



Note: Answer Five questions.

Q₁/ In petroleum non-refinery industries, explain complete your material manufacturing process including (petroleum raw materials, manufacturing steps with block diagram, and the applications).
(20 marks)

Q₂/ The small-scale preparation of 100 g of Thiokol rubber
- Mass of sulfur used (20% excess) ----- g.
- Volume of sodium hydroxide (1 M) used ----- mL.
- Volume of 1,2-dichloroethane (M. Wt.= 98.96 g/mol, & $\rho=1.253 \text{ g/cm}^3$) used ----- mL.
Make complete table of input and output materials balance, take number of unit repeat=4.

(20 marks)

Q₃/

A) Define in details the distillation, and explain it according number of materials, & technique kind.

B) Explain in detail the following processes:

- Reforming.
- Isomerization.
- Cracking.

(20 marks)

Q₄/ Answer two of the following:

A) Define the Sludge, its resources, composition, the treatments, and draw flow diagram.

B) Explain in details the presence of NORM in the petroleum and petrochemical industries.

C) Discuss in details health damages and the treatments of NORM.

(20 marks)

Q₅/ Explain coal tar pitch production, draw block diagram, then discuss:

A) The effect of catalyst used in cracking process.

B) Common petroleum pitch producing processes.

(20 marks)

Q₆/ Petroleum is also used as a raw material in manufacturing more than a thousand other materials, discuss the following questions:

1. Draw block diagram of petroleum products?
2. What are some of the other sources of energy we use?
3. Why are petroleum and coal called fossil fuels?
4. The advantages and disadvantages of some of the different energy sources.
5. What do you think will happen to the price of oil when the known oil reserves are almost used up? Will this help us find more oil? Will higher prices of oil make other materials sources more viable?

(20 marks)