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AG—153—2018

FACULTY OF SCIENCE

M.Sc. (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2018

(CBCS Pattern)

PHYSICAL CHEMISTRY

Paper XVII(533/3)

(Chemical Dynamics)

(Friday, 30-11-2018) **Time : 2.00 p.m. to 5.00 p.m.**

Time—Three Hours *Maximum Marks*—75

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Use of log table and calculator is allowed.

(*iii*) Solve Q. 5 (A), MCQ in one attempt only.

1. Solve any *three* : 15

(*a*) Explain in brief surface rate of effusion.

(*b*) Explain in brief kinetics of consecutive reaction.

(*c*) Calculate A and rate constant for the reaction :

$$CH_3 + H_2 \longrightarrow CH_4 + H \text{ at } 200^oC$$

If the collision diameter is 3.0×10^{-10} m and it is assumed that activation energy is zero for the above reaction.

(*d*) Write a note on autocatalysis.

(*e*) What are main characteristics of Arrhenius equation ?

2. Solve any *three* : 15

(*a*) Write a note on ion interaction.

(*b*) Explain in brief temp. dependence of Hit and trial method.

P.T.O.

(*c*) If the activation energy of a reaction is 90.8 kJ/mol, calculate the fraction of molecules at 600ºC which have enough energy to react to form products.

(*d*) Show the variation of rate reaction with pressure and the three explosion limits.

(*e*) Give an expression for collision theory of unimolecular reaction. How does the order vary with concentration of reacting molecule ?

3. (*a*) Derive : 7

$$\ln \frac{k_2}{k_1} = \frac{Ea}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

Or

Derive :

$$\ln \frac{x_{eq}}{x_{eq} - x} = k_f \frac{[A]_0}{x_{eq}} . t .$$

(*b*) What do you meant by Oscillatory reaction ? Explain Lotka Volterra mechanism of an oscillatory reaction.

Or

Calculate ΔH^*, ΔG^* and ΔS^* for the second order reaction :

$$2NO_{2(g)} \longrightarrow 3NO_{(g)} + O_{2(g)}$$

at 500 K [given : A = 2×10^9 sec^{-1}, Ea = 111 kJ/mol.]

4. (*a*) Derive Frying equation. 7

Or

Show that $t_{3/4} = (2^{n-1} + 1)\ t_{1/2}$, where n is order of reaction. Use this in the reaction of pyrolysis of CH_3—CHO to determine 'n'.

So $t_{1/2}$ = 420 sec. $t_{3/4}$ = 1220 sec in a particular kinetics run.

(*b*) Explain in brief methods used to determine the rate laws. 8

Or

Explain in brief collision theory of reaction rate.

5. (*a*) Select the correct alternative from the following : 5

(*i*) The rate constant for the reaction depends upon each of the following except :

(*a*) Solvent for reaction

(*b*) Temperature

(*c*) Concentration of reactant

(*d*) Nature of reactant

(*ii*) For a reaction A $\rightarrow$ P a graph of [A] *Vs* time is found to be a straight line what is the order of reaction ?

(*a*) Zero (*b*) First

(*c*) Second (*d*) Third

(*iii*) Which of the following does *not* affect the rate of chemical reaction ?

(*a*) Enhalpy

(*b*) Temperature

(*c*) Surface area

(*d*) Concentration of reactant

(*iv*) Arsenic oxide acts in the contact process as :

(*a*) Catalyst (*b*) Promotor

(*c*) Poison (*d*) Enzyme

P.T.O.

(*v*) An example of acid base catalysis is ..... .

(*a*) Inversion of cane sugar

(*b*) Keto enol tautomerism

(*c*) Decomposition of Nitramine

(*d*) All of the above

(*b*) Write short notes on (any *two*) : 10

(*i*) Diffusion probalities

(*ii*) Chemical chaos

(*iii*) Explosion.