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D2BCH2202 (PAGES 2) **Reg.No.....**

Name: .....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(Regular/Improvement/Supplementary)

CHEMISTRY: COMPLEMENTARY COURSE FOR PHYSICS, BOTANY & ZOOLOGY

GCHE2C02T: PHYSICAL CHEMISTRY

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. How is internal energy of a substance change with regard to changes in heat energy and work done in a process?
2. How is Gibb's free energy related to entropy and temperature?
3. The enthalpy change for the transition of liquid to water steam is 40.8 kJ mol^{-1} at 373 K. Calculate the entropy change for the process.
4. Arrive at a relationship between average velocity and RMS velocity of a gas at a certain temperature.
5. Calculate the average translational KE of O_2 gas per mole at 27 °C. What will be the average KE per molecule?
6. What is meant by a space lattice?
7. Identify the following crystal systems (i) a=b=c; $\alpha=\beta=\gamma=90°$; (ii) a = b ≠ c; $\alpha=\beta=\gamma=90°$
8. How does surface tension vary with temperature? Illustrate using a mathematical equation and explain the terms involved.
9. Compare the intermolecular forces in liquids with those in gases.
10. Define the term osmotic pressure. How does osmotic pressure of a given solution vary with temperature?
11. Calculate the cell constant of a cell if N/50 KCl solution is taken in it offers a resistance of 400 ohms. The specific conductance of KCl at the same temperature is 0.00277 $ohm^{-1}cm^{-1}$.
12. Indicate the electrode and cell reactions in the cell :
    $Zn(s)/Zn^{2+}(aq)// Cu^{2+}(aq)/Cu(s)$.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. What are endothermic and exothermic processes?
14. "Entropy of the universe is increasing". Account for this statement.
15. Using (i) ideal gas equation and (ii) van der Waal's equation, calculate the pressure exerted by 2 moles of NH_3 confined in a 5 L flask at 300 K. $a = 4.17$ atm L^2 mol^{-2}; $b = 0.037$ L mol^{-1}.
16. Explain why water exhibits capillary rise while mercury exhibits capillary fall.
17. 10 g of a polymer is present in 200 mL of its solution which exerts an osmotic pressure of 0.03 atm at 298 K. Calculate the molar mass of the solute.
18. Write the formulation of the cell constructed from $Al/Al^{3+}(aq,1M)$ and $Cu/Cu^{2+}(aq,1\ M)$. Give the electrode and cell reactions. Calculate the standard EMF of the cell, Given : $E^{\circ}_{Cu^{2+}/Cu} = 0.34$ V; $E^{\circ}_{Al^{3+}/Al} = -1.66$ V
19. What is a buffer solution? Give an example each of acidic and basic buffer and explain its buffer action.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Derive the Bragg equation. Discuss its application.
21. (a) How is molar conductance of an electrolyte solution experimentally determined?
    (b) The molar conductance of an infinitely dilute solution of acetic acid at 298 K is 390.7 Scm^2mol^{-1}. The specific conductance of a 0.01 M solution of acetic acid is 0.000163 Scm^{-1} at 298 K. Calculate the degree of ionization of acetic acid in 0.01 M solution.

(1 x 10 = 10 Marks)