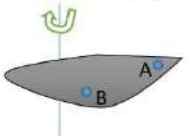
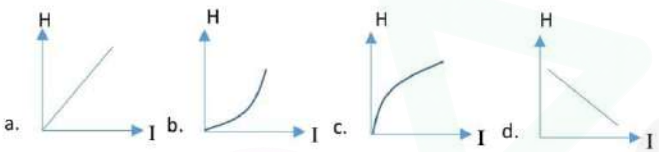
AMBITION ACADEMY SECONDARY School

Model Set-5 (XII Physics)

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

1. **In the figure, A and B are any two particles present in the rigid body which is rotating about the axis. Which of the following is true?**
   a. A and B has same linear acceleration
   b. A and B has same linear velocity
   c. A and B has same angular velocity
   d. The linear velocity of B is more than that of A





2. **A particle executes SHM between $x = -A$ and $x = +A$. The time taken by it to go from $x = 0$ to $\frac{A}{2}$ is T_1 and to go from $\frac{A}{2}$ to A is T_2. Which of the following is correct?**
   a. $T_1 > T_2$ b. $T_1 = T_2$ c. $T_1 < T_2$ d. $T_1 = 2T_2$

3. **A thin wire of length 'L' is bent in the form of circle and dipped inside the soap solution (surface tension = T) so that a thin film of soap forms within the ring. The force with which the film pulls the edge of ring inwards is:**
   a. LT b. 2LT c. $\frac{LT}{2}$ d. $\frac{L}{T}$

4. **A Carnot engine takes 10^3 calories of heat from a reservoir at 227 ^{0}C and rejects heat to a reservoir at 127 ^{0}C. The work done by it is:**
   b. 100 cals b. 200 cals c. 300 cals d. 400 cals

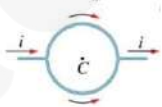
5. **A gas is expanding adiabatically. Which of the following is correct?**
   a. It does work by absorbing heat from the surrounding
   b. It does work in expense of its internal energy
   c. The gas does not perform any work
   d. The gas releases its excess energy to the surrounding

6. **Two pipes, one closed and the other open, vibrate with the same fundamental frequency. If the length of the closed pipe is 30 cm, the length of open pipe is:**
   b. 15 cm b. 60 cm c. 45 cm d. 50 cm

7. **A ray of light is incident on air-medium interface at a glancing angle of $'\alpha'$ so that the reflected light is completely plane polarized. The refractive index of the medium is:**
   a. $sin\alpha$ b. $tan\alpha$ c. $cot\alpha$ d. $cos\alpha$

8. **The heat produced 'H' on a given resistor of resistance 'R' for a given time has which of the following dependence with the current 'I' passing through it?**

9. **A straight conductor carrying current 'I' is split into circular loop as shown in the figure. The magnetic induction at the center of the loop is:**



   a. $\frac{\mu_0 i}{2r}$ b. $\frac{\mu_0 i}{2\pi r}$ c. $\mu_0 i$ d. Zero

10. **A long magnet is cut into two parts such that the ratio of their lengths is 2:1. The ratio of pole strength of the both sections is:**
    b. 1:2 b. 2:1 c. 1:4 d. 1:1

11. **According to the standard model, which particle gives other particles their mass?**
    a. Fermions b. Bosons c. Higgs Bosons d. Leptons

Group B: Short answer Questions (8 × 5 = 40)

1. **Answer the following questions.**
   a. What do you mean by capillarity? **[1]**
   b. Obtain the expression of height of liquid raised inside the capillary tube of radius 'a'. **[3]**
   c. In what case the liquid level depresses inside the capillary tube? Use the relation obtained in part (ii) to justify your answer. **[1]**

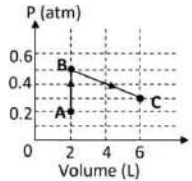
2. **Answer the following questions.**
   a. State the principle of conservation of angular momentum. **[1]**
   b. If the earth suddenly shrinks, what happens to the length of the day? Explain.**[1.5]**
   c. An electron is orbiting around the nucleus in a hydrogen atom. The radius of first Bohr's orbit is $0.529\ \overset{0}{A}$, charge of electron is 1.6×10^{-19}C and mass of electron is 9.1×10^{-31} kg.
      (a) Calculate the moment of inertia of electron about the nucleus. **[1]**
      (b) Calculate the velocity of electron and obtain the value of orbital angular momentum. **[1.5]**

