

# Exam Mate

Mock Test Paper for Std X, XII CBSE Board, IIT - JEE Main &amp; Advanced.

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## MOCK TEST PAPER # 1

### CLASS-XII (PHYSICS)

**Time Allowed : 3 hours****Maximum Marks: 70****GENERAL INSTRUCTIONS**

- All questions are compulsory. There are 27 questions in all.
- This question paper has five sections : Section A, Section B, Section C and Section D.
- Section A contains five questions of one mark each, Section B contains seven questions of two marks each, Section C contains twelve questions of three marks each, Section D contains three questions of five marks each.
- There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

**SECTION-A**

- What is the direction of the force acting on a charged particle  $q$ , moving with a velocity  $\vec{v}$  in a uniform magnetic field  $\vec{B}$  ?
- The instantaneous current from an ac source is  $I = 5\sin 314t$  ampere. What is the rms value of the current ?
- What is the value of refractive index of a medium of polarizing angle  $60^\circ$  ?
- Name the part of electromagnetic spectrum which is suitable for
  - radar systems used in aircraft navigation.
  - treatment of cancer tumours.
- Two nuclei have mass numbers in the ratio 2 : 5. What is the ratio of their nuclear densities ?

**SECTION-B**

- Two point charges,  $q_1 = 10 \times 10^{-8} \text{C}$  and  $q_2 = -2 \times 10^{-8} \text{C}$  are separated by a distance of 60 cm in air.
  - Find at what distance from the 1st charge,  $q_1$ , would the electric potential be zero.
  - Also calculate the electrostatic potential energy of the system.

**OR**

- Two point charges  $4Q$ ,  $Q$  are separated by 1 m in air.
- At what point on the line joining the charges is the electric field intensity zero ?
  - Also calculate the electrostatic potential energy of the system of charges, taking the value of charge  $Q = 2 \times 10^{-7} \text{C}$ .
- The oscillating magnetic field in a plane electromagnetic wave is given by  $B_y = (8 \times 10^{-6}) \sin[2 \times 10^{11} t + 320\pi x] T$ 
    - Calculate the wavelength of the electromagnetic wave.
    - Write down the expression for the oscillating electric field.
  - List any four applications of intersect.
  - What conclusion can you draw from the following observations on a resistor made of alloy manganin ?

Current A	Voltage V	Current A	Voltage V
0.2	3.94	3.0	59.2
0.4	7.87	4.0	78.8
0.6	11.8	5.0	98.6
0.8	15.7	6.0	118.5
1.0	19.7	7.0	138.2
2.0	39.4	8.0	158.0

- Calculate the energy in fusion reaction:

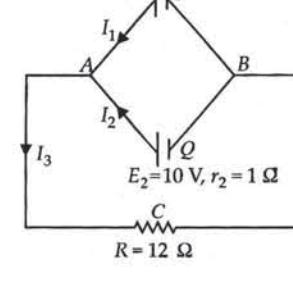
${}_1^2\text{H} + {}_1^2\text{H} \rightarrow {}_2^3\text{He} + n$ , where B.E. of  ${}_1^2\text{H} = 2.23 \text{ MeV}$  and of  ${}_1^3\text{He} = 7.73 \text{ MeV}$

- Answer the following questions:

- A virtual image, we always say, cannot be caught on a screen. Yet when we 'see' a virtual image, we are obviously bringing it on to the 'screen' (i.e., the retina) of our eye. Is there a contradiction?
- The refractive index of diamond is much greater than that of ordinary glass. Is this fact of some use to a diamond cutter ?
- Why is the diffraction of sound wave more evident in daily experience than that of light wave ?

**SECTION-C**

- State Kirchhoff's rules. Apply Kirchhoff's rules to the loops ACBPA and ACBQA to write the expression for the current  $I_1$ ,  $I_2$  and  $I_3$  in the network.



