# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **CHEMISTRY**

SECOND SEMESTER – **APRIL 2022**

**UPH 2301 – PHYSICS FOR CHEMISTRY**

**( 21 BATCH ONLY )**

Date: 27-06-2022 Dept. No. Max. : 100 Marks

Time: 01:00 PM – 04:00 PM

## SECTION A

**Answer ALL the Questions**

| | | | |
|---|---|---|---|
| **1.** | **Define the following** | **(5 x 1 = 5)** | |
| a) | Centrifugal force | K1 | CO1 |
| b) | Viscosity | K1 | CO1 |
| c) | Entropy | K1 | CO1 |
| d) | Double refraction | K1 | CO1 |
| e) | Lattice parameters | K1 | CO1 |
| **2.** | **Fill in the blanks** | **(5 x 1 = 5)** | |
| a) | The distance between the initial and final positions of a particle is called --------- | K1 | CO1 |
| b) | The SI unit of Young's modulus of elasticity is --------- | K1 | CO1 |
| c) | A ------- source of light has only one wavelength. | K1 | CO1 |
| d) | The distance travelled between two consecutive collisions of a gas molecule is known as the ---------- | K1 | CO1 |
| e) | The group of atoms placed in a lattice point in a crystalline substance is known as ----------. | K1 | CO1 |
| **3.** | **Match the following** | **(5 x 1 = 5)** | |
| a) | Equilibrium position — *i.* Surface tension | K2 | CO1 |
| b) | Drop weight method — *ii.* Nearby source | K2 | CO1 |
| c) | Zeroth law of 1hermodynamics — *iii.* Miller indices | K2 | CO1 |
| d) | Fresnel diffraction — *iv.* No force acting | K2 | CO1 |
| e) | Parallel crystal planes — *v.* Temperature | K2 | CO1 |
| **4.** | **TRUE or FALSE** | **(5 x 1 = 5)** | |
| a) | Mass of the bob does not affect the period of a simple pendulum. | K2 | CO1 |
| b) | Gases do not possess viscosity. | K2 | CO1 |
| c) | First law of thermodynamics is applicable to both reversible and irreversible processes. | K2 | CO1 |
| d) | White light is used in the air wedge experiment. | K2 | CO1 |
| e) | A single crystal is to be used in the rotating crystal method. | K2 | CO1 |

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| | **SECTION B** | | |
| **Answer any TWO of the following in 100 words** | | | **(2 x 10 = 20)** |
| 5. | a) Develop an expression for the period of oscillation of a simple pendulum.<br>b) The time period of oscillation of a spring is 1.57 s when a mass of 100 gm is suspended from its lower end. Calculate the force constant of the spring and the K.E of the mass when its displacement is equal to the amplitude. | K3 | CO2 |
| 6. | Obtain the relation between elastic constants. | K3 | CO2 |
| 7. | Explain the formation of interference fringes by an air-wedge. Derive an expression for the fringe width. | K3 | CO2 |
| 8. | Describe briefly the seven crystal systems. | K3 | CO2 |
| | **SECTION C** | | |
| **Answer any TWO of the following in 100 words** | | | **(2 x 10 = 20)** |
| 9. | a) Derive an expression for the maximum height, time of flight and horizontal range of a body projected at an angle with the horizontal. (6)<br>b) Find the angle of projection at which the horizontal range and maximum height of a projectile are equal. (4) | K4 | CO3 |
| 10. | Find an expression for the work done in stretching a wire. Calculate the work done in stretching a uniform metal wire of area of cross-section $10^{-6}$ $m^2$ and length 1.5 m through $4x10^{-3}$ m. Given Young's modulus = $2x10^{11}$ $Nm^{-2}$. | K4 | CO3 |
| 11. | Explain Interference in thin films due to reflected light. | K4 | CO3 |
| 12. | a) State Boyle's law. (2)<br>b) Derive Poiseuille's formula for determining the coefficient of viscosity of a liquid. (8) | K4 | CO3 |
| | **SECTION D** | | |
| **Answer any ONE of the following in 250 words** | | | **(1 x 20 = 20)** |
| 13. | a) Define atomic radius. Calculate the atomic radius for each case of simple cubic, FCC and BCC lattices. (15)<br>b) Iron has BCC structure with atomic radius 0.123 Å. Find the lattice constant and also the volume of the cell. (5) | K5 | CO4 |
| 14. | a) Using kinetic theory derive an expression for the pressure exerted by a gas. (10)<br>b) With neat diagram explain in detail the porous plug experiment. (10) | K5 | CO4 |

## SECTION E

**Answer any ONE of the following in 250 words** **(1 x 20 = 20)**

| | | | |
|---|---|---|---|
| 15. | a) Describe the drop weight method of determining the surface tension and interfacial surface tension of a liquid. (14)<br>b) Water flows through a horizontal tube length 0.2 metres and internal radius $8.1 \times 10^{-4}$ metre under a constant head of the liquid 0.2 metres high. In 12 minutes $8.64 \times 10^{-4}$ $m^3$ of liquid issues from the tube. Calculate the coefficient of viscosity of water. (The density of water = 1000 kg $m^{-3}$ and g = 9.81 $ms^{-2}$) (6) | K6 | CO5 |
| 16. | a) Give the theory of plane transmission grating. Describe the experiment to determine the wavelength of light using the grating. (15)<br>b) Using a grating of 5000 lines per cm of first order spectral line was seen at a certain angle when light of wavelength 5893Å was used. Find the angle of diffraction. (5) | K6 | CO5 |

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