Physics ICS XII

Mock Paper 1 (2026)

Time Allowed: 3 hours and 15 minutes **Maximum Marks: 70**

General Instructions:

- You are allowed an additional 1 5 minutes for only reading the question paper.
- You must NOT start writing during reading time.
- This question paper has 20 questions.
- The paper has four sections: A, B, C and D. Internal choices have been provided in two questions each in Sections B, C and D.
- Section A consists of one question having fourteen sub-parts of one mark each.
- Section B consists of seven questions of two marks each.
- Section C consists of nine questions of three marks each.
- Section D consists of three questions of five marks each.
- Answer all questions.
- The intended marks for questions are given in brackets [].
- A list of useful constants and relations is given at the end of this paper.
- A simple scientific calculator without a programmable memory may be used for calculations.

Section A

1. **Answer the following questions:** **[14]**

(a) **In questions (i) to (vii) below, choose the correct alternative (a), (b), (c) or (d) for each of the questions given below:**

i. When cell of e.m.f. E is connected with an external resistance R, the p.d. across the cell becomes V. The expression for the internal resistance of the cell is **[1]**

a) $\frac{E-V}{V}R$ b) $\frac{V-E}{V}R$

c) $\frac{(V-E)R}{E}$ d) $\frac{V-E}{E}R$

ii. When two bar magnets are brought close to each other? **[1]**

a) None of these b) Only attractive force exists

c) Depends on the alignment of the two magnets d) Only repulsive forces exists

iii. In vacuum, the physical property which remains the same for microwave of wavelength 1 mm and UV radiation 1600 $\overset{o}{A}$ is **[1]**

a) Wavelength b) Distance

c) Frequency d) Speed

iv. The function of brush in a generator is **[1]**

a) to connect load to generated a.c. constant
b) to keep the frequency of generated a.c. constant
c) to connect load to the field magnet
d) to transfer the current from armature to load

v. If a solid transmits the visible light and has a low melting point, it possesses **[1]**

a) convalent bonding
b) van der Waals bonding
c) ionic bonding
d) metallic bonding

vi. When a charged particle is projected perpendicular to a uniform magnetic field, it describes a circular path in which: **[1]**

a) its kinetic energy increases
b) its momentum remains constant
c) its speed remains constant
d) its velocity remains constant

vii. The equipotential surfaces of a uniform electric field E are planes parallel to the YZ plane. **[1]**
What is the direction of the electric field E?

a) The electric field is along z-axis.
b) The electric field is along y-axis.
c) The electric field is along negative y-axis.
d) The electric field is along x-axis.

(b) **Answer the following questions briefly:**

i. Give an example of coherent sources of light. **[1]**

ii. An increase in the filament current in an X-ray tube increases the intensity of X-ray produced. Why? **[1]**

iii. When current flowing through one coil changes from 0 Amp to 15 Amp in 0.2 s, emf of 750 V is induced in an adjacent coil. Calculate the coefficient of mutual inductance of the two coils. **[1]**

iv. What is the relation between potential difference and capacitance? **[1]**

v. According to Bohr, **Angular momentum of an orbiting electron is quantised**. **[1]**
What is meant by this statement ?

vi. State any one advantage of using a reflecting telescope in place of a refracting telescope. **[1]**

vii. Consider the following nuclear reaction, **[1]**
$_{1}^{2}\mathrm{H} + {}_{1}^{2}\mathrm{H} \longrightarrow {}_{2}^{3}\mathrm{He} + {}_{0}^{1}n$
What is the name of this reaction?

Section B

2. At a certain place, a compass points 13° W of geographic North. If the dip at that place is 60° and magnetic field is 0.16 gauss, then find the earth's magnetic field at that place. **[2]**

OR

A closely wound solenoid of 2000 turns and area of cross-section 1.6×10^{-4} m^2, carrying a current of 4 A, is suspended through its centre allowing it to turn in a horizontal plane. If the solenoid is treated

as a magnet, then

i. What is the magnetic moment associated with the solenoid?

ii. What are the force and torque on the solenoid, if a uniform horizontal magnetic field of 7.5×10^{-2} T is set up at an angle of 30° with the axis of the solenoid?

3. The amplitude of the magnetic field part of a harmonic electromagnetic wave in vacuum is B_0 = 510 nT. What is the amplitude of the electric field part of the wave? **[2]**

4. Obtain the resonant frequency (ω_r) of a series L-C-R circuit with L = 2.0 H , C = $32\mu F$ and R =10Ω. What is the Q-value of this circuit? **[2]**

OR

A light bulb is rated 100 W for 220 V AC supply of 50 Hz. Calculate

i. resistance of the bulb

ii. the rms current through the bulb.

5. Zener diodes have higher dopant densities as compared to an ordinary p-n junction. How does it affect the width of the depletion layer and the junction field? **[2]**

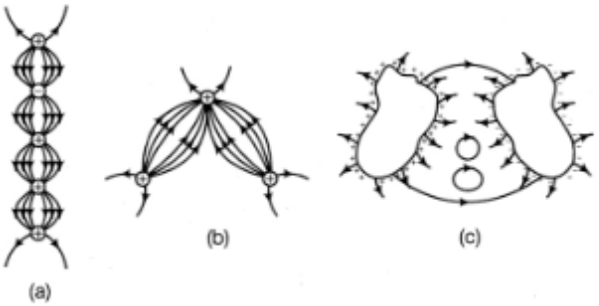
6. The electron in a H-atom circles around the proton with a speed of 2.18×10^6 ms^{-1} in an orbit of radius 5.3×10^{-11} m. **[2]**

Calculate

i. the equivalent current.

ii. magnetic field produced at the proton. Given, charge on electron is 1.6×10^{-19} C and $\mu_0 = 4\pi \times 10^{-7}$ T mA^{-1}.

