

(REVISED COURSE)

QP Code :11873

(2 Hours)

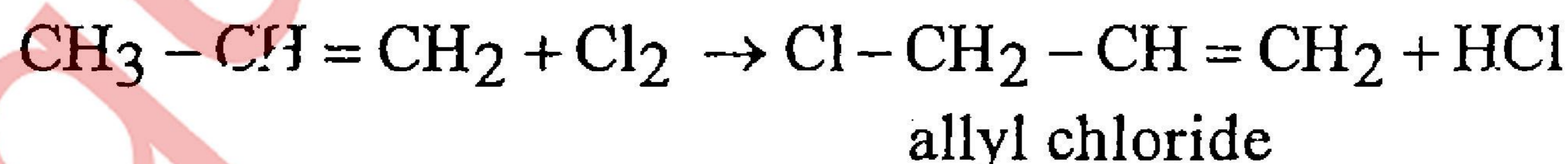
[ Total Marks : 60

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

1. Answer any five of the following :-

- (a) Distinguish between Galvanizing and tinning. 15  
(b) Give composition, properties and uses of Duralumin.  
(c) What is 'cracking' of heavy oil? Mention any four advantages of catalytic cracking over thermal cracking.  
(d) Explain 'Design for Energy Efficiency' principle in Green Chemistry.  
(e) What are composite materials? Mention any four characteristic properties of composite materials.  
(f) Gold and platinum do not get corroded in atmospheric oxygen. Explain.  
(g) A sample of coal has the following composition by mass : C = 75%, H = 7%, O = 8 %, S = 4 %, N = 2% and Ash = 4 %. Calculate Gross Calorific value of the fuel using Dulong's formula.

2. (a) What is Electrochemical corrosion? With a suitable diagram and electrode reactions, explain electrochemical mechanism of rusting of iron in neutral, aqueous medium. 6  
(b) What is meant by 'Knocking' in internal combustion engine? Define Octane number and Cetane number. Name any two anti-knock agents. 5  
(c) Calculate percentage atom economy for the following reaction with respect to allyl chloride. 4



3. (a) A gaseous fuel has the following composition by volume :  
 $\text{H}_2 = 40\%$ ,  $\text{CH}_4 = 30\%$ ,  $\text{CO} = 10\%$ ,  $\text{C}_3\text{H}_8 = 12\%$ ,  $\text{N}_2 = 3\%$ ,  $\text{O}_2 = 2\%$  and  $\text{CO}_2 = 3\%$ . Calculate volume and weight of air required for complete combustion of  $1\text{m}^3$  of fuel. (Mol. wt. of air = 28.949) 6

- (b) Explain conventional and green chemistry route of production of Indigo dye. Highlight the green chemistry principle involved. 5
- (c) How do the following factors affect the rate of corrosion ? 4
- (i) Relative areas of anodic and cathodic parts.
  - (ii) Position of metal in galvanic series.
4. (a) What are alloy steels? Explain special effects of the following metals on properties of alloy steels. 6
- (i) Chromium (ii) Nickel (iii) Cobalt (iv) Tungsten
- (b) Explain differential aeration corrosion with the help of a suitable example. 5
- (c) Explain laminar composites with suitable example. 4
5. (a) What is biodiesel ? Explain method to obtain biodiesel from vegetable oil. What are the advantages of biodiesel ? 6
- (b) What is Powder metallurgy ? Explain Powder Injection moulding method of compaction. 5
- (c) Define matrix phase of composite material. State functions of matrix phase. 4
6. (a) What is the principle of cathodic protection method of corrosion control ? Explain Sacrificial anodic protection method. 5
- (b) 2.5 g. of a coal sample was analysed for nitrogen content by Kjeldahl's method. The liberated ammonia required 12.7ml of 0.5N  $\text{H}_2\text{SO}_4$  solution for neutralization. In a separate experiment, using Bomb calorimeter, 1.5 g of coal sample gave 0.28g of  $\text{BaSO}_4$ . Calculate percentage Nitrogen and Sulphur in the sample. 5
- (c) How are plain carbon steels classified based on carbon content ? What are the drawbacks of plain carbon steels? 5
-