

Time: 2 hours

Max. Marks 60

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_4 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 $\text{Ni} | \text{Ni}^{2+}$ and $\text{Cu}^{2+} | \text{Cu}$ half cells and calculate standard potential if, $E^\circ_{\text{Ni}} = -0.257\text{V}$ and $E^\circ_{\text{Cu}} = 0.337\text{V}$.

4

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

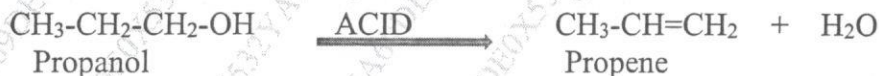
6

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

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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^3 of gaseous fuel having the following composition: $\text{H}_2 = 30\%$, $\text{CH}_4 = 50\%$, $\text{N}_2 = 7\%$, $\text{CO}_2 = 10\%$, $\text{O}_2 = 3\%$ (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
