

Reg. No. : .....

Name : .....

**SY-224**

**SECOND YEAR HIGHER SECONDARY  
MODEL EXAMINATION, FEBRUARY 2023**

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 ഉത്തരപ്പെപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.



Answer any 5 questions from 1 to 7. Each carries 1 score.

$5 \times 1 = 5$

1. Name the physical quantity whose S.I. unit is  $\text{N C}^{-1}$ .
2. Two capacitors of equal capacitance when connected in series have a capacitance of  $C_1$ . When connected in parallel, they have a capacitance of  $C_2$ . What is the value of  $C_1/C_2$ ?
3. Lenz's law is in accordance with law of conservation of \_\_\_\_\_.
4. Name the physical quantity which can be expressed by the ratio of the amplitude of electric field to the magnetic field in an electromagnetic wave.
5. "Critical angle depends on the colour of light". Whether the statement is true or false?
6. A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65. What is the nature of the lens?
7. The binding energy of a nucleus is a measure of its
  - (a) Charge
  - (b) Mass
  - (c) Stability
  - (d) Momentum

Answer any 5 questions from 8 to 14. Each carries 2 scores.

$5 \times 2 = 10$

8. What happens to the drift velocity of charge carriers of a wire if its
  - (a) Potential difference is doubled. (1)
  - (b) Length is increased. (1)
9. (a) S.I. unit of magnetic moment of a dipole is
  - (a) Am
  - (b)  $\text{Am}^2$
  - (c) JT
  - (d)  $\text{JT}^{-2}$  (1)

- (b) Figure shows a magnetic substance placed in an external magnetic field. Identify the substance. (1)



10. (a) Can a transformer be used to step up or step down a DC voltage ? Justify your answer. (1)
- (b) Why do we use soft iron core in a transformer ? (1)

11. Match the following :

- (a) Radio waves - Night vision camera  
(b) UV Rays - Cellular phone  
(c) Micro waves - Water purifier  
(d) Infrared - Radar  
- To destroy cancer cells (2)

12. Sketch the wavefront corresponding to light from the following sources :

- (i) A point source (1)
- (ii) A distant source (1)

13. (a) In Rutherford scattering experiment, most of the  $\alpha$  particle go unscattered while some of them are scattered through large angles. What can be concluded from this ? (1)
- (b) What will be the angle of scattering when impact parameter is 0 ? (1)

14. Calculate binding energy of  ${}_{20}\text{Ca}^{40}$  from the following data :

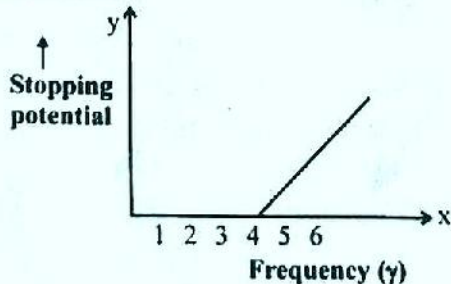
- mass of proton : 1.007825 a.m.u  
mass of neutron : 1.008665 a.m.u  
mass of  ${}_{20}\text{Ca}^{40}$  : 39.962589 a.m.u.

(2)

Answer any 6 questions from 15 to 21. Each carries 3 scores.

6 × 3 = 18

15. An electric dipole of dipole moment  $p$  is placed in a uniform electric field  $E$ .
- (a) Define dipole moment. (1)
- (b) Obtain an expression for torque acting on it. (2)
16. (a) Draw an equipotential surface due to an isolated point charge. (1)
- (b) If the electric field intensity at a given point is zero, will the electric potential necessarily be zero at that point? Why? (2)
17. (a) How will you convert a galvanometer into voltmeter. (1)
- (b) A galvanometer with a coil resistance  $12 \Omega$  shows full scale deflection for a current of  $3 \text{ mA}$ . How will you convert the galvanometer into voltmeter of range  $0 - 18 \text{ V}$ ? (2)
18. (a) State Gauss's law in magnetism. (1)
- (b) Two substances P and Q have their relative permeability slightly greater and less than one respectively. What do you conclude about P and Q? (2)
19. (a) State Huygens principle. (1)
- (b) Using Huygen's wave theory, verify the law of reflection. (2)
20. (a) The variation of stopping potential with frequency of sodium is given below. Calculate its work function. (1)



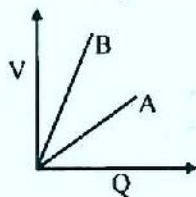
- (b) The work function for two metals are in the ratio  $1 : 2$ . Find the ratio of threshold wavelength of those metals. (2)
21. Draw the circuit diagram of a full wave rectifier and explain its working. Also, draw the input and output waveform. (3)



Answer any 3 questions from 22 to 25. Each carries 4 scores.

$3 \times 4 = 12$

22. (a) In a parallel plate capacitor, how is the capacity affected when
- (i) the distance between the plates is doubled. (1)
  - (ii) the area of the plates is halved (1)
- (b) figure shows the variation of voltage  $V$  across the plates of two capacitors A and B verses increase of charge  $Q$  stored on them . Which of the two capacitors has higher capacitance ? Give reason for your answer. (2)



23. (a) Kirchoff's second law is based on law of conservation of
- (i) Charge (ii) Energy
  - (iii) Momentum (iv) Angular momentum (1)
- (b) Use Kirchoff's rules to analyse the Wheatstone bridge and arrive at whetstones condition for balancing the bridge. (3)
24. (a) Define self- inductance. (1)
- (b) Derive an expression for self-inductance of a coil. (3)
25. (a) Draw a labelled ray diagram of a compound microscope forming an image at the near point of eye. (2)
- (b) Obtain an expression for the magnification produced by a compound microscope. (2)

Answer any 3 questions from 26 to 29. Each carries 5 scores.

$3 \times 5 = 15$

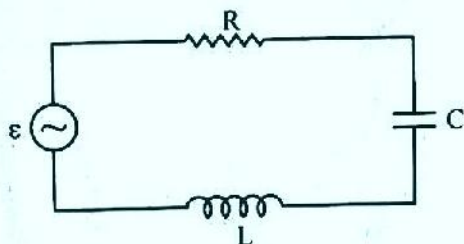
26. (a) What do you understand by the term electric flux ? Write its S.I. unit. (2)
- (b) Using Gauss's theorem, find the electric field intensity at a point
- (i) outside the spherical shell.
  - (ii) inside the spherical shell. (3)

27. A charged particle is entering a uniform magnetic field normally.

- (a) What is the path of the charged particle? (1)
- (b) Is there any change in the kinetic energy of the charged particle? Explain. (1)
- (c) Prove that the frequency of revolution of the charged particle is independent of its velocity. (3)

28. (a) The equation of a.c. is given by  $V = 200\sqrt{2} \sin(100\pi t)$ . Find the r.m.s. value and frequency. (1)

- (b) Figure shows a series LCR circuit connected to a variable frequency. Obtain the impedance of the circuit using phasor diagram. (3)



- (c) What is the value of power factor in the circuit at resonance? (1)

29. (a) Draw the ray diagram to show refraction of light through a glass prism. Hence obtain the prism formula to determine the refractive index of the material of the prism. (3)

- (b) Show graphically the variation of angle of deviation with angle of incidence for a ray of light entering a prism. (1)

- (c) If the refractive index of the material of the prism is 1.49, find the critical angle of the prism. (1)