UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 1st Semester Examination, 2020

CC2-CHEMISTRY

PHYSICAL CHEMISTRY

Full Marks: 40

ASSIGNMENT

The figures in the margin indicate full marks.
All symbols are of usual significance.

Answer any *four* questions 10×4 = 40

1. (a) Write the Van der Waal's Equation of state for *n* moles of gas.. 1
   (b) Why does '*a*' and '*b*' signify? 2
   (c) Give the units of '*a*' and '*b*' in SI. 2
   (d) What is Virial Equation of state? 2
   (e) Express the Van der Waal's Equation of state in the form of virial equation of state. 3

2. (a) Write down the Maxwell-Boltzmann Distribution Law of molecular velocities, and transform it in terms of translational kinetic energy. 2+3
   (b) Draw and explain the Maxwell-Boltzmann distribution curves to show the effect of increase of temperature. 1+3
   (c) Define Most Probable Velocity. 1

3. (a) Define : 2+2
      (i) Collision Number
      (ii) Collision Frequency.
   (b) What is Mean Free Path? How is mean free path dependent on Temperature and Pressure? 2+2
   (c) Explain why the co-efficient of viscosity of a gas 1+1
      (i) increases with increasing temperature
      (ii) is independent of pressure at constant temperature.

4. (a) State the principle on Equipartition of Energy. 3
   (b) Apply the principle to calculate C_P for H_2O (water) and CO_2 (carbonrdioxide) considering the contributions of all the degrees of freedom. 4

(c) Derive the relation: 3

$$P_C V_C = \frac{3}{8} RT_C$$

5. (a) Derive Bragg's Equation of Crystallography. 4
   (b) What is meant by unit cell? 1
   (c) Larger the value of Miller index, smaller is the intercept of the plane on the axis. Justify. 2
   (d) It is not possible to indentify the position of hydrogen atom in a crystal using X-ray diffraction study. Explain. 3

6. (a) Why is it that five-fold rotation axis is absent in crystal system? 4
   (b) 'Cube has the highest symmetry' — Justify or correct. 3
   (c) "KCl has a face centred cubic lattice. However, it appears from X-ray data to be a simple cubic" — Explain. 3

7. (a) What is Buffer Capacity? 2
   (b) Derive the Henderson's Equation. 3
   (c) What is Common-ion effect? 2
   (d) How does common-ion effect influence solubility and solubility product? 3

8. (a) Discuss the Theory of acid-base Indicators. 4
   (b) What is meant by buffer range? 1
   (c) How can Surface Tension of a liquid be measured by Capillary rise method? 4
   (d) Give the relation between surface tension and temperature. 1

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