



Code Number:

**A****Aakash****Medical | IIT-JEE | Foundations**

Corp. Office: Aakash Educational Services Limited, 3rd Floor, Incuspace Campus- 2, Plot No. 13,  
Sector- 18, Udyog Vihar, Gurugram, Haryana - 122015

Time: 3 hrs.

**Mock Test Paper for Class-XII**

Max. Marks: 70

**PHYSICS**

Roll No.

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**GENERAL INSTRUCTIONS**

Read the following instructions carefully and follow them:

1. The Question paper consists of parts **A, B, C and D**
2. **Part A - I** consists of **15 Multiple choice** questions,  
**Part A - II** consists of **5 fill up the blanks** questions
3. All the questions of **Part A - I and II** are to be answered **compulsorily**
4. **Part B** consists of **8 short answer type** questions carrying **2 marks** each, out of which **5 questions** to be answered
5. **Part C** consists of **8 short answer type** questions carrying **3 marks** each, out of which **5 questions** to be answered
6. **Part - D** consists of **V and VI**.  
**Part D - V** consists of **5 long answer type** questions carrying **5 marks** each, out of which **3 questions** to be answered.  
**Part D - VI** consists of **4 numerical problems** carrying **5 marks** each, out of which **2 question** to be answered.
7. Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.
8. Direct answers to numerical problems without relevant formula and detailed solutions will not carry any marks

**PART-A**

**I. Select the correct alternative from the choices given below: 15 x 1 = 15**

1. The total charge of an electric dipole is  
 (a) Infinity                      (b) Zero                              (c) +e                              (d) -e
2. Identify the 'WRONG' statement regarding electrostatics of conductors.  
 (a) Electric field inside a charged conductor is zero  
 (b) There is no excess charge inside a charged conductor  
 (c) Electric potential is constant throughout the volume of a conductor  
 (d) Electric field is tangential at all points on the surface of a charged conductor
3. The magnitude of drift velocity per unit electric field is called  
 (a) mobility                      (b) current density                      (c) resistivity                      (d) conductivity
4. **Statement I:** A galvanometer is converted into an ammeter by connecting a resistor of low resistance in parallel with it.

**Statement II:** The voltage sensitivity of a galvanometer depends on number of turns of the coil.

**Pick the correct answer:**

- (a) Both statements I and II are correct                      (b) Both statements I and II are wrong
- (c) Only statement I is correct                      (d) Only statement II is correct
5. A small compass needle of magnetic dipole moment 'm' is placed in uniform magnetic field 'B' at an angle  $\theta$ , then the magnetic potential energy of the needle is  
 (a)  $+mB \sin\theta$                       (b)  $-mB \sin\theta$                       (c)  $+mB \cos\theta$                       (d)  $-mB \cos\theta$
6. The Polarity of induced emf is given by  
 (a) Faraday's law                      (b) Lenz's law  
 (c) Gauss's law in magnetostatics                      (d) Ampere's circuital law
7. A rectangular loop is moving out of a uniform magnetic field region to a field-free region with constant velocity  $\vec{v}$  as shown in figure. Then, in the coil



- (a) No emf is induced                      (b) No current is induced
- (c) Constant emf is induced                      (d) Varying emf is induced
8. In purely inductive ac circuit, the power factor is  
 (a) +1                      (b) -1                      (c) 0                      (d)  $\infty$
9. In which of the following sequence, does electromagnetic waves are arranged in increasing order of wavelength?  
 (a) X-rays, ultraviolet rays, microwaves                      (b) Ultraviolet rays, X-rays, microwaves  
 (c) Microwaves, Ultraviolet rays, X-rays                      (d) X-rays, Microwaves, Ultraviolet rays
10. A ray of light travelling from denser to rarer medium undergoes total internal reflection when  
 (a) angle of incidence is less than critical angle.                      (b) angle of incidence is greater than critical angle.  
 (c) angle of incidence is equal to critical angle.                      (d) angle of incidence is zero.

11. For which one of the following phase difference between two coherent light waves, the constructive interference takes place?
- (a)  $\frac{\pi}{2}$                       (b)  $\pi$                       (c)  $2\pi$                       (d)  $3\pi$
12. If Planck's constant and basic unit of electric charge are 'h' and 'e' respectively, then in photoelectric effect, the graph between stopping potential (V) and frequency ( $\gamma$ ) is a straight line with slope equal to
- (a) h/e                      (b) e/h                      (c) e                      (d) h
13. de Broglie hypothesis provides an explanation for
- (a) J. J. Thomson's atomic model  
 (b) Rutherford's nuclear model of atom  
 (c) Geiger-Marsden experiment  
 (d) Bohr's second postulate of quantization of angular momentum
14. The nuclear radius 'R' depends on mass number 'A' as
- (a)  $R \propto A^2$                       (b)  $R \propto A^{1/2}$                       (c)  $R \propto A^3$                       (d)  $R \propto A^{1/3}$
15. The List - I and List - II respectively represent materials and energy band gap  $E_g$ . Identify the correct match.

