

March 2022

**B.Sc.(H) Chemistry- I SEMESTER****Physical Chemistry - I (BCH102)**

Time: 90 Minutes

Max. Marks:25

- Instructions:**
1. It is compulsory to answer all the questions (1 marks each) of Part -A in short.
  2. Answer any three questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) What is excluded volume and how is it related to actual volume of the gas molecule? (1)
- (b) Define degree of freedom of motion of gas molecule. How many different types of degree of freedom are possessed by linear and non-linear molecules? (1)
- (c) Calculate the root mean square velocity of oxygen molecule at S.T.P (1)
- (d) Define London or dispersive forces. How do they originate? (1)
- (e) How does viscosity vary with temperature? (1)
- (f) Define inversion temperature. (1)
- (g) Define the term specific and molar refractivity. (1)
- (h) List the various symmetry elements present in cube. (1)
- (i) The distance of separation between (123) plane is 0.24nm. What will be the distance of separation between (246) planes? (1)
- (j) Calculate hydrogen ion concentration in moles per litre of a solution whose pH is 4. (1)

**PART -B**

- Q2 (a) Define Most probable velocity, Average velocity and Root mean square velocity. Give ratio between them and show their value on Maxwell distribution curve of velocity. (3)
- (b) How does mean free path of gas molecules depends upon temperature and pressure of gas? (2)
- Q3 (a) Write notes on Weiss indices and Miller indices. What are the miller indices of plane having crystal intercepts the three axes at the multiples of 3/2, 2 and 1 of the axial lengths? (2)
- (b) Derive Bragg's equation for diffraction of X-rays by crystals (3)
- Q4 Describe Powder method of X-ray diffraction studies by crystal. What are its advantages over Bragg's method? How inter planer spacing distance can be calculated using this method? (5)

- Q5 (a) Define surface tension. Explain one method for the determination of surface tension of liquid. (3)
- (b) Explain the cleansing action of detergents. (2)
- Q6 (a) Prove that the degree of hydrolysis of the solution of salt of weak acid with a weak base is independent of the concentration of the solution. (2)
- (b) Explain buffer capacity and buffer range. Derive the Hendersons-Hasselbalch equation for pH of acidic buffer mixture. (3)

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