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Total Number of Pages : 02

B.Tech
15BS1103

1st Semester Back Examination 2018-19

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 : E847

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Short Answer Type Questions (Answer All-10) (2 x 10)

- What information are conveyed by ψ and ψ^2 ?
- Determine the de-Broglie wavelength of an electron travelling at 5% of the speed of light?
- What are the Miller indices, if the plane intersects the crystal lattice at a, 2b, 3c ?
- Differentiate between the triple point and critical point with one example from each.
- The radii of Cs^+ and Br^- are 169pm and 240 pm respectively. Predict the structure of CsCl and its coordination number in Cs^+ .
- The time for half-completion of a reaction is changed from 120 sec to 60 sec when the initial concentration is changed from 0.60 to 1.2 mol lit^{-1} . Determine the order of this reaction.
- Write the chemical reaction for propane fuel cell.
- Four moles of perfect gas are expanded from a pressure of 20Nm^{-2} to 2Nm^{-2} at 310K. What is the free energy associated with this process?
- How will you represent the rate of the reaction: $2\text{A} + \text{B} \rightarrow 4\text{C}$?
- What percent of T_1/T_2 gives heat engine an ideal efficiency of 25%?

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- The concentration of reactants and rate for the reaction: $\text{A} + \text{B} \rightarrow$ are as follows at 300K:

Sl No.	[A], mol/lit	[A], mol/lit	Initial rate
1	2.5×10^{-4}	3.25×10^{-4}	5.0×10^{-4}
2	5.0×10^{-4}	6.5×10^{-4}	4.0×10^{-3}
3	1.0×10^{-3}	1.3×10^{-3}	1.6×10^{-2}

- Determine (i) the order with respect to A and B (ii) rate constant at 300K.
- Draw the molecular orbital configuration of O_2 , O_2^- , O_2^{2-} , O_2^+ . Compare magnetic behavior and bond length among these species.
- The density of a face-centered cubic element (atomic mass = 60.2 amu) is 6.8 g cm^{-3} . Calculate the length of the edge of the unit cell. Predict the packing fraction for this element.
- The emf of the cell: $\text{Cd} | \text{CdCl}_2 (\text{saturated}) || \text{AgCl} | \text{Ag}$ is 0.90V and 0.912 V at 37°C and 7°C respectively. Calculate the change in free energy and enthalpy of this reaction.
- A face-centred cubic crystal possesses an atomic radius of 180pm. Calculate the spacing of (i) (220) and (ii) (111) planes.

- f) At unit atmospheric pressure, a galvanic cell consisting of Cu (1M) versus H₂ electrode was used to determine the pH of an unknown solution which was placed in H₂ electrode compartment. The emf of the cell at 25^oC was found to be 0.42V. Calculate the pH of this unknown solution. Reduction potential of Cu electrode is +0.36V.
- g) The catalysed decomposition of hydrogen peroxide follows first-order reaction. This reaction is 50% completed in 1 hour at 420K. Determine the activation energy of this reaction if 50% of this reaction is completed at 600K in 20 minutes.
- h) Prove that $[\delta V/\delta T]_P = (\delta S/\delta P)_T$
- i) Iodine molecule dissociate in to atom after absorbing radiation of 4800A^o. If one quantum of radiation is absorbed by each molecule, then calculate lattice energy of Iodine atom. (Bond energy of iodine=240KJ)
- j) What is the emf of the following cell at 25^oC? Write the cell reaction.
 Zn(s) | Zn²⁺ (0.2M) || Ag⁺ (0.002M) | Ag(s)
 The standard emf of the cell is 1.60V.
- k) Derive the relationship for change in entropy for an ideal gas at constant pressure.
- l) Describe the functioning of lead storage cell with the net chemical reactions.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Combustion of diborane (B₂H₆) proceeds according to the equation: B₂H₆(g) + 3 O₂ → B₂O₃ (g) + 3 H₂O (g) with liberation of 480 kcal of heat per mole of B₂H₆. Combustion of boron produces B₂O₃(g) and released 290 kcal per g atom. Standard heat of formation of H₂O(g) is -57.8 kcal mole⁻¹. Calculate the ΔH_f of diborane. Describe the law of thermodynamics which confirms to this relation. **(16)**
- Q4** Define phase rule. With the help of this, draw and describe the phase diagram of Fe-C systems. How it is different from phase diagram of sulphur system? **(16)**
- Q5** Distinguish between unit cell and lattice. How many types of Bravais lattices. Determine the number of atoms, coordination number and atomic radii for simple cubic BCC and FCC cell in a cubic lattice. **(16)**
- Q6** Differentiate between order and molecularity of the reactions. Describe the salient features of the theory of absolute reaction rates. **(16)**