

Part - A : Marks : 20

1. a) Calculate total kmol of flue gas produced by burning completely 1 kmol of n-heptane (C_7H_{16}) using theoretical air. (2)
- b) A solid fuel on analysis shows (% by weight) Carbon = 70 and ash = 30
For Air/fuel ratio (by weight) of 10:1, calculate % volumetric composition of flue gas produced by complete combustion of the solid fuel. (3)
- c) A fuel gas is burnt with 10% excess air. The fuel gas has the following % composition by kmol :
 $CO_2 = 4$, $C_2H_4 = 0.4$, $CO = 29$, $H_2 = 12$, $CH_4 = 2.6$ and $N_2 = 52$. Assuming complete combustion, calculate the kmol of total air supplied/100 kmol of fuel gas. (4)

2. Write brief note on

- a) Weathering of coal during storage (2)
- b) Combustion with stationary flame (3)

3. Describe with the help of a neat schematic diagram the 'Lurgi Spul-Gas Process' for lignite carbonization.

Or

Describe in detail the 'coalification process'.

Part B : MM: 20

Attempt all the Questions

1. Explain the upstream processing of petroleum oils. (3)

2. Write short notes on the following topics (6)

- a) Conversion of gaseous fuels to liquid fuels (3)
- b) Nuclear waste disposal (3)

3. Answer yes or no

- a) Sweet crude oil has high sulfur contents and sweet taste.
- b) Calorific Value of petroleum oil is lesser than that of brown coals
- c) Platforming uses cobalt oxide as a catalyst for cracking
- d) Bombay high crude is a lighter crude (1)
- e) Kinematic viscosity shows the kinetics of oil cracking
- f) India imports almost 80% of its requirement of petroleum oil (3)

4. Calculate the API gravity of Arabian crude oil having specific gravity of 0.983 (at 15.5°C) (2)

5. Calculate the latent heat of vapourization of Venezuelan crude kcal/Kg at 39°C and the specific gravity of crude oil is 0.869 at 15°C (3)

6. Calculate the GCV (gross calorific value) in kcal/Nm³ and the Wobbe Index of the town gas having the following composition (% volume): methane 89% (CV of methane 9500 kcal/Nm³) and butane 1% (CV of butane 36711 kcal/Nm³) ethane 8% (CV of ethane 16611 kcal/Nm³) and propane 2% (CV of propane 23688 kcal/Nm³) (3)