



GEMS SCHOOL

Dhapakhel, Lalitpur

Model Question SET -4

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.

[6x2 =12]

- Is dimensionally correct equation necessarily be a correct physical relation? What about dimensionally wrong equation?
- \vec{C} is the vector sum of \vec{A} and \vec{B} i.e. $\vec{C} = \vec{A} + \vec{B}$ for $C=A+B$ to be true, what is the angle between \vec{A} and \vec{B} ?
- It is easier to pull a heavy load than to push it. Why?
- A person in an artificial satellite revolving around the earth feels weightlessness, why?
- Why a wrench of longer arm is preferred more?
- Why suction effect is experienced by a person standing close to a platform at a station when a fast train passes?
- Roads are banked at the turnings, why?

2. Answer, in brief, any TWO questions.

[2x2 = 4]

- A gas has two specific heats. Which one is greater and why?
- Why is dew formed on the grass but not on the leaves of a tree?
- If air is a bad conductor of heat, why do we not feel warm without clothes?

3. Answer, in brief, any ONE question.

[1x2 = 2]

- A ray of light originated in air falls perpendicularly on the shorter face of a right angled isosceles ($90^\circ-45^\circ-45^\circ$) triangular glass prism of refractive index 1.5. Find the angle of deviation in this case in a diagram.
- What is dispersive power and chromatic aberration?

4. Answer, in brief, any ONE question.

[1x2 = 2]

- The vehicles carrying inflammable fluid drag a long metal chain over the ground, why?
- A man inside an insulated hollow metal cage does not receive a shock although it is connected to a high voltage, explain why?

'Group B'

5. Answer any THREE questions.

[3x4 = 12]

- What is projectile? Obtain an expression for the time of flight, horizontal range and maximum height attained by a projectile.
- How does the acceleration due to gravity vary with the altitude and depth? Show where will the value of g maximum.
- Define SHM. Obtain an expression for the time period of a mass attached with suspended helical spring.
- Prove that the surface energy and surface tension are numerically same. Explain the concept of the angle of contact, with necessary figure, when the surface of the liquid is convex if viewed from the above.

6. Answer any TWO questions.

[2x4 = 8]

- Derive ideal gas equation and calculate the value of the universal gas constant.
- What do you mean by perfectly black body? State and explain Stefan's law of black body radiation.
- Show that $PV^\gamma = \text{constant}$ for a gas undergoing adiabatic change.

7. Answer any **ONE** question.

[1x4 = 4]

- Define focal length of a lens. Obtain an expression for the equivalent focal length of two lenses in contact.
- What is lateral shift? Derive an expression for its value. How does the lateral shift change with the increase in the angle of incidence?

8. Answer any **ONE** question.

[1x4 = 4]

- Define electric field and potential. Show that electric field at a point is numerically equal to the negative of potential gradient..
- State and prove Gauss theorem in electrostatics. Use it to obtain the expression for electric field intensity at a point outside, surface and inside a charged spherical conductor.

'Group C'

9. Solve any **THREE** numerical problems.

[3x4 = 12]

- Three spherical raindrops of equal size are falling vertically through air with a terminal velocity of 0.15 m/s. What would be the terminal velocity if these drops were to coalesce to form a larger spherical drop?
- A copper wire and a steel wire of the same cross sectional area and of length 1m and 2m respectively are connected end to end .A force is applied, which stretches their combined length by 1 cm. Find how much each wire is elongated. ($Y_c=1.17 \times 10^{11} \text{ N/m}^2$, $Y_s= 2 \times 10^{11} \text{ N/m}^2$)
- A constant torque of 500N turns a wheel which has a moment of inertia 20 kg m^2 about its center. Find the angular velocity in 2 seconds and kinetic energy gained in 10 revolutions.
- A bullet of mass 20 gm travelling horizontally at 100 ms^{-1} embeds itself in the centre of a block of wood mass 1 Kg, which is suspended by light vertical string 1m in length. Calculate the maximum inclination of the string to the vertical.

10. Solve any **TWO** numerical problems.

[2x4 = 8]

- What will be the thermal efficiency of an engine if it takes 8 KJ heat from the source and rejects 6 KJ to the sink in one cycle?
- A glass flask of volume 400 cm^3 is just filled with mercury at 0°C . How much mercury overflows when the temperature of the system is raised to 80°C . The coefficient of cubical expansion of glass is $1.2 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$ and that of mercury is $1.8 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$.
- A brass pendulum clock keeps correct time at 15°C . How many seconds per day it will lose or gain at 0°C ? (Coefficient of linear expansion of brass = $2.0 \times 10^{-5} \text{ K}^{-1}$).

11. The eyepiece of a refracting telescope has a focal length of 90 cm. The distance between objective and eyepiece is 1.8 m and the final image is at infinity. What is the angular magnification of the telescope? [4]

12. A parallel plate air capacitor has a plate separation of 5 mm and is charged to a potential difference of 400 V. Calculate the energy density in the region between the plates. [3]