

HYM

HALF YEARLY EXAMINATION - 2024

12 - Std

PHYSICS

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Time : 3.00 hrs.

Marks : 70

PART- A

Choose the correct answer and write it with option :

15 x 1 = 15

- An electric field $\vec{E} = 10x \hat{i}$ exists in a certain region of space. Then the potential difference $V = V_o - V_A$, where V_o is the potential at the origin and V_A is the potential at $x = 2$ m is:
 (a) 10 V (b) -20 V (c) +20 V (d) -10 V
- Van de Graff Generator is used to produce potential difference of
 (a) 10^4 V (b) 10^{-4} V (c) 10^7 V (d) 10^{-7} V
- In Joule's heating law, when R and t are constant, if the H is taken along the y axis and I^2 along the x axis, the graph is
 (a) straight line (b) parabola (c) circle (d) ellipse
- A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is nearly
 (a) 1.0 A m² (b) 1.2 A m² (c) 0.5 A m² (d) 0.8 A m²
- S.I unit of magnetic flux is
 (a) Wb m⁻² (b) T (c) Wb m (d) T m²
- Fraunhofer lines are an example of _____ spectrum.
 (a) line emission (b) line absorption (c) band emission (d) band absorption
- If the velocity and wavelength of light in air is V_a and λ_a and that in water is V_w and λ_w , then the refractive index of water is;
 (a) $\frac{V_w}{V_a}$ (b) $\frac{V_a}{V_w}$ (c) $\frac{\lambda_a}{\lambda_w}$ (d) $\frac{V_a}{V_w} \frac{\lambda_a}{\lambda_w}$
- A ray of light strikes a glass plate at an angle 60° . If the reflected and refracted rays are perpendicular to each other, the refractive index of the glass is,
 (a) $\sqrt{3}$ (b) $\frac{3}{2}$ (c) $\sqrt{\frac{3}{2}}$ (d) 2
- The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by
 (a) $\lambda_p \propto \lambda_e$ (b) $\lambda_p \propto \sqrt{\lambda_e}$ (c) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$ (d) $\lambda_p \propto \lambda_e^2$
- The ratio between the first three orbits of hydrogen atom is
 (a) 1:2:3 (b) 2:4:6 (c) 1:4:9 (d) 1:3:5
- If the input to the NOT gate is A = 1100, its output is
 (a) 0100 (b) 1000 (c) 1100 (d) 0011
- The technology used for stopping the brain from processing pain is
 (a) Precision medicine (b) Wireless brain sensor
 (c) Virtual reality (d) Radiology
- Binding energy of Helium nucleus is 28.33Mev. Binding energy per nucleon of Helium nucleus is
 (a) 14.16 Mev (b) 7 Mev (c) 7.8Mev (d) 14Mev

14. _____ nature of electron is used in the construction of electron microscope
 (a) Dual nature (b) particle nature (c) wave nature (d) quantum nature
15. A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is
 (a) 1.2 (b) 0.83 (c) 0.12 (d) 0.9

PART-B

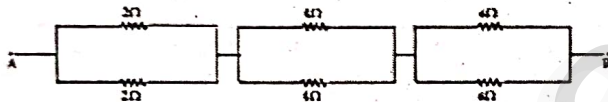
Answer any SIX questions and Question No.19 is compulsory.

16. Define electric flux. Give it's unit. 6 X 2 = 12
17. Why nichrome is used as heating element in electric heaters?
18. Define curie's law.
19. Prove the Boolean identity $AC+ABC = AC$.
20. What are the properties of Nuclear force.
21. Distinguish between Nanoscience and Nanotechnology.
22. Define stopping potential.
23. What is dispersion?
24. Write a notes on Gauss's law in magnetism.

PART - C

Answer any SIX questions and Question No. 29 is compulsory.

25. Derive an expression for capacitance of parallel plate capacitor. 6 x 3 = 18
26. Calculate the equivalent resistance between A and B in the given circuit.



27. Write a short notes on (1) X - ray (2) micro waves.
28. How is a galvanometer converted into an ammeter?
29. A 400 mH coil of negligible resistance is connected to an AC circuit in which an effective current of 6 mA is flowing. Find out the voltage across the coil if the frequency is 1000 Hz.
30. Discuss about Nicol prism.
31. Give the application of photocells.
32. Explain Alpha decay and beta decay.
33. State De Morgan's theorems.

