9/12/2023

Paper / Subject Code: 29713 / Engineering Chemistry - II

F.E. Sem II (C Scheme, R-2019) All Branches. Dec 2023.

Time: 2 hours **Max. Marks 60**

N.B. 1. Question No.1 is compulsory.
2. Attempt any three from Q.2 to Q.6
3. Draw a neat diagram and write chemical reactions where necessary.
4. Figures to the right indicate full marks.
5. Atomic weights: H = 1, C = 12, N = 14, O = 16.

Q.1 Answer any five from the following. **(15 Marks)**

a Explain why gold, silver, platinum do not undergo corrosion.

b A coal sample was subjected to ultimate analysis. 1.5 g of coal sample on combustion in bomb calorimeter produced 0.24g of $BaSO_4$. Calculate the % of sulphur.

c Explain the principle "prevention of wastes" of green chemistry.

d Define spectroscopy and give any two differences between absorption and emission spectra.

e What is knocking? What are the effects of knocking of gasoline?

f Calculate the standard emf of a cell reaction at 25^0C,
$Cr(s)|Cr^{3+}_{(1M)}||Co^{2+}_{(1M)}|Co(s)$
$E^oCo = -0.280V$, $E^oCr = -0.74V$

g Distinguish between galvanizing and tinning.

Q.2 a Define corrosion? Explain the mechanism of corrosion by absorption of oxygen with diagram and reactions. **6**

b What is green fuel? Give the preparation method of bio-diesel and also mention its advantages. **5**

c Write a note on oxygenates and role of catalytic converter. **4**

Q.3 a How do the following factors affect the rate of corrosion: **6**
(i) Relative areas of anodic to cathodic part.
(ii)Position of metal in galvanic series.
(iii)Purity of metal.

b Calculate higher and lower calorific value of coal sample containing C-80%, O-3%, H-7%, S-3.5%, N=2.1% and the remaining is ash. **5**

c Differentiate between Electrolytic and Galvanic cell. **4**

Q.4 **a** Calculate the volume and weight of air required for complete combustion of $1m^3$ of gaseous fuel having the following composition: CO = 10%, C_3H_8 = 12%, CH_4 =30%, N_2 = 3 %, H_2 = 40%, CO_2 = 3%, O_2 = 2.0% (Molecular weight of air =28.949). **6**

b Write a traditional and greener pathway for the synthesis of carbaryl. Write the name of the principle associated with this synthesis. **5**

c What is the selection rule? Explain any two Selection rules. **4**

Q.5 **a** Define spectroscopy and electromagnetic spectrum show the various regions of electromagnetic spectrum with the help of diagram. **6**

b Calculate the percentage atom economy for the following reaction with respect to acetanilide. **5**

$$C_6H_5NH_2 + (CH_3CO)_2O \longrightarrow C_6H_5NHCOCH_3 + CH_3COOH$$

Given Atomic Weights: C = 12, H = 1, O = 16, N = 14

c Explain impressed current cathodic protection of corrosion control. **4**

Q.6 **a** What is an electrochemical cell? Give construction and working of any one reference electrode with the help of diagram and reactions. **6**

b Define Octane and Cetane number. 2.4999 g of coal sample was taken in a silica crucible and heated in an oven maintained at 110^0C for one hour. The weight after heating was 2.368g. Calculate the percentage moisture content in the coal. **5**

c Explain mechanism of electrochemical corrosion by the evolution of hydrogen with the help of a diagram. **4**

****