SY-224

SY-224

Reg. No. : ....

Name : ....

SECOND YEAR HIGHER SECONDARY
SECOND TERMINAL EXAMINATION, DECEMBER-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.

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Answer any 5 questions from 1 to 7. Each carries 1 score. $(5 \times 1 = 5)$

1. Name the electromagnetic wave which is used in LASIK eye surgery.

2. Which phenomenon of light supports its transverse nature ?

3. Telescopes with mirror objectives are called _____ .

4. Write the equation for power dissipated in LCR series circuit at resonance.

5. The presence of dielectric medium _____ (increases/decreases) the force between two point charges.

6. The susceptibility of a magnetic material is 5499, its relative permeability is _____ .

7. A magnet is moved towards a coil as shown in figure. Redraw the figure in your answer booklet and mark the direction of current in the coil.
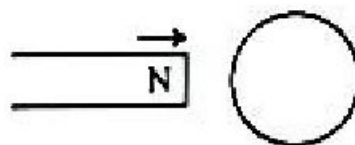
Answer any 5 questions from 8 to 14. Each carries 2 scores. $(5 \times 2 = 10)$

8. A polythene piece rubbed with wool is found to have a negative charge of 3×10^{-7} C. Estimate the number of electrons transferred.

9. Write any two differences between electric field and magnetic field.

10. State Gauss's law in magnetism.

11. What is displacement current ? Write the expression for displacement current.

12. Current in a circuit falls from 5 A to 0 A in 0.1 s. If an average emf of 200 V induced, calculate the self-inductance of the circuit.

13. Draw the ray diagram corresponding to the image formation at 'D' in a compound microscope. (D – the least distance of distinct vision)

14. What is the shape of the wave front in each of the following cases ?

    (a) Light diverging from a point source.

    (b) Light emerging out of a convex lens when a point source is placed at its focus.

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

15. (a) An electric dipole is placed in a uniform electric field E, the electrostatic potential energy of the dipole system is _____. (1)

    (b) An electron and a proton are separated by a distance of 1 Fermi. Calculate the electrostatic potential energy of the system. (2)

    (Charge of electron/proton = $\pm 1.6 \times 10^{-19}$ C)

16. Write any two properties of dia, para and ferromagnetic substances.

17. (a) The unit of Self-Inductance is _____. (1)

(b) Derive an equation for magnetic potential energy of a solenoid. (2)

18. (a) An ac voltage $V = V_m \sin \omega t$ is applied across a capacitor 'C', derive an equation for the instantaneous current. (2)

(b) What is the average power consumed in the capacitor over a complete cycle of ac ? (1)

19. (a) Write lens Maker's formula. (1)

(b) Double-convex lenses are to be manufactured from a glass of refractive index 1.55, with both faces of the same radius of curvature. What is the radius of curvature required if the focal length is to be 20 cm ? (2)

20. (a) Write the conditions for getting dark and bright bands in an interference pattern. (1)

(b) In a Young's double slit experiment, the slits are separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth fringe is measured to be 1.2 cm. Determine the wavelength of light used in experiment. (2)

21. (a) Write any one use of Microwaves. (1)

(b) A plane electromagnetic wave of frequency 25 MHz travels in free space along X-direction. At a particular point in space and time $\vec{E} = 6.3 \, \hat{j}$ V/m, what is $\vec{B}$ at this point ? (2)
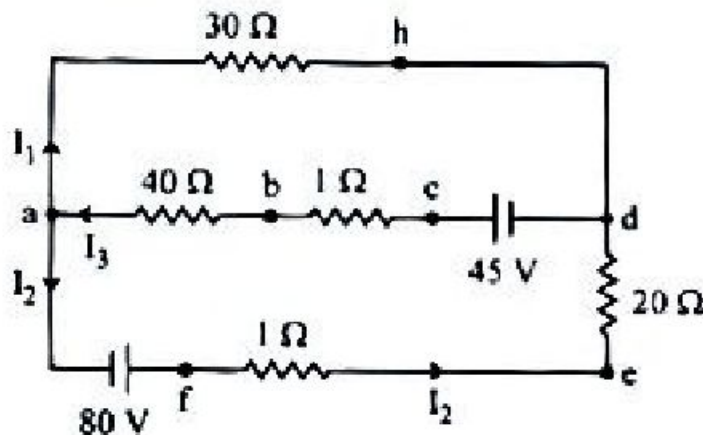
22. (a) Three cells having emf's E_1, E_2 and E_3 having internal resistance r_1, r_2 and r_3 are connected as shown below :

Write the effective emf and effective internal resistance of the combination. (2)

(b)

(i) Apply junction rule at 'a'. (1)

(ii) Apply loop rule at loop abdha. (1)

23. Derive Snell's law of refraction of plane waves using Huygens's principle.

24. (a) Derive the relation connecting focal length and radius of curvature of a spherical mirror. (2)

(b) What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 20 cm ? Is the system a converging or diverging lens ? Ignore thickness of the lenses. (2)

25. (a) Explain any two energy losses in a transformer. (2)

(b) A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determine the rms value of the current in the circuit. (2)

26. (a) The working principle of an ac generator is _____ . (1)

(b) With the help of a diagram, explain the working of an ac generator and derive an equation for emf inducted in it. (4)

27. (a) Write the mathematical form of Ampere's circuital theorem. (1)

(b) Using Biot–Savart law, derive an equation to find the magnetic field at an axial point of a current carrying circular loop. (4)

28. (a) Using the phasor diagram of an LCR series circuit ($V_L > V_C$), derive an equation for the impedance of the circuit. (3)

(b) A series LCR circuit connected to a variable frequency source 230 V. L = 5 H, C = 80 μF and R = 40 Ω. Determine the source frequency which drives the circuit in resonance. (2)

29. (a) Draw the ray diagram of refraction of light through a glass prism and derive equations for angle of prism A and angle of deviation 'δ'. (4)

(b) Draw the ray diagram of prism corresponding to minimum deviation. (1)

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