III B.Sc. Petroleum & Petrochemicals

Semester - V

Paper – VI: **Petrochemicals-I**

Unit 1: Feed stock for petrochemicals – Purification of gases – ethanolamine sweetening process – separation of gases into individual Constituents, separation of C_4 Components by extractive distillations – Low temperature fractionation – Special techniques – Absorption – Low temperature combination for Separation of Gases.

Unit 2: Natural Gas:

Physical and thermodynamic properties of Natural gas – Low temperature processing of Natural gas for separation of ethane and heavy hydrocarbons – dehydration and sweetening of Natural Gas, Liquefaction of Natural gas and its Production of Substitute Natural Gas (SNG) from Naphtha.

Liquefied Petroleum Gas:

Sources of LPG – Composition of LPG – Chemical and physical properties of LPG – Production of LPG - Handling and safe use of LPG.

Unit 3: Synthesis gas and its production:

Steam reforming of Hydrocarbons – production of synthesis gas by steam reforming of Natural gas, steam reforming of Naphtha and partial oxidation of Fuel oil – Lurgi Coal gasification – Fischer Tropsch Syn gas technology.

After treatment of synthesis gas – Production of pure hydrogen, production of Ammonia synthesis gas, methanol synthesis gas – oxo – synthesis gas and pure carbon monoxide.

Unit 4: Chemicals from Synthesis gas:

Production of methanol – Oxo synthesis – production of Propionaldehyde and 2 – Ethyl Hexanol – Production of Acetic Acid and Butanol from synthesis gas – Fractionation of Air – Air separation plant, synthesis of Urea.

Unit 5: Synthetic Detergents:

Classification of detergents – Detergents through olefins – manufacture of Linear Alkyl Benzenes, n-paraffin's production and Detergents from n-paraffin's – Manufacture of Aryl Benzene sulphonate (Surf) – manufacture of Alkylated Phenol detergents - Finishing of detergents – additives to detergents.

Suggested Reading:

1) A text on petrochemicals by Dr. B.K. Bhaskara Rao, Khanna Publishers, Delhi.

2) Petrochemical process Technology by I.D. Mall Macmillan India Ltd.,

3) Fuels and petrochemical processing by B.K. Sharma Goel Publishing House Meerut.

4) Introduction to Petrochemicals by Sukumar Maiti Oxford I.B.H.

III B.Sc., Petroleum & Petrochemicals

MODEL QUESTION PAPER

Paper VI – Petrochemicals – I

Time: 2 $^{1}/_{2}$ Hrs. Semester - V Max. Marks 60

Section – I

Answer any Three questions from the following.
All questions carry equal marks 3 x 16 =18 marks

1. a. With a neat Flow diagram, explain the typical Ethanolamine Sweetening process. ?
b. What are the different separation Techniques available industrially to separate gases into individual constituents? Discuss any one process briefly.

2. a. Explain how Dehydration and sweetening of Natural gas is carried out.
b. What is LPG? Write down the various sources of LPG.

Discuss in detail about the safe handling and safe usage of LPG as a fuel keeping in view its properties.

3. a. With neat flow chart, describe the manufacture of synthesis gas by steam reforming of Naphtha.
b. Write briefly about Fischer Tropsch syn gas Technology

4. a. With a neat flow diagram describe the method of production of 2- Ethyl hexanol by Oxo – process.
b. With a neat flow diagram describe how Acetic Acid can be manufactured from Methanol and Carbon Monoxide (BASF method).

5. a. Write about the classification of Detergents. With a neat flow chart describe how detergents can be produced from olefins.
b. Discuss the production of detergents from n - Paraffin's with a neat flow chart.

Section II

Write short notes on any FOUR of the following

4x3=12 Marks

6. Hypersorber.
7. Distinguish LNG, SNG and CNG.
8. Ammonia Synthesis Gas.
9. Oxo Synthesis.
10. Additives to detergents.

Note to paper setter:

In section I, one essay question is to be set from each of the 5 units. Similarly, in section II one short answer question is to be set from each of the 5 units.

