

**Model Set-4 (XII Physics)**

Circle the best alternative to the following questions

(11 × 1 = 11)

**Group 'A'**

Answer the following questions.

[8 × 5 = 40]

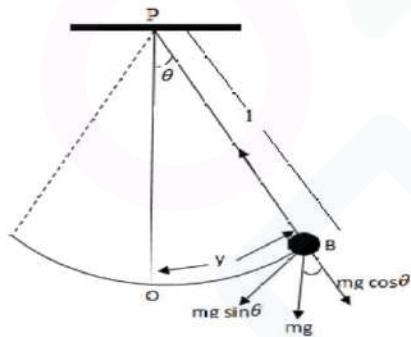
- According to the law of conservation of angular momentum,**
  - $m_1 v_1 = m_2 v_2$
  - $a_1 v_1 = a_2 v_2$
  - $w_1 I_1 = w_2 I_2$
  - $P_1 V_1 = P_2 V_2$
- The displacement of an object attached to a spring and executive simple harmonic motion is given by  $x = 2 \times 10^{-2} \cos \pi t$  (in meter). The time at which the maximum speed first occurs is**
  - 0.5 sec
  - 0.75 sec
  - 0.12 sec
  - 0.25 sec
- Which of the following is true about Viscosity?**
  - It increases with increase in temperature
  - Decreases with decrease in temperature
  - Decreases with increase in temperature
  - Independent of temperature
- If the kinetic energy for the ideal gas is  $\frac{5}{2} RT$ , the molar heat capacity at constant Volume is,**
  - 1.5R
  - 2.0R
  - 2.5R
  - 3.0R
- The more effective way of increasing the efficiency the to Carnot engine is to**
  - Increase higher temperature
  - Decrease higher temperature
  - Increase lower temperature
  - Decrease lower temperature
- A bat emits ultrasonic sound of frequency 1000 kHz in air. If this sound meets a water surface, what will be the ratio of the wavelength of the reflected sound to the transmitted sound? Given speed of sound in air is 340 m/s and in water is 1480 m/s**
  - 1700/7400
  - 170/740
  - 17/74
  - 0.17/0.74
- Which of the following sources gives best monochromatic light?**
  - A ordinary bulb
  - A LED bulb
  - A laser light
  - A mercury tube
- Meissner effect is strictly followed by**
  - Ferromagnetic materials
  - Paramagnetic materials
  - Diamagnetic materials
  - All of above
- If the current  $I$  flows through a circular coil of radius  $r$  then the field at the center of the coil is:**
  - Inversely proportional to  $I^2$
  - Direction proportional to  $I$
  - Directly proportional to  $r$
  - Inversely proportional to  $r^2$
- Power factor of an ac circuit is a measure of**
  - Virtual power
  - Power lost in the circuit
  - Mean power
  - Peak power
- The output of two-input NOR gate is high:**
  - Only if both inputs are high
  - Only if both inputs are low
  - Only if one input is high and other is low
  - If at least one input is high

## Group 'B'

## Short Answer Questions

(8 × 5 = 40)

1. For the streamline flow of an ideal fluid (non-viscous and incompressible), the sum of pressure energy, kinetic energy and potential energy per unit mass is always constant.
- Define the term Streamline flow and how it differs from turbulent flow? [2]
  - Derive the relation between above mentioned energies. [2]
  - What happens to the result obtained in (b) if the fluid is flowing in a horizontal pipe? [1]
2. A simple pendulum is a heavy mass suspended by an inextensible, weightless string from rigid support as shown in figure.
- Define 'point of suspension' and 'point of oscillation'. [1]

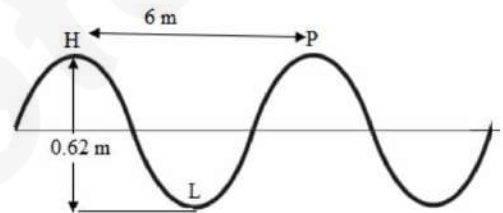


- Explain and prove that the time period of simple pendulum is  $T = 2\pi \sqrt{\frac{l}{g}}$  [2]

- How does the frequency of vibration of a simple pendulum related to its length? Hence estimate the frequency of second pendulum. [2]

