

N.B.

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 weight: C = 12, H = 1, O = 16, N = 14, S = 32, Cl = 35.5

**Q.1 Answer any five from the following:****15**

- a. Explain Fluorescence phenomena in brief.
- b. Define electrochemistry and explain redox reaction.
- c. Define fuels. Give characteristics of good fuel.
- d. Why Galvanizing is preferred over tinning?
- e. Explain 'Design for energy efficiency' principle of Green Chemistry.
- f. Explain any two selection rules of spectroscopy.
- g. 2.5g of coal sample on combustion in Bomb's calorimeter produced 0.28 g of BaSO<sub>4</sub> precipitate. Calculate the percentage of sulphur.

**Q.2 a)** Explain how does following factors affect rate of corrosion:**6**

- i) pH of the medium.
- ii) Relative area of anodic and cathodic parts of metal.
- iii) Position of metal in galvanic series.

b) Explain the conventional and greener pathway for the synthesis of Indigo. **5**  
Mention the principle associated with this synthesis

c) Write the cell reaction for Ni | Ni<sup>2+</sup> and Cu<sup>2+</sup> | Cu half cells and calculate standard potential if, E<sup>0</sup><sub>Ni</sub> = -0.257V and E<sup>0</sup><sub>Cu</sub> = 0.337V. **4**

**Q.3 a)** What is Flame photometry? Explain it with respect to principle, working, diagram and applications. **6**

b) What is reference electrode? Differentiate between Electrolytic and galvanic cell. **5**

c) Calculate % atom economy for the following reaction: **4**



**Q.4 a)** Calculate the volume and weight of air required for complete combustion of 1m<sup>3</sup> of gaseous fuel having the following composition: H<sub>2</sub> = 30%, CH<sub>4</sub> = 50%, N<sub>2</sub> = 7 %, CO<sub>2</sub> = 10%, O<sub>2</sub> = 3% (Molecular weight of air = 28.94). **6**

b) Explain trans-esterification method for preparation of biodiesel from vegetable oil with reaction and give its advantages. **5**

c) Differentiate between absorption and emission spectra. **4**

- Q.5**
- a) Explain the mechanism of dry corrosion due to oxygen gas with the help of diagram and reactions. 6
  - b) A sample of coal was found to contain C = 82%, H = 4%, S = 1%, O = 1%, N = 2%, Ash=10%. Calculate HCV and LCV using Dulong's Formula. 5
  - c) Draw a well labelled Jablonski diagram. 4
- Q.6**
- a) Explain Sacrificial anode cathodic protection method to control corrosion of metal pipeline with its principle, diagram and applications. 6
  - b) 2.5 gm of air-dried coal sample was taken silica crucible, after heating it in an oven at 110°C for 1hr the residue weighed 2.45g. The residue was then ignited at 750°C for half an hour and weighed after cooling, constant weight of 0.101 g was obtained. Calculate % Moisture content and % Ash in this sample of coal. 5
  - c) Draw a well labelled diagram of electromagnetic spectrum showing various regions. 4

\*\*\*\*\*