STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted from the academic year 2019-20 and thereafter)
SUBJECT CODE: 19CH/PE/CP15

M. Sc. DEGREE EXAMINATION, APRIL 2021
BRANCH IV- CHEMISTRY
FOURTH SEMESTER

COURSE: MAJOR ELECTIVE
PAPER: CORROSION AND ITS PREVENTION
TIME: 90 MINUTES **MAX MARKS: 50**

SECTION A **(11 X 1 = 11)**

Answer All Questions

I Fill in the blanks

1 The metal which is considered to have ultimate resistance to corrosion is _____.

2 A constant OCP over long periods of time (minutes) indicates that the system may be _____.

3 The type of corrosion that occurs due to concentration difference inside the component is _____.

II Match the following

	Column I		Column II
4	Dry Corrosion	A	Precipitates on metal
5	Ethanolamine	B	Oxygen Scavenger
6	Chromates	C	Localised Corrosion
7	Pitting Corrosion	D	Increases with increase in temperature
8	Hydrazine	E	Passivating Inhibitor
		F	Adsorption on metal

III Answer in a line or two

9 What is the significance of NACE test methods?

10 What are biofilms?

11 Represent an electrode concentration cell.

SECTION – B

Answer any three Questions **(3 x 8 =24marks)**

12. (a) Consider the half reactions

Zn^{2+} (aq) + $2e^{-}$ → Zn(s) E^{o} = –0.763 V

Pb^{2+} (aq) + 2e– → Pb(s) E^{o} = –0.126 V (2)

(i) Combine the two to form an electrochemical cell such that reaction is spontaneous and give the reaction. (2)

(ii) Represent the cell (2)

(iii) Calculate E_{cell} for the given electrochemical cell. (2)

(iv) Calculate free energy change for the reaction.

13. With the help of an example explain galvanic corrosion (8)

14. Define passivity. Using a graphical representation explain the corrosion characteristics of a metal based on its passivity (2+6)

15. Derive an expression for corrosion rate in terms of current density. (8)

SECTION – C

Answer any one Question **(1x 15 =15marks)**

16. (a) Discuss Anodic polarisation and cathodic polarisation (8)

(b) (i) A loss of 50 g has been reported for a sheet of carbon steel of dimensions 1 m X 4 m in a period of 8 months. Convert that mass loss to a penetration rate of the steel in mm units. Calculate the corrosion rate in g m^{-2} day^{-1}? (5)

(ii) 12 g of zinc metal are dissolved in a 1 M HCl solution. Calculate the coulombs of current produced by the anodic process? (2)

17. (a) What is mixed potential theory? Discuss its hypothesis (7)

(b) (i) Enumerate the five different methods used to combat corrosion. (5)

(ii) Explain the principle of impressed current cathodic potential (3)

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