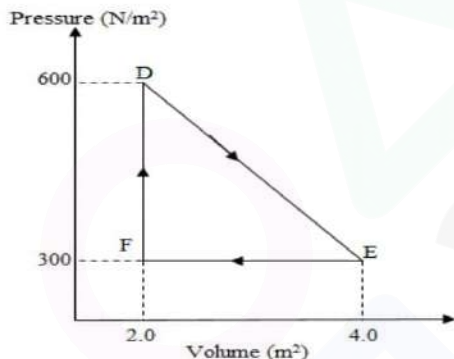
OR

- A fan with blades takes a longer time to come to rest than without blades. Why? [1]
  - Define the radius of gyration and derive the relation between torque and moment of inertia of a rigid body. [3]
  - Calculate the moment of inertia and radius of gyration of a rod in the given case. [2]
3. A fisherman notices that his boat is moving up and down periodically owing to waves on the surface of the water. It takes 2.5 sec for the boat to travel from its highest point to its lowest, a total distance of 0.6 m. The fisherman sees that the wave crests are spaced 6 m apart.

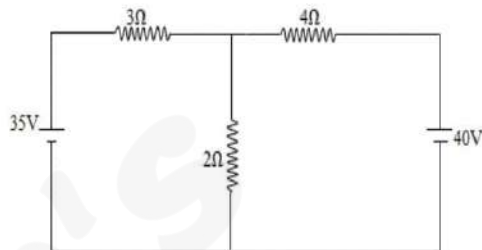


- Define wave and amplitude of wave. [2]
- How fast are the waves travelling? [2]
- What is the phase difference between points H and P, H and L? [1]

4. A thermodynamic process is taken from an original state D to an intermediate state E by the linear process shown in P-V diagram. Its volume is then reduced to the original value from E to F by an isobaric process.
- Define isobaric and isochoric process. [1]
  - The work done in one cycle. [2]
  - What is the molar heat capacity of the gas at constant temperature. [1]
  - If the pressure of a gas during adiabatic process is proportional to cube of its absolute temperature. Find the value of molar heat ratio. [1]



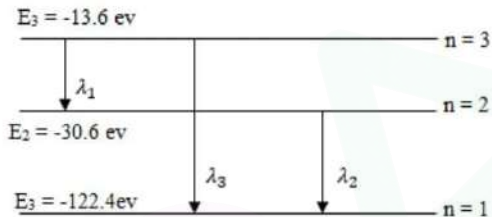
5. Study the following figure and answer the following questions.
- State and explain Kirchhoff's current and voltage laws. [2]
  - Calculate the current in  $2\ \Omega$  resistor in the given circuit. [3]



6. Dip circle measures the angle of dip at the different location of the earth. It is used in surveying, mining and study of earth magnetism.
- Define an angle of dip. [1]
  - Derive the relation;  $\text{Cot}^2\delta = \text{Cot}^2\delta_1 + \text{Cot}^2\delta_2$ , where symbols have their usual meaning. [3]
  - What will be the value of dip angle at the pole and equator of the earth? [2]
7. When x-ray wave travels through a very small aperture, it bends from its original path, this phenomenon is called diffraction of x-ray. Bragg studied and established a mathematical relation between lattice spacing and the wavelength of x-ray.
- What is the basic phenomenon of X-ray production? [1]
  - Derive Bragg's law and explain how is this law used to determine the crystal plane spacing. [2]
  - An X-ray tube operates at 18 kV. Calculate the maximum speed of the electron striking the target. ( $m_e = 9 \times 10^{-31}$  kg,  $e = 1.6 \times 10^{-19}$  C.) [2]

8. A certain atom has energy levels 1, 2 and 3 corresponding to the increasing values of energy  $E_3 > E_2 > E_1$ . If  $\lambda_1$ ,  $\lambda_2$ , and  $\lambda_3$  are wavelengths of radiation as shown in the figure, then calculate the following.

