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Total Number of Pages: 02

B.Tech.
15BS1103

2nd Semester Back Examination 2017-18

CHEMISTRY

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH,
CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT,
ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING,
MME, PE, PLASTIC, TEXTILE

Time: 3 Hours

Max Marks : 100

Q.CODE : C800

Answer Part-A which is compulsory and any four from Part-B.

The figures in the right hand margin indicate marks.

Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1 Answer the following questions: *multiple type or dash fill up type:* (2 x 10)

a) The coordination number in a hexagonal close-packed (hcp) crystal structure is _____.

- (i) 8, (ii) 6,
(iii) 4, (iv) 12

b) In the phase diagram of sulfur system, the transition curve represents the equilibrium between _____ and _____.

c) A process is said to be spontaneous, if it satisfies the condition _____

- (i) $\Delta G > 0$, (ii) $\Delta G < 0$,
(iii) $\Delta G = 0$ (iv) can not be predicted

d) Evaporation of water is an example of _____ reaction.
(exothermic/endothermic)

e) Quinhydrone electrode is an example of _____

- (i) Redox electrode, (ii) Gas electrode,
(iii) Metal-metal ion electrode (iv) Metal-insoluble salt electrode

f) The bond order for O_2 and O_2^- (peroxide ion) are _____ and _____ respectively.

g) In case of Schottky defects, density of solid _____

- (i) Remains unchanged, (ii) Increases, (iii) Decreases

h) The unit of rate constant for 2nd order reaction is _____

i) The hydrogenation of ethylene in presence of Nickel catalyst is an example of _____ catalysis. (homogeneous/ heterogeneous)

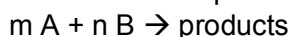
j) Which of the following relationship(s) is (are) correct?

- (i) $-\Delta G = -nFE_{\text{cell}}$ (ii) $-\Delta G = nFE_{\text{cell}}$
(iii) $\Delta G = nFE_{\text{cell}}$ (iv) Both (i) & (ii)

Q2 Answer the following questions: *Short answer type:* (2 x 10)

a) What is activation energy? How is it related to rate of a reaction?

b) Write the rate equation for the following reaction:



c) Define unit cell. How many atoms/particles present per unit cell of FCC lattice?

d) Write down the Gibbs Helmholtz equation and define the terms involved.

e) Explain zero order reaction with one example.

- f) Write the electrode notation and electrode reaction for calomel electrode.
- g) How many phases and components are present in water-kerosene oil system?
- h) Calculate the pH of the solution with $[\text{OH}^-] = 10^{-8} \text{ M}$.
- i) Determine the wavelength associated with a cricket ball of mass 400 g moving with velocity $1.5 \times 10^5 \text{ m/s}$.
- j) What do you mean by state function? Give two examples.

Part – B (Answer any four questions)

- Q3** a) What is spontaneity of a reaction? Describe the criteria for spontaneity and equilibrium of chemical reactions. **(10)**
- b) Differentiate between Frenkel defects and Schottky defects in solids. **(5)**
- Q4** a) State the law of mass action. Discuss the factors affecting the rate of a reaction. **(10)**
- b) For a cell, EMF is 1.018 V at 293 K. Calculate ΔG , ΔH and ΔS for the cell reaction in the cell. Temperature coefficient $(\partial E/\partial T)_p = -4 \times 10^{-5} \text{ V/K}$ **(5)**
- Q5** a) Derive the integrated rate equation for a second order reaction, when
(i) $2A \rightarrow \text{Products}$ (ii) $A + B \rightarrow \text{Products}$. **(10)**
Show that half-life period for this reaction varies inversely with the initial concentration of the reactant.
- b) Write the half cell reactions and calculate the EMF of the following cell at 25 °C using Nernst equation. **(5)**

$$\text{Zn}_{(s)} | \text{Zn}^{2+} (1\text{M}) || \text{I}^- (0.1\text{M}) | \text{Cu}_{(s)} | \text{Cu}_{(s)}$$
 The Standard electrode potentials are $E^\circ (\text{Zn}^{2+}/\text{Zn}) = -0.76\text{V}$ and $E^\circ (\text{Cu}/\text{Cu}^{2+}) = -0.17\text{V}$
- Q6** a) Derive all the four Maxwell's thermodynamic relations. **(10)**
- b) Derive concept of entropy from second law of thermodynamics. **(5)**
- Q7** a) Draw the molecular orbital diagram for O_2 molecule. Write down the electronic configuration, bond order and magnetic behavior of it. **(10)**
- b) Discuss the construction and cell reaction of a storage cell. **(5)**
- Q8** a) Explain the phase diagram for sulfur system with a neat diagram. **(10)**
- b) A compound with FCC crystal structure has a density of 2.163 g/cm^3 and molecular weight is 58.5 g/mol . Calculate the edge length of its unit cell. **(5)**
- Q9** a) Write short notes on any two : **(5 x 2)**
 (i) Standard hydrogen electrode
 (ii) L.C.A.O.
 (iii) Collision theory
- b) Calculate the change in entropy in (J/K) when an ideal gas expands from a volume of 3 L to 30 L at 27 °C. ($R = 8.314 \text{ J/K-mol}$) **(5)**