

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 ΔE , when one mole of monoatomic gas expands adiabatically against constant external pressure of 1 atm. from volume of 2.0 dm^3 to 8.0 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.
 $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{+2}(\text{aq.}) \longrightarrow \text{Cr}^{+3}(\text{aq.}) + \text{Fe}^{+3}(\text{aq.})$ 7M
- 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 CO_2 and S in H_2S .