- The longest possible wavelength of the energy emission. [2]
- The shortest possible wavelength of the energy emission. [2]
- Derive the relation of  $\lambda_3$  in terms of  $\lambda_1$  and  $\lambda_2$ . [1]

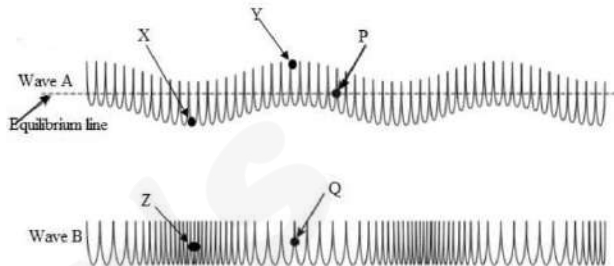


### Group 'C'

#### Answer the following Questions

(8 × 5 = 40)

9. The diagram shows two waves; 'wave A' and 'wave B' are propagating through the medium. Study the figure and answer the following questions.
- Name the point X, Y, Z and Q [1]
  - Identify wave A and wave B and differentiate them. [2]
  - What is polarization of light? State and prove Brewster's law. [3]
  - Calculate the polarizing angle for the light travelling from water of refractive index 1.33 to glass of refractive index 1.53. [2]



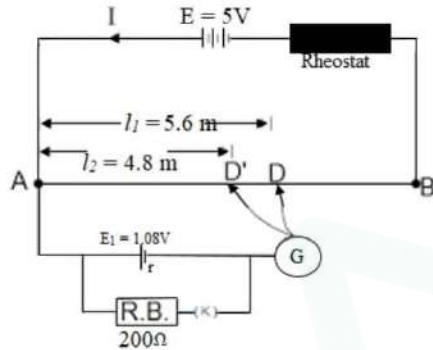
10. a. State and explain Ampere's law [2]  
 b. Use Ampere's law to find magnetic fields due to a solenoid which is bent in a circular shape [2]  
 c. Define one ampere in terms of force. [2]  
 d. A circular coil has 100 turns and a mean diameter of 20 cm. It carries a current of 5A. Find the strength of the magnetic field at a point on its axis at a distance of 15 cm from the center of the coil. [2]

OR

**A potentiometer is given below which is an arrangement and measures the emf of a cell and internal resistance. The galvanometer shows null deflection at D' and D. From the figure below, answer the following questions.**

- What is the principle of potentiometer? [1]
- Show that the internal resistance is  $r = R \left( \frac{l_2 - l_1}{l_1} \right)$ , where symbols have their usual meaning. [3]
- What is the function of galvanometer and rheostat in this arrangement? [2]

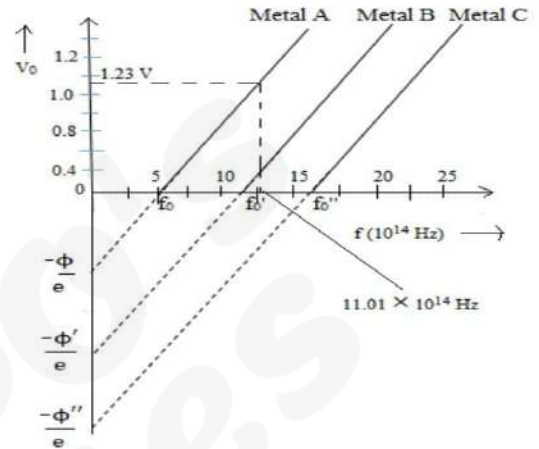
- d. Calculate the internal resistance of the cell from the given data in figure. [2]



11. a. Define seismic wave and hence differentiate between P-wave and S-wave. [2]  
 b. Describe briefly about Gorkha earthquake. [2]  
 c. What is gravitational wave? Write it's any two properties. [2]  
 d. What is nanotechnology? Describe its application. [2]

OR

**Einstein's photoelectric equation was experimentally verified by R. A. Millikan and also determine the value of Planck's constant 'h'. Study the following figure and answer the following questions.**



- a. Describe an experiment to determine the value of the Planck's constant in photoelectric effect. [2]  
 b. Work function of any metal is 1.9 eV, what does it means? Which of three metals A, B and C has higher work function? [2]  
 c. Use the graph for metal A and determine i). threshold frequency ii). Planck's constant. [2]  
 d. What information do you get from slope of the graphs and what does the value the intercept of graph B in the potential axis represents? [2]