

PRE-BOARD EXAMINATION – 2080 (2024)

Grade: XII

F.M.: 75

Time: 3:00 hrs.

PHYSICS (PHY. 1021)

P.M.: 30

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all questions.

GROUP A

Multiple Choice Questions.

(11×1=11)

Tick the correct answer.

- The graph between length (l) and the time period (T) of simple pendulum executing simple harmonic motion is:
 - hyperbola
 - straight line
 - circle
 - parabola
- A circular disc is rotating with angular velocity ω . If a man standing on the edges of the disc walks towards the centre, then the angular velocity of the disc will be:
 - Decreases
 - Increases
 - be halved
 - not change
- A liquid does not wet the surface of a solid if the angle of contact is:
 - zero
 - $<90^\circ$
 - $>90^\circ$
 - any negative value
- An ideal monoatomic gas is taken round the cycle ABCDA as shown in fig-1. The work done during the cycle is:
 - $P_1 V_1$
 - $(V_2 + V_1) P_2$
 - $(V_2 - V_1) (V_2 - V_1)$
 - $(V_2 - V_1) P_2$
- The law of Kelvin Planck statement about the:
 - Conservation of energy
 - Conservation of heat
 - Conservation of work
 - Conservation of heat into work

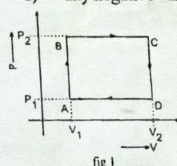


fig 1

A sonometer wire is vibrating in its third overtone, then there are:

- 3 antinode and 4 node
- 3 antinode and 3 node
- 5 node and 4 antinode
- 5 antinode and 4 node

- A beam of light strikes a piece of glass at an angle of incidence 60° . It is found that the reflected beam is completely plane polarized, then the refractive index of glass is:

- 1.5
- $\sqrt{3}$
- 2
- $\frac{3}{2}$

- If a current carrying rectangular coil PQRS is placed near the long straight current carrying conductor (Fig-2), then:

- net force experienced by coil is zero.
- net force is towards the straight conductor
- net force is away from the straight conductor
- none of the above.

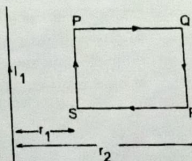


Fig-2

- In the fig-3, AB is a wire of potentiometer with the increase in the value of resistance R, the shift in the balance point I will be:
 - towards B
 - towards A
 - remains constant
 - towards is then back towards A.
- Area of hysteresis curve indicates
 - Retentivity
 - coercivity
 - loss of energy per cycle
 - Gain of energy per cycle
- The point where the seismic waves start is called-
 - epicenter
 - hypocenter
 - metacenter
 - seismic center

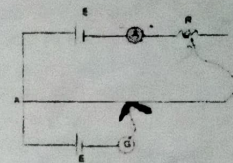


Fig.-3

Group: B

Short Answer Questions.

(8×5=40)

- Define the torque, show that the work done by torque in rotating body through $d\theta$ is $\tau d\theta$. [1+2]
- A grinding stone has moment of inertia 50 kgm^2 . A constant couple is applied to grindstone has found to a speed of 150 rpm, 10 sec after starting from rest. Calculate torque applied. [2]

OR

- A bob in a simple pendulum is a hollow sphere filled with water. A small hole is bored at the bottom of the sphere, and the pendulum is made to vibrate. What happens to the time period? Explain. [2]
- The displacement of an oscillating object as a function of time is as shown in fig-4. Calculate the:
 - Time period. [1]
 - Frequency and angular frequency. [1]
 - Amplitude and maximum velocity. [1]
- What is angle of contact? [1]

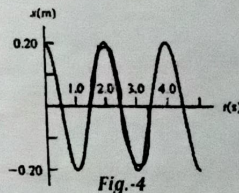


Fig.-4

- Derive an ascent formula for liquid column in capillary tube. [2]
- Three spherical rain drops of equal size are falling vertically through air with terminal velocity of 0.150 ms^{-1} . What would be the terminal velocity if these drops were to coalesce to form a large spherical drop? [2]
- Derive an expression for work done during adiabatic process. [3]
- Air is compressed adiabatically to half of it's volume. Calculate the change in it's temperature. ($\gamma = 1.4$) [2]

- Q16. a) Which mode of vibration does the figure represent and also indicate the position of node and antinodes in fig-5.
- b) Obtain the frequency of the given mode of vibration in terms of fundamental frequency.

