

(2 Hours)

[Total Marks: 60]

Note:

1. **Question No.1 is compulsory**
2. Attempt any **Three** Questions from the remaining Five Questions
3. Figures to the right indicate full marks
4. Atomic Weights: C = 12, H = 1, O = 16, N = 14, S = 32, Cl = 35.5

- Q1 Attempt any **Five** of the following: **15**
- a. What are fuels? Give characteristics of good fuel.
 - b. How does position of metal in galvanic series affect corrosion.
 - c. Explain 'Prevention of waste' principle in green chemistry.
 - d. Define Spectroscopy and Electromagnetic spectrum.
 - e. Give the principle of cathodic protection. What are the two types of cathodic protection?
 - f. A cell is constructed from Ni / Ni⁺² and Cu⁺² / Cu half cells. Given E⁰Ni = - 0.257 V and E⁰Cu = 0.337 V. Find out the standard potential of the cell.
 - 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.
- Q2a What is Electrochemical corrosion? Explain Hydrogen evolution mechanism with the help of diagram. **6**
- b Define Green Chemistry. Calculate the percentage atom economy for the following reaction with respect to allyl chloride. **5**
- $$\text{CH}_3\text{-CH}=\text{CH}_2 + \text{Cl}_2 \rightarrow \text{Cl-CH}_2\text{-CH}=\text{CH}_2 + \text{HCl}$$
- Propene Allyl chloride
- c What is knocking. Explain the role of anti-knocking agents. **4**
- Q3a What is oxidation corrosion. Name the different types of oxide layer formed and state which oxidelayers are non-protective in nature. Explain with suitable examples. **6**
- b 3.2 gm of coal in Kjeldahl's experiment evolved NH₃ gas was absorbed in 40 ml of 0.5 N H₂SO₄. After absorption the excess acid required 16 ml of 0.5N NaOH for complete neutralization. 2.5 gms of 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**
- Q4a Proximate analysis consist of determinations of which contents in the coal. 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 Explain conventional and green route method of manufacturing of Carbaryl. By this method which principle of Green Chemistry is shown? **5**
- c How is the rate of corrosion influenced by: **4**
- (i) pH of the medium
 - (ii) Relative areas of cathode and anode parts.

- Q5a 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**
- Q6a What are reference electrodes? Give construction and working of any one secondary reference electrode. **6**
- b (i) What is unleaded petrol? Give the advantages of oxygenates. **5**
(ii) Define Octane and Cetane number, also give its significance.
- c What are selection rules? Explain any two selection rules. **4**
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