UP Board Class 12 Physics 2026 Set 346 DU Question Paper

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General Instructions

(i) This question paper contains 30 questions. All questions are compulsory.

(ii) It comprises 6 single-correct multiple-choice questions.

(iii) Attempt every question; detailed solutions are provided in the companion solutions booklet.

1. A proton, an electron and an α-particle placed in a uniform electric field experience forces F_1, F_2 and F_3 respectively. Then:

(A) $F_1 = F_2 = F_3$

(B) $F_1 = F_2 \neq F_3$

(C) $F_1 > F_2 > F_3$

(D) $F_1 < F_2 < F_3$

2. Two resistors R and $2R$ are connected in parallel in an electric circuit. The thermal energies developed in R and $2R$ are in the ratio:

(A) 1 : 2

(B) 2 : 1

(C) 1 : 4

(D) 4 : 1

3. The unit of $\dfrac{1}{\mu_0 \varepsilon_0}$ is:

(A) $\mathrm{m\,s^{-1}}$

(B) $\mathrm{m^{-1}\,s}$

(C) $\mathrm{m^2\,s^{-2}}$

(D) $\mathrm{m^{-2}\,s^2}$

4. In an AC circuit, if the current $i = 2\sin\omega t$ ampere and the voltage $V = 5\cos\omega t$ volt, then the power loss will be:

(A) zero

(B) 5 W

(C) 10 W

(D) 2·5 W

5. A thin transparent sheet is placed in front of one slit of a Young's double slit. The fringe width will:

(A) increase

(B) decrease

(C) remain same

(D) none of these

6. When an impurity is doped into an intrinsic semiconductor, the conductivity of the semiconductor:

(A) increases

(B) decreases

(C) remains the same

(D) becomes zero

7. Find out the magnetic moment of a rectangular coil of size 20 cm × 10 cm having 10 A current.

8. Write the unit of self-inductance.

9. Amplitude of intensity of magnetic field of an electromagnetic wave in vacuum is 500 nT. What will be the amplitude of the intensity of electric field of the wave?

10. Draw (i – δ) curve for a triangular prism and show the angle of minimum deviation.

11. Energy of hydrogen atom in ground state is −13·6 eV. What will be the kinetic energy and the potential energy of the electron in the state?

12. Find out equivalent energy of 1·0 gm of a substance.

13. Prove that the energy density inside a charged capacitor is $\frac{1}{2}\varepsilon_0 E^2$.

14. A circular coil of radius 2.0 cm carries a current of 1.0 A. If the coil has 100 turns, find the intensity of magnetic field at the centre of the coil.

15.

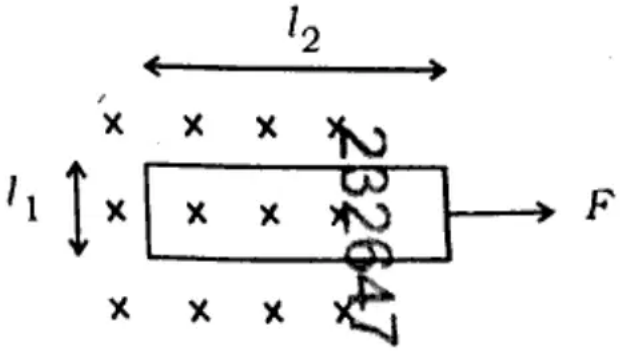


Figure shows a rectangular loop being pulled out of a magnetic field B with a velocity v by applying an external force F. Find the amount of magnetic force induced on the loop and show its direction.

16. Discuss the working method of a half-wave rectifier using a p-n junction diode.

17. What is relaxation time? Find the equation of the relation between drift velocity and relaxation time.

18. In an L-C-R circuit, the inductive reactance of a coil is 400 Ω and the capacitive reactance of a condenser is 100 Ω and $R = 400\ \Omega$. Find the power factor of the circuit.

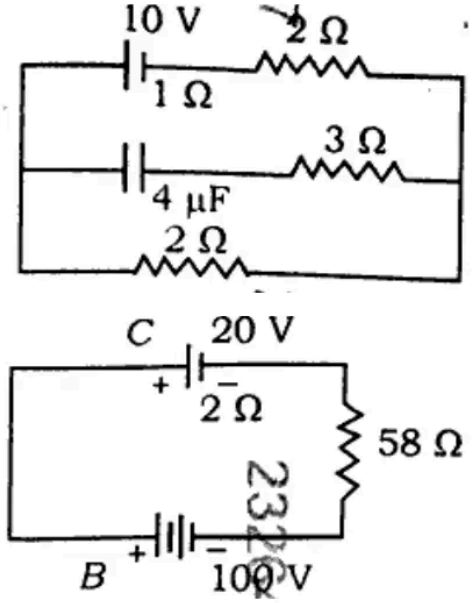
19. Explain total internal reflection. Discuss the working of an optical fibre.

20. The energy of a photon is 10 eV. Determine (i) the dynamic mass of the photon, (ii) the frequency of the photon.
(Given: $h = 6.6 \times 10^{-34}$ J s, $c = 3 \times 10^{8}$ m/s, $1\ \text{eV} = 1.6 \times 10^{-19}$ J.)

21. Explain displacement current and write the formula related to Ampere-Maxwell's law.

22. Draw the ray diagram of a compound microscope. Find the expression for its magnifying power.

23.

