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Total Number of Pages:02

**B.TECH**  
**15BS1103**

**2<sup>nd</sup> Semester Back Examination 2016-17**

**CHEMISTRY**

**BRANCH: ALL**

**Time: 3 Hours**

**Max Marks: 100**

**Q.CODE: Z775**

**Answer Part-A which is compulsory and any four from Part-B.  
The figures in the right hand margin indicate marks.**

**Part – A (Answer all the questions)**

- Q1 Answer the following questions: (2 x 10)**
- The bond order and number of unpaired electrons in  $\text{He}_2$  is \_\_\_\_\_ & \_\_\_\_\_ respectively.
  - The radius ratio of cation to anion in an octahedral arrangement is from \_\_\_\_\_ to \_\_\_\_\_.
  - The number of components in  $\text{CCl}_4\text{-H}_2\text{O}$  system is/are \_\_\_\_\_.
  - Density of a substance is a \_\_\_\_\_ property. (extensive/intensive)
  - The cell which converts chemical energy to electrical energy is called \_\_\_\_\_ cell.
  - The unit of rate of constant for a n-th order reaction is \_\_\_\_\_.
  - The energy and frequency of a radiation are related as \_\_\_\_\_.
  - The no of atoms per unit cell in a body centered cubic cell is \_\_\_\_\_.
  - The thermodynamic condition for spontaneity of a process is \_\_\_\_\_.
  - The half life period of a chemical reaction becomes two times of its original value when the initial concentration of the reactant becomes double. The order of the reaction is \_\_\_\_\_.
- Q2 Answer the following questions: Short answer type (2 x 10)**
- Write down the reduced phase rule and the terms associated with it.
  - Show that the bond order of  $\text{F}_2$  is one.
  - Determine the Miller indices of cube faces of a cubic crystal?
  - Write down the Clapeyron-Clausius equation for solid-liquid equilibria and explain each term associated with it.
  - What is extensive property? Give two examples of it.
  - What is triple point? Mention the values of pressure and temperature of water at its triple point.
  - Calculate the degrees of freedom of an unsaturated sugar solution in equilibrium with its vapour?
  - Write down the expression for rate constant of a second order reaction when both the reactants are same.
  - What do you mean by battery? Write different types of batteries.
  - Calculate the number of NaCl units present per unit cell of NaCl.

**Part – B (Answer any four questions)**

- Q3** a) Draw the molecular orbital diagram for O<sub>2</sub> molecule. Write down the electronic configuration, bond order and magnetic behavior of it. (8)
- b) Calculate the wavelength associated with a bullet of 2.2gms which is shot out with a velocity of 3000m/s. (4)
- c) Write down the Schrödinger wave equation and interpret  $\Psi$ ,  $\Psi^2$ . (3)
- Q4** a) What is Atomic Packing Fraction (APF)? Calculate the APF of each cubic crystal structure. (10)
- b) Sodium chloride (NaCl) crystals have fcc structure. The density of NaCl is 2.18g cm<sup>-3</sup>. Calculate the distance between two neighbouring Na<sup>+</sup> and Cl<sup>-</sup>. (At. Mass of K=23, Cl=35.5) (5)
- Q5** a) Prove that (7)
- $$\left[ \frac{\partial(G/T)}{\partial T} \right]_P = \frac{-H}{T^2}$$
- where symbols have their usual meaning.
- b) Calculate the change in entropy when one mole of an ideal gas contracts reversibly from a volume of 10dm<sup>3</sup> to 1dm<sup>3</sup> at 25<sup>o</sup>C. (4)
- c) State and explain Hess's Law of constant heat summation. (4)
- Q6** a) Derive the expression of rate constant of a first order reaction and show that the half life period is independent of initial concentration. (10)
- b) What is catalysis? Explain that catalytic reactions are highly specific. (5)
- Q7** a) What is phase rule? Draw and explain phase diagram for a one component three phase system. (10)
- b) An alloy of Cd and Bi contains 50% Cd by mass. Calculate the mass of eutectic in 2kg of alloy, if the eutectic system contains 60% Bi by mass. (5)
- Q8** a) What are the factors affect the rate of a reaction? Discuss each factor briefly. (10)
- b) Write the difference between reversible and irreversible cell. (5)
- Q9** a) Write the construction, principle of working and cell reaction of a lead acid storage cell. (10)
- b) Calculate the emf of the following cell at 25<sup>o</sup>C (5)
- Zn<sub>(s)</sub>/Zn<sup>2+</sup><sub>(aq)</sub>(0.1M)//Ag<sup>+</sup><sub>(aq)</sub>(0.5M)/Ag<sub>(s)</sub>. Given that the standard reduction potential of Zn and Ag is -0.76v and +0.8v respectively