Paper / Subject Code: 29713 / Engineering Chemistry - II June'2023

FE Sem II (R-2019 C Scheme) "All Branches"

16/2023

Time: 2 hours Max. Marks 60

1. **Question No.1 is compulsory**
2. Attempt any **Three** Questions from the remaining Five Questions
3. Figures to the right indicate full marks
   Atomic weight: H = 1, C = 12, N = 14, O = 16, S=32

Q1. Attempt any **Five** of the following: (15)

a. Give the principle of cathodic protection? What are the two types of cathodic protection?
b. Define Spectroscopy and Electromagnetic spectrum.
c. A cell is constructed from Ni / Ni^{+2} and Cu^{+2}/Cu half cells. Given E^0Ni = - 0.257 V and E^0Cu = 0.337 V. Find out the standard potential of the cell.
d. How does position of metal in galvanic series affect corrosion.
e. Explain 'Prevention of waste' principle in green chemistry.
f. What are fuels? Give the characteristics of good fuel.
g. A sample of coal has the following composition by mass:
   C = 85%, H = 6%, O = 8%, S = 0.5% and Ash = 0.5%. Calculate HCV using Dulong's Formula.

Q2. a. What is Electrochemical corrosion? Explain Hydrogen evolution mechanism with the help of Diagram. (6)

b. Define Green chemistry. Calculate the % atom economy for the following synthesis process of propene. (5)

$$\underset{\text{Propanol}}{CH_3\text{-}CH_2\text{-}CH_2\text{-}OH} \xrightarrow{HCl} \underset{\text{Propene}}{CH_3\text{-}CH{=}CH_2} + H_2O$$

c. What is knocking. Explain the role of anti-knocking agents. (4)

Q3. a. What is oxidation corrosion. Name the different types of oxide layer formed and state which oxide layers are non-protective in nature. Explain with suitable examples. (6)

b. 3.2 gm of coal in Kjeldahl's experiment evolved NH_3 gas was absorbed in 40 ml of 0.5 N H_2SO_4. After absorption the excess acid required 16 ml of 0.5N NaOH for complete neutralization. 2.5 gmsof coal sample in quantitative analysis gave 0.42 gm BaSO4. Calculate the % N and S. (5)

c. What is Electrochemistry? Differentiate between Electrolytic cell and Galvanic cell. (4)

Q4. a. Calculate the weight of air required for complete combustion of 1Kg coal containing C=65%, H=4%, O=5%, S=2%, N=4%, moisture=10% and remaining ash. (6)

b. Give conventional and green chemistry route of production of Indigo. Highlight the green chemistry principles in this case. (5)

c. How is the rate of corrosion influenced by:
(i) pH of the medium
(ii) Relative areas of cathode and anode parts. (4)

Q5. a. Give in tabular form the relation between electromagnetic spectrum, types of spectroscopy and corresponding energy changes. (6)

b. Explain trans-esterification method for synthesis of bio- diesel. Mention advantages of Bio-diesel. (5)

c. What are metallic coatings? Distinguish between galvanizing and tinning. (4)

Q6. a. What are reference electrodes? Give construction and working of any one secondary reference electrode. (6)

b. What is meant by knocking in internal combustion engine? Define octane number and name any two anti-knock agents. (5)

c. What are selection rules? Explain any two selection rules. (4)

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