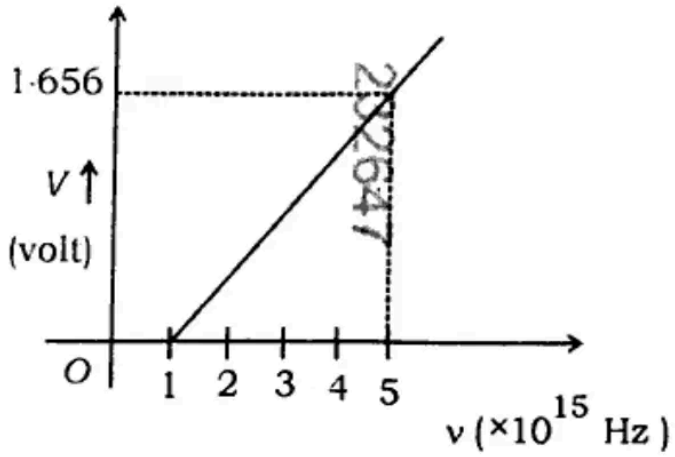


Find the current supplied by the battery in the network shown in the figure. Also calculate the terminal voltage across the cell and the charge on the capacitor.

OR

What do you mean by electromotive force (EMF) of a cell? In the circuit shown, calculate the terminal voltage of the cell C. The battery B is of negligible internal resistance.

24.

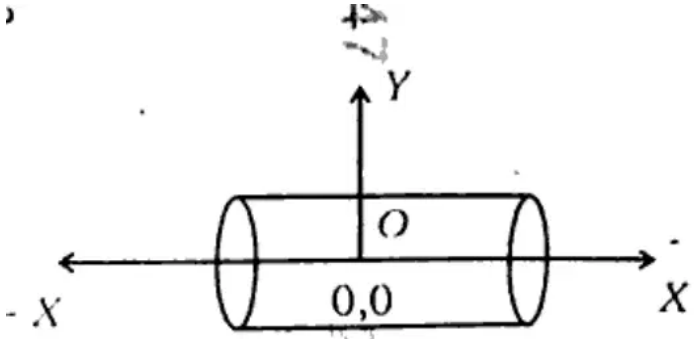


In the figure, the plot of stopping potential versus frequency of light used in an experiment of the photoelectric effect is shown. Find the ratio h/e and the work function.
(From the graph: the line meets the frequency axis at $\nu_0 = 1 \times 10^{15}$ Hz, and the stopping potential is $V = 1.656$ V at $\nu = 5 \times 10^{15}$ Hz.)

25. Write the characteristics of nuclear force. How is it different from gravitational and electric (electrostatic) forces?

26. Energy of the n^{th} state of a hydrogen atom is $E_n = -\frac{13.6}{n^2}$ eV. A hydrogen sample is prepared in a particular excited state A. Photons of energy 2.55 eV get absorbed by the sample to take some electrons to a particular further excited state B. Find the quantum numbers of states A and B.

27.

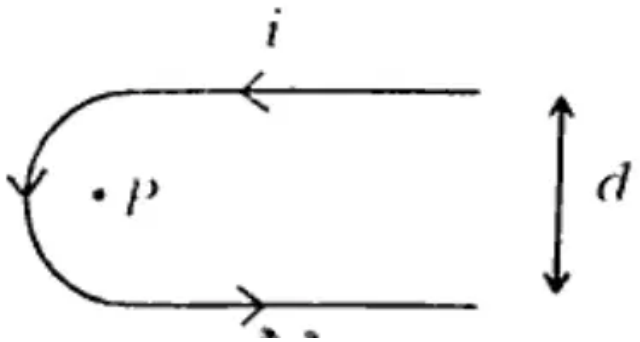


Option 1: What is Gauss's law? The figure shows a cylinder placed in an electric field $\vec{E} = 100\,\hat{i}\,\text{N/C}$. $\vec{E}$ is positive when $x > 0$ and negative when $x < 0$. Length of the cylinder is $30\ \text{cm}$ and radius of each plane surface is $3.5\ \text{cm}$; its centre is at O. Find the electric fluxes ϕ_1, ϕ_2 and ϕ_3 linked with each plane and the curved surface respectively. What will be the net charge inside the cylinder?

OR

Option 2: Obtain the formula for the capacitance of a parallel plate capacitor when a dielectric medium is partially filled in between its plates.

28.



Option 1: With the help of the given figure, prove that the magnetic field produced at point P is $B = \frac{\mu_0 i}{2d}\left[1 + \frac{2}{\pi}\right]$. (The wire is hairpin-shaped: a semicircular arc joined to two long straight parallel segments carrying current i; P is at the centre of the arc and the straight segments are a distance d apart.)

OR

Option 2: What is a radial magnetic field? Explain the working of a moving coil galvanometer with a suitable diagram. How can a galvanometer be converted into an ammeter and a voltmeter?

29. Show the position of focus (f) in ray diagram for convex mirror. At what distance from a convex mirror of focal length 2.0 m should a boy stand so that his image has a height equal to half the original height?

OR

What is wavefront? Explain the refraction of waves with the help of Huygens' principle.

30. How can p-type and n-type crystal from pure semiconductor be formed? Find the maximum wavelength of electromagnetic radiation which can create a hole-electron pair in germanium of a band-gap 0.65 eV.

OR

How is the conductivity of a metal and semiconductor changed with raising temperature? Calculate the conductivity of an n-type semiconductor from the following data: Density of conduction electrons = 8×10^{13} /cm^3, Density of holes = 5×10^{12} /cm^3, Mobility of conduction electrons = 2.3×10^4 cm^2/V·s, Mobility of holes = 100 cm^2/V·s.