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SECOND SEMESTER BSc DEGREE EXAMINATION, MAY-2017
(Regular/Supplementary/Improvement)
(CUCBCSS – UG)

CC15 U CHE 2 C02 – PHYSICAL CHEMISTRY
(Complementary Course: Chemistry)
(2015 Admission Onwards)

Time: 3 Hrs   Maximum: 64 Marks

Section - A
(Answer all questions. Each question carries 1 Mark)

1. A process in which the......... of the system is kept constant is called an Isobaric process.
2. Among pressure, viscosity, surface area and surface tension, the extensive property of the system is....................
3. RMS velocity of N_2 is.......... than that of CO_2 at the same temperature.
4. A crystalline solid possesses............... range order.
5. Number of atoms present in the body centered cubic unit cell is.............
6. Vapour pressure of a liquid...............with increase in temperature.
7. SI Unit of co-efficient of viscosity is..................
8. pH of 0.1 N sodium hydroxide solution is................
9. The molar conductance of an electrolyte solution...........with increase in dilution.
10. Cell reaction is spontaneous when ΔG is................

(10 x 1 = 10 Marks)

Section - B
(Answer any seven questions. Each question carries 2 marks)

11. Define path function. Give an example.
12. State the second law of thermodynamics in terms of entropy.
13. A system absorbs 7.5 KJ of heat and performs 2500 J of work. Calculate the internal energy change produced in the system.
14. Calculate the temperature at which the RMS velocity of hydrogen equals that of oxygen at 320 K.
15. What are the causes for the deviations of real gases from ideal behaviour?
16. Explain reverse osmosis.
17. Why an increase in temperature does cause a decrease in surface tension?
18. What is a fuel cell? Give an example.
19. Define ionic product of water. What is its value at 298K?
20. Why an aqueous solution of ferric chloride is acidic, while an aqueous solution of ammonium acetate is almost neutral.

(7 x 2 = 14 Marks)

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Section -C
(Answer any four questions. Each question carries 5 marks)

21. Show that the change in free energy is the amount of useful work.
22. State and explain the Third law of Thermodynamics.
23. What is a liquid crystal? Compare the structural features of nematic and smectic liquid crystals.
24. The first order diffraction of a beam of X- rays of wavelength 15.4 nm from the (100) planes of a crystal occurs at an angle of $11^0 29'$. Calculate distance between (100) planes.
25. Derive the Henderson equation for the NH_4OH /NH_4Cl buffer.
26. Give the conductometric titration curves for a weak acid against strong base titration and a strong acid against weak base titration. Explain the reasons for the variation of shapes of the curves.

$$(4 \times 5 = 20 \text{ Marks})$$

Section -D
(Answer any two questions. Each question carries 10 marks)

27. (a). Give the criteria for a process to be spontaneous based on ΔH, ΔS and T
    (b) At what temperature does the reaction

    $$C(s) + H_2O(g) \longrightarrow CO(g) + H_2O(g) \quad \text{becomes spontaneous if}$$

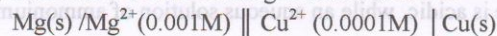 $\Delta H = + 40.08$ KJ and $\Delta S = + 133.6$ J K^{-1}

    $$(5 + 5 = 10 \text{ Marks})$$

28. a) Give the Maxwell's law of distribution of molecular velocities. Give the significance of Maxwell's equation and the effect of temperature on distribution of molecular velocities.
    b) Show that the ratio, most probable velocity: average velocity: RMS velocity is 1:1.128: 1.224

    $$(5 + 5 = 10 \text{ Marks})$$

29. a). State and explain Henry's law. What are its limitations?
    b). Describe the Berkeley and Hartley method of determining osmotic pressure of a solution.

    $$(5 + 5 = 10 \text{ Marks})$$

30. a). Give the Nernst equation for electrode potential and explain the terms involved.
    b). Draw a well labeled diagram of calomel electrode. Write electrode reaction and representation of the electrode.
    c) Calculate the EMF of the given Cell at 298 K

    $Mg(s) /Mg^{2+}(0.001M) \parallel Cu^{2+} (0.0001M) \mid Cu(s)$

    Given that $E^0 Mg^{2+}/Mg$ = -2.37 V, $E^0 Cu^{2+}/Cu$= + 0.34 V

    $$(3 + 3 + 4 = 10 \text{ Marks})$$

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