OR

   a. Distinguish between streamlined and turbulent flow of fluid. **[1]**
   b. Why does airplane run before taking a lift? Explain. **[2]**
   c. Rain drops each of radius 1mm are falling with steady velocity of 5 cm/s. Eight such drops coalesce to form a single drop, calculate its terminal velocity. **[2]**

3. Answer the following questions.
   a. What do you mean by polarization of light**? [1]**
   b. State and explain Brewster's law. **[3]**
   c. What is the refractive index of material for which polarizing angle id 30^0? **[1]**

4. **The process ABC shown in the P-V diagram in figure involves 0.0175 mole of an ideal gas.**



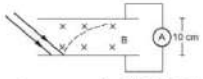
   a. **State first law of thermodynamics and explain its significance.**
   b. What was the lowest temperature the gas reached in this process? Where did it occur? **[1.5]**
   c. How much work was done by or on the gas from A to B? From B to C**?[2]**
   d. If 215 J of heat was put into the gas during abc, how many of those heat will convert into the internal energy? **[1.5]**

5. **Answer the following questions.**
   a. A current carrying wire placed in a magnetic field experience a force. Why? Explain**. [1]**
   b. How does a rectangular coil placed in a uniform magnetic field experience torque? Explain with figure and necessary calculations. **[2]**
   c. Your friend ascertains that he can measure the value of magnetic field at a region of space with the help of a conducting wire, a source, some pieces of resistors, some known weights, voltmeter, and ammeter. Do you agree with him? How? **[2]**

6. **Adjacent figure shows a square loop having 100 turns, an area of 2.5×10^{-3} m^2 and a resistance of 100 Ω. The magnetic field has a magnitude B = 0. 40 T. The loop is slowly and uniformly pulled out of the field in 1.0 s.**

   a. What is the e.m.f. induced in the left arm of the loop? Why is this e.m.f. induced? **[1+1=2]**
   b. What current flows through the loop**?[1]**
   c. How much force does the magnetic field exert on the left arm of the loop**?[1]**
   d. How much work has been done to pull the loop out of the magnetic field**?[1]**

7. **Answer the following questions.**
   a. What do you mean by the *photoelectric work function* of the material? **[1]**
   b. Alkali metals are mostly used to make photocells, why? Explain. **[1]**
   c. In the figure, two metallic plates are 10 cm apart and are connected with the ammeter A. A magnetic field (**B**) exists parallel to the plates as shown. The work function of the emitter (lower plate) is 2.39 eV and the wavelength of light falling varies between 400 nm to 600 nm. Calculate the minimum value of **B** so that the ammeter shows zero reading. **[3]**



8. **Answer the following questions.**
   a. Balmer series was observed and analyzed before the other series. Can you suggest a reason for such an order? **[1]**
   b. Obtain the wavelength in a hydrogen spectrum that lies within the range of 500 nm to 700 nm. **[2]**
   c. Can you apply Bohr's atomic model to calculate the energy of valance electrons in He atom as similar to H-atom? Do you think any necessary modifications in the Bohr's theory for such a case? Explain. **[2]**

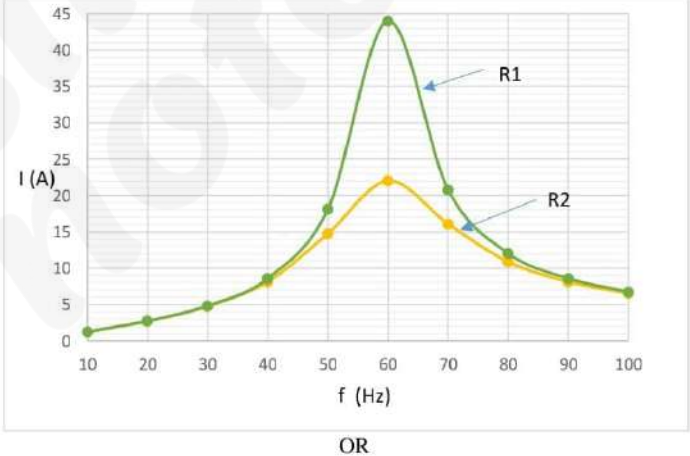
OR

   a. Give the logic symbol and truth table of NOR gate. **[1+1]**
   b. The PN junction diode allows only the unidirectional flow of current. Explain the detailed mechanism of this process with necessary diagrams. **[3]**

Long answer Questions ($3 \times 8 = 24$)

