

(2 Hours)

| Total Marks : 60

N.B. : (1) Question No. 1 is **compulsory**.
 (2) Attempt any three questions out of the remaining five questions.
 (3) All questions carry equal marks.
 (4) Figures to the right indicate full marks.
 (5) Atomic weights : H = 1, C = 12, N = 14, O = 16, S = 32, Cl = 35.

1. Answer any five of the following :-

(a) What is 'Oxidation corrosion' ? Why do gold and platinum metal not get corroded in atmospheric oxygen ?

(b) Give composition, properties and uses of German silver.

(c) What is 'cracking' of heavy oil ? Mention any four advantages of catalytic cracking over thermal cracking.

(d) Explain 'prevention of waste' principle in Green Chemistry.

(e) What are composite materials ? Mention any four characteristics of composite materials.

(f) What is metal cladding ? How is 'alclad' obtained ?

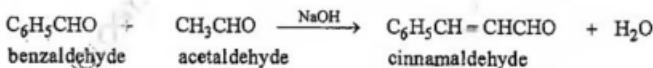
(g) 1.5g of a coal sample was burnt in a combustion apparatus and the products of combustion were collected in previously weighed KOH bulb and CaCl_2 tube. The increase in weights of KOH bulb and CaCl_2 tube were found to be 3.92g and 1.25g respectively. Calculate percentage carbon and hydrogen in the sample.

2. (a) How do the following factors affect the rate of corrosion?

- (i) Relative areas of anodic and cathodic parts
- (ii) Purity of metal
- (iii) pH of medium

(b) What is meant by 'Knocking' in internal combustion engine ? Define Octane number. Name any two anti-knock agents.

(c) Calculate percentage atom economy for the following reaction with respect to cinnamaldehyde.



3. (a) A gaseous fuel has the following composition by volume

11. A gas fuel has the following composition by volume:
 $\text{C}_2\text{H}_6 = 46\%$ $\text{H}_2 = 30\%$ $\text{CH}_4 = 10\%$
 $\text{C}_2\text{H}_4 = 4\%$ $\text{N}_2 = 1\%$ $\text{CO}_2 = 2\%$ and $\text{O}_2 = 7\%$

Calculate volume and weight of air required for complete combustion of 1m^3 of fuel (Mol. wt. of air = 28.949)

(b) Explain conventional and greener route of production of Indigo dye. Highlight the green chemistry principle involved. 5

(c) Explain Galvanic corrosion with the help of a suitable example and diagram. 4

4. (a) What is powder metallurgy ? List various steps involved in powder metallurgy. Mention the aim of each step. 6

(b) With the help of a diagram and electrode reactions, explain mechanism of electrochemical corrosion of iron by hydrogen evolution, in acidic medium. 5

(c) Explain 'sandwich panel' type layered structural composites, with a suitable diagram. Mention their application. 4

5. (a) With a suitable diagram, explain process of refining of petroleum. Name any two fractions obtained. 6

(b) How are plain carbon steels classified based on carbon content ? What are the drawbacks of plain carbon steels ? 5

(c) Discuss influence of any two chemical factors on adhesive action. 4

6. (a) Define 'Paint'. Mention any four constituents of paint with their functions. 5

(b) A sample of coal has the following composition by mass :
 $C = 70\%$, $H = 10\%$, $O = 4\%$
 $S = 2\%$, $N = 2\%$ and $Ash = 12\%$ 5

Calculate Gross and Net calorific value using Dulong's formula.

(c) Distinguish between Brass and Bronze. 5