PART-D

Answer all Questions :

5 x 5 = 25

34. a) Calculate the electric field due to a dipole on its equatorial plane. (OR)
 b) Explain about compound microscope and obtain equation for magnification.
35. a) Derive the mirror equation and the equation for lateral magnification. (OR)
 b) How the emf of two cells are compared using potentiometer?
36. a) Obtain an expression for magnetic field due to long current carrying solenoid. (OR)
 b) Give the construction and working of photo emissive cell.
37. a) What is absorption spectra?. Explain their types. (OR)
 b) Explain J. J. Thomson experiment to determine specific charge.
38. a) Draw the circuit diagram of a half wave rectifier and explain it's working. (OR)
 b) Find out the phase relationship between voltage and current in a pure inductive circuit.

M.M. Hr. Sec. School, Thirunagar-Mdu

HALF YEARLY EXAM - 2024

PHYSICS

Std: XII

Answer Key:

PART-A

- | | |
|---------------------------|------------------------|
| 1) a) +20V | a) +20V |
| 2) b) 10^7 V | b) 10^7 V |
| 3) a) நேர்க்கோடு | a) a straight line |
| 4) b) 1.2 Am^2 | b) 1.2 Am^2 |
| 5) a) Tm^2 | a) Tm^2 |
| 6) b) பரி அக்சர்ப்ப | b) line absorption |
| 7) b) $\frac{V_a}{V_w}$ | b) $\frac{V_a}{V_w}$ |
| 8) a) $\sqrt{3}$ | a) $\sqrt{3}$ |
| 9) a) $n_p \propto d_e^2$ | a) $n_p \propto d_e^2$ |
| 10) b) 1:4:9 | b) 1:4:9 |
| 11) a) 0011 | a) 0011 |
| 12) a) அகிர்வியை உணரலா | a) Virtual reality |
| 13) b) 7MeV | b) 7MeV |
| 14) a) அலைவியை | a) Wave nature |
| 15) b) 0.83 | b) 0.83 |

16) PART-B

Electric flux:

No. of electric field lines crossing a given area kept normal to electric field. Unit: Nm^2/C

17) Ni:- Heating Element:-

(i) High specific resistance (ii) Without oxidation.

18) Curie's law: Magnetic susceptibility of Paramagnetic material decreases with increase in temp. $\chi_m \propto 1/T$.

19) $Ac + ABC = Ac$; $Ac(1+B) = Ac \cdot 1$

$Ac \cdot 1 = Ac$ $Ac + ABC = Ac$

20) Properties of Nuclear force: (i) Strongest force in nature (ii) very short range force (iii) attractive force (iv) not acts as e's.

21) Nano Science & Nanotechnology:
Write Any 3 difference

22) Stopping Potential: -ve Potential given to the anode for which the Photo electric current becomes zero.

23) Dispersion: Splitting of white light into its constituent colours.

24) Gauss law: - Write Gauss law in Magnetism.

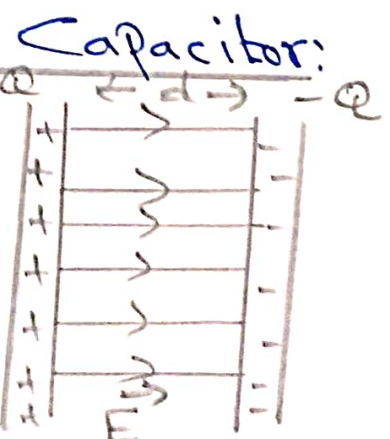
PART-C

25) Capacitance of a Parallel Plate

$$\sigma = \frac{Q}{A} ; E = \frac{\sigma}{\epsilon_0} = \frac{Q}{A\epsilon_0}$$

$$V = Ed = \frac{Qd}{A\epsilon_0} ; C = \frac{Q}{V}$$

$$C = \frac{\epsilon_0 A}{d}$$



26) $\frac{1}{R_{P_1}} = \frac{1}{R_1} + \frac{1}{R_2}$ (ii) $\frac{1}{R_{P_2}} = \frac{1}{4} + \frac{1}{4}$ (iii) $\frac{1}{R_{P_3}} = \frac{1}{6} + \frac{1}{6}$

