Registration No : | | | | | | | | | | |

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) $-\Delta G = -nFE_{cell}$ (ii) $-\Delta G = nFE_{cell}$
(iii) $\Delta G = nFE_{cell}$ (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:
m A + n B → products

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 $[OH^-] = 10^{-8}$ M.

i) Determine the wavelength associated with a cricket ball of mass 400 g moving with velocity 1.5×10^5 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 $(\partial E/\partial T)_p = -4 \times 10^{-5}$ V/K **(5)**

Q5 **a)** Derive the integrated rate equation for a second order reaction, when **(10)**
(i) 2A → Products (ii) A+ B → Products.
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 ^oC using Nernst equation. **(5)**

$Zn_{(s)}| Zn^{2+}$ (1M) || I^- (0.1M)| $CuI_{(s)}$ | $Cu_{(s)}$

The Standard electrode potentials are E^o (Zn^{2+}/Zn) = - 0.76V and E^o $(CuI/Cu/I^-)$ = - 0.17V

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 ^oC. (R= 8.314 J/K-mol) **(5)**