



PROGRAM : NATIONAL DIPLOMA
ENGINEERING METALLURGY

SUBJECT : **CORROSION III**

CODE : **TKR31-1**

DATE : EXAMINATION
20 NOVEMBER 2019

DURATION : 08:30 - 11:30

WEIGHT : 40 : 60

TOTAL MARKS : 100

EXAMINER : MR GA COMBRINK

MODERATOR : DR J Delport

NUMBER OF PAGES : 3 PAGES

INSTRUCTIONS : ALL THE ANSWERS MUST BE COMPLETED IN THE
EXAM SCRIPS AND HANDED IN
QUESTION PAPERS MUST BE HANDED IN.

REQUIREMENTS : 1 POCKET CALCULATOR
NO CORRECTION FLUID SHALL BE USED
ALL WORK SHALL BE HANDED

INSTRUCTIONS TO CANDIDATES:

ANSWER ALL THE QUESTIONS ON THE EXAM SCRIPS
HAND IN ALL WORK.

QUESTION 1

Define corrosion? And explain why it occurs.

[8]

QUESTION 2

In an aerated environment draw the basic corrosion cell illustrating where the corrosion process is mostly evident (visible)? What is the rate-determining step? Name the relevant parts and processes.

[10]

QUESTION 3

Explain how in a normal environment why atmospheric corrosion occurs on steel. Depict, by means of a diagram how this should change if (a) a droplet of human perspiration had to fall onto the steel surface and (b) lithium chloride is present. Explain whether inert dust on the steel surface will influence the rate of corrosion?

[10]

QUESTION 4

Draw the Pourbaix diagram for the steel in water system and explain each region on the diagram. What are the dominant species in each region and why is this so?

[16]

QUESTION 5

When welding austenitic stainless steel, carbide formation at grain boundaries can occur, what is this phenomenon called and what preventative action would you take to avoid future corrosion problems? Explain the typical problems that are likely to occur.

[12]

QUESTION 6

Explain Anodising. Draw a schematic section of Anodised Aluminium giving typical film thicknesses and configuration. How do we seal the anodised surface? Is the freshly anodised surface anodic or cathodic to the underlying metal substrate. Explain the mechanism when the anodised surface is scratched.

[10]

QUESTION 7

What constitutes an organic coating and what is each ingredient's function. What are the two generic types of organic coatings?

[12]

QUESTION 8

How do the surface contaminants: -

1. Dust
2. Oil/grease
3. Old loose paint
4. Moisture/dew

Influence the future performance of a coating? How do you treat each case? (Discuss each one separately.)

[12]

QUESTION 9

What is the definition of a corrosion inhibitor? Explain using Evans diagrams the various mechanisms whereby corrosion inhibitors work.

[10]

Total marks

[100]