$\frac{1}{R_{P_1}} = \frac{1}{2} + \frac{1}{2} = \frac{2}{2}$ $\frac{1}{R_{P_2}} = \frac{1}{2}$ $\frac{1}{R_{P_3}} = \frac{1}{3}$

$R_{P_1} = 1\Omega$ $R_{P_2} = 2\Omega$ $R_{P_3} = 3\Omega$

$R = R_{P_1} + R_{P_2} + R_{P_3} = 1 + 2 + 3$

$R = 6\Omega$

27) (1) X-rays (2) Microwaves.
Write 3 Points.

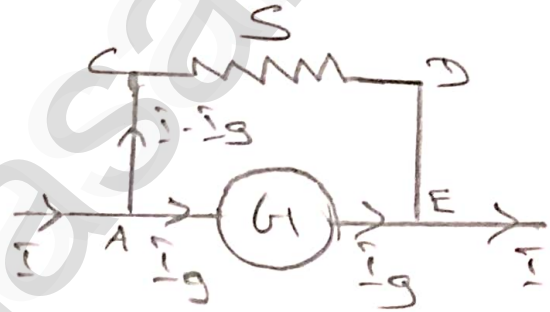
28) Galvanometer converted into Ammeter:

$V_G = V_S$

$(I - I_G) \cdot S = I_G R_G$

$S = \frac{I_G R_G}{I - I_G}$

$\frac{1}{R_a} = \frac{1}{R_G} + \frac{1}{S}$



29) $X_L = \omega L = L \times 2\pi f$

$X_L = 2 \times 3.14 \times 1000 \times 4$

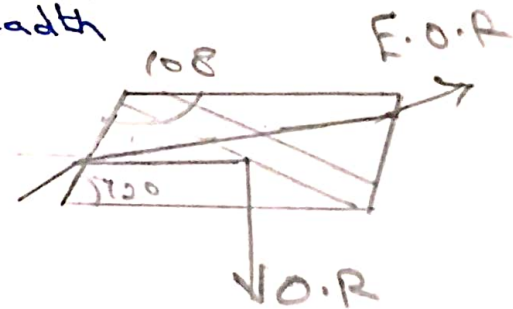
$X_L = 2512\Omega$

$V = I X_L = 6 \times 10^{-3} \times 2512$

$V = 15.072 \text{ Volts}$

30) Nicol Prism: Plc:- Double refraction

- i) 3 times its breadth
- ii) 90° & 108°
- iii) O.R & E.O.R.
- iv) Polariser & Analyser



31) Application of Photo cells:

- i) Switches & sensors
- ii) reproduction sound in Cinematography
- iii) Street light that switch on & off

32) Demorgan's Theorem

- i) $\overline{A+B} = \bar{A} \cdot \bar{B}$
- ii) $\overline{A \cdot B} = \bar{A} + \bar{B}$

34) a) Equatorial Plane:

PART-D

Diagram with Explanation

$$E_+ = \frac{q}{4\pi\epsilon_0(r^2 + a^2)}$$

$$E_- = \frac{q}{4\pi\epsilon_0(r^2 + a^2)}$$

$$E_{tot} = -2E_+ \cos\theta$$

$$E_{tot} = -\frac{P}{4\pi\epsilon_0 r^3}$$

35) b) Comparison of emf using Potentiometer:

Diagram with Explanation

$$E_1 = I r l_1; E_2 = I r l_2$$

$$\frac{E_1}{E_2} = \frac{I r l_1}{I r l_2} = \frac{l_1}{l_2}$$

$$\frac{E_1}{E_2} = \frac{l_1}{l_2}$$

34) b) Compound Microscope:

Diagram with Explanation

$$M_o = \frac{h'}{h}$$

$$f \text{ an } \beta = \frac{h}{f_o} = \frac{h'}{l}$$

$$M_c = 1 + D/f_c$$

$$M = \left(\frac{l}{f_o}\right) \left(1 + \frac{D}{f_c}\right)$$

36) a) Mag. field due to long Current carrying Solenoid:

