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**V.P. & R.P.T.P. SCIENCE COLLEGE, VALLABHVIDYANAGAR.**

**Date: 14/03/15**

**Time: 12.30 to 1.30 pm** **B.Sc. (Sem-II)**

**PHYSICAL CHEMISTRY (US02CCHE02)**
**INTERNAL TEST – 2015** **Marks:25**

**Q-1. Choose the one alternative that best completes the statement or answers the question.** **(03)**

(i) Which of the following is not an intensive property?

(a) pressure (b) volume (c) concentration (d) density

(ii) For the chemical reaction A → B, it is found that the rate of a reaction doubles when the concentration of A is increased by four times. The order of reaction is ...

(a) two (b) one (c) zero (d) half

(iii) For the reaction : $2NO_2 + F_2 \rightarrow 2NO_2$,the differential rate law =.....

(a)Rate = k $[NO_2]^2$ $[F_2]$ (b) Rate = k $[NO_2]$ $[F_2]$

(c) Rate = k $[NO_2]$ [F] (d) Rate = k $[NO_2F]$ $[F_2]$



**Q-2. Give answers of any two questions.** **(04)**

(i) "The work done on a simple mechanical system is equal to the change in its energy." Explain.

(ii) Classify the system according to number of phases present in the system.

(iii) Define the terms: elementary process and principle of microscopic reversibility.

(iv) Discuss the temperature dependence of rate constant and derive the equation:

$\ln (k_2/ k_1) = - E_a /R(1/T_2 - 1/T_1)$

**Q-3**

(a) Derive Kirchhoff's equation. **(05)**

(b) When 78 gm of $C_6H_6$ is burnt completely in oxygen to form liquid water and $CO_2$ gas, $\Delta H$ is –781 Kcal at 25 °C. Calculate the value of $\Delta E$ of this reaction at constant volume. ($R = 1.987$ cal $deg^{-}mol^{-}$). **(04)**



**OR**

**Q-3**

(a) Define internal energy. Prove that the internal energy is a state function. **(05)**

(b) Calculate the heat of formation of $H_2SO_4$ using the data given below. **(04)**

Enthalpies of formation of $SO_{2(g)}$ and $H_2O_{(l)}$ are –70.9 and –68.4 Kcal/mole.

Heat of combustion of $SO_{2(g)}$ to $SO_{3(g)}$ is –23.49 Kcal/mole.

$SO_{3(g)} + H_2O_{(l)} \rightarrow H_2SO_{4(l)}$ $\Delta H = -31.14$ Kcal/mole.

**Q-4** (a) "The mechanism of a reaction may change upon changing reaction conditions." **(05)** Explain giving suitable example.

(b) Rate constant of decomposition of azomethane is $0.0231min^{-}$ This reaction is of first order. What fraction of azomethane will be decomposed in 1.5 hours? How long will it take to be 60% completed? **(04)**

**OR**

**Q-4** (a)Derive integrated rate law for second order reaction and give its characteristics. **(05)**

(b)How many times the rate constant of a reaction is increased if the temperature is increased from 298 K to 313 K. Activation energy is 13020.55 cal. **(04)**