

# GUJARAT TECHNOLOGICAL UNIVERSITY

## BE-6 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

**Subject Name & Code:**

**PETROLEUM REFINING AND PETROCHEMICALS (3160510)**

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### **Unit 1: Basics of Petroleum**

#### **Repeated Questions:**

1. **Discuss the composition of crude oil.** (Verified S25 - Q1a, 03 marks); (Verified S23 - Q1a, 03 marks); (Verified S22 - Q1b, 04 marks - This asks for "evidences in favor of biogenic origin", which is related to composition/origin).
2. **Discuss classification of crude oil in brief. / How crude oil is classified? Discuss.** (Verified W25 - Q1b, 04 marks); (Verified S23 - Q1b, 04 marks); (Verified W24 - Q2c, 07 marks); (Verified S24 - Q1b, 04 marks); (Verified W23 - Q1a, 03 marks).
3. **Discuss the recent scenario of production of crude oil and refineries in India. / Brief about Indian refining scenario and oil reservoirs in India.** (Verified W25 - Q1c, 07 marks); (Verified S23 - Q1c, 07 marks); (Verified W24 - Q1b, 04 marks); (Verified S24 - Q1c, 07 marks); (Verified S22 - Q1a, 03 marks).

#### **Other Important Questions:**

4. **Give an account of crude oil refining scenario in global context.** (Verified S25 - Q1b, 04 marks).
  5. **Categorize different crude oils based on their characteristics.** (Verified S25 - Q1c, 07 marks).
  6. **State and explain evidences in favor of biogenic origin of crude oil.** (Verified S22 - Q1b, 04 marks).
  7. **Explain the biogenic theory for formation of crude oil in detail.** (Verified W24 - Q3b, 04 marks).
  8. **Explain in detail: Composition of crude oil.** (Verified W22 - Q3c, 07 marks).
  9. **Explain in brief: Role of crude oil in Global economy.** (Verified W22 - Q5a, 03 marks); (Verified W23 - Q5b, 04 marks).
  10. **Describe different arrangement of distillation towers in petroleum fractioning with the help of neat sketches.** (Verified W23 - Q1c, 07 marks); (Verified S22 - Q3c, 07 marks).
  11. **Enlist various pipe still heaters used for heating crude petroleum. Explain any two in brief.** (Verified W22 - Q3c OR, 07 marks).
  12. **List the physical impurities found in crude oil and the related problems.** (Verified S25 - Q3a OR, 03 marks).
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## Unit 2: Properties of Petroleum Products

### Repeated Questions:

1. **Define/Explain: Flash point and Fire point / Flash point, Pour point, Smoke point.** (Verified W25 - Q2a, 03 marks); (Verified W24 - Q1a, 03 marks).
2. **Discuss any three tests for testing of gasoline in detail. / Enlist various tests for gasoline and explain all in detail.** (Verified W25 - Q2c, 07 marks); (Verified S23 - Q2c, 07 marks); (Verified W24 - Q1c, 07 marks).
3. **Explain in brief: Cloud and Pour Point. / Discuss cloud point and pour point test.** (Verified W25 - Q3a, 03 marks); (Verified S24 - Q5a, 03 marks).
4. **Explain ASTM distillation process/test.** (Verified W25 - Q3a OR, 03 marks); (Verified W24 - Q3a, 03 marks); (Verified S25 - Q2b, 04 marks).
5. **Discuss Octane number and its significance. / Explain in brief: Octane Number and knocking.** (Verified W25 - Q5a, 03 marks); (Verified S23 - Q3a, 03 marks).
6. **Discuss about different types of additives added in gasoline and their functions. / Explain the role and need of additives of gasoline. Discuss each type of additive in detail.** (Verified W25 - Q2c OR, 07 marks); (Verified S23 - Q2c OR, 07 marks); (Verified S24 - Q2c OR, 07 marks); (Verified W24 - Q2c OR, 07 marks).
7. **Discuss any two tests recommended for kerosene. / Discuss about different tests and properties of kerosene in brief.** (Verified W25 - Q3b OR, 04 marks); (Verified S24 - Q2c, 07 marks); (Verified S22 - Q2c, 07 marks).
8. **Discuss any two tests recommended for diesel fuels? Explain any two. / Mention the different tests recommended for diesel fuels? Discuss any two.** (Verified S23 - Q3b OR, 04 marks); (Verified S24 - Q3b OR, 04 marks).
9. **Explain in brief: Cetane Number and its significance.** (Verified S24 - Q3a, 03 marks).
10. **Define Following: (i) Smoke point (ii) Pour point (iii) Cetane number (iv) Softening point / (i) Octane number (ii) Cetane number (iii) Softening point.** (Verified W22 - Q4b, 04 marks); (Verified W23 - Q2a, 03 marks); (Verified S25 - Q4b, 04 marks).

