AMBITION ACADEMY SECONDARY School

Model Set-2 (XII Physics)

Circle the best alternative to the following questions (11 × 1 = 11)

Group 'A'

Answer the following questions. **[8 × 5 = 40]**

1. **The moment of inertia of a uniform rod of length L and mass M about an axis passing through its one end and perpendicular to its length is,**
   a. $\frac{1}{12}ML^2$ b. ML^2 c. $\frac{1}{3}ML^2$ d. $\frac{1}{6}ML^2$

2. **If the displacement of a particle performing simple harmonic motion is $y = a\cos(\omega t + \varphi)$, the acceleration of the particle is:**
   a. $-\omega^2 a\cos(\omega t + \varphi)$ b. $\omega^2 a\sin(\omega t + \varphi)$
   c. $-\omega^2 a\sin(\omega t + \varphi)$ d. $\omega^2 a\cos(\omega t + \varphi)$

3. **F_1 is the adhesive force between glass and liquid and F_2 is the adhesive force between liquid molecules. When $F_2 = \sqrt{2}\,F_1$ then,**
   a. Liquid makes the concave meniscus
   b. Liquid makes the convex meniscus
   c. Liquid surface remains horizontal
   d. None of the above

4. **If the kinetic energy for the ideal gas is 3/2 RT, the molar heat capacity at constant pressure is,**
   a. 0.5R b. 1.5R c. 2.0R d. 2.5R

5. **A Carnot engine has the same efficiency between 800K to 500K and y K to 600K. The value of y is:**
   a. 472°C b. 687°C c. 846°C d. 960°C

6. **In which of the following condition the Doppler effect is absent?**
   a. The source and observer are moving towards each other
   b. The observer is moving towards the source
   c. The source is moving away from the observer
   d. Neither the source nor the observer is moving relative to one another

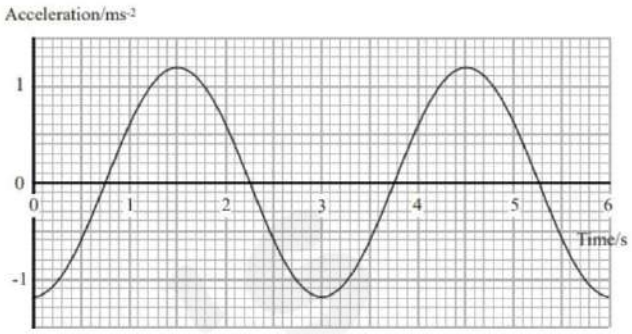
7. **Young's double slit experiment performed inside the water, the fringe width will:**
   a. Decrease b. Increase c. Remains same d. None
8. **Thermopile is used to measure:**
   a. Emf b. Temperature c. Current d. Resistance
9. **The direction of the force F experienced by a charge q moving with velocity v in a magnetic field B is**
   a. Along B
   b. Along v
   c. In the plane containing **B** and v
   d. Perpendicular to the plane containing B and v
10. **In Whitestone's Bridge principle, if the battery and galvanometer are interchanged, the condition for balance**
    a. Is disturbed
    b. Is not disturbed
    c. Depends upon the value of resistance of the bridge
    d. Depends upon the resistance of the galvanometer
11. **The uncertainty principle is applicable to:**
    a. Microscopic articles b. Macroscopic particles
    c. Particle of any size d. Gases

Group 'B'

Short Answer Questions **(8 × 5 = 40)**

1. **If a steel ball is falling through glycerin, it accelerates at first due to gravity and after some time its velocity reaches a steady value called terminal velocity.**
   a. Define the term 'viscosity' and 'coefficient of viscosity. **[2]**
   b. Derive the expression for the terminal velocity of the steel ball. **[2]**
   c. What would be the motion of an object if its density is less than the density of the medium? **[1]**

2. **The waves are being studied by means of a buoy anchored in the harbor. As the waves pass the buoy they make it perform simple harmonic motion in the vertical direction. A sensor inside the buoy measures its acceleration.**
   The graph below shows how this acceleration varies with time.

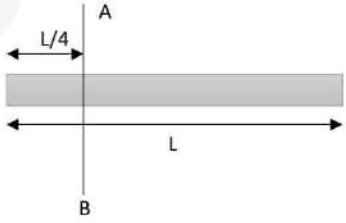


   a. Define simple harmonic motion. **[1]**
   b. State values for the period and maximum acceleration of the buoy. **[2]**
   c. Calculate the amplitude of oscillation of the buoy. **[2]**

OR

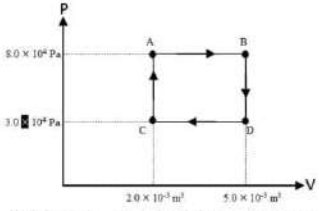
The figure shows a uniform rod PQ of length 'L' and mass 'M' which can rotate about an axis AB which is perpendicular to its length.

   a. Define the term moment of inertia. **[1]**
   b. Calculate the moment of inertia of a rod about the axis AB in the given case. **[2]**
   c. Calculate the moment of inertia and radius of gyration of a rod of mass 20 kg, length 30 cm about an axis passing through the one side and perpendicular to its length. **[2]**

