16U612   (Pages: 3)   Name: …………..……….

Reg. No…………..………

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2019

(Regular/Supplementary/Improvement)

(CUCBCSS - UG)

CC15U CHE6 B11 - PHYSICAL CHEMISTRY III

Chemistry - Core Course

(2015 Admission onwards)

Time: Three Hours   Maximum: 80 Marks

Section A

Answer *all* questions. Each question carries 1 mark.

1. In S.I. system what is the unit of specific conductance?

2. Write the representation of calomel electrode.

3. Express the relationship between specific conductance and equivalent conductance

4. Determine the trend in the relative basic strength in the series: ClO_4^-, ClO_3^-, ClO_2^- based on Lewis concept.

5. Calculate the degree of hydrolysis of 0.10 M solution of sodium acetate at 25^oC. $K_a = 1.5 \times 10^{-5}$ and $K_w = 1.008 \times 10^{-14}$.

6. Write the expression for buffer index and explain the terms involved.

7. State and explain Henry's law.

8. Determine the crystal system with the following unit cell parameters $a = b \neq c$, $\alpha = \beta = \gamma = 90^o$

9. What is unit cell and space lattice?

10. Give two examples for Nematic type liquid crystal.

(10 x 1= 10 Marks)

Section B

Answer any *ten* questions. Each question carries 2 marks.

11. The resistance of 10.5 M solution of an electrolyte in a cell was found to be 45Ω. Calculate the molar conductance of the solution if the electrodes in cell are 2.2 cm apart and have an area 3.8 cm^2.

12. State and explain Kohlraush's law. Illustrate how this law is used for the calculation of molar conductance at infinite dilution of weak electrolytes.

13. What are fuel cells? Describe the functioning of hydrogen-oxygen fuel cell.

14. Calculate the potential of an electrode consisting of zinc metal in zinc sulphate solution in which $[Zn^{2+}] = 0.01$ M, for the reaction $Zn + 2e^- \leftrightarrows Zn(s), E^0 = -0.76\,V$

(1)   **Turn Over**

15. What is meant by electrochemical series? Using the data given in the series how would you explain why zinc reacts with H_2SO_4 to give H_2 but silver does not?

16. Calculate the degree of dissociation and the hydrogen ion concentration in 0.005 M aqueous solution of acetic acid at 30 ^{o}C, K_a for acetic acid is 1×10^{-5} moles / litre.

17. Write a note on the action of buffer mixture of weak acid and its salt with a strong base.

18. Give an example of a solution showing large positive deviation from ideal behavior. Explain the non- ideal behavior with the help of a diagram.

19. Using Henry's law constants for O_2 (3.3×10^7) and N_2 (6.51×10^7), calculate the mole fractions of O_2 and N_2 dissolved in water at 25 ^{o}C.

20. Write a note on law of constancy of interfacial angles.

21. At room temperature polonium crystallises in primitive cubic unit cell. If **a** = 3.36 Å. Calculate the theoretical density of polonium. Molar mass of polonium = 209 g/mol.

22. Explain Schottky defect with an example.

(10 x 2= 20 Marks)

Section C
Answer any *five* questions. Each question carries 6 marks.

23. Write a note Debye-Falkenhagen and Wein effects with example for each.

24. How would you measure pH of a solution using EMF measurements?

25. Derive an expression for the Nernst equation for electrode potential and EMF of a cell.

26. Calculate the pH of a solution prepared by mixing 50.0 mL of 0.200 M CH_3COOH and 50.0 mL of 0.100 M NaOH.

27. Explain the applications of reverse osmosis.

28. A 10% aqueous solution by mass of a nonvolatile solute boils at 102.35 ^{o}C. Calculate the molar mass of the solute. $K_b = 0.52$ K kg mol^{-1}.

29. Derive Bragg's equation.

30. What are liquid crystals? Explain the classification and properties of liquid crystals with examples.

(5 x 6= 30 Marks)

Section D
Answer any *two* questions. Each question carries 10 marks.

31. A) What is transport number? Explain its determination by Hittorf's method.

    B) Give an account of conductometric titrations.

32. A) Explain briefly on the electrochemical theory of corrosion.

    B) Calculate the EMF of the concentration cell consisting of zinc electrode, one immersed in a solution of 0.01 molal and the other in a solution of 0.1 molal at 25 ^{o}C. The two solutions are separated by a salt bridge. The mean activity co-efficient of the electrolyte may be assumed to be unity.

33. A) Write a note on vant Hoff factor and abnormal molecular mass.

    B) Derive an expression for the degree of hydrolysis of weak acid and weak base.

34. A) Give an account of the structure of AB and AB_2 type crystals

    B) Explain the non-stoichiometric defects with special emphasis to metal excess and metal deficiency defects.

(2 x 10= 20 Marks)

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