### Other Important Questions:

11. **Define any two properties employed for Gasoline and its significance.** (Verified S24 - Q1a, 03 marks).
12. **Describe any two important properties employed for Gasoline.** (Verified S22 - Q1c, 07 marks).
13. **Enlist important properties & tests for gasoline and explain any one in brief.** (Verified W22 - Q2b, 04 marks).
14. **Explain and discuss about the additives for gasoline.** (Verified S22 - Q2b, 04 marks).
15. **What are the needs of additives for gasoline fuels? Describe any two.** (Verified S25 - Q2c, 07 marks).
16. **List the important tests and properties of kerosene.** (Verified S25 - Q3a, 03 marks).
17. **Discuss briefly; Aniline point and Diesel Index.** (Verified S24 - Q2a, 03 marks).
18. **Discuss properties of Formaldehyde.** (Verified W25 - Q3a, 03 marks).
19. **Discuss properties and applications of Polypropylene.** (Verified W25 - Q5a OR, 03 marks); (Verified S24 - Q5a OR, 03 marks).
20. **Discuss softening point and penetration index with respect to Bitumen.** (Verified S23 - Q5a, 03 marks).
21. **Explain Ball and Ring test for bitumen.** (Verified W24 - Q3a OR, 03 marks).
22. **Specify two most important tests for bitumen in detail.** (Verified S25 - Q2c OR, 07 marks).
23. **Explain Penetration index test for Bitumen in brief.** (Verified W22 - Q5b OR, 04 marks).
24. **Explain True boiling point test with neat sketch.** (Verified W25 - Q5b OR, 04 marks); (Verified S24 - Q5b OR, 04 marks).
25. **Discuss about different test and properties of petroleum oil.** (Verified W23 - Q5c, 07 marks).
26. **Enlist important properties & applications of naphtha.** (Verified S25 - Q1a, 03 marks).
27. **Describe any two important properties employed for Diesel in detail.** (Verified S22 - Q2c OR, 07 marks).

28. **Discuss properties of LPG.** (Verified S24 - Q4a OR, 03 marks).
  29. **Discuss properties and applications of Ethylene dichloride.** (Verified S23 - Q5a OR, 03 marks).
  30. **Write down various properties and uses of Poly Vinyl Chloride (PVC).** (Verified W23 - Q3b OR, 04 marks).
  31. **Write down various properties and uses of formaldehyde.** (Verified W23 - Q5b, 04 marks).
  32. **List the important properties and uses of formaldehyde.** (Verified S25 - Q5a OR, 03 marks).
  33. **Enlist various properties and uses of Chloromethane.** (Verified W22 - Q4a, 03 marks).
  34. **List the major industrial application of chloromethane.** (Verified S25 - Q5a, 03 marks).
  35. **Discuss major engineering problems, properties and uses of acetic acid.** (Verified W23 - Q3a OR, 03 marks).
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### Unit 3: Processing of Petroleum

