

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(New) • EXAMINATION – WINTER 2016****Subject Code:2133607****Date:06/01/2017****Subject Name:Physical Chemistry****Time:10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1	Short Questions	14
1	As the temperature of a reaction is increased, the rate of the reaction increases because the (a) reactant molecules collide with greater energy (b) reactant molecules collide less frequently (c) reactant molecules collide less frequently and with greater energy (d) activation energy is lowered	1
2	For an adiabatic process, according to first law of thermodynamics, (a) $\Delta E = -w$ (b) $\Delta E = w$ (c) $\Delta E = q - w$ (d) none of these	1
3	Second law of thermodynamics	1
4	Which of the following statements is incorrect (a) enzymes are catalysts (b) urease is an enzyme (c) enzymes can catalyze any reaction (d) enzymes are in colloidal state	1
5	As the temperature of a reaction is increased, the rate of the reaction increases because the (a) reactant molecules collide with greater energy (b) reactant molecules collide less frequently (c) reactant molecules collide less frequently and with greater energy (d) activation energy is lowered	1
6	A catalyst can be described as a substance that: (a) undergoes change to accelerate the rate of the reaction (b) increases the kinetic energy of the reactants (c) provides a path of lower activation energy for the reaction (d) lowers the potential energy of the products with respect to the energy of the reactants	1
7	Define the term molecularity of reaction.	1
8	For decomposition of hydrogen peroxide reactions the rate constant, k , has the unit(s) (1) lit/mol (2) 1/time (3) time. mol/lit (4) none of these	1
9	For a reaction, $A \rightarrow$ products, a graph of $[A]$ versus time is found to be a straight line. What is the order of this reaction? (a) zero order (b) first order (c) second order (d) third order	1
10	Which of the following sets of properties constitute intensive properties? (a) temperature, pressure and volume (b) mass, density and volume (c) density, pressure and temperature (d) internal energy, density and pressure	1
11	Electrolytic cells are electrochemical cells in which _____ reactions are forced to occur by the input of electrical energy. (a) spontaneous (b) non-spontaneous (c) exothermic (d) endothermic	1

12	For a pure gas and mixture of gases, the degrees of freedom are (a) 2 and 2 (b) 2 and 3 (c) 3 and 2 (d) 3 and 3	1
13	The occurrence of the same substance in more than one crystalline forms is known as (a) isomerism (b) racemization (c) polymorphism (d) none of these	1
14	Arsenic oxide acts in the Contact process as (a) a catalyst (b) a promoter (c) a poison (d) an enzyme	1
Q.2	(a) Explain relation between electromotive force and free energy.	03
	(b) The reduced volume and reduced temperature of a gas are 10.2 and 0.7. What will be its pressure if its critical pressure (P_c) is 4.25 atm?	04
	(c) Define the term electrochemical cell. Explain application of salt bridge in electrochemical cell by taking suitable examples.	07
OR		
	(c) Define the term enzyme catalysis with examples. Explain mechanism and characteristics of enzyme.	07
Q.3	(a) What do you mean by redox reaction? Explain redox reaction at least with two examples.	03
	(b) Explain concentration cell in details with suitable example.	04
	(c) Write a note on critical phenomenon in details with suitable examples.	07
OR		
	(a) Write a note on emulsion.	03
	(b) Explain heterogeneous and homogeneous catalysis with suitable examples.	04
	(c) Explain collision theory of reaction rates in details along with its limitations.	07
Q.4	(a) Give the characteristics of catalytic reactions.	03
	(b) Explain zero order and pseudo reaction with examples.	04
	(c) Derive the equation for relation between change in enthalpy and change in free energy. Find out change in enthalpy for the reaction $\text{H}_2\text{F}_2(\text{g}) \longrightarrow \text{H}_{2\text{g}} + \text{F}_{2\text{g}}$ Change in internal energy is given -14.2 kcal/mole at 298 K	07
OR		
Q.4	(a) A gas contained in a cylinder fitted with a frictionless piston expands against a constant external pressure of 1 atm from a volume of 5 litres to a volume of 10 litres. In doing so it absorbs 400 J thermal energy from its surroundings. Determine ΔE for the process.	03
	(b) What do you mean by order of reaction? Derive mathematical expression for the rate constant of a reaction ($A+B \rightarrow \text{Products}$)	04
	(c) Define the term condensed system. Explain phase rule for condensed system.	07
Q.5	(a) Explain phase rule for one component four phase system.	03
	(b) Derive equation for the calculation of half-cell potential. What is the potential of half-cell consisting copper electrode in 0.01 M copper sulphate solution at 298 K, $E^\circ = 0.763 \text{ V}$.	04
	(c) Define surface tension, capillary action. How it plays an important role in bubble formation?	07
OR		
Q.5	(a) Derive equation for first order reaction.	03
	(b) Derive Young Laplace & Kelvin equation.	04
	(c) Explain phase rule for four phase one components system.	07