- If a light beam shows no intensity variation when transmitted through a polaroid which is rotated, does it mean that the light is unpolarized ? Explain briefly.
- i. Define activity of a radioactive material and write its SI unit.
- ii. Plot a graph showing variation of activity of a given radioactive sample with time.
- iii. The sequence of stepwise decay of a radioactive nucleus is  $D \xrightarrow{\alpha} D_1 \xrightarrow{\beta^-} D_2$ . If the atomic number and mass number of  $D_2$  are 71 and 176 respectively, what are their corresponding values for  $D$  ?
- A  $10\mu\text{F}$  capacitor is charged by a 30 V dc supply and then connected across an uncharged  $50\mu\text{F}$  capacitor. Calculate (i) the final potential difference across the combination, and (ii) the initial and final energies. How will you account for the difference in energy ?
- (a) Draw a ray diagram showing the formation of image by a reflecting telescope.  
(b) Write two advantages of a reflecting telescope over a refracting telescope.
- An electron and a proton are accelerated through the same potential. Which one of the two has (i) greater value of de Broglie wavelength associated with it and (ii) less momentum ? Justify your answer.
- Write two basic modes of communication. Explain the process of amplitude modulation. Draw a schematic sketch showing how amplitude modulated signal is obtained by superposing a modulating signal over a sinusoidal carrier wave.
- An illuminated object and a screen are placed 90 cm apart. Determine the focal length and nature of the lens required to produce a clear image on the screen, twice the size of the object.

**OR**

The image obtained with a convex lens is erect and its length is four times the length of the object. If the focal length of the lens is 20 cm, calculate the object and image distance.

- i. Draw a neat labelled ray diagram of an astronomical telescope in normal adjustment. Explain briefly its working.
- ii. An astronomical telescope uses two lenses of powers 10D and 1D. What is its magnifying power in normal adjustment ?
- The deuteron is bound by nuclear forces just as H-atom is made up of p and e bound by electrostatic forces. If we consider the force between neutron and proton in deuteron as given in the form of a Coulomb potential but with an effective charge  $e'$ :

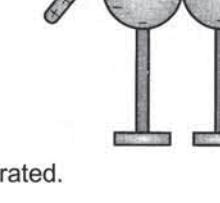
$$F = \frac{1}{4\pi\epsilon_0} \frac{e'^2}{r} . \text{Estimate the value of } (e'/e) \text{ given that the binding energy of a deuteron is } 2.2 \text{ MeV.}$$

- White light reflected at perpendicular incidence from a soap film has, in the visible spectrum, an interference maximum at  $6000 \text{ Å}^0$  and a minimum at  $4500 \text{ Å}^0$  with no minimum in between. If  $\mu = 4/3$  for the film, what is the thickness of the film ?

**OR**

A convex lens of focal length 20 cm is placed coaxially with a convex mirror of radius of curvature 20 cm. The two are kept at 15 cm from each other. A point object lies 60 cm in front of the convex lens. Draw a ray diagram to show the formation of the image by the combination. Determine the nature and position of the image formed.

- A glass rod rubbed with silk is brought close to two uncharged metallic spheres in contact with each other, inducing charges on them as shown in the following figure. Describe what happens, when



- the spheres are slightly separated.
- the glass rod is subsequently removed, and
- the spheres are separated far apart.

**SECTION-D**

- Give the principle, construction, theory and working of an ac generator.

**OR**

Draw a labelled circuit arrangement showing the winding of primary and secondary coils in a transformer. Explain the underlying principle and working of a transformer. Write any two major sources of energy loss in this device.

- A long straight wire of uniform cross section of radius  $a$  is carrying a steady current  $I$ . Use Ampere's circuital law to obtain a relation showing the variation of the magnetic field ( $B$ ) inside and outside the wire with distance  $r$ , ( $r < a$ ) and ( $r > a$ ) at the field point from the centre of its cross section. Plot of graph showing the nature of this variation.

**OR**

State Biot-Savart's law. Using this law derive an expression for the magnetic field at a point situated at a distance of  $x$  metre from the centre of a circular coil of  $N$  turns and radius  $r$  carrying a current of  $IA$ .

- Explain briefly, with the help of circuit diagram, how V-I characteristic of a p-n junction diode are obtained in (i) forward bias, and (ii) reverse bias. Draw the shape of the curve obtained.

**OR**

Discuss common emitter amplifier, using n-p-n transistor. Find its current gain, voltage gain and power gain.

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