

Time: 2.30 Hours

Marks: 75

1. Attempt all questions.
2. All questions carry equal marks.
3. Draw neat labelled diagram wherever necessary.
4. Use of log table & non programmable calculator is allowed.
5. For Q.2,Q.3 & Q.4 attempt A&B OR C&D

**Q. 1 Do as directed. (any fifteen)**  
**Define the following terms:**

15M

- 1 System
- 2 Adiabatic wall
- 3 Exothermic reaction
- 4 Unimolecular reaction
- 5 Chemical kinetics
- 6 Redox reaction
- 7 Reduction

**Fill in the blanks:**

- 8 Enthalpy of the system is represented by the symbol -----.
- 9 If work is done by the system, W is ----- (Positive/ Negative)
- 10 S.I. unit of internal energy is -----.
- 11 In Second order reaction, the rate of the reaction is proportional to the product of ----- concentration.
- 12 The minus sign indicating that concentration of the reactant ----- with time.

**Name the following :**

- 13 A process in which volume of the system remains constant.

**State True or False:**

- 14 Decomposition of hydrogen peroxide is an example of first order reaction.
- 15 The half time require to complete reaction is same for first & second order reaction.
- 16 An element that loses an electron to another chemical species in a redox chemical reaction is known as reductant.

**Balance the following reaction:**

- 17  $\text{Fe}_3\text{O}_4 + \text{C} \rightarrow \text{Fe} + \text{CO}$
- 18  $\text{S} + \text{HNO}_3 \rightarrow \text{SO}_2 + \text{NO}_2 + \text{H}_2\text{O}$

**Give one word for the following:**

- 19 A chemical reaction in which reactant involves more than one phase.
- 20 A molecule that gain electrons.

- Q.2 A i)** Classify the thermodynamic systems based on the nature of the boundary. 4M
- Q.2.A ii)** Calculate  $q$ ,  $w$  and  $\Delta E$ , when one mole of monoatomic gas expands adiabatically against constant external pressure of 1 atm. from volume of  $2.0 \text{ dm}^3$  to  $8.0 \text{ dm}^3$  at 300K. 4M
- Q.2 B** Explain the term 'Entropy' and enlist its characteristics. 7M
- OR
- Q.2 C** Discuss the four steps of Carnot Cycle. 8M
- Q.2 D** State the objective and limitations of thermodynamics 7M
- Q.3 A** Derive integrated rate equation for first order reaction. 8M
- Q.3 B** Discuss the kinetic characteristics of second order reaction. 7M
- OR
- Q.3 C** Show that for first order reaction time to complete first order reaction is independent of initial concentration. 8M
- Q.3 D** A second order reaction with equal initial concentration is 66.67 % complete in 2 hours. Calculate specific reaction rate. 7M
- Q.4 A** Justify oxidation and reduction reaction proceed side by side. 8M
- Q.4 B** Write the balanced chemical equation of following reaction. 7M
- $$\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{+2}(\text{aq.}) \longrightarrow \text{Cr}^{+3}(\text{aq.}) + \text{Fe}^{+3}(\text{aq.})$$
- OR
- Q.4 C** Explain the ion electron method of balancing equations. 8M
- Q.4 D** What are addition reactions? Explain using suitable examples. 7M
- Q.5** Write short note on (any three) 15M
- Zeroth law of thermodynamics.
  - Graphical method for determining order of reaction.
  - Order of reaction.
  - Oxidizing agents.
  - Oxidation number of C in  $\text{CO}_2$  and S in  $\text{H}_2\text{S}$ .