**Repeated Questions:**

1. **Discuss in brief Vacuum Distillation Unit (VDU).** (Verified W25 - Q2b, 04 marks); (Verified S23 - Q2b, 04 marks).
2. **Write short note on Electric desalting process. / Explain electric desalter with neat sketch.** (Verified W25 - Q3b, 04 marks); (Verified S23 - Q3b, 04 marks); (Verified S24 - Q3b, 04 marks); (Verified W24 - Q2b, 04 marks); (Verified S22 - Q3a, 03 marks).
3. **Discuss in brief Atmospheric Distillation Unit (ADU). / Write a short note on Atmospheric Distillation Unit.** (Verified S24 - Q2b, 04 marks); (Verified S22 - Q3b, 04 marks).
4. **Differentiate: Atmospheric Distillation Unit (ADU) and Vacuum Distillation Unit (VDU) for crude petroleum.** (Verified W22 - Q1a, 03 marks).
5. **Discuss about ADU for the crude petroleum. / Discuss about VDU for the crude petroleum.** (Verified W23 - Q1b, 04 marks); (Verified S25 - Q4a, 03 marks).
6. **Discuss the challenges of pumping waxy crude and how to overcome them. / Explain in brief: Pumping of waxy crude oil.** (Verified S25 - Q2a, 03 marks); (Verified W24 - Q4a OR, 03 marks); (Verified W22 - Q3b OR, 04 marks).

**Other Important Questions:**

7. **Explain in brief: Necessity and types of Cracking.** (Verified W22 - Q1b, 04 marks).
8. **Define cracking of crude petroleum. Explain Dubb's two coil process of thermal cracking in detail. / Define thermal cracking of crude petroleum and explain Dubb's two coil process of thermal cracking in detail.** (Verified W22 - Q4c, 07 marks); (Verified S25 - Q4c, 07 marks).

## Unit 4: Treatment Techniques

### Repeated Questions:

1. **Discuss in brief about Lead Doctor sweetening process for gasoline. / Explain lead Doctor process in detail.** (Verified W25 - Q4b, 04 marks); (Verified W24 - Q4b, 04 marks); (Verified W23 - Q2b, 04 marks).
2. **Discuss in brief about Merox sweetening process for gasoline. / Explain Merox sweetening process for gasoline treatment. / Write a short note on Merox Sweetening.** (Verified S24 - Q4b, 04 marks); (Verified W23 - Q3c OR, 07 marks); (Verified S22 - Q3c OR, 07 marks); (Verified S25 - Q3b, 04 marks).
3. **Differentiate between Merox sweetening process and Lead doctoring process for gasoline.** (Verified S23 - Q4b, 07 marks).
4. **List various sweetening processes and brief the adverse effects of impurities present in the petroleum product.** (Verified W24 - Q2a, 03 marks).
5. **Define sweetening of gas. Enlist various sweetening techniques for gases.** (Verified W22 - Q2a, 03 marks).
6. **Discuss production of LPG and any one treatment of LPG in detail. / Discuss manufacturing process of LPG with neat sketch / flow sheet.** (Verified S25 - Q3c, 07 marks); (Verified S23 - Q4c, 07 marks); (Verified S22 - Q3b OR, 04 marks).

### Other Important Questions:

7. **Enlist various treatment techniques of gasoline. Explain Lead Doctoring treatment technique for gasoline in detail.** (Verified W22 - Q5c, 07 marks).
  8. **Explain the process of Lead doctoring of gasoline.** (Verified S22 - Q3a OR, 03 marks).
  9. **Discuss about different types of additives added in gasoline and their functions.** (This question is also highly relevant to Unit 2 - Properties, and is listed there under Repeated Questions).
  10. **What is dewaxing? Why it is required? Explain any one method for dewaxing of lube oil / tubes.** (Verified W23 - Q4b OR, 04 marks); (Verified S25 - Q3b OR, 04 marks).
  11. **Enlist various treatment methods of lube oil. Explain Phenol extraction method in detail.** (Verified W22 - Q5c OR, 07 marks).
  12. **Compare phenol extraction and furfural extraction.** (Verified W24 - Q4b OR, 04 marks).
  13. **How deasphalting process is carried out for Lubricating oil? Explain in brief.** (Verified S23 - Q4a OR, 03 marks).
  14. **Explain in brief: Conradson carbon residue method for lube oil.** (Verified W22 - Q4b OR, 04 marks).
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## Unit 5: Thermal & Catalytic Cracking

