

B. Sc. DEGREE END SEMESTER EXAMINATION OCT. 2020: JANUARY 2021**SEMESTER – 5: CHEMISTRY (CORE COURSE)****COURSE: 15U5RCHE07, PHYSICAL CHEMISTRY - 1**

(Common for Regular 2018 admission and Improvement / Supplementary 2017/2016/2015 admissions)

Time: Three Hours

Max. Marks: 60

PART A***Answer all questions. 1 mark each***

1. Which effect is utilised in the liquefaction of gases?
2. How is the coefficient of viscosity and fluidity related?
3. Give the Schoenflies symbol for the point group of C₆H₆ molecule.
4. How many elements of symmetry are possessed by a cubic crystal?
5. liquid crystals are used in LCD technique.
6. Explain the terms adsorbent and adsorbate.
7. Give the Freundlich adsorption isotherm and specify the terms.
8. Why is the vapour pressure of a solution of glucose in water lower than that of pure water?

(1 × 8 = 8)

PART B***Answer any six questions. 2 marks each***

9. What are the symmetry elements present in CHCl₃?
10. Calculate the various degrees of freedom of: (a) C₆H₆ (b) CO₂
11. Give the main theory of Langmuir adsorption.
12. The first order diffraction for a cubic lattice occurs at an angle of 11° 28' with X-rays of wavelength 1.54 Å. Calculate the interplanar distance.
13. Calculate the Boyle's temperature T_B for CO₂ gas assuming it to be a van der Waals gas. Given a = 3.59 atm dm⁶ mol⁻² and b = 0.0427 dm³ mol⁻¹
14. Why do liquid drops assume spherical shape?
15. What is critical compressibility factor? Give its expression.
16. What is anisotropic crystal? Give example.

(2 × 6 = 12)

PART C***Answer any four questions. 5 marks each***

17. Define (i). Osmosis (ii) Osmotic pressure (iii) semipermeable membrane (iv) Reverse Osmosis and one application of reverse osmosis.
18. Explain the symmetry element of BF₃ molecule and identify the point group.
19. Describe vander Waals equation in virial form. How can this be used to determine the Boyle temperature?

20. Differentiate cubic close packing and hexagonal close packing.
21. What is surface tension? How is it determined?
22. What are liquid crystals? How are they classified? (5 × 4 = 20)

PART D

Answer any two questions. 10 marks each

23. (a) Describe the features of Maxwell distribution of molecular velocities and illustrate the effect of temperature on this distribution. (4 Marks)
- (b) Explain critical constants. The van der Waals constants of a gas are $a = 3.59 \text{ dm}^6 \text{ atm mol}^{-2}$ and $b = 0.0427 \text{ dm}^3 \text{ mol}^{-1}$. Calculate its critical constants. (6Marks)
24. (a) Briefly discuss about the symmetry elements with examples. (5 Marks)
- (b) Discuss the structure of NaCl from X-ray diffraction studies. (5 marks)
25. (a) How is the surface area of adsorbent determined from BET theory? (5 Marks)
- (b) Discuss the factors influencing the solubility of gases in liquids. (5 Marks)
26. What is meant by coefficient of viscosity? How is viscosity determined using Ostwald viscometer? (10 × 2 = 20)
