

**Q.P. Code :13125**

**[Time: Two Hours]**

**[ Marks:60]**

Please check whether you have got the right question paper.

- N.B:
1. Question.No.1 is compulsory.
  2. Attempt **any three** questions out of remaining five.
  3. Figures to the right indicate full marks.
  4. Atomic weights:- C=12, S=32, N=14,H=1,O=16,Cl=35.5

1. Answer **any five** from the following **15**
- a) Select the compound which possesses highest octane number and highest cetane number out of n-heptane, n- octane and isooctane.
  - b) Iron does not rust even if the zinc coating is broken in a galvanized iron pipe. Give reasons.
  - c) Calculate the higher and lower calorific values of coal sample containing 84% carbon, 1.5% sulphur, 0.6 Nitrogen, 5.5% hydrogen and 8.4% oxygen.
  - d) What are the drawbacks of plain carbon steel.
  - e) Explain the principle 'Prevention of waste' in Green Chemistry.
  - f) Define and classify composite materials.
  - g) Mention three functions of thinner in paint.
- 2.
- a) Define corrosion of metals. Explain the electrochemical theory of wet corrosion, giving its mechanism. **6**
  - b) i) 1.56 g of a coal sample was kjeldahlised and NH<sub>3</sub> gas thus evolved was absorbed in 50ml of 0.1N H<sub>2</sub>SO<sub>4</sub>. After absorption the excess (residual) acid required 6.25 mL of 0.1N NaOH for exact neutralization. Calculate the percentage of N in the coal sample. **3**  
ii) What is super critical CO<sub>2</sub>? Why is it considered a green solvent **2**
  - c) Write a short note on Particle reinforced composites. **4**
- 3.
- a) What is cracking? Explain in detail –fixed bed catalytic cracking. **6**
  - b) i) Write a brief note on Heat resistant steel **3**  
ii) A metal rod half immersed in water starts corroding at the bottom. Give reasons. **2**
  - c) Calculate the percentage atom economy for the following reaction with respect to allyl chloride. **4**  
$$\text{CH}_3\text{-CH=CH}_2 + \text{Cl}_2 \rightarrow \text{Cl-CH}_2\text{-CH = CH}_2 + \text{HCl}$$

Allylchloride.
- 4.
- a) Explain how the following factors affect the rate of corrosion **6**
    - i) pH
    - ii) Ratio of anode to cathode areas
    - iii) Position of metal in galvanic series.

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- b) i) Write a brief note on products obtained from natural materials **3**  
ii) Define structural composites. **2**
- c) Define Shape memory Alloys and mention its applications (at least four) **4**

- 5.**
- a) A sample of coal was found to contain the following constituents. C=81%; O=8% S=1%; H=5%, N=1% and Ash=4% **6**  
Calculate the minimum weight and volume of air required for the complete combustion of 1kg of coal.
- b) i) Discuss in brief sacrificial anode method of corrosion protection. **3**  
ii) What is powder metallurgy? Mention any two advantages and two limitations of powder metallurgy **2**
- c) Explain with suitable equations conventional and green synthesis of carbaryl. Also mention the principle of green chemistry involved. **4**

- 6.**
- a) Mention the composition, properties and uses of (Any two) **6**  
i) Duralumin  
ii) German silver  
iii) Gun metal
- b) i) Mention the advantages of composite materials **3**  
ii) Distinguish between anodic and cathodic coating **2**
- c) What is biodiesel? Discuss the method to obtain biodiesel. What are the advantages of biodiesel? **4**
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