

Physics

- (a) Mention the characteristics of a simple harmonic motion. Give three examples of such motion.

(b) A particle of mass 0.2 kg executes simple harmonic motion along a path of length 0.2 metres at the rate of 600 oscillations per minute. Find the kinetic and potential energies in Joules when the displacement is $x = A/2$, where A stands for the amplitude.

(c) Show that for a particle hanging on a string of length l the motion along a vertical circle can just be maintained only when its horizontal velocity at the lowest point is equal to $\sqrt{5gl}$, g being the acceleration due to gravity.
- (a) Distinguish between a stationary wave and progressive wave.

(b) At what temperature sound travels in nitrogen with the same velocity as in oxygen at 31°C , given that the atomic weights of the gases are 14 and 16 respectively.

(c) The 50 cms long identical sonometer wires are stretched by the same tension to give a note of frequency 300. By how much should the length of one of them be increased to give 5 beats per second?
- (a) Distinguish between an ideal gas and a real gas. Explain the significance of Boyle temperature.

(b) A gas is allowed to expand adiabatically and reversibly. What is the change in entropy?

(c) One gm molecule of a gas expands isothermally to twice its initial volume, Calculate the change in its entropy in terms of the gas constant.
- (a) Find the capacity of a spherical conductor.

(b) Sixty four bubbles of water having equal radii and equal and similar charges unit to form a large bubble. How will the electric potential change?

(c) A $1\ \mu\text{F}$ capacitor and $2\ \mu\text{F}$ capacitor are connected in series across a 240 volt line. Find the charge on each capacitor.
- (a) Draw diagrams to show the lines of force due to a bar magnet with its north pole pointing north. Locate the neutral points.

(b) When a magnet of magnetic moment M is placed in a uniform magnetic field of intensity H with its axis making an angle of θ with the direction of the field. Find the moment of the couple acting on the magnet.

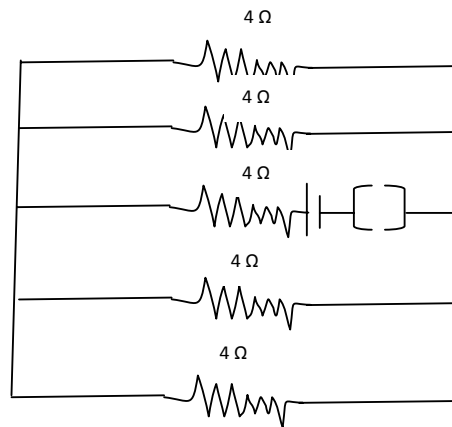
(c) A bar having negligible breadth and thickness has a period of vibration 2 second in a horizontal plane. It is broken into two equal pieces. Find the period of oscillation of each piece.
- (a) What is Seebeck effect ? How can you demonstrate it?

(b) Two electric bulbs, each designed to operate with a power of 500 watts in a 220 volt line, are put in series in a 110 volt line.
What will be the power generated by each bulb?

(c) A coil of resistance $25\ \Omega$ generates, 25,200 calories of heat per minute. Find the voltage across the coil.

Physics

7. (a) Discuss deviation without dispersion stating its conditions.
(b) If A be the angle of the prism, μ be the refractive index and δ be the deviation of a refracted ray through the prism, prove that for a very thin prism and small angle of incidence $\delta = (\mu - 1) A$.
(c) A candle is placed at a distance 3ft from the wall. Where a convex lens of focal length 8 inches must be placed so that a real image is formed on the wall?
8. (a) State Faraday's two laws of electrolysis. How can you verify the laws experimentally?
(b) Apply Lenz's law to find the direction of current induced in a coil when the south pole of magnet is (i) brought near it (ii) taken away from it.
(c) Five 4Ω resistances and 2 V battery and an ammeter are connected as shown in the figure. Find the ammeter reading.



9. (a) Explain the function of a grid in a triode valve.
(b) With the necessary circuit diagram describe working of a full wave rectifier.
(c) The slope of the anode current-grid potential curve of a triode valve is 2 mA/volt and the slope of the anode current –anode potential curve is 0.25 mA/volt. Calculate the amplification factor of the valve.
10. (a) What do you understand by the diffraction of the X-ray ? Discuss Bragg's law.
(b) The radius of the 1st Bohr orbit of hydrogen atom is 0.53 \AA . What is the radii of its second and third orbits?
(c) What does x represents in the following reaction ?
 ${}_4\text{Be}^9 + {}_2\text{He}^4 \rightarrow {}_6\text{C}^{12} + x$