

**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  $A \rightarrow B$ , 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 :  $2\text{NO}_2 + \text{F}_2 \rightarrow 2\text{NO}_2\text{F}$ , the differential rate law =.....  
(a) Rate =  $k [\text{NO}_2]^2 [\text{F}_2]$                       (b) Rate =  $k [\text{NO}_2] [\text{F}_2]$   
(c) Rate =  $k [\text{NO}_2] [\text{F}]$                       (d) Rate =  $k [\text{NO}_2\text{F}] [\text{F}_2]$



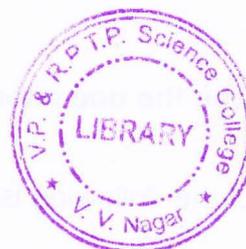
**Q-2. Give answers of any two questions. (04)**

- (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  $25^\circ C$ . Calculate the value of  $\Delta E$  of this reaction at constant volume. ( $R = 1.987$  cal  $deg^{-1}mol^{-1}$ ). (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.
- $SO_{3(g)} + H_2O_{(l)} \rightarrow H_2SO_{4(l)} \quad \Delta H = -31.14$  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  $0.0231 \text{ min}^{-1}$ . This reaction is of first order. What fraction of azomethane will be decomposed in 1.5 hours? (04)
- How long will it take to be 60% completed?

**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)