

N.B. : (1) Question No. 1 is Compulsory.
 (2) Attempt any three from remaining fix questions
 (3) All questions carry equal marks.
 (4) Figures to the right indicate full marks.
 (5) Atomic weights : H=1, C=12, S=32, N=14, O=16, Cl=35.5, Ba=137.3, Na=23, Mg=24.

1. Answer any five from the following : - 15

(a) What are propellants ? State important characteristics of good propellant.
 (b) Compare Galvanizing and Tinning.
 (c) Give composition, properties and uses of Wood's Metal.
 (d) Write a note on 'Green Reagent'.
 (e) Define terms :-
 (i) Composite material (ii) Matrix phase (iii) Dispersed phase.
 (f) List three main constituents of Varnish & give functions of each.
 (g) A coal sample was subjected to ultimate analysis :
 1.6 gm of coal on combustion in a Bomb calorimeter gave 0.47 gm of BaSO₄
 Calculate % of sulphur in the coal sample.

2. (a) What is dry corrosion ? Explain with example how nature of oxidised product affect the rate of corrosion. 6
 (b) What is cracking ? Explain fixed bed catalytic cracking with diagram. 5
 (c) Calculate percentage atom economy for the following reaction w.r. to methyl iso-cyanate 4

$$\text{CH}_3\text{NH}_2 + \text{COCl}_2 \rightarrow \text{CH}_3\text{-N}=\text{C=O} + 2\text{HCl}$$

 methyl iso cyanate.

3. (a) A gaseous fuel has the following composition by volume. 6
 $\text{CH}_4 = 35\%$, $\text{C}_2\text{H}_4 = 5\%$, $\text{CO} = 15\%$, $\text{H}_2 = 40\%$, $\text{N}_2 = 1$ water vapour = 4%
 Calculate volume & weight of air required for complete combustion of 1m³ of fuel
 [mol.wt of air = 28.94]
 (b) Explain conventional & green synthesis of adipic acid. Mention the green chemistry principle involved. 5
 (c) How the rate of corrosion influenced by following factors. 4
 (i) PH of medium (ii) Over voltage.

4. (a) What is powder Metallurgy ? How are metal powders prepared using. 6
 (i) Atomization (ii) Chemical reduction
 (b) What is cathodic protection ? Explain Impressed current method of corrosion control. 5

TURN OVER

(c) Write a note on 'Sandwitch panel' type layered composites. 4

5. (a) What is Bio-diesel ? Explain the trans esterification method for its synthesis. 6
Mention advantages of biodiesel as fuel.

(b) What are alloys ? Explain any four purposes of making alloys with suitable example. 5

(c) Discuss the physical factors influencing adhesive action. 4

6. (a) Write a note on differential aeration corrosion. 5

(b) 2.5 gm of air dried coal sample was taken in a silica crucible , after heating it in an electric oven at 110°C for 1hr the residue was weighed 2.41 gm. The residue was heated in Silica crucible covered with vented lid at a temperature $925 \pm 25^{\circ}\text{C}$ for exactly 7 minutes. After cooling the weight of residue was found to contain 1.98 gm. The residue was then ignited to a constant weight of 0.246 gm. Report the results of above analysis. 5

(c) Explain the effects of following elements on alloying :- 5

- (i) Nickel
- (ii) Chromium
- (iii) Cobalt
- (iv) Molybdenum
- (v) Carbon.