# **Unit1**

# **Fuel**

Q.1 Why Otto Hoffmann’s oven is preferred over all other methods forcarbonization.

Q.2 Why catalytic cracking is advantageous over thermal cracking?

Q.3 Good petrol is bad diesel. Explain with chemical structure of petrol and diesel.

Q.4 How antiknocking properties of petrol and diesel can be increased?

Q.5 Give brief about the Kjeldahl’s method for the determination of Nitrogen.

Q.6 A gaseous fuel has following composition by volume:H2 = 36%, CH4 = 6%, N2 = 38%, O2 = 16%, CO = 4%. If 30% excess of air is used, find the weight of air actually supplied per m3 of the gas.

Q.7 1.09g of a sample of a coal was used for Nitrogen estimation by Kjeldahl’smethod. The ammonium obtained was absorbed in 25mL of N/10 H2SO4. Toneutralize the remaining acid, 15 mL of 0.1 N NaOH was required. Determine the percentage of Nitrogen in coal.

Q.8 Why is net calorific value less than gross calorific value?

Q.9 Differentiate between octane number and cetane number.

Q.10 Why should an ideal fuel have moderate ignition temperature?

**Unit 2**

**Phase rule and Catalysis**

Q1 Discuss the action and role of promoters and inhibitors in the process of catalysis?

Q2 Explain shape selective catalysis with examples.

Q3 Discuss in detail the mechanism and kinetics of enzyme catalyzed reactions.

Q4 Discuss the kinetics of acid and base catalyzed reactions in detail.

Q5 Taking a suitable example, give the mechanism of the surface reaction involving a heterogeneous catalyst.

Q6 Why a rough surface piece of Pt acts as a good catalyst in comparison to a smooth surface in the manufacture of H2SO4 by contact process.

Q7 What is autocatalysis? Explain giving suitable examples.

Q8 Write a short note explaining the mechanism for catalysis by Wilkinson’s catalyst.

Q9 Oxidation of SO2 to SO3 is catalyzed by NO. Explain giving chemical equations, the various steps involved in this conversion.

Q10 Explain the effect of pH and temperature on the rate of bio-catalytic reactions.

Q11 a) State Gibb’s phase rule.

b) Mention advantages and disadvantages of phase rule.

c) Explain the phase diagram of Pb-Ag system and discuss its practical application of it.

Q11 a) Differentiate between triple point and critical point.

b) Calculate the number of phases, components and degree of freedom in the following:

i) Sulphur system Sr Sm Sl Sv

ii) An aqueous solution of glucose

**Unit 3**

**WATER TECHNOLOGY**

Q1. Explain how the hardness of water is removed by EDTA method.

Q2. What is caustic embrittlement? Explain its causes and prevention.

Q3.What are the methods of water softening by external treatment?

Q4. Explain the following terms: (i) Reverse Osmosis (ii) Electrodialysis (iii) Priming & foaming

Q5. How is alkalinity from various ions determined in water?

Q6. Describe the principle and procedure involved in Zeolite process for the treatment of water.

Q7. Why Calgon conditioning is better than phosphate conditioning?

Q8. A water sample contains: Mg(HCO3)2=73ppm, Ca(HCO3)2=40.5ppm, MgSO4 = 12ppm, CaCl2=222ppm, KCl=30ppm. Calculate the quantity of Lime (80% pure) and soda (95% pure) required for softening 50,000 litre of water.

Q9. 100ml of H2O sample when titrated against N/50 H2SO4, using phenolphthalein as an indicator, gave the end point with 10ml of acid. Another 100ml of the sample also required 10ml of the acid to obtain methyl orange end point. What type of alkalinity is present in the sample and what is its magnitude?

Q10. 50ml of a sample of hard water was titrated against 0.01M EDTA, it required 15ml of EDTA for titration.50ml of the same hard water after boiling and filtering etc. required 5ml of EDTA for titration. Calculate the total and temporary hardness of water.

**Unit 4**

**Corrosion**

Q.1 Explain the mechanism of dry and wet corrosion.

Q.2 Why corrosion rate is higher in pitting corrosion?

Q.3 Explain the term Passivity.

Q.4 How galvanic series helps in predicting the corrosion behavior of metals in different environments?

Q.5 Explain cathodic protection and anodic protection in detail.

Q.6 What are corrosion inhibitors? Explain their types.

Q.7 Explain the following:-

1. Galvanization
2. Tinning
3. Electroplating
4. Metal cladding

Q.8 Impure metal corrodes faster than pure metal under identical conditions. Give reason.

Q.9 Why amalgamated zinc reacts slowly with dilute acids?

Q.10 A pure metal rod half immersed vertically in water starts corroding at the bottom. Give reason.