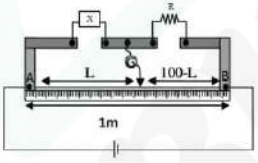


3. a. On which factors speed of sound depends? **[1]**
   b. Describe Newton's formula for the speed of sound and explain why Laplace made correction on it? **[2]**
   c. At what temperature, the velocity of sound in air is increased by 40% to that at 27°C. **[2]**

4. **A series of thermodynamic processes is shown in P-V diagram. In process AB, 150 J of heat is added to the system. Find :**
   a. The internal energy change in process AB. **[2]**
   b. Work done in expanding the gas from B to C. **[1]**
   c. The work done in one cycle. **[2]**

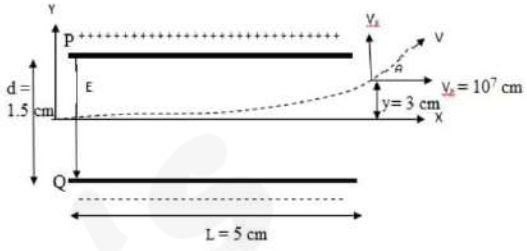


5. **A meter bridge is an electrical instrument which works on the wheatstone bridge principle is used for measuring the unknown resistance 'X' with the help of other known resistance 'R'.**
   a. Derive the expression for unknown resistance 'X' using a meter bridge. **[2]**
   b. What happens to the value of 'X' in equation if position of 'X' and 'R' in the exchanged? **[2]**
   c. If R = 10 Ω and the null deflection point is 60 cm away from point A, what is the value of X?**[1]**



6. **Biot-Savart law is a mathematical tool devised to calculate the magnitude of the magnetic field due to steady current distribution.**
   a. State Biot-Savart law. **[1]**
   b. How this law is used to calculate the magnetic field due to solenoid**?[2]**
   c. The magnetic flux passing perpendicular to the plane of a coil is given by $\emptyset = 4t^2 + 5t + 2$, where $\emptyset$ is in Weber and t in second. Calculate the magnitude of instantaneous emf induced in the coil when t = 3 sec. **[2]**

7. **A beam of electrons is moving with a velocity v_x passes between two horizontal parallel plane as shown:**
   a. Show that the path of an electron in the electric field is parabolic in nature. **[3]**
   b. Study the figure below and calculate potential difference between plates, value of θ and resultant velocity 'v'. **[2]**

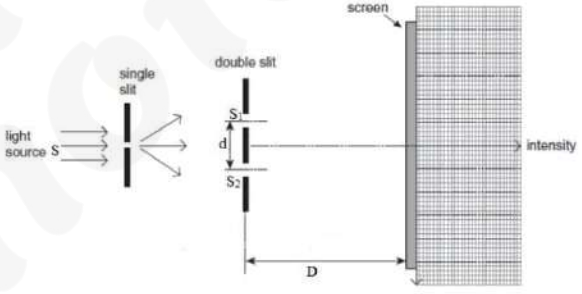


8. **Answer the following questions.**
   a. What do you mean by voltage regulation? **[1]**
   b. Explain the working of a Zener diode as a voltage regulator. **[4]**

Group 'C'

Answer the following Questions **(8× 5 = 40)**

9. The diagram shows Young's double-slit experiment performed with a tungsten filament lamp as the light source.



   a. For an interference pattern to be observed, the light has to be emitted by two coherent sources. What is meant by coherent sources? **[1]**
   b. What do you mean by fringe width? Calculate that, the value of fringe width is $\beta = \lambda D/d$, and show that this value is the same for both bright and dark fringes. **[3]**

c. What happens to the interference fringes if coherent source S is replaced by headlight of vehicles? **[2]**

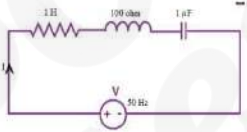
d. A scientist carries out the Young double-slit experiment using a laser that emits violet light of wavelength 405 nm. The separation of the slits is 5.00×10^{-5} m. Using a meter ruler the scientist measures the separation of two adjacent bright fringes in the central region of the pattern to be 4 mm. Calculate the distance between the double slits and the screen. **[2]**

10. Answer the following questions.

a. Define LCR Series circuit. **[1]**

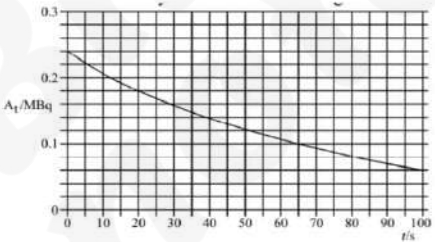
b. Sketch the phasor diagram for R-L, R-C and L-C-R series circuit. **[2]**

c. With circuit diagram show that the impedance of L-C-R series circuit is $Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$, where symbols have their usual meaning also obtain phase factor in this case. **[3]**



d. Study the given diagram and calculate the phase shift between current and voltage. **[2]**

11. A radioactive nuclide decays by emitting α particles. The graph shows how the rate of decay A of the source changes with time t.



a. List out the laws of radioactivity disintegration.[2]

b. Study the given figure and calculate the value of: **[1 + 1+ 1]**

i. Half-life of nuclide

ii. Decay constant

iii. The initial number of undecayed nuclei present at time t = 0.

c. Each decay releases 1.0×10^{-12}J. For the time interval between t = 30s and t = 80s, calculate the number of nuclei that decay and the energy released. **[3]**