

**Meghalaya Board
Class XII
Physics
Sample Paper 2**

Time allowed: 3 hours**Maximum Marks: 70****General Instructions:**

- (i) The figures in the margin indicate full marks for the questions.
- (ii) All questions are compulsory.
- (iii) All the answers are to be written in the Answer Script.
- (iv) There is no overall choice. However, internal choices have been provided in two questions of two marks, two questions of three marks and one question of five marks.
- (v) Use of non-programmable ordinary scientific calculator and/or logarithmic tables is allowed.
- (vi) Use of Mobile Phones, Pagers and such other electronic gadgets are not allowed in the Examination Hall.
- (vii) Use the following values of physical constants wherever necessary :
Speed of light in vacuum, $c = 3 \times 10^8 \text{ m s}^{-1}$
Planck's constant, $h = 6.63 \times 10^{-34} \text{ J-s}$
Permittivity of free space, ϵ_0
 $= 8.86 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
Permeability of free space, $\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$
Mass of electron, $m_e = 9.11 \times 10^{-31} \text{ kg}$
Mass of proton, $m_p = 1.67 \times 10^{-27} \text{ kg}$
Electronic charge, $e = 1.6 \times 10^{-19} \text{ C}$
- (viii) General candidates are not allowed to attempt the questions meant for Elementary School Teacher Candidates.

Choose and write the correct answer in the answer script: **$\frac{1}{2} \times 8 = 4$**

**GROUP-A
(Multiple Choice Type Questions)**

1. If you blow air over the top of a fairly large drinking straw you can hear a fundamental frequency due to a standing wave being set up in the straw. What happens to the fundamental frequency if while blowing you cut the straw in half with a pair of scissors? $\frac{1}{2}$
- (i) The fundamental frequency decreases
 - (ii) The fundamental frequency increases
 - (iii) The fundamental frequency remains unchanged
 - (iv) Insufficient information

- 2.** Gases exert pressure on the walls of the container because the gas molecules: $\frac{1}{2}$
(i) collide one another
(ii) exert intermolecular attraction
(iii) possess momentum
(iv) expand on absorbing heat
- 3.** Which of the given phenomena is not related to convection? $\frac{1}{2}$
(i) Formation of trade winds
(ii) Maintaining comfortable room temperature in cold countries
(iii) In winter metallic handles appear colder than wooden door
(iv) Formation of land and sea breezes
- 4.** When the angle of contact between a solid and a liquid is 90° , then $\frac{1}{2}$
(i) Cohesive force = Adhesive force
(ii) Cohesive force \gg Adhesive force
(iii) Cohesive force $>$ Adhesive force
(iv) Cohesive force $<$ Adhesive force
- 5.** Kepler's law of areas can be understood as a consequence of: $\frac{1}{2}$
(i) conservation of angular momentum
(ii) conservation of linear momentum
(iii) conservation of energy
(iv) conservation of mass
- 6.** Which unit system is presently internationally accepted? $\frac{1}{2}$
(i) cgs
(ii) fps
(iii) mks
(iv) SI
- 7.** A coordinate system that enables us to describe the position of a body in space at any instant of time is called $\frac{1}{2}$
(i) Origin
(ii) Reference Point
(iii) Intersection Point
(iv) Reference Frame
- 8.** If a body is projected with an angle θ to the horizontal, then $\frac{1}{2}$
(i) Its velocity is always perpendicular to its acceleration
(ii) Its velocity becomes zero at its maximum height
(iii) Its velocity makes zero angle with the horizontal at its maximum height
(iv) The body just before hitting the ground, the direction of velocity coincides with the acceleration

GROUP-B
(Very Short Answer Type Questions)

Answer the following questions in a few words/sentences.

