



GEMS SCHOOL

Dhapakhel, Lalitpur

Model Question

SET – 6

PHYSICS

Class: XI
Time: 3:00 hours

Full Marks: 75
Pass Marks: 27

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Group 'A'

1. Answer, in brief, any **SIX** questions. [6×2=12]
- a) The displacement of an oscillator is given by $x = x_0 + B_1 \cos \omega_1 t + \frac{B_2^2}{B_1^2} \cos \omega_2 t$. Here x is measured in meter and t is measured in seconds. Find the dimensional formula x_0 , B_2 and ω_2 .
- b) At what angle two forces of magnitude $(P+Q)$ and $(P-Q)$ act, so that their resultant is $\sqrt{3P^2 + Q^2}$?
- c) A boat wants to take his boat to a point just opposite on the other bank of the river with water flowing its usual course. How should he row and why?
- d) No energy is consumed in planetary motion. Why?
- e) Why is ladder more apt to slip when a person is high upon it than when he just begins to climb?
- f) Explain why steel is said to be more elastic than rubber.
- g) Small air bubbles rise slowly while big bubbles rise rapidly through the liquid. Why?
2. Answer, in brief, any **TWO** questions. [2×2=4]
- a) The difference between length of a certain brass rod and that of a steel rod is claimed to be constant at all temperatures. Is this possible?
- b) Why are dews formed in the early morning hours and mostly on the grass blades but not on tree leaves?
- c) Why do diesel engines need no spark plugs?

3. Answer in brief, any **ONE** question. [1×2=2]
- a) A glass prism is immersed in water. What happens to the value of angle of minimum deviation?
- b) What happens to the illuminance of a surface decrease as it is moved away from the light source?
4. Answer in brief any **ONE** question. [1×2=2]
- a) Why can more charge be placed on a metal if it is highly polished than when its surface is rough?
- b) Calculate the ratio of maximum capacitance to the minimum capacitance of the circuit when n number of capacitors each of capacitance C are connected.

Group 'B'

5. Answer any **THREE** questions. [3×4=12]
- a) Define centripetal and centrifugal forces. Calculate the force acting on a body moving with a uniform speed along a circular path.
- b) What is geostationary satellite? Obtain an expression for the total energy of a satellite orbiting round the earth.
- c) Define SHM. Derive a relation for total energy of a simple harmonic oscillator. Show that the particle obeys the law of conservation of energy.
- d) Define the terms: torque, couple and moment of a couple. Derive an expression for the work done by a couple.
6. Answer any **TWO** questions. [2×4=8]
- a) Define the coefficient of thermal conductivity. Describe Searle's method of determining thermal conductivity.
- b) Define linear and cubical expansivities of solid, and establish a relation between their coefficients
- c) What are reversible and irreversible processes? Derive an expression for the work done by an ideal gas during isothermal expansion.

7. Answer any **ONE** question. [1×4=4]
- a) What is chromatic aberration? Show that for a lens, the chromatic aberration is the product of dispersive power and focal length of mean light.
 - b) Describe the construction and working of a compound microscope and hence derive an expression for its magnifying power.

8. Answer any **ONE** question. [1×4=4]
- a) Define electric field intensity and potential gradient. Establish a relation between them.
 - b) Define potential difference. Derive an expression for the potential difference formula and hence obtain the potential at point due to a point charge.

Group 'C'

9. Answer any **THREE** numerical questions: [3×4=12]
- a) A batter hits a baseball so that it leaves the bat with an initial speed 37 m/s at an angle of 53° . Find the position of the ball and the magnitude and direction of its velocity after 2 seconds. Treat the baseball as a projectile.
 - b) A stationary mass explodes into two parts of mass 4 units and 40 units respectively. If the larger mass has an initial K.E. 10J, what is the initial kinetic energy of the smaller mass?
 - c) Calculate the acceleration of a block sliding down a slope of 30° . Given coefficient of friction is 0.25 and $g = 9.8 \text{ ms}^{-2}$.
 - d) Water enters a house through a pipe with an inside diameter of 2.0 cm at an absolute pressure of $4.0 \times 10^5 \text{ Pa}$. A 1.0 cm diameter pipe leads to the second floor bath room 5.0 m above. If the flow speed at the inlet pipe is 1.5 m/s, find flow speed, pressure and volume flow rate in the bath- room.

10. Answer any **TWO** numerical questions: [2×4=8]
- a) Determine the final result when 400 gm of water and 100gm of ice at 0°C are in a copper calorimeter of mass 500 gm into which is 10 gm of steam at 100°C is passed. (sp. Heat of copper= $400 \text{ Jkg}^{-1}\text{K}^{-1}$, specific latent heat of ice= $3.34 \times 10^5 \text{ Jkg}^{-1}$, specific latent heat of steam= $2.26 \times 10^6 \text{ Jkg}^{-1}$)
 - b) At what temperature will the average speed of oxygen molecule be sufficient so as to escape from the earth? (escape velocity from the earth is 11.2 Km/s and mass of one oxygen molecule is $53.4 \times 10^{-24} \text{ gm}$)
 - c) 16 gm of oxygen having volume 0.02 m^3 at a temperature of 27°C and pressure of $2 \times 10^5 \text{ Nm}^{-2}$ is heated at constant pressure until its volume increases to 0.03 m^3 . Calculate the external work done and increase in internal energy of the gas if its Molar heat capacity at constant volume is $0.8 \text{ J mol}^{-1} \text{ K}^{-1}$ and Molar mass of oxygen is 32.

11. A convex lens of focal length 24 cm (refractive index = 1.5) is totally immersed in water (refractive index = 1.33). Find its focal length in water. [4]

12. A thundercloud and the earth can be regarded as a parallel plate capacitor. Taking the area of the thundercloud to be 50 km^2 , its height above the earth as 1 km and its potential as 100 kV, calculate the energy stored in it. [3]

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