List-I	List-II
(i) Conductors	(p) $E_g > 3\text{eV}$
(ii) Insulators	(q) $E_g < 3\text{eV}$
(iii) Semiconductors	(r) $E_g = 0$

- (a) (i) - (q); (ii) - (r); (iii) - (p)                      (b) (i) - (r); (ii) - (p); (iii) - (q)  
 (c) (i) - (p); (ii) - (r); (iii) - (q)                      (d) (i) - (r); (ii) - (q); (iii) - (p)

**II. Fill in the blanks by choosing the appropriate word/Words from those given below:                      5 x 1 = 5**

(magnetic flux, magnetic susceptibility, electric dipole moment, greater than, photon, half of)

16. Polar molecules have permanent \_\_\_\_\_.
17. The \_\_\_\_\_ through any closed surface is zero.
18. In step-up transformer, the number of turns in secondary coil is \_\_\_\_\_ the number of turns in primary coil.
19. The intensity of light coming out of a single polaroid is \_\_\_\_\_ the incident intensity.
20. In interaction of radiation with matter, radiation behaves as if it is made up of packet of energy called \_\_\_\_\_.

**PART-B**

**III. Answer any FIVE of the following questions                      5 x 2 = 10**

21. State and explain Coulomb's law in electrostatics.
22. Graphically represent the variation of resistivity with absolute temperature for the following materials.  
 (i) Copper (ii) Semi-conductor
23. What is Lorentz force? Write the expression for it.
24. The current in a coil falls from 2A to 0 in time 0.1s. If an average emf of 20V is induced in this coil, then calculate its self-inductance.
25. Give any two uses of infrared waves.

26. Define power of a lens. Write its SI unit.
27. Write two advantages of reflecting telescope over refracting telescope.
28. On which factors does the conductivity of extrinsic semiconductor depend?

### PART-C

**IV. Answer any FIVE of the following questions:**

**5 x 3 = 15**

29. Write three properties of electric field lines.
30. Obtain an expression for effective capacitance of two capacitors connected in parallel.
31. A square coil of side 10 cm, 50 turns, carrying a current of 10A is placed in uniform magnetic field of 0.80 T in such a way that, the normal drawn to the plane of the coil makes an angle  $30^\circ$  with the direction of magnetic field. Find the magnitude of torque experienced by the coil.
32. Distinguish between diamagnetic and paramagnetic materials.
33. Derive an expression for motional emf induced in a straight conductor moving perpendicular to the uniform magnetic field.
34. Write three experimental observations of photoelectric effect.
35. State the three postulates of Bohr's atomic model.
36. Mention the characteristic features of nuclear force.

### PART-D

**V. Answer any THREE of the following questions:**

**3 x 5 = 15**

37. Define electrostatic potential. Obtain an expression for electrostatic potential at a point due to an isolated point charge.
38. Using Kirchhoff's laws, arrive at the balancing condition of the Wheatstone bridge.
39. Derive an expression for magnetic field at a point on the axis of a circular current loop.
40. (a) State Huygen's principle of wavefronts.  
(b) Using Huygen's principle, show that the angle of incidence is equal to the angle of reflection, when a plane wavefront is reflected by a plane surface.
41. (a) What is full-wave rectifier?  
(b) Explain the working of a full-wave rectifier using neat circuit diagram.  
(c) Draw input-output waveforms of full-wave rectifier.

**VI. Answer any TWO of the following questions**

**2 x 5 = 10**

42. Two-point charges  $2\mu\text{C}$  and  $3\mu\text{C}$  are placed at the two corners A and B of an equilateral triangle ABC of side 0.2m. Calculate the magnitude of resultant electric field at the corner C of that triangle.
43. Two identical cells either connected in series or in parallel combination give the same value of current 0.5A through an external resistor of resistance  $2\ \Omega$ . Find the emf and internal resistance of each cell.
44. A resistor of  $100\ \Omega$ , an inductor of 200 mH and a capacitor of  $100\ \mu\text{F}$  are connected in series to a 220V, 50 Hz ac source. Calculate (i) impedance and (ii) current in the circuit.
45. The angle of minimum deviation produced in a glass prism is  $40^\circ$ . Calculate the refractive index of the material of the prism, if the refracting angle of prism is  $60^\circ$ . Also calculate the new angle of minimum deviation when the prism is immersed in water of refractive index 1.33.

