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C 21089 (Pages : 3) Name.....

Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2017

(CUCBCSS—UG)

Chemistry

CHE 6B 11—PHYSICAL CHEMISTRY—III

Time : Three Hours Maximum : 80 Marks

Section A

Answer in one word **or** *sentence.*
Answer **all** *questions.*

1. Write the relation between specific conductance and equivalent conductance.
2. Ionic product of water is ——— $mol^2\ dm^{-2}$ at 25°C .
3. The electrode potential of standard hydrogen electrode is ———.
4. Write the Nernst equation for electrode potential.
5. The pH of a solution is 5, its hydrogen ion concentration is ———.
6. Name one acid buffer.
7. The solubility product of sparingly soluble salt AB at room temperature is $1.21 \times 10^{-6}\ mol^2\ dm^{-6}$. Calculate its solubility.
8. When a non-volatile solute is dissolved in a pure solvent, the vapour pressure of the pure solvent ———.
9. Calculate the Miller indices for crystal planes with intercepts 2a, 1b, 2c.
10. Calculate the number of atoms in face centred cubic unit cell.

(10 × 1 = 10 marks)

Section B

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

11. How will you determine the solubility product of sparingly soluble salt by conductance measurement.
12. Write the Debye-Huckel -Onsager equation.
13. Write down the electrode reaction and cell reaction in the following cell :

    Pt ; $H_2(g)$, $H^+(aq)$ // $Cl^-(aq)$, Hg_2Cl_2, Hg : Pt.

Turn over

14. How will you determine the pH of a solution by EMF measurment.

15. What is a standard cell ? Give an example.

16. A solution containing 2.5 g of a solute dissolved in 75 g of water boiled at 100.5°C. Calculate the molar mass of the solute. (K_b for water = 0.52 K mol^{-1}).

17. Why is a solution of ammonium chloride acidic ?

18. Abnormal molar masses are obtained in the case of certain solutes in colligative property methods. Why ?

19. What are intrinsic semiconductors ? Give examples.

20. At what angle would a first order reflection be observed in the X ray diffraction of a set of crystal planes for which d = 0.285 nm, if the X rays used have a wavelength of 0.075 nm.

21. What is liquid junction potential ? How can we eliminate liquid junction potential ?

22. Draw the (123) and (211) planes in the unit cell of a cubic lattice.

(10 × 2 = 20 marks)

Section C

Answer any **five** *questions.*
Each carries 6 *marks.*

23. State and explain Faraday's laws of electrolysis.

24. Outline Hittorf's method of determination of transport number.

25. Derive the expression for the EMF of concentration cell without transference.

26. Explain the Bronsted- Lowry concepts of acids and bases.

27. Discuss the construction and working of a calomel electrode.

28. 1.50 g of NaCl was dissolved in 500 g of water and the elevation in boiling point observed is 0.05deg. Calculate the Van't Hoff factor Kb = 0.514 deg mol^{-1}.

29. Derive the Bragg equation.

30. What are liquid crystals ? How are they classified ? Discuss the properties and applications of liquid crystals.

(5 × 6 = 30 marks)

Section D

Answer any **two** *questions.*
Each carries 10 *marks.*

31. (a) State and explain Kohlrausch's law of independent migration of ions. Mention any two of its applications.

    (b) The molar conductances of sodium acetate, hydrochloric acid and sodium chloride at infinite dilution are 91.0×10^{-4}, 426.2×10^{-4} and 126.5×10^{-4} Sm^2 mol^{-1} respectively. Calculate he molar conductance at infinite dilution of acetic acid.

32. (a) Discuss the hydrogen- oxygen fuel cell.

    (b) Derive the Henderson equation for the pH of an acidic buffer.

33. State and explain :

    (a) Henry's law and its applications.

    (b) Raoult's law, ideal and non-ideal solutions.

34. (a) Discuss the principle and applications of EMF measurements in acid - base titrations,

    (b) Briefly explain the stoichiometric defects in crystals.

$(2 \times 10 = 20$ marks)