

(REVISED COURSE)
(2 Hours)
[Total Marks : 60

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Attempt any three question from 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, Ba = 137.3

1. Answer any five of the following :—

- (a) Define Octane number of gasoline. How is knocking tendency of gasoline related to chemical structure of hydrocarbons present? **15**
- (b) What are metallic coatings? Distinguish between anodic and cathodic coating.
- (c) Give composition, properties and uses of Wood's metal.
- (d) Explain 'prevention of waste' principle in Green Chemistry.
- (e) Give classification of composite materials.
- (f) What is 'Oxidation corrosion'? Explain why pure aluminium metal exhibits good corrosion resistance in atmospheric oxygen.
- (g) A coal sample was subjected to ultimate analysis 1.5g of coal on combustion in a Bomb calorimeter gave 0.24g of BaSO₄. Calculate percentage sulphur in the coal sample.
2. (a) How do the following factors affect the rate of corrosion? **6**
- (i) Relative areas of anodic and cathodic parts.
 - (ii) Position of metal in galvanic series.
 - (iii) pH of medium
- (b) With a suitable diagram, explain process of refining of petroleum. **5**
- (c) Calculate percentage atom economy for the following reaction with respect to acetanilide. **4**
- $$\text{C}_6\text{H}_5\text{NH}_2 + (\text{CH}_3\text{CO})_2\text{O} \rightarrow \text{C}_6\text{H}_5\text{NHCOCH}_3 + \text{CH}_3\text{COOH}$$
- aniline
acetanilide
3. (a) A gaseous fuel has the following composition by volume. **6**
- H₂ = 55%, CH₄ = 30%, C₂H₄ = 5% CO = 5%, N₂ = 1%, CO₂ = 2% and O₂ = 2%. Calculate volume and weight of air required for complete combustion of 1m³ of fuel. (Mol.wt. of air = 28.949)

- (b) Explain conventional and green chemistry route of production of adipic acid. 5
Highlight the green chemistry principle involved.
- (c) What is the principle of cathodic protection method of corrosion control? Explain 4
the method of Impressed current cathodic protection.
4. (a) What are the drawbacks of plain carbon steels? Explain special effects of the 6
following metals on properties of alloy steels:
(i) Nickel (ii) Chromium (iii) Cobalt (iv) Tungsten
- (b) With a suitable diagram and electrode reactions, explain electrochemical 5
mechanism of rusting of iron in neutral, aqueous medium.
- (c) Discuss the influence of any two chemical factors on adhesive action. 4
5. (a) With a schematic diagram, explain Fixed Bed Catalytic Cracking. Mention any 6
two advantages of catalytic cracking over thermal cracking.
- (b) List various steps involved in powder metallurgy. Mention the aim of each step. 5
Give any two advantages of powder metallurgy.
- (c) Explain 'sandwich panel' type layered composites with a suitable diagram. Mention 4
their application.
6. (a) Define 'Paint'. Mention any four constituents of paint and state functions of each 5
constituent.
- (b) A sample of coal has the following composition by mass : C = 80%, H = 4%, 5
O = 6%, S = 3%, N = 2% and Ash = 5%. Calculate Gross and Net Calorific value
using Dulong's's formula.
- (c) What is an alloy? Explain any four purposes of alloying with suitable examples. 5
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