9. **The equation of plane progressive wave travelling in a medium in its standard form is given by $y = Asin(\omega t - kx)$ where symbols have their usual meanings.**
   a. Show that particles of the medium vibrate simple harmonically. **[2]**
   b. When the sound wave in the form of the given equation travel in the medium, the variation of pressure in a medium takes place. Show that, the change in pressure occurs according to: $P = P_0 Cos(\omega t - kx)$, where $P_0 = BAk$ is the pressure amplitude and B is the bulk modulus of the medium. **[3]**
   c. For a person with normal hearing, the faintest sound that can be heard at a frequency of 400 Hz has a pressure amplitude of about 6×10^{-5} Pa. Calculate the corresponding intensity and intensity level. (take speed of sound 344 m/s and density of air 1.2 kg/m^3). **[1.5+1.5 =3]**

10. **The graph below shows two curves showing the variation of current with the frequency of ac through a LCR series circuit. The lower curve corresponds to the resonance when resistor R_2 is used and the upper when the resistor R_1 is used.**
   a. What do you mean by resonance in LCR circuit? **[1]**
   b. Show that the frequency at which resonance occurs is: $f = \frac{1}{2\pi\sqrt{LC}}$, where symbols carry their usual meanings. **[2]**
   c. Obtain the resonating frequency from the graph below. **[1]**
   d. Which is greater, R_1 or R_2? Justify your answer. **[1]**
   e. The inductor used has inductance of 0.08H. Find the capacitance of the capacitor used. **[2]**
   f. What would be the effect in the peak of the upper curve if some resistor is connected parallel to R_1? **[1]**



OR

a. Write one advantage of Ampere's circuital law over the Biot-Savart's law in the calculations of magnetic fields due to current carrying wires. **[1]**

b. Using this law, find the expression of the magnetic field (B) at a point 'r' distance away from the straight wire carrying current. **[2]**

c. Plot a graph to show how 'B' varies with 'r'. **[2]**

d. Two parallel wires carry 12A and 8A currents in the same direction. If the wires are 10 cm apart, find where a third parallel wire also carrying current must be placed so that the force experienced by it shall be zero. **[3]**

11. Answer the following questions.

a. What do you mean by specific charge of electron**?** Are specific charges of electron and proton equal**? [1+1=2]**

b. How did J. J. Thomson measure the velocity of such a high-energy electrons in his experiment? Explain. **[1]**

c. Suppose a beam of electrons enters into the region of uniform magnetic field which is perpendicular to the direction of the motion of electrons. Explain how the path of electron beam becomes circular. **[2]**

d. Considering the case as in part (iii), show that the frequency of the electron in circular path is independent of the velocity**. [3]**

OR

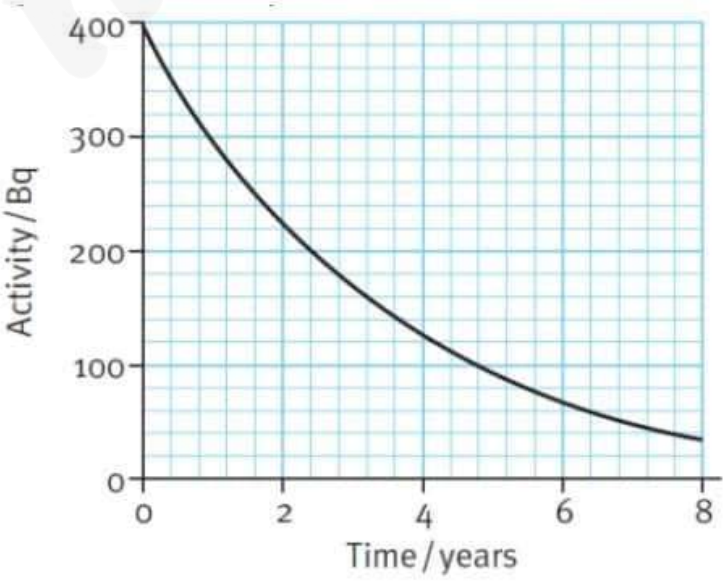
The following graph shows the decay of radioactive caesium $_{55}Cs^{134}$. Study the following graph and answer the questions.

a. Heavy, unstable nuclei usually decay by emitting an α or β particle. Why don't they usually emit a single proton or neutron? **[2]**

b. Find the half-life period of Cs. **[1]**

c. Write an equation which represents the given graph. **[1]**

d. What is initial number of atoms present in the sample? **[2]**



e. Find the number of atoms present in the sample after 4 years have elapsed. **[2**