### Repeated Questions:

1. **Explain briefly Visbreaking. / Write explanatory note on visbreaking. / Explain in brief: Visbreaking technique for crude petroleum.** (Verified W25 - Q4a, 03 marks); (Verified S23 - Q2a, 03 marks); (Verified W23 - Q4a, 03 marks); (Verified W22 - Q3a OR, 03 marks).
2. **Discuss with neat diagram Fluid catalytic cracking (FCC) in detail. / Explain (FCC) fluidized catalytic cracking with neat sketch.** (Verified W25 - Q3c, 07 marks); (Verified S23 - Q3c OR, 07 marks); (Verified S24 - Q3c, 07 marks); (Verified W24 - Q4c, 07 marks); (Verified W23 - Q2c, 07 marks); (Verified S25 - Q4c OR, 07 marks).
3. **Explain catalytic reforming in detail. / Explain catalytic reforming in terms of reaction, catalyst, feed stock, operating condition, end products and effect of operating variables.** (Verified W23 - Q2c OR, 07 marks); (Verified S23 - Q3c, 07 marks); (Verified S22 - Q4c, 07 marks).
4. **Discuss in detail about Plat forming with neat sketch. / Describe plat forming in detail with a neat diagram.** (Verified W25 - Q3c OR, 07 marks); (Verified S22 - Q4b OR, 04 marks).
5. **Explain briefly delayed coking. / What is delayed coking? Describe the delayed coking operation with diagram.** (Verified S24 - Q4a, 03 marks); (Verified S22 - Q4c OR, 07 marks).
6. **Explain about delayed coker unit in detail.** (Verified W24 - Q3c OR, 07 marks).
7. **Compare thermal and catalytic cracking.** (Verified W24 - Q4a, 03 marks).

### Other Important Questions:

8. **Explain isomerization and polymerization units of refinery.** (Verified W24 - Q3c, 07 marks).
  9. **Briefly explain catalytic alkylation.** (Verified W24 - Q3b OR, 04 marks).
  10. **Explain need of reforming unit and explain with neat sketch. Also write on regeneration of catalyst in reformer unit.** (Verified W24 - Q4c OR, 07 marks).
  11. **Explain reforming process for crude processing.** (Verified S22 - Q4a OR, 03 marks).
  12. **Differentiate between moving bed crackers and fluidized bed crackers.** (Verified S22 - Q4b, 04 marks).
  13. **Discuss about various catalysts used in catalytic cracking.** (Verified S22 - Q4a, 03 marks).
  14. **Write a short note on platforming catalyst.** (Verified S25 - Q4b OR, 04 marks).
  15. **Explain in brief: Hydrocracking technique for crude petroleum.** (Verified W22 - Q3a, 03 marks).
  16. **Draw detailed diagram of Platforming process.** (Verified S23 - Q4a, 03 marks).
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## Unit 6: C1 and C2 Petrochemicals

### Repeated Questions:

1. **Discuss manufacturing process of Methanol with neat sketch. / Explain in detail with a neat flow diagram: Manufacturing process of Methanol.** (Verified S24 - Q4c, 07 marks); (Verified W22 - Q2c, 07 marks).
2. **Discuss major engineering problems involved in the Manufacturing/production of Methanol.** (Verified W25 - Q5b, 04 marks); (Verified S23 - Q4b OR, 04 marks); (Verified S24 - Q5b, 04 marks); (Verified S22 - Q5a, 03 marks); (Verified S25 - Q5b, 04 marks).
3. **Discuss manufacturing process of Ethylene with neat sketch. / With the help of a detailed flow diagram explain the manufacturing process of Ethylene.** (Verified W25 - Q4c, 07 marks); (Verified S23 - Q4c OR, 07 marks); (Verified S24 - Q4c OR, 07 marks).
4. **Discuss major engineering problems involved in production of ethylene.** (Verified S22 - Q5b, 04 marks).
5. **Discuss major engineering problems associated with the manufacturing process of Ethylene in brief.** (Verified W22 - Q3b OR, 04 marks).
6. **Discuss manufacturing process of Ethylene dichloride with neat flow diagram / flow sheet.** (Verified W25 - Q5c OR, 07 marks); (Verified S24 - Q5c OR, 07 marks); (Verified S25 - Q5c, 07 marks).
7. **Discuss manufacturing process of LDPE with neat sketch / flow sheet along with its application.** (Verified W25 - Q5c, 07 marks); (Verified S23 - Q5c, 07 marks); (Verified S24 - Q7c OR, 07 marks); (Verified W23 - Q3c OR, 07 marks); (Verified S25 - Q5c OR, 07 marks); (Verified S22 - Q5c, 07 marks). *[Note: LDPE is a polymer derived from C2 petrochemical Ethylene].*
8. **Discuss major engineering problems involved in production of PVC. / manufacturing of Vinyl chloride monomer (VCM).** (Verified W25 - Q3b, 04 marks); (Verified S24 - Q4b OR, 04 marks); (Verified S23 - Q5b, 04 marks); (Verified S25 - Q5b OR, 04 marks). *[Note: VCM is the monomer for PVC].*
9. **Discuss formaldehyde production with neat sketch. / With the help of a detailed flow diagram explain the manufacturing process of Styrene.** (Verified W24 - Q5c, 07 marks); (Verified W25 - Q3c, 07 marks). *[Note: Styrene is an aromatic, but its production process question is grouped here as it was asked alongside formaldehyde in W25].*

