

HISSAN CENTRAL EXAMINATION - 2080 (2024)

Class: XII

Subject: Physics

Subject Code: 1021 D2

F.M: 75 (11 Marks Obj+ 64 Marks Sub)

Time: 3hrs

Group A: Multiple Choice Question [11 × 1 = 11] Time: 25 Minutes

Attempt all questions.

Rewrite the correct option in your answer sheet.

1. If L represents angular momentum, I represents moment of inertia, then

$\frac{L^2}{2I}$ represents

- a) Potential Energy b) Torque
c) Angular acceleration d) Rotational Kinetic Energy

2. The total energy of a particle executing SHM proportional to the

- a) Amplitude
b) Maximum velocity of motion
c) Frequency
d) Square of amplitude of motion

3. In a liquid having convex meniscus in a glass surface the angle of contact will be.

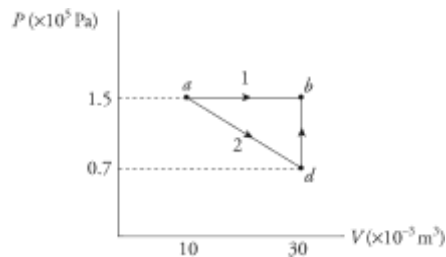
- a) 0° b) 90° c) greater than 90° d) less than 90°

4. In adiabatic process, which relation is correct?

- a) $\frac{T}{P^{\frac{1}{\gamma-1}}} = \text{constant}$ b) $P_1^\gamma V_1^\gamma = \text{constant}$
c) $P_1 V_1 = \text{constant}$ d) $T V^{\gamma-1} = \text{constant}$

5. The value of work done from a to b by a system in the given graph is

- a) 3000J
b) 300J
c) 4000J
d) 5000J



6. The displacement of a particle is given by $y = 5 \times 10^{-4} \sin(100t - 50x)$ where x and y are in metre. The velocity of wave is

- a) 2m/s b) 5m/s c) 3m/s d) 4m/s

7. The first and second resonances are obtained at depth of 21.5cm and 64.5cm in a resonance air column experiment. The third resonance will be obtained at

- a) 98.5cm b) 107.5cm c) 118.5cm d) 88.5cm

8. A potentiometer is more sensitive than a voltmeter because

- a) Voltmeter has very high resistance.
b) Voltmeter has very low resistance
c) Potentiometer does not draw any current from the source of unknown potential difference.
d) Potentiometer has very high resistance.

9. The magnetic field intensity at one end of due to long current carrying solenoid is

- a) $\mu_0 n I$ b) $\frac{\mu_0 n I}{2}$ c) $\frac{\mu_0 I}{2r}$ d) $\frac{\mu_0 n I}{2\pi}$

10. Which substance have high value of susceptibility.....

- a) Cu b) Al c) Na d) Co

11. What is the name of point where seismic wave starts?

- a. Seismic centre b. Hypocenter c. Epicenter d. metacenter

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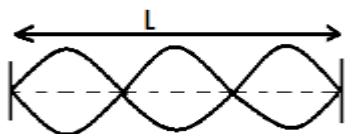
GROUP B

Short Answers Question:

[8 × 5=40]

12. a) Define torque and couple in rotational motion. Also derive an expression for the work done by a couple. [1+2]
b) Bottle cap can be opened easily by using two fingers. Why? [2]
- OR**
- a) Define surface tension. [1]
b) Establish a relation between surface tension and surface energy of a liquid. [2]
c) Two spherical rain drops of equal size are falling vertically through air with a certain terminal velocity. If these two drops were to coalesce to form a single drop and fall with a new terminal velocity. Find the ratio of new terminal velocity of the drop to the original terminal velocity the drop.
13. a) Define the term phase in simple harmonic motion. Write down the displacement equation of SHM with phase difference. [2]
b) A glider with mass $m = 2.00\text{kg}$ sits on a frictionless horizontal air track connected to a spring with force constant $K = 5.00\text{N/m}$. You pull the glider, stretching the spring 0.100m and then releases. The glider begins to move back towards its equilibrium position ($x = 0$). What is its velocity when $x = 0.080\text{m}$? [3]
14. a) Discuss the limitations of first law of thermodynamics. [1]
b) State Kelvin statement of second law of thermodynamics. [1]
c) Draw the P-V diagram of petrol engine. Hence explain its working with the help of the diagram. [3]

15. The following figure shows the certain mode of vibration of stretched string. Study the figure and answer the questions.

