



**SECOND YEAR HIGHER SECONDARY  
MODEL EXAMINATION, FEBRUARY – 2024**

Part – III

Time : 2 Hours

**PHYSICS**

Cool-off time : 15 Minutes

Maximum : 60 scores

**General Instructions to Candidates :**

- There is a 'Cool-off time' of 15 minutes in addition to the writing time.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

**വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :**

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Questions 1 to 7 carry 1 score each. Answer any 5.

1. The number of electric field lines passing normally through unit area is called \_\_\_\_\_.
2. The dipole moment per unit volume is called \_\_\_\_\_.
3. At high enough temperature, a ferro-magnet become a \_\_\_\_\_.
4. Electromagnetic radiation belonging to the region with wavelength of about 400 nm to 700 nm is called \_\_\_\_\_.
5. The phenomenon of photoelectric emission was discovered by \_\_\_\_\_.
6. Electron revolves around the nucleus only in those orbits for which the angular momentum is some integral multiple of \_\_\_\_\_.
7. An intrinsic semi-conductor will behave like \_\_\_\_\_ at  $T = 0$  K.

Questions 8 to 14 carry 2 scores each. Answer any 5.

8. Differentiate between linear charge density and surface charge density.
9. Plot the graph showing the temperature dependence of resistivity for a typical semi-conductor.

10. State Faraday's law of electromagnetic induction.
11. A light bulb is rated at 100 W for a 220 V supply. Find the resistance of the bulb.
12. Explain Coherent sources.
13. Explain Einstein's photoelectric equation.
14. Draw the energy level diagram for the hydrogen atom.

Questions 15 to 21 carry 3 scores each. Answer any 6.

(6 × 3 = 18)

15. (a) Derive the expression for the potential due to a point charge. (2)
- (b) Plot the graph showing the variation of potential 'V' with distance 'r'. (1)
16. (a) State Ampere's circuital law. (1)
- (b) Obtain the expression for the magnetic field at a distance 'r' from a long, straight wire carrying a current 'I'. (2)
17. Obtain the expression for the magnetic energy stored in a solenoid in terms of magnetic field 'B', area 'A' and length 'l' of the solenoid.

18. (a) How electromagnetic waves are produced? (1)  
 (b) Why infrared waves are called heat waves? (2)
19. Explain the refraction of a plane wave using Huygens' principle.
20. (a) What is radioactivity? (1)  
 (b) Explain the energy generation in stars. (2)
21. (a) Explain a half wave rectifier. (2)  
 (b) Draw the input and output voltage waveforms of a half wave rectifier. (1)

Questions 22 to 25 carry 4 scores each. Answer any 3.

(3 × 4 = 12)

22. (a) Obtain the expression for the energy stored in a capacitor. (2)  
 (b) A 900 pF capacitor is charged by a 100 V battery (fig. 1). If the capacitor is disconnected from the battery and connected to another 900 pF capacitor (fig. 2), what is the electrostatic energy stored in the system? (2)

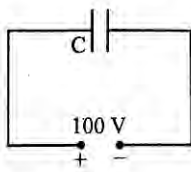


Fig. 1

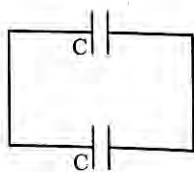


Fig. 2

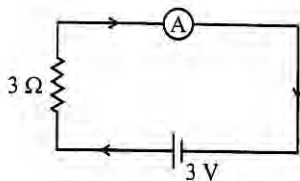
23. (a) State Kirchhoff's loop rule. (2)  
 (b) Derive the balancing condition of Wheatstone bridge, with a neat diagram. (2)

24. (a) Explain Gauss's law in magnetism. (2)  
 (b) If magnetic monopoles existed, how the Gauss's law of magnetism be modified? (2)
25. (a) State Laws of Refraction. (2)  
 (b) Explain total internal reflection. (2)

Questions 26 to 29 carry 5 scores each. Answer any 3.

(3 × 5 = 15)

26. (a) Derive the expression for the field of an electric dipole at points on the equatorial plane. (3)  
 (b) A system has two charges  $q_A = 2.5 \times 10^{-7} \text{ C}$  and  $q_B = -2.5 \times 10^{-7} \text{ C}$  located at points A(0, 0, -15 cm) and B(0, 0, +15 cm) respectively. What are the total charge and electric dipole moment of the system? (2)
27. (a) Define current sensitivity. (1)  
 (b) How will you convert a galvanometer into a voltmeter? (2)  
 (c) In the circuit given below, what is the value of the current of the ammeter shown is having a resistance of  $60 \Omega$ ? (2)



28. (a) Explain the principle of a transformer. (1)  
 (b) Distinguish between step-up and step-down transformer. (2)  
 (c) List the four losses of a transformer. (2)

29. (a) Derive the expression for the refractive index of a prism, with a neat diagram. (4)
- (b) Obtain the expression for the angle of minimum deviation for a small angled prism. (1)

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