KATHMANDU UNIVERSITY
End Semester Examination
June/July 2024

Level : B.Pharm
Year : I
Time : 2 hrs. 30 mins.

09. July

Course : PHYS 104
Semester : I
F. M. : 55

SECTION "B"
[5Q × 4 = 20 marks]

1. Define conservative force. Show that conservative force is the negative gradient of potential energy.

2. What is the highest order spectrum, which can be seen with monochromatic light of wavelength 6000Å by means of a diffraction grating with 5000 lines per cm?

OR

A 0.05kg ingot of metal is heated to 200°C and then dropped into a calorimeter containing 0.4kg of water initially at 20°C. The final equilibrium temperature of the mixed system is 22.4°C. Find the specific heat of the metal. (Given: Specific heat of water = 4186 J/kg°C)

3. How Nicol prism can be used as a polarizer and analyzer? Explain.

4. Deduce Planck's radiation formula by using the postulates of black body radiation and hence obtain Rayleigh-Jean's law from Planck's law.

OR

Show that work done in an adiabatic expansion of an ideal gas from the state (P_1, V_1) to a state (P_2, V_2) is given by $W = \frac{1}{\gamma - 1}(P_1V_1 - P_2V_2)$.

5. With well labeled diagram describe the working principle of GM counter.

OR

Write short notes on alpha, beta and gamma decays.

SECTION "C"
[5Q × 7 = 35 marks]

6. Define torque and angular momentum. Show that rate of change of angular momentum is equal to torque acting on it. State and explain the principle of conservation of angular momentum.

P.T.O.

7. Establish the differential equation of compound pendulum and obtain its time period. Show that point of suspension and point of oscillation are interchangeable. Also find the minimum time period.

OR

Obtain equation of continuity for the flow of an ideal fluid flowing through a pipe. State and prove Bernoulli's theorem for non-viscous and incompressible flow.

8. Describe the formation of circular Newton's rings and hence show that the rings are not equally spaced. Also discuss how Newton's rings are used to calculate the wavelength of sodium light.

OR

Explain the concept of entropy and disorder. Show that the change in entropy is constant during a reversible process and is greater than zero during an irreversible process.

9. Define Q-value of a nuclear reaction. Derive an expression for the Q-value of the reaction X (x, y) Y in terms of kinetic energies of the incident and product particles and masses of the various particles and nuclei. Assume the target nucleus to be at rest in the laboratory. Discuss the case when the product particle emerges at right angles to the incident direction.

OR

What is Raman effect? What are stokes and anti-stokes lines in Raman scattering? Give the quantum mechanical explanation of Raman spectra with energy level diagram.

10. A hypodermic syringe contains a medicine with the density of water as shown in figure 2C. The barrel of the syringe has a cross-sectional are $2.5\times10^{-5}\ m^2$, and the needle has a cross-sectional area $1\times10^{-6}\ m^2$. In the absence of a force on the plunger, the pressure everywhere is 1 atm. A force $\vec{F}$ of magnitude 2 N acts on the plunger, making medicine squirt horizontally from the needle. Determine the speed of the medicine as it leaves the needle's tip.

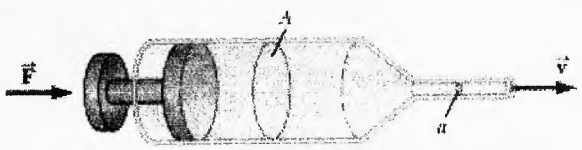

Figure 2C

OR

A gas molecule having a speed of 300 m/s collides elastically with another molecule of the same mass which is initially at rest. After collision the first molecule moves at an angle of 30° to its initial direction. Find the speed of each molecule after collision and the angle made with the incident direction by the recoiling target molecule.