

**SIXTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)  
EXAMINATION, MARCH 2017**

(UG-CCSS)

Chemistry

CH6 B17—PHYSICAL CHEMISTRY—III

Time : Three Hours

Maximum : 30 Weightage

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

- 1 The time for half change of a reaction doubled, when the initial concentration of the reactant is reduced to half the initial value. The reaction is of :
  - (a) First order.
  - (b) Second order.
  - (c) Zero order.
  - (d) Third order.
- 2 The rate law is derived from :
  - (a) Kirchoff's equation.
  - (b) Arrhenius equation.
  - (c) Gibb's-Helmholtz equation.
  - (d) Law of mass action.
- 3 Which theory is used to explain the mechanism of enzyme catalysis ?
- 4 Which region of the electromagnetic radiation is capable of bringing about a photochemical reaction ?
- 5 Faraday's first law of electrolysis deals with the :
  - (a) Relation between the amount of substance liberated and the equivalent mass.
  - (b) Relation between the quantity of electricity passed and amount substance deposited or liberated.
  - (c) Relation between the nature of ions and the amount of substance deposited or liberated.
  - (d) Both (a) and (b).
- 6 Ostwald dilution law is applicable in the case of \_\_\_\_\_.
- 7 Abnormal conductance is shown by :
  - (a)  $H^+$ .
  - (b)  $OH^-$ .
  - (c)  $Na^+$ .
  - (d) Both  $H^+$  and  $OH^-$ .
- 8 Which among the following salts give a basic solution, when dissolved in water ?
  - (a)  $NH_4Cl$ .
  - (b)  $Na_2CO_3$ .
  - (c)  $FeCl_3$ .
  - (d)  $NaCl$ .
- 9 The electrode potential of a standard hydrogen electrode is taken as \_\_\_\_\_.

Turn over

- 10 Which of the following electrolyte is not used in filling a salt bridge ?  
 (a)  $\text{KNO}_3$ . (b)  $\text{NH}_4\text{NO}_3$ .  
 (c)  $\text{KCl}$ . (d)  $\text{ZnSO}_4$ .
- 11 A \_\_\_\_\_ computer results when the features of analog and digital computers are combined.
- 12 C language is called a \_\_\_\_\_ level language.

(12 × ¼ = 3 weightage)

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

- 13 Distinguish between Order and Molecularity of a reaction.
- 14 The half-life period of a first order decomposition reaction is 2 hours. How much time will it take for the decomposition of 90 % of the reactants ?
- 15 Explain chemiluminescence with a suitable example.
- 16 State and explain Beer-Lambert's law.
- 17 The specific conductance of a saturated solution of  $\text{AgCl}$  is  $3.6 \times 10^{-6}$  mhos at  $25^\circ\text{C}$ . and that of pure water is  $1.8 \times 10^{-6}$  mhos. If the  $\lambda^\circ$  values of  $\text{Ag}^+$  and  $\text{Cl}^-$  respectively are 61.90 and  $76.1 \text{ ohm}^{-1} \text{ cm}^2 \text{ eq}^{-1}$ , calculate the solubility of  $\text{AgCl}$  in water at  $25^\circ\text{C}$ .
- 18 Explain the working of a silver-silverchloride electrode.
- 19 In the electrochemical cell  $\text{Zn(s)} \mid \text{Zn}^{2+}_{(4 \times 10^{-4} \text{M})} \parallel \text{Cd}^{2+}_{(0.2 \text{M})} \mid \text{Cd(s)}$ , the  $E^\circ$  values at  $25^\circ \text{C}$ . are  $\text{Zn}^{2+}/\text{Zn} = -0.763 \text{V}$  and  $\text{Cd}^{2+}/\text{Cd} = -0.403 \text{V}$ . Calculate the standard free energy change for the cell reaction at  $25^\circ \text{C}$ .
- 20 Name any *three* free and open chemistry software available in the internet for molecular viewing.
- 21 Write any four features of C language.

(9 × 1 = 9 weightage)

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

- 22 Illustrate the features of collision theory of reaction rate.
- 23 When acetone is exposed to a radiation of 313 nm, it absorbs  $2.6956 \times 10^{16}$  photons per second. When the exposure is continued for  $1.15 \times 10^4$  seconds,  $8.68 \times 10^{-5}$  mol of acetone undergoes photodissociation. Calculate the quantum yield of the dissociation.
- 24 Write briefly on : (i) Wein effect and (ii) Debye-Falkenhagen effect.
- 25 Derive the Henderson equation for the pH of a buffer. Calculate the pH of a buffer solution containing 0.1 M  $\text{CH}_3\text{COOH}$  and 0.01 M  $\text{CH}_3\text{COONa}$ .  $\text{pK}_a$  value of acetic acid is 4.74.
- 26 Explain the effect of solvents in deciding the strengths of acids and bases, with suitable examples.
- 27 What are concentration cells ? How are they classified ? Give examples.
- 28 Write the C program for the determination of normality of a solution.

(5 × 2 = 10 weightage)



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

- 29 (a) Derive an equation for the dependence of reaction rate upon temperature. Explain the determination and significance of Arrhenius parameters.
- (b) The rate of a reaction triples, when the temperature increases from 20° C. to 50° C. Calculate the energy of activation for the reaction.
- 30 (a) State and explain Kohlrausch's law of independent migration of ions. Discuss any *three* of its important applications.
- (b) The equivalent conductivities at infinite dilution of HCl, NaCl and CH<sub>3</sub>COONa are 426.16, 126.45 and 91 S cm<sup>2</sup> eq<sup>-1</sup> respectively. If the degree of dissociation of 0.1 N CH<sub>3</sub>COOH is 1 × 10<sup>-3</sup>, calculate the equivalent conductivity of CH<sub>3</sub>COOH at this concentration.
- 31 (a) Explain the principle of potentiometric titrations. What are the advantages of potentiometric titrations ?
- (b) Discuss the electrochemical theory of rusting of iron.

(2 × 4 = 8 weightage)