كلية الهندسة – جامعة مصراته

فصل الربيع 2014/2013		القسم/هندسة النفط
المقرر/التآكل في الصناعات النفطية	الامتحان النهائي	الزمن: ساعتان ونصف
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أجب علي جميع الأسئلة الاتية

Q1

a. With small details define the following terminologies (5 marks)

a. Wet and dry corrosion.

b. Partial reactions.

c. Cell potential.

d. Rate of corrosion.

e. Protection Potential

b. For a cell composed of two electrodes their reaction is given by the equation:

$$Fe + Cu^{+2}(aq) \longrightarrow Fe^{+2}(aq) + Cu$$

Given the PE of Steel = -0.44 V , PE of Cupper = 0.34 V, gas molar constant R=8.314 J mol^{-1} k^{-1} Temperature T= 298 K^0 and Faraday's constant F= 96485C mol^{-1} .

a. Estimate the Equilibrium constant K.
b. Calculate the free Energy ΔG for the reaction.
c. Comment on the corrosion possibility. **(7 marks)**

Q2

In an electrical measurement for corrosion, a piece of cylindrical iron of 5 cm in diameter corrodes in air producing ferrous oxide. It is found that current density = 1.75μA/cm^2

a. Calculate corrosion penetration rate in mm/yr if the iron density is 9.8 gm/cm^3 and its atomic weight is 55.8. **(6 marks)**

b. Estimate the time taken in years to reach such corrosion if weight loss amounts to 350g. **(6 marks)**

Q3

a. Give brief accounts on the methods that used for the protection of corrosion.**(6 marks)**

b. Select two of these methods and describe them in details. **(6 marks)**

Q4

a. In an experiment to measure inhibition efficiency RI for a typical inhibitor, it was fount that corrosion before adding inhibitor amounts 1.55μA/cm^2 while after adding 5g amounts 0.097 μA/cm^2. Calculate RI for this inhibitor. **(6 marks)**

b. If the protection potential E_{prot} is defined by the following equation:

$$E_{prot} = E^{\circ} - \frac{0.354}{n}$$

If the std potential of iron -0.44, calculate the E_{prot} for iron in ferrous oxide formation **(6marks)**

Q5

Give detailed information of the corrosion in oil industry specifying:

a. Why oil industry is more susceptible to corrosion?. **(4 marks)**

b. What are the locations due to corrosion? **(4 marks)**

c. How corrosion in each area can be minimized? **(4 marks)**

END

Good luck