

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<sup>2+</sup> and Cu<sup>2+</sup>/Cu half cells. Given E<sup>0</sup>Ni = - 0.257 V and E<sup>0</sup>Cu = 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)



- 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<sub>3</sub> gas was absorbed in 40 ml of 0.5 N H<sub>2</sub>SO<sub>4</sub>. 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 BaSO<sub>4</sub>. 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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