V.P. & R.P.T.P. SCIENCE COLLEGE

B.Sc. (SEMESTER – II) INTERNAL EXAMINATION

PHYSICAL CHEMISTRY: US02CCHE02 **Time: 1:30 pm to 2:30 pm**

Date: 15-03-2016, Tuesday **Total Marks: 25**

Q – 1: Choose the correct option from the following. (Multiple choice question) [03]

(i) For exothermic reactions, ΔH is _____ while for endothermic reactions it is _____.

(a) positive, negative (b) positive, positive
(c) negative, negative (d) negative, positive

(ii) The sum of power to which the concentration of a substance appears in the rate expression is known as _____.

(a) rate of reaction (b) order of reaction w. r. to that substance
(c) overall order of reaction (d) molecularity of reaction

(iii) Which of the following value is a slope for the plot of $\log k \rightarrow 1/T$?

(a) Ea/2.303R (b) R/2.303 Ea (c) –Ea/2.303 R (d) -2.303 Ea/R

Q – 2: Answer the following. (Any two) [04]

(i) Show that $\Delta E = q_v$

(ii) Define: (1) isobaric process (2) intensive properties

(iii) Write mechanism and rate law of reaction: $2Br^- + 2H^+ + H_2O_2 = Br_2 + 2H_2O$.

(iv) If concentration is measure in moles per liter and time in second then what is the unit of rate constant for first order and second order reaction.

Q – 3 (a) Define work. Derive the expression for work associated with pressure volume change. [05]

(b) For the reaction $N_2O_{4(g)} \rightarrow 2NO_{2(g)}$ at 298 K and 1 atm pressure, the heat of reaction is [04]
-14.1 kcal/mole then what is ΔE of the reaction. Given: R = 1.987 cal.

OR

Q – 3 (a) Define standard enthalpy change. Derive Kirchoff's equation. [05]

(b) Using Hess' law, calculate the standard heat of formation of carbon monoxide. [04]

(i) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$, $\Delta H°_{298} = -94.05$ Kcal mole^{-1}

(ii) $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{2(g)}$, $\Delta H°_{298} = -67.6$ Kcal mole^{-1}

Q – 4 (a) Derive the integrated rate law for first order reaction. Write its characteristics also. [05]

(b) State and explain the principle of detailed balancing for single-step reaction. [04]

OR

Q – 4 (a) For the reaction between gaseous chlorine and nitric oxide, $2NO + Cl_2 \rightarrow 2NOCl$ [05]
It is found that doubling the concentration of both reactants, increases the rate by a factor of eight, but doubling the chlorine concentration alone only doubles the rate. What is the order of reaction with respect to nitric oxide and chlorine?

(b) "The mechanism of a reaction may change if the conditions under which it is run are altered." Explain giving suitable example. [04]