Q.P. Code : **5816**

(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 = 35.5

1. Answer any **five** of the following :- 15
   (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.

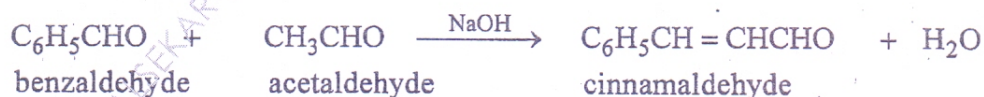2. (a) How do the following factors affect the rate of corrosion ? 6
   (i) Relative areas of anodic and cathodic parts
   (ii) Purity of metal
   (iii) pH of medium
   (b) What is meant by 'Knocking' in internal combustion engine ? Define Octane 5 number. Name any two anti-knock agents.
   (c) Calculate percentage atom economy for the following reaction with respect 4 to cinnamaldehyde.

   $$C_6H_5CHO + CH_3CHO \xrightarrow{NaOH} C_6H_5CH=CHCHO + H_2O$$
   benzaldehyde   acetaldehyde   cinnamaldehyde

3. (a) A gaseous fuel has the follwing composition by volume. 6
   CO = 46% H_2 = 30% CH_4 = 10%
   C_2H_4 = 4% N_2 = 1% CO_2 = 2%   and O_2 = 7%

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

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

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

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

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

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

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

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

    (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 :   5
$C = 70\%$, $H = 10\%$, $O = 4\%$
$S = 2\%$ $N = 2\%$ and $Ash = 12\%$

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

    (c)   Distinguish between Brass and Bronze.   5

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