2021

CHEMISTRY

(Chemical Dynamics and Electrochemistry)

Full Marks:60

Time: 3 hours

The figure of margin indicate full marks for the question

1. Answer the following questions: **1x5=5**

a) What is pseudo-unimolecular reaction?

b) If E_a of a reaction is zero, what will be the value of K?

c) Define temperature coefficient of a reaction.

d) Define half wave potential.

e) What are dendrites in battery?

2. Answer any five from the following questions **3x5 = 15**

a) How rate constant of a reaction is related with temperature. Can the activation energy of a reaction be zero or negative. Explain?

b) Write the postulates limitations of collision theory

c) Briefly explain RRKM theory

d) What are the criteria for an effective collision? Explain.

e) What is DME? Explain

f) What is polarography? Explain.

Contd.....

g) What is the Cell Potential of the electrochemical cell in which the cell reaction is: $Pb^{2+} + Cd \rightarrow Pb + Cd^{2+}$;

Given that $E^{o}_{cell} = 0.277$ volts, temperature = 25°C,

$[Cd^{2+}] = 0.02M$, and $[Pb^{2+}] = 0.2M$

h) Define voltametry. What are the types of voltametry and mention any three of it.

3. Answer any ten from the following questions 4x10 = 40

a) Explain solid-state battery? Give its uses and advantages.

b) Derive Butler-Voltmer equation.

c) Define and derive Tafel Plots.

d) Explain fuel cell and its advantages. Mention one of its types.

e) Explain Lindermann theory and derive the rate expression for an unimolecular reaction.

f) Compare transition state theory and collision theory for the rate of bimolecular reaction.

g) Discuss in details the collision theory of bimolecular reactions. What are the limitation of this theory.

h) Derive RRK Theory and write its features.

i)

$$A + B \underset{}{\overset{k_1}{\rightleftharpoons}} (AB)^{\#} \xrightarrow{k_2} \text{Product}$$

Where $(AB)^{\#}$ is the activated complex, proposed a suitable mechanism for this reaction.

j) Explain Hinshelwood Theory and mention its limitations

k) Show that in every first order reaction the time required for completion of 75% reaction is double the time required for 50% reaction.

l) For a consecutive reaction $A \rightarrow B \rightarrow C$,

Derive $[B]_t = A_o (K_1/K_2-K_1) [e^{-K_1 t} - e^{-K_2 t}]$ at time t and symbols have their usual meanings.

m) What is anodic and cathodic corrosion? How can it be prevented.

n) What is Ossilatory reaction? Explain briefly with suitable example.