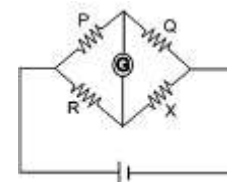


- a) Which mode of the vibration does the figure represent indicate the positions of nodes and antinodes. [1]

- b) Draw the similar figure for the fundamental mode of the vibration and hence obtain the formula for fundamental frequency. [2]
c) Obtain the frequency of the given mode of vibration in terms of fundamental frequency. [2]

16. The following figure shows a Wheatstone bridge circuit. Study the circuit and answer the following questions.

- a) How can we make Wheatstone bridge more sensitive? [1]
b) Write down the balanced condition of Wheatstone bridge. [1]
c) Draw the diagram of Meter bridge and discuss its working to find unknown resistance and resistivity. [3]



17. a) Explain the Bragg's law of diffraction on the basis of atomic planes of a crystal. [3]
b) Calculate the de-Broglie wavelength of an electron which has been accelerated through a potential difference of 200V . ($m_e = 9.1 \times 10^{-31}\text{ kg}$, $h = 6.6 \times 10^{-34}\text{ Js}$) [2]
18. a) What is magnetic flux? Give its SI unit. [1]
b) State the law which is used to design AC generator in a hydropower. [1]
c) A transformer has 800 turns on the primary coil and 50 turns in the secondary coil. What is the output voltage if the input is 3.3KV ? If the transformer is assumed to have an efficiency of 100%, what primary current is required if 1KW is to be drawn from secondary? [2]
19. a) Describe the importance of Millikan's oil drop experiment. In which principle does it work? [2]
b) A beam of electrons is under the effect of $1.36 \times 10^4\text{V}$ applied across two parallel plates 4cm apart and a magnetic field of induction $2 \times 10^{-3}\text{ T}$ at right angles to each other. If the two fields together produce no deflection in the electron beam, calculate the velocity of electrons. What will be the radius of the orbit, if the electric field is made zero? [$e/m = 1.8 \times 10^{-11}\text{ C/kg}$] [3]

OR

- a) What is forward and reverse biasing of a junction diode? [2]

- b) Draw I-V graph of junction diode in forward biasing. How can you find forward resistance of the junction diode using graph? [2]
 c) Give two applications of junction diode. [1]

GROUP C

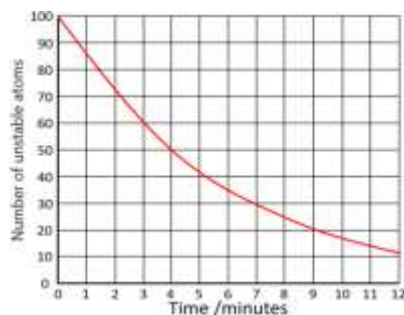
Long Answer Questions. [3 × 8 = 24]

20. a) What are interference and diffraction of light?
 b) Discuss similarities between interference and diffraction. [1]
 c) Explain diffraction pattern due to a single slit and derive the condition of secondary minima. [3]
 d) A diffraction grating has 400 lines per mm is normally illuminated by a monochromatic light of wavelength 600 nm. Calculate the angle of first order diffraction and maximum possible order of diffraction pattern. [2]

21. a) What are the laws of radioactive disintegration? Derive the decay equation. [3]

- b) Discuss the uses of radioactivity in human life. [1]

- c) A graph between number of radioactive sample and time is as shown in figure.



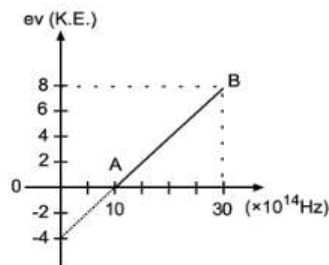
- i. What is the half-life of the sample? [1]

- ii. Calculate the decay constant. [1]

- iii. Write down the scheme of alpha and beta decay from an unstable nucleus. [2]

OR

- a) What is photoelectric effect? [1]
 b) Write the Einstein's photoelectric equation and discuss how it is in accordance with law of conservation of energy? [2]
 c. (i) What does slope of line represent? [1]



- (ii) Write down value of threshold frequency and then obtain value of work function of metal? [2]

- (iii) Determine the value of Planck's constant using the graph. [2]

22. a) State Ampere's circuital law give its limitations. [2]
 b) How can you find the expression of magnetic field due to a
 c) A slice of semiconductor is 2.5 mm thick and carries a current of 140 mA. A magnetic field of flux density 0.5 T, correctly applied produces a maximum Hall voltage of 7.75 mV between the edges of the slice. Calculate the number of free charge carriers per unit volume. ($e = 1.6 \times 10^{-19} \text{ C}$). [3]

OR

- a) Discuss the advantages of AC over DC. [2]
 b) Discuss the phase relation between the voltage and current in the a.c. circuit containing capacitor and resistor in series and hence derive an expression for the impedance for the circuit. [3]
 c) A constant A.C supply is connected to a series circuit consisting of a resistance of 300Ω in series with a capacitance of $6.67\mu\text{F}$, the frequency of the supply being $\frac{300}{2\pi} \text{ Hz}$. It is desired to reduce the current in the circuit to half its value. Show how this could be done by placing an additional resistance in series. Calculate the magnitude of the extra resistance. [3]

THE END