Diagram with Explanation

$$\oint \vec{B} \cdot d\vec{x} = \mu_0 I_{\text{enclosed}}$$

$$\oint \vec{B} \cdot d\vec{x} = BL; I_{\text{enclosed}} = NI$$

$$BL = \mu_0 NI; B = \mu_0 \frac{NI}{l}$$

$$B = \mu_0 n I$$

35) a) Mirror Equation:

Diagram with Explanation

$$\frac{A'B'}{AB} = \frac{PA'}{PA}$$

$$\frac{A'B'}{AB} = \frac{A'F}{PF}$$

$$PA = -u; PA' = -v; PF = -f$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$M = \frac{-v}{u}$$

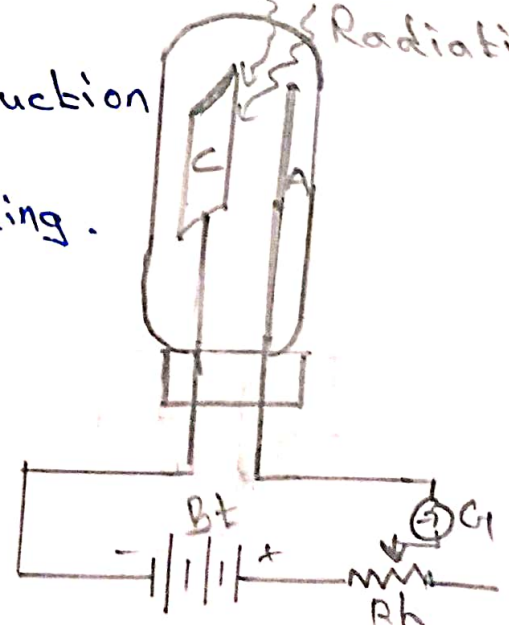
$$M = \frac{f}{f-u}$$

36) b) Photo emissive Cell:

Principle: Photoelectric Effect. Radiation.

i) Construction

ii) Working.



27) Absorption Spectra:

When light is allowed to pass through a absorbing substance.

- Types:-
- i) Continuous Absorption
 - ii) Line Absorption
 - iii) Band Absorption.

37) b) J.J. Thomson e/m:

Principle: Deflection of e^- in both E & B.

Construction & Diagram.

$eE = Bev$

$$v = E/B$$

P.E = K.E

$eV = \frac{1}{2}mv^2$

$\frac{eV}{m} = \frac{v^2}{2}$

$\frac{eV}{m} = \frac{E^2}{2VB^2}$

$$\frac{e}{m} = 1.7 \times 10^{11} \text{ ckg}^{-1}$$

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38) a) Half-Wave Rectifier

Circuit Diagram & Waveforms.

Working:-

$$\eta = \frac{\text{O/P D.C Power}}{\text{i/P A.C Power}}$$

$$\eta = 40.6\%$$

38) b) Pure inductive

Circuit:

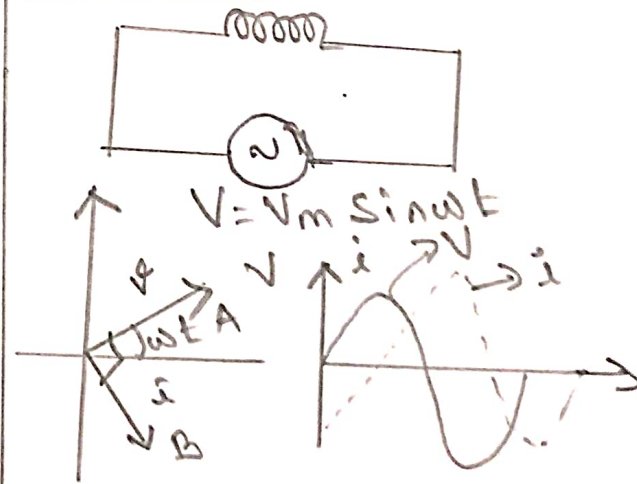
$V = V_m \sin \omega t$; $V + E = 0$

$di = \frac{V_m}{L} \int \sin \omega t dt$

$i = \frac{V_m}{\omega L} (-\cos \omega t) + \text{Const}$

$i = I_m \sin(\omega t - \pi/2)$

$$X_L = \omega L$$



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