

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Chemistry—Core Course X

CH 6B 17—PHYSICAL CHEMISTRY—III

Time : Three Hours

Maximum : 30 Weightage

I. Answer all the questions. Each question carries a weightage $\frac{1}{4}$. This part contains multiple choice, fill in the blank and one word answer questions.

- 1 The unit of rate constant for a reaction is found to be the same as the unit of rate. The order of the reaction will be :
 - (a) Zero.
 - (b) One.
 - (c) Three.
 - (d) two.
- 2 The dependence of reaction rate upon the concentration of various reactants in the reaction can be obtained from :
 - (a) Arrhenius equation.
 - (b) Van't Hoff equation.
 - (c) Rate law.
 - (d) Specific reaction rate.
- 3 According to collision theory, for an effective collision :
 - (a) The colliding molecules should possess a minimum energy called threshold energy.
 - (b) Collision should be properly oriented.
 - (c) Colliding molecules should possess activation energy.
 - (d) Both (a) and (b).
- 4 Which law states that each molecule taking part in a photochemical reaction absorbs one photon ?
- 5 The molar conductance of a strong electrolyte increases with dilution and reaches a maximum constant value called _____.
- 6 The ionic product of water increases with increase in temperature, because the self ionisation of water is _____.
- 7 The relation $\lambda_m^c = \lambda_m^\infty - b\sqrt{c}$, is the mathematical formulation of
 - (a) Ostwald dilution law.
 - (b) Debye-Falkenhagen equation.
 - (c) Kohlrausch's law.
 - (d) Debye, Huckle Onsagar relation.

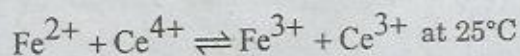
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- 8 Aqueous solution of which of the following substance is acidic in nature ?
 (a) NH_4Cl . (b) Na_2CO_3 .
 (c) NH_4COOH_3 . (d) CH_3COONa .
- 9 The value of electrode potential of a half cell is independent of :
 (a) Temperature. (b) Nature of the ions.
 (c) Volume of the solution. (d) Concentration of ions.
- 10 Standard emf of a cell and the standard free energy change of the reaction are related as _____.
- 11 The capacity of a computer memory is measured in _____.
- 12 C language has been developed by :
 (a) James Martin. (b) Dennis Ritchie.
 (c) Eckert and Mouchly. (d) Kenneth Kurtz.

(12 × ¼ = 3 weightage)

II. Answer *all* the questions. Each carries a weightage 1 :

- 13 Write any four characteristics of a first order reaction.
- 14 The rate of reaction doubled, when the temperature is increased from 27°C to 37°C. Calculate the activation energy of the reaction.
- 15 What are photosensitization reactions ?
- 16 Distinguish between fluorescence and phosphorescence.
- 17 The equivalent conductance of 0.05N solution of CH_3COOH is $110 \text{ ohm}^{-1} \text{ cm}^2 \text{ eq}^{-1}$. Calculate the degree of dissociation of CH_3COOH at this concentration, if the ionic conductance of H^+ and CH_3COO^- are 349.5 and $40 \text{ ohm}^{-1} \text{ cm}^2 \text{ eq}^{-1}$ respectively.
- 18 Discuss the construction of a standard hydrogen electrode.
- 19 In the electrochemical cell $\text{Fe}^{2+} | \text{Fe}^{3+} || \text{Ce}^{4+} | \text{Ce}^{3+}$, $E^\circ_{\text{Ce}^{4+}/\text{Ce}^{3+}}$ is 1.44 V and $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}}$ is 0.68 V. Calculate the equilibrium constant for the cell reaction.



- 20 Why C language is classified as the Middle Level Language ?
- 21 What are constants and variables in C program ?

(9 × 1 = 9 weightage)

III. Answer any *five* questions. Each carries a weightage 2.

- 22 Explain the adsorption theory of catalysis.
- 23 When a monochromatic radiation is passed through 0.05m solution of a substance, the intensity of the radiation is reduced to 25% of the initial value after passing through 10 cm length of the solution. Calculate the value of absorbance and molar extinction coefficient of the substance.
- 24 Write the principle of conductometric titration and give any four advantages of the method.
- 25 Explain the term solubility product. The solubility of a sparingly soluble metal chloride MX_2 in water is $1 \times 10^{-4}\text{M}$. Calculate the solubility product.
- 26 What are buffer solutions? How are they classified? Explain the mechanism of buffer action.
- 27 Explain the potentiometric method of determining the pH of a solution.
- 28 Write the C program for the determination of half life period of a radioactive nucleus.

(5 × 2 = 10 weightage)

IV. Answer any *two* questions. Each question carries a weightage 4.

- 29 (a) Derive the integral rate equation for a second order reaction of the type $2\text{A} \rightarrow \text{products}$.
(b) Write any two methods for the determination of order of a reaction.
- 30 (a) Define transport number of an ion. Discuss the moving boundary method for the measurement of transport number.
(b) A 0.1 molar aqueous solution of LiCl is placed in a moving boundary cell of area of cross section 1.17 cm^2 . The solution is electrolysed for 131 minutes with a constant current of $9.42 \times 10^{-3} \text{ A}$, when the Li^+ boundary is observed to move a distance of 2.08 cm. Calculate the transference number of Li^+ ions.
31. (a) What are the fuel cells? Explain the working of $\text{H}_2\text{-O}_2$ fuel cell.
(b) Write note on :
 - (i) Liquid junction potential.
 - (ii) Half-wave potential.

(2 × 4 = 8 weightage)