Meghalaya Board
Class XII
Physics
Sample Paper 1

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, $c = 3 \times 10^8$ m s^{-1}
Planck's constant, $h = 6.63 \times 10^{-34}$ J-s
Permittivity of free space, ε_0
$= 8.86 \times 10^{-12}$ C^2 N^{-1} m^{-2}
Permeability of free space, $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}
Mass of electron, $m_e = 9.11 \times 10^{-31}$ kg.
Mass of proton, $m_p = 1.67 \times 10^{-27}$ kg
Electronic charge, $e = 1.6 \times 10^{-19}$ 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: **½ x 8=4**

GROUP-A
(Multiple Choice Type Questions)

1. The quantization of charge has little practical consequence and can be ignored at the **½**
(i) microscopic level
(ii) macroscopic level
(iii) all levels
(iv) information is given is insufficient to decide

2. A dielectric develops a _____in an external electric field. **½**
(i) net dipole moment
(ii) zero dipole moment
(iii) zero charge separation
(iv) positive charge

3. Kirchhoff's second law is applicable only to **½**
(i) open loops
(ii) closed and open loops
(iii) closed loops
(iv) mechanical systems

4. A charge moves through a magnetic field with a certain velocity. Direction of force can be obtained by applying **½**
(i) Ampere's rule
(ii) Fleming's right hand rule
(iii) Rule of cross product
(iv) Cork screw rule

5. The magnetic induction left behind in the sample after the magnetizing field has been removed is called **½**
(i) Hyteresis
(ii) Ferromagnetism
(iii) Retentivity
(iv) Coercivity

6. If we take the analogy between mechanical motion and electric circuits, then inductance is analogous to **½**
(i) force
(ii) torque
(iii) momentum
(iv) moment of inertia

7. In a set a bulb and a capacitor are connected what with happen if we increase the frequency **½**
(i) bulb will glow dimmer
(ii) bulb will glow brighter
(iii) bulb will glow dim and bright alternately
(iv) bulb will stop glowing

8. How much time from sunrise to sunset is lengthened because of atmospheric refraction? **½**

(i) 2 minutes
(ii) 2 hours
(iii) 4 minutes
(iv) 4 hours

GROUP-B
(Very Short Answer Type Questions)

Answer the following questions in a few words/sentences. **1x8=8**

9. Cyclotron is not suitable for accelerating electrons. Why? **1**

10. What do you understand by Foucault currents? **1**

11. In a Young's double slit experiment, monochromatic source is replaced by a source of white light. How are the interference fringes effected by this? **1**

12. What happens, when the impact parameter of an alpha particle in Rutherford experiment is minimum? **1**

13. Can we have resonance in RL or RC circuit? Also give reason **1**

14. Why do long distance radio broadcast use short wave bands? **1**

15. If the base region of a transistor is made large as compared to a usual transistor, how does it affect (i) the collector current (ii) current gain of this transistor? **1**

16. Frequency of input voltage of a half wave rectifier is 50 Hz. What will be the frequency of the output voltage? **1**

GROUP-C
(Short Answer Type-I Questions)
Answer the following questions within 30 words each: 2x8=16

17. . If $\vec{E} = 6\hat{i} + 3\hat{j} + 4\hat{k}$, calculate the electric flux through a surface of area 20 units in y-z plane. **2**

18. Suppose a lens has different radii of curvature, it forms an image of an object placed on its axis. If we reverse the lens will the position of the image of the object change?