### Other Important Questions:

10. **Enlist various routes for methanol synthesis. / State various routes of production of methanol.** (Verified W24 - Q5a, 03 marks); (Verified W23 - Q3a, 03 marks).
11. **Discuss various applications of SBR and Methanol.** (Verified W24 - Q5b, 04 marks).
12. **List various C1, C2 based and aromatic petrochemicals.** (Verified W24 - Q5a OR, 03 marks).
13. **With the help of a detailed flow diagram explain the manufacturing process of Ethylene Glycol.** (Verified W22 - Q2c OR, 07 marks).
14. **Explain in detail with a neat flow diagram: Manufacturing process of Butadiene.** (Verified W22 - Q1c, 07 marks). *[Note: Butadiene is a C4 petrochemical].*
15. **Enlist major engineering problems associated with production of ethylene oxide.** (Verified W23 - Q4a OR, 03 marks).
16. **Discuss manufacturing process of HDPE with neat sketch along with its application and also explain difference between HDPE and LDPE. / differentiate between HDPE and LDPE.** (Verified S24 - Q7c, 07 marks); (Verified W24 - Q5c OR, 07 marks); (Verified S22 - Q5c, 07 marks). *[Note: HDPE is a polymer derived from C2 petrochemical Ethylene].*

## Unit 7: C3, C4, Aromatics and Polymers

### Repeated Questions:

1. **Discuss manufacturing process of Polypropylene with neat flow diagram / flow sheet.** (Verified S23 - Q5c OR, 07 marks); (Verified W22 - Q4c OR, 07 marks); (Verified S22 - Q5c, 07 marks).
2. **With the help of a detailed flow diagram explain the manufacturing process of Styrene.** (Verified W25 - Q3c, 07 marks) *[Listed in Unit 6 due to context, but belongs here]*.
3. **Discuss manufacturing process of Styrene with neat flow diagram.** (Verified W23 - Q4c, 07 marks).
4. **Explain BTX separation in brief. / With the help of a neat flow sheet describe the process of BTX separation.** (Verified W24 - Q5b OR, 04 marks); (Verified S25 - Q3c OR, 07 marks).
5. **Discuss properties and applications of Polypropylene.** (This question is also highly relevant to Unit 2 - Properties, and is listed there under Repeated Questions).
6. **Discuss industrial uses of polypropylene.** (Verified W23 - Q4b, 04 marks).

### Other Important Questions:

7. **Explain in brief: BTX separation.** (Verified W22 - Q5a OR, 03 marks).
8. **Write in brief: Properties and applications of SBR.** (Verified S23 - Q3a OR, 03 marks).
9. **Discuss about different types of additives added in gasoline and their functions.** (This question is highly relevant to Additives, which are often petrochemical-derived, but is listed under Unit 2 - Properties as its primary focus is on fuel properties).
10. **List the various types of gases from petroleum.** (Verified W23 - Q5a, 03 marks).
11. **List out various types of gases from petroleum and explain about any one.** (Verified S25 - Q4a OR, 03 marks).
12. **Explain any three types of gases in detail.** (Verified S22 - Q2a, 03 marks).
13. **Enlist major petrochemical units in India.** (Verified W23 - Q5a OR, 03 marks).
14. **Discuss about the current scenario of world petrochemical industry.** (Verified W23 - Q5c OR, 07 marks).

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