

**Unit-1**

1. a) Draw neat and labelled diagram and explain coke manufactured by Otto-Hoffmann's methods. (8)
- b) What are the Knocking and Octane number? How these are related to the chemical structure of the fuel. [marks 8]

**OR**

- a) With the help of neat labelled diagram, describe how gasoline can be synthesized from water gas. [marks 8]
- b) (1) Explain the advantages and disadvantage of gaseous fuel. [marks 4]
- (2) Write the comparative study of solid, liquid and gaseous fuels. [marks 4]

**Unit-2**

2. a) Give the experimental details for calculating higher and lower calorific values of solid fuel by Bomb-calorimeter. [marks 8]
- b) A sample of petrol as found to contain 15.4% of hydrogen and 84.6% of carbon by weight. Calculate the volume of oxygen at NTP required for the complete combustion of 1 kg of this fuel. [marks 8]

**OR**

a) Write short notes on :

(1) Fuel gas analysis by Orsat's apparatus. [marks 4]

(2) Ultimate analysis of coal. [marks 4]

b) A gaseous fuel have the following composition by volume.

H<sub>2</sub>=20%, CH<sub>4</sub>=50%, CO=20%, CO<sub>2</sub>=5%, N<sub>2</sub>=50%. If 50% excess of air is used, find the weight of air

actually supplied per m<sup>3</sup> of this gas. [marks 8]

**Unit-3**

3. Define the terms phase, component and degree of freedom. Explain the sulphur system with phase diagram. [marks 16]

**OR**

What is reduced phase rule? Explain the terms involved in it. Explain Bi-Cd system with phase diagram. [marks 16]

**Unit-4**

4. a) Explain Meissner effect in superconductors. Write the application of superconductor. [marks 8]

b) Write short notes on Fullerenes. [marks 8]

**OR**

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**a) What are optical fibre? Describe the construction, working, and application of optical fibre.**

**[marks 8]**

**b) What is organic electronic materials? How do they differ from inorganic semiconductor? [marks 8]**

**Unit-5**

**5. Define corrosion of metals. What are different type of corrosion? Explain the electrochemical theory of wet corrosion, giving its mechanism. [marks 16]**

**OR**

**Write short notes on any Three of the following : [marks 6+5+5]**

- a) Protective-Inorganic and Organic Coating.**
- b) Pitting corrosion.**
- c) Galvanic cell.**
- d) Passivation.**