Or

Why is it that the images formed by total internal reflection are brighter than those formed by mirrors or lenses? **2**

19. Two coils connected in series have a resistance of $18\,\Omega$ and when connected in parallel have a resistance of $4\,\Omega$. Find the value of individual resistances of the coils. **2**

20. A short bar magnet placed with its axis at 30 degrees with a uniform magnetic field of 0.35 T. A torque of 0.055 J is experienced by the magnet. Find the magnetic moment **2**

21. Calculate the time period of visible light for which the human eye is most sensitive **2**

22. What do you mean by sensitivity of potentiometer? How can we increase the sensitivity of potentiometer? **2**

23. Why does photoelectric emission not take place if the frequency of incident radiation is less than threshold value? **2**

24. In the Rutherford's nuclear model of the atom, the nucleus (radius about 10^{-5}) in analogous to the sun about which the electron moves in orbit (radius ~ 10^{-10} m) like the earth orbits around the sun. If the dimensions of the solar system had the same proportions as those of atom, would the earth be closer to or farther away from sun than actual it is? The radius of earth is about 1.5 X 10^{11} m. The radius of sun is taken as 7×10^{8} m. **2**

Or

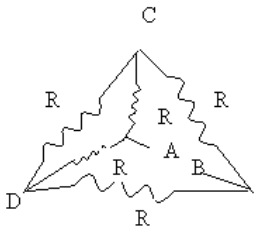
Find the ratio of the speeds of infra red rays and gamma rays in vacuum?

GROUP-D
(Short Answer Type-II Questions)

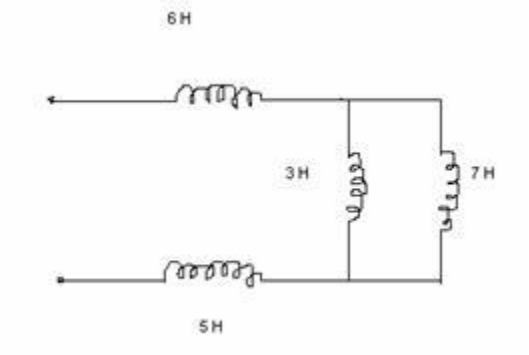
Answer the following questions in 30-40 words each: 3x9=27

25. How many electrons should be removed from a coin of mass 3.2 g, so that it just float in an electric field of intensity 10^{10} NC^{-1}, directed upward **3**

26. What is the equivalent resistance between the terminals A and B in the figure below: **3**



27. **3**



Calculate total inductance. (3)

Or

The expression for magnetic flux is given by $\phi = 4t^2 + t + 5$ milliweber. Calculate the emf induced at t = 3 s.

28. What is an unpolarized light? Explain with the help of suitable ray diagram how an unpolarized light can be polarized by reflection from a transparent medium. Write the expression for Brewster angle in terms of the refractive index of denser medium

Or

Two polaroids are placed 90Âº to each other and the transmitted intensity is zero. What happens when one more polaroid is placed between these two bisecting the angle between them. Take intensity of unpolarised light I_o'. How will the intensity of transmitted light vary on further rotating the third polaroid? **3**

29. A pure inductive circuit does not consume any power in a complete cycle. Prove it. **3**

30. Prove that apparent depth is ¾ of real depth. **3**

31. In a Young's double slit experiment the interval between the slits is 0.200 mm. For the light of wavelength $6000A^0$, interference fringes are formed on a screen at a distance of 0.800m.

(a) What is the distance of second dark fringe from the central fringe?

(b) What is the distance of second bright fringe from the central fringe?

32. What do you mean by bandwidth of a signal? How much bandwidth is considered adequate for (i) speech signal (ii) music signal (iii) video and TV signals? **3**

33. What is satellite communication? Explain its working **3**

GROUP-E
(Long Answer Type Questions)

Answer the following questions in 70-80 words each: 5x3=15

34. Explain how a bar magnet can be considered as a solenoid and also deduce the formula for magnetic field of a bar magnet? **5**

Or

A z-axis directed very long wire of radius "a" carries a total z-axis directed current I. What is the magnetic field distribution, both inside and outside the wire, if the current is evenly distributed throughout the wire?

35. What is meant by interference of light? What are two types of interference? In a double slit experiment with monochromatic light, fringes are observed on a screen placed at some distance from the slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5} m. If the distance between the slits is 10^{-3} m, calculate the wavelength of light used. **5**

36. Write the logic symbol and truth table of an AND gate. Explain how this gate is realised in practice by using two diodes. **5**