitational force (d) strong nuclear force
(iv) two protons are kept at a separation of 40 A0 . Fn is the nuclear force and Fe is the electrostatic force between them. Then
(a) Fn <<Fe (b) Fn= Fe (c) Fn >> Fe (d) Fn ≈ Fe

(v) All the nucleons in an atom are held by
(a) nuclear forces (b) vander waal's forces
(c) tensor forces (d) coulomb forces

[SECTION E] **(03X5=15)**

31. (a)
(i) Find equivalent capacitance between A and B in the combination given below. Each capacitor is of 4 μF capacitance



(ii) If a dc source of 14 V is connected across AB, how much charge is drawn from the source and what is the energy stored in the network?
(b) The mean electric energy density between the plates of a charged capacitor is (here q= charge on the capacitor and A= area of the capacitor plate)

OR

31.(a) Derive an expression for the electric field E due to a dipole of length '2a' at a point distant r from the centre of the dipole on the axial line.
(b) Draw a graph of E versus r for r >> a.
(c) If this dipole were kept in a uniform external electric field E0, diagrammatically represent the position of the dipole in stable and unstable equilibrium and write the expressions for the torque acting on the dipole in both the cases.

32. (a) Draw a schematic arrangement for winding of primary and secondary coil in a transformer when the two coils are wound on top of each other.
(b) State the underlying principle of a transformer and obtain the expression for the ratio of secondary to primary voltage in terms of the (i) number of secondary and primary windings and (ii) primary and secondary currents. (c) Write the main assumption involved in deriving the above relations.
(d) Write any two reasons due to which energy losses may occur in actual transformers.

OR

32
(a) Draw a labelled diagram of a step-up transformer. Obtain the ratio of secondary to primary voltage in terms of number of turns and currents in the two coils.

(b) A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns. What should be the number of turns in the secondary in order to get output power at 230 V?

33. (a) Derive the Lens Maker's formula.
(b) Focal length of a plano convex lens is 20 cm in air. Refractive index of glass is 1.5 . Calculate the radius of curvature of the lens surface. What will be its focal length, when it is immersed in water of refractive index $\frac{4}{3}$.

OR

33

(a) Figure shows a cross-section of a light pipe made of a glass fibre of refractive index 1.68. The outer covering of the pipe is made of a material of refractive index 1.44. What is the range of the angles of the incident rays with the axis of the pipe for which total reflections inside the pipe take place, as shown in the figure.
(b) What is the answer if there is no outer covering of the pipe?