Reg. No. : .....

Name : .....

SY 624

SECOND YEAR HIGHER SECONDARY MODEL EXAMINATION, FEBRUARY 2025

Part – III

PHYSICS

Maximum : 60 Scores

Time : 2 Hours

Cool-off Time : 15 Minutes

General Instructions to Candidates :

- *There is a 'Cool off time' of 15 minutes in addition to the writing time.*
- *Use 'cool off time' to get familiar with questions and to plan your answers.*
- *Read questions carefully before answering.*
- *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 മിനിട്ട് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Score

SECTION – A

Answer any 5 questions from 1 to 7. Each carries 1 score. **(5×1=5)**

1. The SI unit of electric charge is _____

2. A hollow metal sphere of radius 1 cm is charged with a potential 10 V on its surface. Then the potential at the centre of the sphere is _____

   a) 0 V b) 10 V c) 20 V d) 5 V

3. Give the equation of motional emf induced in a conductor of length *l*, moving with velocity V in a uniform magnetic field B.

4. What do you mean by displacement current ?

5. Two lenses of powers +7D and –3D are combined. The focal length of the combination would be _____

   a) –50 cm

   b) +50 cm

   c) –25 cm

   d) +25 cm

6. Ionisation energy of hydrogen atom is _____ eV.

7. Ratio of the radii of two nuclei of mass numbers A_1 and A_2 is _____

Score

SECTION – B

Answer any 5 questions from 8 to 14. Each carries 2 scores. **(5×2=10)**

8. Name a material which is used to make wire bound standard resistor. Give reason.

9. State Gauss's law in magnetism.

10. A power transmission line feeds power at 2200 V with a current of 5A to stepdown transformer with its primary winding having 4000 turns. Calculate the number of turns and current in the secondary in order to get output power at 220 V.

11. Which electromagnetic wave is used for the following purposes ?

    a) In cellular phone **(1)**

    b) In remote switch. **(1)**

12. Write the condition for constructive and destructive interference.

13. From Bohr's second postulate of quantisation, how can we obtain the de Broglie wavelength of electron orbiting around the nucleus ?

14. a) What is mass defect ? **(1)**

    b) How is it related to binding energy ? **(1)**

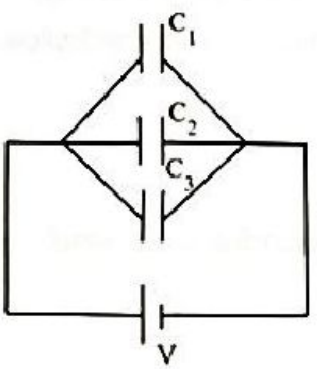
Score

SECTION – C

Answer any 6 questions from 15 to 21. Each carries 3 scores. **(6×3=18)**

15. Obtain the expression for the electric field at a point on the axial line of an electric dipole.

16. Three capacitors C_1, C_2, C_3 are arranged as shown below.



a) Derive the expression for the effective capacitance of this combination. **(2)**

b) If $C_1 = C_2 = C_3 = C$, in the above circuit, what is the effective capacitance ? **(1)**

17. Using Ampere's circuital theorem, find out the magnetic field at a point due to an infinite long straight conductor.

Score

18. Compare the magnetic susceptibility and magnetic permeability of diamagnetic, paramagnetic and ferromagnetic substances.

19. With the help of neat diagram explain reflection of plane wave using Huygen's principle.

20. a) Draw the graph showing the variation of photoelectric current with intensity of light. (1)

b) The work function of caesium is 2.14 eV. Find the threshold frequency for caesium. ($h = 6.63\times10^{-34}$ Js) (2)

21. Explain the working of a full wave rectifier having two diodes by drawing the circuit diagram.

SECTION – D

Answer any 3 questions from 22 to 25. Each carries 4 scores. (3×4=12)

22. a) Draw the equipotential surface around a point charge. (1)

b) Derive the expression for electric potential at any point due to an electric dipole. (3)

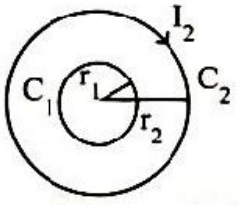
Score

23. a) State Kirchhoff's junction rule. (1)

b) Obtain the balancing condition of Wheatstone's bridge with the help of a diagram. (3)

24. a) What is self induction ? (1)

b) Two concentric circular coils C_1 and C_2, radius r_1 and r_2 ($r_1 << r_2$) respectively are kept coaxially as shown in the figure.



If the current I_2 is passed through C_2, then find the expression for mutual inductance between the two coils. (3)

25. a) Represent the image formation in a compound microscope diagramatically. (2)

b) A small telescope has an objective of focal length 144 cm and an eye piece of focal length 6.0 cm. What is the magnifying power of the telescope ? What is the separation between the objective and eye piece ? (2)

Score

SECTION – E

Answer any 3 questions from 26 to 29. Each carries 5 scores. **(3×5=15)**

26. a) State whether the following statements are true or false.

1) Gauss's law is true for any closed surface, irrespective of its size or shape. **(1)**

2) Gauss's law is based on inverse square dependence on distance as in coulomb's law. **(1)**

b) Using Gauss's law, obtain the expression for electric field due to a uniformly charged infinite plane sheet. **(3)**

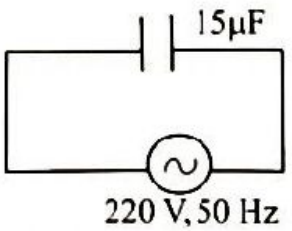
27. a) Explain the theory and working of a moving coil galvanometer. **(3)**

b) How can you convert a galvanometer into a voltmeter ? **(1)**

c) Write the equation of current sensitivity of a moving coil galvanometer. **(1)**

Score

28. A 15 μF capacitor is connected to a 220 V, 50 Hz source as shown in the figure.



a) Determine the capacitive reactance. **(1)**

b) Calculate the rms and peak value of current in the circuit. **(2)**

c) Show that when ac is applied to a capacitive circuit, the current leads the emf by $\frac{\pi}{2}$. **(2)**

29. a) With the help of a neat diagram obtain the expression for the refractive index of the material of the prism. **(4)**

b) Plot the graph showing angle of deviation versus angle of incidence for a triangular prism. **(1)**