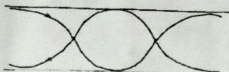


Fig.-5

- c) If the length of given organ pipe is 50 cm. What is the fundamental frequency. [Given, velocity of sound is 350 ms^{-1}]

OR

- a) State Doppler's effect. [1]
- b) Derive the apparent frequency of sound when an observer moves towards a stationary source. [2]

- c) From the given information, as shown in figure, find the apparent frequency heard by observer, where the symbol have their usual meaning. [frequency of sound emitted by source (f) = 500 Hz]. [2]

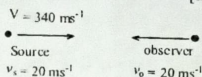


Fig.-6

16. a) What is Wheatstone bridge. [1]
- b) How can we make Wheatstone bridge more sensitive? [1]
- c) By using Kirchhoff's law, derive the balance condition of Wheatstone bridge. [3]
17. a) What is forward biasing in PN junction diode? [1]
- b) Describe with neat diagram, the full wave rectification process by using semiconductor diodes. [3]
- c) Write down the use of filter circuit. [1]
18. a) State Lenz's law. [1]
- b) Explain, how Lenz's law is in accordance with principle of conservation of energy. [2]
- c) A straight conductor of length 25 cm is moving perpendicular to its length with a uniform speed of 10 ms^{-1} , making an angle 45° with a uniform magnetic field of 10 T. Calculate the emf induced across its length. [2]
19. a) Explain the importance of carbon dating. [2]
- b) Calculate the activity of 0.1 mg sample of Sr-90, whose half life period is 28 years. [3]

Group: C

Long Answer Questions.

(3×8=24)

20. a) What is diffraction of light. [1]
- b) Derive the condition for secondary maxima and minima in diffraction pattern due to a single slit. [3]
- c) The diffraction of sound wave is more evident in daily experience than that of light waves. Why? [2]
- d) A plane transmission grating has 5000 lines per cm and the second order spectral line is diffracted through 30° . Calculate the wavelength of light used. [2]
21. a) State Ampere's circuital law. [1]
- b) Write its limitations. [1]
- c) Use this law to calculate the magnetic field at a point on the axis of a current carrying long solenoid. [3]

- d) A circular coil of 100 turns has a radius of 10 cm and carries a current of 5 A. Determine the magnetic field at a point on the axis of the coil at a distance of 5 cm from the center of the coil. [3]

OR

- a) Discuss the advantages of AC over DC. [2]
- b) Derive an expression of impedance in LCR series circuit. [3]
- c) An iron cored coil of 2 H and 50Ω resistance is placed in series with a resistor of 950Ω and 220 V, 50 Hz ac supply is connected across the arrangement. Find:
- the current flowing through the circuit.
 - the voltage across the coil.
 - the phase angle between current and voltage.

[1+1+1]

22. a) Can photoelectric effect be explained on the basis of wave theory of radiation? [1]
- b) Define work function. [1]
- c) Describe Millikan's experiment to determine the value of Planck's constant h. [3]

In an experiment on photoelectric effect, the graph between maximum K.E. (E_k) & frequency f is found to be a straight line shown in fig-7. Compute the value of threshold frequency, Planck's constant and work function. [1+1+1]

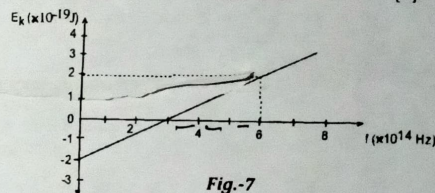


Fig.-7

OR

- a) If a proton & an electron have the same speed which one has the longer de-Broglie wave length? Explain. [2]
- b) Define excitation potential & ionization potential. [2]
- c) In a set of experiments on a hypothetical one-electron atom, you measure the wavelength of the photons emitted from transitions ending in the ground state ($n = 1$), as shown in the energy level diagram. You also observed that it takes 17.50 eV to ionize the atom. Calculate:
- Energy of each level ($n = 1, 2, 3, \& 4$) shown in the fig-8.
 - If the electron made a transition from the $n = 4$ to the $n = 2$ level, what wavelength of light would it emit? [2+2]

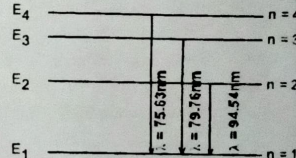


Fig.-8

Best of Luck