Grade: XII Subject: Physics (102)
Full marks: 75 (11 marks Obj+ 64 marks Sub)   **Time: 3 Hours**
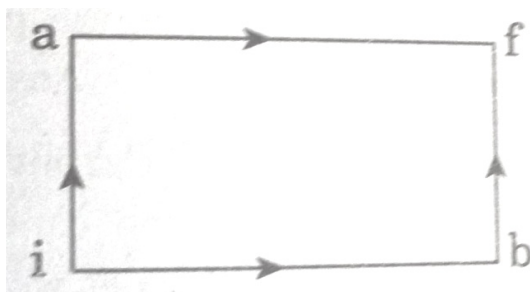
Attempt all the questions:

Group "A"

Rewrite the correct option in your answer sheet: **11X1=11**
1)   The internal energy of an ideal gas depends upon
        a. temperature   b. Pressure
        c. Volume   d. both (a) and (b)
2)   When a system is taken from initial state i to final state f along the path iaf, it is found that
        Q = 50Cal and w = 20 Cal. Along the path ibf Q = 36 Cal, then w along the path ibf is:

        a. 56 Cal   b. 16 Cal   c. 14 Cal   d. 6 Cal

3)   A wave is represented by the equation $y = 7\sin\left(7\pi t - 0.04x + \dfrac{\pi}{3}\right)$, where x is in meters and

    t is in seconds. The speed of the wave is
        a. $175\pi m/s$ b. $49\pi m/s$ c. $\dfrac{49}{\pi} m/s$ d. $0.28\pi m/s$

4)   Following graph shows the variation of velocity with temperature. The correct answer is:

(a)   (b)

(c)   (d)
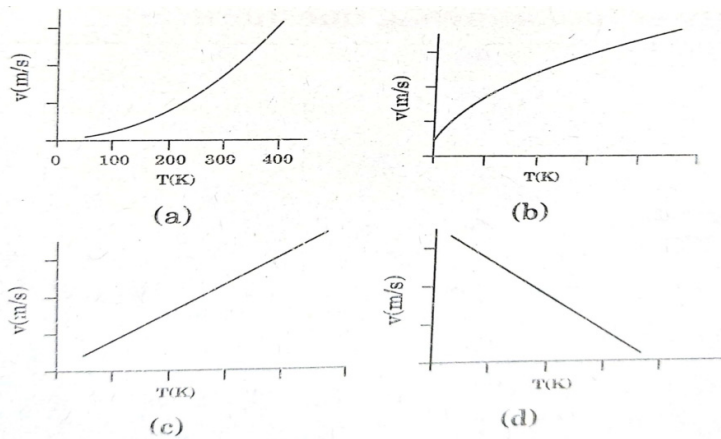
5) A closed organ pipe and an open organ pipe have their first overtime identical in frequency. Their lengths are in the ratio
    a. 1:2   b.2:3   c.3:4   d. 4:5

6) Which can produce maximum pitch of sound?
    a. lion   b.man   c.woman   d. mosquito

7) Huygen's wave theory of light cannot explain
    a. diffraction   b. interference   c.polarization   d. Photoelectric effect

8) A cell has an emf of 1.5 V when short circuited, it gives a current of 3A. the internal resistance of the cell is:
    a. 0.5Ω   b. 2.0Ω   c.4.5Ω   d. 1.5Ω

9) When the temperature of a semiconductor is increased, it's electrical conductivity
    a. increases   b. remains same
    c.decreases   d. first increases then decreases

10) An LCR series circuit, the capacitance is made one fourth when in resonance. Then what should be the change in inductance so that the circuit remains in resonance.
    a. 4 times   b. ¼ times   c.8 times   d. 2 times

11) What are bosons?
    a. elementary crew members on merchant vessels.
    b. Subatomic particles that carry forces
    c. A term in particle physics used to describe matter.
    d. An electron switch used in nano circuits.

Group "B"

Short answer questions: **8X5=40**

1.

a) Describe angular simple harmonic motion.   1

b) Differentiate between simple harmonic and angular harmonic motion.   2

c) A particle executes S.H.M. in a line 4 cm long. Its velocity when passed through the center of the line is 12 cm/s. Find the period.

