This question paper contains **4** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **1609**

Unique Paper Code : **222251** **C**

Name of the Paper : **Physics—I (PHCT-201)**

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : **II**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in total.

Use of non-programmable calculator is allowed.

1. (*a*) State and prove Stokes' theorem of vector calculus. Give its physical significance with suitable example. 1,4,3

(*b*) What are polar and axial vectors ? Give *one* example of each. 2,1

(*c*) Given $\vec{F}$ is a vector quantity. Prove the following vector identities : 2,2

(*i*) $\vec{\nabla} \cdot \left(\vec{\nabla} \times \vec{F} \right) = 0$

(*ii*) $\vec{\nabla} \times \left(\vec{\nabla} \times \vec{F} \right) = \vec{\nabla} \left(\vec{\nabla} \cdot \vec{F} \right) - \nabla^2 \vec{F}$.

P.T.O.

2. (*a*) What are conservative forces ? Give *two* examples of conservative forces. 2,2

(*b*) State and prove work energy theorem. 2,5

(*c*) Two particles of masses 50 g and 80 g are moving opposite to each other with speed 2 m/s and 5 m/s respectively, on a straight line. They collide elastically. Find the change in momentum of each particle. 4

3. (*a*) Give statement of law of conservation of angular momentum. Give *two* examples of its application where the law of conservation of angular momentum helps us to understand rotational motion. 3,3

(*b*) A solid sphere of mass 200 g and radius 5 cm is rotating about its own axis. It completes 5 revolutions in 2 minutes, calculate its : 6

(*i*) Moment of inertia

(*ii*) Angular momentum, and

(*iii*) Rotational kinetic energy.

(*c*) What are pseudoforces ? Give *one* example of pseudoforce. State important condition when a pseudoforce can be taken into the account. 1,1,1

4. (*a*) Define damped oscillations. Give *one* example. 1,1

(*b*) Write the differential equation for a damped harmonic oscillator. Solve the differential equation for its displacement for under-damped condition only. 3,5

(*c*) What are Lissajous figures ? Compute (graphically or analytically), the result of two simple harmonic vibrations of same amplitudes and at right angle to each other when their frequencies are in the ratio of 1 : 2 for phase difference of : 1,4

(*i*) 0

(*ii*) $\frac{\pi}{4}$

(*iii*) $\frac{\pi}{2}$ and

(*iv*) π.

5. (*a*) Describe with necessary theory, the Young's double slit method of determining wavelength of monochromatic light. 8

(*b*) Two glass plates enclose a wedge shaped air film, touching at one edge and separated by a wire of 0.05 mm diameter at a distance 10 cm from the edge. Film is illuminated with monochromatic light of wavelength 5893 Å. Calculate the fringe width. 4

(*c*) Why a broad source is required to observe interference fringes in a thin film ? Explain with necessary diagram. 3

6. (*a*) What is diffraction ? How is it different or similar to interference ? 2,2

(*b*) Discuss analytically, the intensity pattern for principal maxima of diffraction pattern due a plane transmission grating. 8

(*c*) A parallel beam of monochromatic light of wavelength 5893 Å is incident perpendicularly on a single slit of width 0.1 mm. Calculate the angular width of central maximum. 3

7. (*a*) Describe Nicol prism, showing clearly how is it constructed and what is its action ? Also explain how it can be used as a polarizer and as an analyser. 4,4

(*b*) A polarizer and an analyser are oriented so that the minimum intensity of light is transmitted. To what fraction of its maximum value is the intensity of transmitted light reduced when an analyser is rotated by 30°. 4

(*c*) How one can distinguish between circularly and elliptically polarized light experimentally ? 3