CBSE Class 12 Physics 2025 Compartment Question Paper With Solutions

Time Allowed :3 Hour	**Maximum Marks :**70	**Total questions :**33

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 33 questions. All questions are compulsory.
2. This question paper is divided into five sections Sections A, B, C, D and E.
3. In Section A Questions no. 1 to 16 are Multiple Choice type questions. Each question carries 1 mark.
4. In Section B Questions no. 17 to 21 are Very Short Answer type questions.Each question carries 2 marks.
5. In Section C Questions no. 22 to 28 are Short Answer type questions. Each question carries 3 marks.
6. In Section D Questions no. 29 and 30 are case study based questions. Each question carries 4 marks.
7. In Section E Questions no. 31 to 33 are Long Answer type questions. Each question carries 5 marks.
8. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions in all the Sections except Section A.
9. Kindly note that there is a separate question paper for Visually Impaired candidates.

1. An electric dipole consists of charges $\pm 4\mu C$ separated by a distance of $6\,cm$. Calculate the electric field at a point on the axial line at a distance $20\,cm$ from its center.

Solution:

Step 1: Use the formula for electric field on axial line of dipole:

$$E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{2p}{r^3}$$

Where:

$$p = q \cdot 2a = 4 \times 10^{-6} \cdot 0.06 = 2.4 \times 10^{-7}\, C \cdot m$$

r = 0.20 m, $1_{\frac{}{4\pi\varepsilon_0 = 9\times10^9\, Nm^2/C^2}}$

$$E = 9 \times 10^9 \cdot \frac{2 \cdot 2.4 \times 10^{-7}}{(0.2)^3} = 9 \times 10^9 \cdot \frac{4.8 \times 10^{-7}}{8 \times 10^{-3}} = 9 \times 10^9 \cdot 6 \times 10^{-5} = 5.4 \times 10^5\, N/C$$

Final Answer:

$$\boxed{E = 5.4 \times 10^5 \text{ N/C (along dipole axis)}}$$

Quick Tip

The electric field on the axial line of a dipole is directed along the dipole moment and decreases with cube of the distance from the center.

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2. A parallel plate capacitor is charged to potential $V = 300\,V$ and then disconnected from the battery. If the separation between the plates is doubled, what will be the new potential difference across the plates?

Solution:

Step 1: Use the formula for potential:

$$V = \frac{Q}{C}$$

Since battery is disconnected, charge Q remains constant.

Capacitance of parallel plate:

$$C = \frac{\varepsilon_0 A}{d} \Rightarrow C \propto \frac{1}{d}$$

If d is doubled, then C becomes $C/2$. Hence,

$$V' = \frac{Q}{C/2} = 2V \Rightarrow V' = 2 \cdot 300 = 600\,V$$

Final Answer:

$$\boxed{V' = 600\,V}$$

Quick Tip

If a charged capacitor is isolated and plate separation changes, the charge stays constant. Use $V = \frac{Q}{C}$ to calculate the new potential.

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3. A convex lens of focal length $f = 15\,cm$ forms a real image of a 6 cm tall object placed at 30 cm. Find the position, nature, and height of the image.

Solution:

Step 1: Use the lens formula:

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

$$f = 15\,cm, \quad u = -30\,cm \quad \text{(object on left)}$$

$$\frac{1}{v} = \frac{1}{15} - \frac{1}{30} = \frac{2-1}{30} = \frac{1}{30} \Rightarrow v = 30\,cm$$

Step 2: Find magnification:

$$m = \frac{v}{u} = \frac{30}{-30} = -1 \Rightarrow h' = mh = -1 \cdot 6 = -6\,cm$$

Negative sign implies real, inverted image.

Final Answer:

$$\boxed{\text{Image at } 30\,cm \text{ on opposite side, real, inverted, height } = 6\,cm}$$

Quick Tip

For lenses, always follow sign conventions strictly. Real images are inverted and have negative height; virtual images are upright and positive.

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4. Find the magnetic field at a point 5 cm away from a long straight wire carrying current $I = 20\,A$.

Solution:

Use the Ampere's Law formula:

$$B = \frac{\mu_0 I}{2\pi r}$$

Where:

$$\mu_0 = 4\pi \times 10^{-7}\,Tm/A, \quad I = 20\,A, \quad r = 0.05\,m$$

$$B = \frac{4\pi \times 10^{-7} \cdot 20}{2\pi \cdot 0.05} = \frac{8 \times 10^{-6}}{0.05} = 1.6 \times 10^{-4}\,T$$

Final Answer:

$$\boxed{B = 1.6 \times 10^{-4}\,\text{T (Tesla)}}$$

Quick Tip

Always convert distance to meters. The magnetic field due to a long wire is inversely proportional to the distance from it.

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5. The half-life of a radioactive element is 10 minutes. Find the time in which its activity reduces to 1/16 of the original.

Solution:

Use the formula:

$$N = N_0 \cdot \left(\frac{1}{2}\right)^n \Rightarrow \frac{N}{N_0} = \frac{1}{16} = \left(\frac{1}{2}\right)^4 \Rightarrow n = 4 \text{ half-lives}$$

$$\text{Time } t = n \cdot T_{1/2} = 4 \cdot 10 = 40 \text{ minutes}$$

Final Answer:

$$\boxed{40 \text{ minutes}}$$

Quick Tip

When quantity becomes $\frac{1}{2^n}$, the number of half-lives is n. Multiply by given half-life time to find the total elapsed time.