III B.Sc., - Petroleum & Petrochemicals
Paper –VI: SEMESTER - V
PETROCHEMICALS - I
QUESTION BANK

Essay Questions: 16 M

UNIT –I:

1. a. With a neat Flow diagram, explain the typical Ethanolamine sweetening process.
   b. What are the different separation Techniques available industrially to Separate Gases into individual constituents? Discuss any one process briefly

2. a. Write in detail about the separation of C_4 Components by extractive distillations
   b. Explain briefly about the Low temperature combination for Separation of Gases.

UNIT –II:

5. a. Explain how Dehydration and sweetening of Natural gas is carried out.
   b. Explain about the Low temperature processing of Natural gas for separation of
   Ethane

2. a. Write down the various sources of LPG.
   Discuss in detail about the safe handling and safe usage of LPG as a fuel keeping in view its properties.
   b. Explain in detail about the production of LPG

3. a. Explain in detail about the Production of Substitute Natural Gas (SNG) from Naphtha.
   b. Write about the Liquefaction of Natural gas

UNIT –III:

1. a. With neat flow chart, describe the manufacture of synthesis gas by steam reforming of Naphtha.
   b. Write briefly about Fischer Tropsch syn gas Technology

2. a. Explain in detail about the production of Ammonia synthesis gas
   b. Explain in detail about the production of Methanol by Oxo - synthesis

UNIT –IV:

1. a. With a neat flow diagram describe the method of production of 2- Ethyl hexanol by
   Oxo – process.
   b. With a neat flow diagram describe how Acetic Acid can be manufactured from Methanol and Carbon Monoxide (BASF method).
2. a. Explain about the design and working of Air separation plant.
   b. Explain in detail about the synthesis of Urea.

UNIT –V:

1. a. With a neat flow chart describe how detergents can be produced from olefins.
   b. Discuss the production of detergents from n - Paraffin's with a neat flow chart.

2. a. Explain in detail about the manufacture of Alkylated Phenol detergents
   b. Explain in detail about the Manufacture of Aryl Benzene sulphonate (Surf)

Short answer questions: 03 M

UNIT - I:

1. Explain about the purification of gases
2. Write about absorption technique
3. Explain about the separation of gases into individual constituents
4. Write a note on hypersorber

UNIT - II:

4. Write about composition of natural gas
5. Write about the properties of natural gas
6. What is LPG? Write the composition of LPG
7. Write briefly about the properties of LPG

UNIT - III:

1. Write briefly about Lurgi coal gasification
2. Write about the steam reforming of hydro carbons
3. Write about the production of pure hydrogen

UNIT - IV:

1. Write about Oxo synthesis
2. Explain about the production of Butanol

UNIT - V:

1. Explain briefly about additives to detergents
4. Write about the classification of detergents
5. Write about the finishing of detergents

IMPORTANT NOTE TO PAPER SETTER:

In section - I, one essay question is to be set from each of the five units. Similarly in

Section - II, one short answer question is to be set from each of the five units.

Questions should be given from QUESTION BANK.

III B.SC., - (Petroleum & Petrochemicals)

Practical Syllabus

Semester - V

Practical -V (At the end of Fifth semester)

a. Determination of Specific gravity by Specific gravity bottle.

b. Determination of Specific gravity by Pyknometer.

c. Simple Distillation

d. Steam distillation.

PRACTICAL – VI (At the end of Fifth Semester)

1) Determination of Partition Coefficient.

2) Diffusion coefficient.

3) Colorimetric estimation of $KMnO_4$ solution.

4) Colorimetric estimation of Fe (III) – Thiocyanate Method.

SCHEME OF VALUATION — Max. Marks: 35

1)	Procedure to be written in the first 15 minutes	10 Marks
2)	Recording of data and reporting the value Marks upto 2% error	15
	Error up to 5%	10 Marks
	Error greater than 5%	5 Marks
3)	Viva – Voice	5 Marks
4)	Record	5 Marks