Q P Code: NP-1774

(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 15 related to chemical structure of hydrocarbons present?
 - (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?

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- (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 4 acetanilide.

$$C_5H_5NH_2 + (CH_3CO)_2O \rightarrow C_6H_5NHCOCH_3 + CH_3COOH$$
 aniline acetanilide

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

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 drawbakes of plain earbon 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.
- 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%, 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