7. Explain, why the following curves cannot possibly represent electrostatic field lines? **[2]**



8. With reference to a semiconductor diode, explain the terms: **[2]**

i. Depletion region

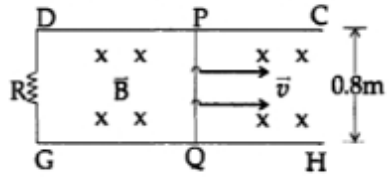
ii. Potential barrier or barrier p.d.

Section C

9. A proton and an electron have same de-Broglie wavelength. Which of them moves fast and which possesses more kinetic energy? Justify your answer. **[3]**

10. Figure below shows two thick metallic rails CD and GH kept parallel to each other 0.8 m apart. They are joined to each other by a resistance wire R having a resistance of 5Ω. A thick metallic rod PQ rests on the rails. There is a uniform magnetic ield B = 0.2 T, which is perpendicular to the **[3]**

plane of the rails, pointing into the paper.



a. Calculate magnitude and direction of the current induced in the rod PQ if it is moved towards right with a constant velocity -36 km/hr.

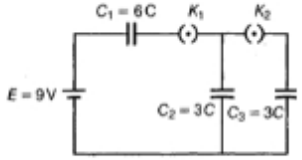
b. The rod PQ is now made to perform simple harmonic motion with a frequency of 3Hz and an amplitude of 4 cm. Calculate the maximum value of the emf induced in the rod.

OR

i. Define the term **mutual-inductance** and write its SI unit.

ii. Obtain the expression for the mutual inductance of two long coaxial solenoids S_1 and S_2 wound one over the other, each of length L and radii r_1 and r_2; and n_1 and n_2 number of turns per unit length, when a current I is set up in the outer solenoid S_2.

11. In the circuit shown below, initially k_1 is closed and k_2 is opened, what are the charges on each of the capacitors? Then k_1 was opened and k_2 was closed (order is important), what will be the charge on each capacitor now? [Given, $C = 1\mu\text{F}$] **[3]**



12. i. What is meant by the term activity of a radioactive substance? **[3]**

ii. A radioactive sample has a half-life of 1.4×10^{16} s and a mass number of 238. Calculate the number of disintegration of 1 g of this sample.

OR

A radioactive isotope has a half-life of T year. How long will it take the activity to reduce to

i. 3.125 % and

ii. 1 % of its original value?

13. With the help of a ray diagram obtain the expression for the magnifying power of a simple microscope when the image is formed at least distance of distinct vision. **[3]**

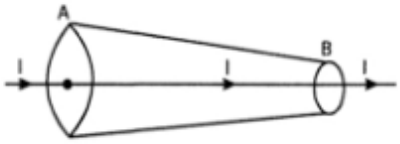
14. A given coin has a mass of 3.0 g. Calculate the nuclear energy that would be required to separate all the neutrons and protons from each other. For simplicity assume that the coin is entirely made of $^{63}_{29}\text{Cu}$ atoms (of mass 62.92960 u). **[3]**

15. i. What is meant by: **[3]**

a. Drift velocity and

b. Relaxation time

ii. A metallic plug AB is carrying a current I as shown in the figure below. State how the drift velocity of free electrons varies, if at all, from end A to end B



16. Derive an expression for the magnetic moment $(\vec{\mu})$ of an electron revolving around the nucleus in terms of its angular momentum $(\vec{l})$. What is the direction of the magnetic moment of the electron with respect to its angular momentum? **[3]**

17. The terminology of different parts of the electromagnetic spectrum is given in the text. Use the formula E = hv (for energy of a quantum of radiation: photon) and obtain the photon energy in units of eV for different parts of the electromagnetic spectrum. In what way are the different scales of photon energies that you obtain related to the sources of electromagnetic radiation? **[3]**

Section D

18. A resistor of 400 Q, an inductor of $\frac{5}{\pi}$ H and a capacitor of $\frac{50}{\pi}\mu$F are connected m series across n a source of alternating voltage of 140 sin100πt V. Find the voltage (rms) across the resistor, the inductor and the capacitor. Is the algebraic sum of these voltage more than the source voltage? If yes, resolve the paradox. **[5]**

OR

An AC generator generating an emf of ε = 300 sin(100πt)V is connected to a series combination of 16 μF capacitor, 1H inductor and 100Ω resistor. Calculate

i. impedance of the circuit at the given frequency.

ii. resonant frequency f_0.

iii. power factor at resonant frequency f_0.

19. In Young's double slit experiment using monochromatic light L_1 of wavelength 700 nm, 10th bright fringe was obtained at a certain point P on a screen. **[5]**
Which bright fringe will be obtained at the same point P, if monochromatic light of wavelength 500 nm is used in place of L_1. (No other alterations were made in the experimental set up.)

OR

A beam of light, consisting of two wavelengths 560 nm and 420 nm, is used to obtain interference fringes in a Young's double slit experiment. Find the least distance from the central maxima, where the bright fringes due to both the wavelengths coincide. The distance between the two slits is 4 mm and the screen is at a distance of 1m from the slits.

20. Explain using a labelled diagram, the principle and working of a moving coil galvanometer. What is the function of **[5]**

i. uniform radial magnetic field?

ii. soft iron core? Also, define the terms.

iii. current sensitivity?

iv. voltage sensitivity of a galvanometer? Why does increasing the current sensitivity not necessarily increase voltage sensitivity?