MANIPAL
ACADEMY of HIGHER EDUCATION
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Reg. No.										

DEPARTMENT OF SCIENCES, III SEMESTER M.Sc (CHEMISTRY)
END SEMESTER EXAMINATIONS, DECEMBER 2020

Applied Electrochemistry and Industrial Catalysis [CHM- 5005]
(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours Date:02-01-2021 MAX. MARKS: 50

Note: (i) Answer **ALL** questions
(ii) Draw diagrams, and write equations wherever necessary

1.A Explain the following by giving appropriate reason

(i) Pitting corrosion is one of the most destructive form of corrosion.

(ii) Intergranular corrosion is observed in stainless steel used at high temperature.

(iii) Erosion corrosion is observed in metals exhibiting passive nature also

(iv) Pourbaix diagram provides useful information regarding the corrosion behavior of metals.

1.B Derive Butler-Volmer equation, and from that arrive at Tafel equation. **[4 + 6]**

2.A **(a)** Highlighting the principles of mixed electrode potential theory, draw and explain Evan's diagram.

(b) Explain anodic protection of metal.

2.B Explain the mechanism of the following:

(a) Electro reduction of aliphatic and aromatic halogenated hydrocarbons

(b) Explain basic principles of electro synthesis. Mention two advantageous and two limitations of electro synthesis. **[4 +6]**

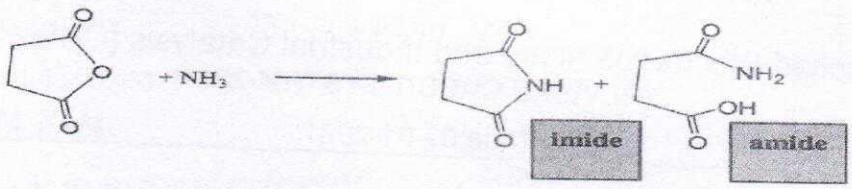
3.A **(a)** Distinguish between galvanostatic and potentiostatic approach for electro synthesis.

(b) Write mechanism of electro-synthesis of chlorate.

3.B What is meant by thermal degradation of catalyst? Explain the mechanism of sintering of metals and supporters in a catalyst. How it can be prevented? **[4 +6]**

4.A Distinguish between activity and selectivity of the catalyst. Explain the role of Zeolite as shape selective catalyst support.

4.B **(a)** The following homogeneous catalytic reaction, run in a solution continuous process, is used to produce imide and amide



Initial Moles:	**1**	**1**	**0**	**0**
Final Moles:	**0.1**	**0.1**	**0.8**	**0.1**

Calculate the % conversion of succinic anhydride, yield of imide, and selectivity to imide and amide?

(b) Explain with neat diagram Fischer-Tropsch Process of obtaining diesel fuel.

[4+6]

5.A **(a)** Give Reason: Development of suitable catalyst for oxidative dehydrogenation reaction is more challenging in industry.

(b) Explain how gold nanoparticles is act as attractive candidates for organic transformation.

(c) Write the Sabatier's principle for catalyst/substrate interaction. **[1+ 2+ 1]**

5.B Explain the following in electro catalysis

(i) Electrolysis of water (ii) Mechanism of hydrogen evolution reaction

(iii) Choice of Pt as electro catalyst (iii) Special features of electro catalysis as compared to conventional catalysis **[2+2+1+1]**

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