OR

a) State the law of flotation.   1

b) Establish the relation between surface tension and surface energy.   2

c) Find the work done in blowing a soap bubble of surface tension 0.06 Nm^{-1} from 2 cm radius to 5 cm radius.   2

2.

a) State Second law of thermodynamics. 1

b) What do you mean by a heat engine and it's efficiency? 1

c) A carnot engine whose high temperature reservoir is at 400 k takes in 100 calories of heat at this temperature in each cycle and gives up 80 cal to the low temperature reservoir. What is the temperature of the latter reservoir? What is the thermal efficiency of the cycle? 3

3.

a) Define Doppler effect. 1

b) Two vibrating turning forks have identical frequencies, but one is stationary and the other is mounted at the rim of a rotating platform. What does a listener hear? Explain. 2

c) If a listener L is at rest and the siren is moving away from L at 30m/s. what frequency does the listener hear? 2

4.

a) What are coherent sources? 1

b) Does the interference of light waves obey the law of conservation of energy? Explain. 2

c) Two sources give interference patterns which are observed on a screen. D is distance apart from the sources. The fringe width will be 2w. If the distance D is now doubled, what will be the fringe width? 2

5.

a) Write about Wheatstone bridge. 1

b) Show the circuit diagram with the balance condition of Wheatstone bridge. 1

c) The four arms of a Wheatstone bridge in figure have the following resistances, AB = 100W, BC = 10W, CD = 5 W, DA = 60W. The galvanometer of 15W resistance is connected across BD. Calculate the current through the galvanometer when the potentical difference of 10v is maintained across AC.

OR
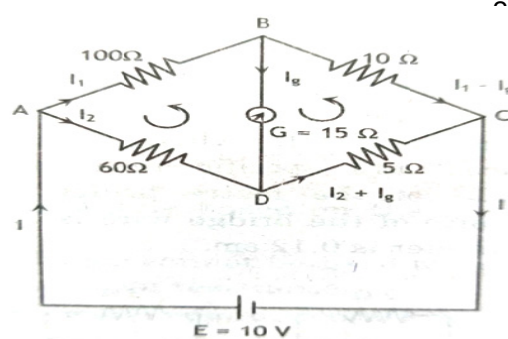
a) What is a thermocouple? 1
b) Discuss the variation of thermo emf in a thermocouple with the change in temperature. 2
c) Generally, Sb-Bi thermocouple is preferred in all experimental work, why? Explain. 2

6.
   a) Write the expression for the force on a charge q moving with a velocity v in a magnetic field B.   1
   b) State and explain the right hand rule for finding the direction of magnetic force on a moving charge in a magnetic field.   2
   c) What is the force on a wire of length 4 cm placed inside a solenoid near its center making an angle 60^0 with the axis? The wire carries a current of 12A and the magnetic field due to solenoid has magnitude of 0.25T.   2
7.
   a) Draw a neat labeled diagram of Millikan's oil drop experiment set up for determination of charge on an electron.   1
   b) What is the nature of the path for electrons in electric and magnetic fields?   1
   c) An electron moves in a circular path of radius 20 cm in a uniform magnetic field of 2×10^{-3} T. Find the speed of the electron and period of revolution.   3
8.
   a) What is the depletion layer?   1
   b) Why is NOT gate called an inverter?   1
   Explain operations of AND, OR and NAND gates with a truth table and circuit diagram.

Group "C"

Long answer questions: 3X8=24

9)
   a) Define angular momentum.   1
   b) State and prove the principle of conservation of angular momentum.   2
   c) Does the angular momentum of a body moving in a circular path change? Give explanation to your answer.   2
   d) A ballet dancer spins about a vertical axis at 1 r.p.s. with her arms outstretched with her arms folded her moment of inertia about the vertical axis decreases by 60%. Calculate the new rate of revolution.   3
10)
   a) State Lenz's law of electromagnetic induction.   1
   b) How will you verify it experimentally.   2
   c) Show that Lenz law is in accordance with the law of conservation of energy.   2
   d) An aeroplane with wing span 50 m flying horizontally with a speed of 360 km/hr. over the earth's magnetic field is 0.4 T. find the potential difference between the tip of the wings.

OR

   a) What is meant by magnetic hysteresis?   1
   b) Sketch a typical hysteresis curve and explain what can be deduced from this about the magnetic properties of the material.   2
   c) Can we have magnetic hysteresis in paramagnetic or diamagnetic subsjatces?2
   d) A soft iron ring has a mean diameter of 0.2 m and an area of cross-section of $5 \times 10^{-4} m^2$. It is uniformly wound with 2000 turns carrying a current of 2A and the magnetic flux in the iron is 8×10^{-3} Wb. What is the relative permeability of the iron?   3

11)
   a) What do you mean by radioactivity?   1
   b) Explain radioactive disintegration law and derive decay equation.   3
   c) What is health hazard of nuclear radiation and what are safety precautions?   2
   d) The half life of radius is 1600 yrs. What is the fraction of sample undecayed after 6400 yrs?   2