1x8=8

- 9.** Why do long distance radio broadcast use short wave bands? **1**
- 10.** Can we measure the potential difference of a p-n junction by putting a sensitive voltmeter across its terminals? **1**
- 11.** Why is nuclear fusion not possible in laboratory? **1**
- 12.** Are matter waves electromagnetic in nature? **1**
- 13.** State the reason, why two independent sources of light cannot be considered as coherent sources. **1**
- 14.** What are total reflecting prism? What is the phenomena behind reflecting glass prism? **1**
- 15.** Define the term 'wattless current'. **1**
- 16.** When the magnetic flux passing through a coil changes, will the induced emf and current is always produced in the coil? **1**

GROUP-C

(Short Answer Type-I Questions)

Answer the following questions within 30 words each:

2x8=16

17. Why do we need amplification of modulated signal in a transmitter and again need amplification before detection? **2**

18. Which gate is called as an inverter?

Or

What is a zener diode? Why is it also known as breakdown diode? **2**

19. The mass of the nucleus is less than the sum of the masses of the nucleons forming it, why? **2**

20. In Rutherford's experiment, a thin gold foil was bombarded with alpha particles. According to Thomson's "plum-pudding" model of the atom, what should have happened? **2**

21. Why is it difficult to remove a free electron from copper than sodium? Which has higher threshold wavelength? **2**

22. Why is interference pattern not detected when the two coherent sources are far apart? **2**

23. Violet light is incident on a thin convex lens. If this light is replaced by red light, explain with reason, how the power of the lens would change? **2**

24. How are infrared waves produced? Why are these referred to as 'heat waves'? **2**

Or

Find the ratio of the speeds of infra red rays and gamma rays in vacuum?

GROUP-D
(Short Answer Type-II Questions)

Answer the following questions in 30-40 words each: 3x9=27

- 25.** There are two capacitors A and B. Frequency of A is double than that of B but the capacitance is same. Find the ratio of there rectances. **3**
- 26.** A metallic rod of length l is rotated at a constant angular speed ω , normal to a uniform magnetic field B . Derive an expression for the current induced in the rod, if the resistance of the rod is R . **3**
- 27.** What is Hysteresis Loop? What is its significance? **3**

Or

Suppose we have a magnetic needle of length $2l$ with magnetic moment ' M ' and pole strength ' m '. We divide it into two pieces from the middle. What will be the magnetic moment and pole strength of the resultant pieces?

- 28.** A beam of protons passes undeflected with a horizontal velocity v , through a region of electric and magnetic fields, mutually perpendicular to each other and normal to the direction of the beam. If the magnitudes of the electric and magnetic fields are 50 kV/m and 100 mT respectively ; calculate the
(i) velocity v of the beam.
(ii) force with which it strikes a target on the screen, if the proton beam current is equal to 0.80 mA.

Or

Discuss the nature of the paths executed by the charge particle moving in a uniform magnetic field? **3**

- 29.** Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons. **3**
- 30.** How does a polar dielectric develop a net dipole moment in an external field? **3**
- 31.** How can we find the net electric field at a point due to a charge distribution? **3**
- 32.** What is a digital signal? Write two advantages of digital communication. Give any one difference between Fax and E-mail systems of communication. **3**
- 33.** Define decay constant of a radioactive sample. Which of the following radiation α -rays, β -rays and γ -rays, (i) Are similar to x - rays? (ii) Are easily absorbed by matter? **3**

GROUP-E
(Long Answer Type Questions)

Answer the following questions in 70-80 words each:

5x3=15

- 34.** What is the frequency of radiation emitted when a hydrogen atom de-excites from level x to level $(x-1)$? For large x , show that this frequency equals the classical frequency of revolution of the electron in the orbit. **5**

Or

Rutherford atom model is based on the classical concept that electrons are revolving around a central positive nucleus.

- (a) Mention the drawback of Rutherford atom model and how it is rectified in Bohr's atom model?
- (b) From Bohr's theory obtain the de Broglie wavelength of an electron orbiting around the nucleus.
- (c) Give the statement of Heisenberg's uncertainty principle and express it mathematically.
- 35.** State Huygen's principle. Show, with the help of a suitable diagram, how this principle is used to obtain the diffraction pattern by a single slit. Draw a plot of intensity distribution and explain clearly why the secondary maxima become weaker with increasing order (n) of the secondary maxima. **5**
- 36.** Describe briefly, with the help of a labelled diagram, the basic elements of an A.C. generator. State its underlying principle. Show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field. Write the expression for the instantaneous value of the emf induced in the rotating loop. **5**