Class: 10th

Subject: Chemistry

Chapter 16: Chemical Industries

Important MCQs:

1. What is the purpose of metallurgy?

(a) Mixing metals

(b) Refining minerals

(c) Extracting metals from ores ✅

(d) Producing alloys

2. Which three raw materials are used in the Solvay's process for sodium carbonate?

(a) Sodium chloride, ammonia, carbon dioxide ✅

(b) Sodium chloride, water, oxygen

(c) Sodium hydroxide, ammonia, carbon monoxide

(d) Ammonia, hydrogen, methane

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3. Which compound is formed when ammonia and carbon dioxide react during urea manufacture?

(a) Sodium carbonate

(b) Ammonium nitrate

(c) Ammonium carbamate ✅

(d) Ammonium chloride

4. What method is used to refine crude oil in refineries?

(a) Simple distillation

(b) Electrolysis

(c) Fractional distillation ✅

(d) Magnetic separation

5. Which of the following is a residual product of crude oil heated above 400°C?

(a) Petrol

(b) Kerosene

(c) Paraffin wax ✅

(d) Diesel

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6. What is metallurgy?

(a) Study of fertilizers

(b) Study of metals

(c) Extraction of metals from ores ✅

(d) Refining of petroleum

7. Which two substances are manufactured using Solvay's Process?

(a) Urea and nitric acid

(b) Baking soda and washing soda ✅

(c) Ammonia and urea

(d) Hydrochloric acid and lime

8. Which fertilizer is discussed as important for plant growth?

(a) Ammonium nitrate

(b) Urea ✅

(c) Potassium sulphate

(d) Super phosphate

9. Which industry is highly important in the modern

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age of communication?

(a) Textile industry

(b) Fertilizer industry

(c) Petroleum industry ✅

(d) Steel industry

10. How many large industrial units came to Pakistan after partition?

(a) 921

(b) 100

(c) 34 ✅

(d) 73

11. What are minerals?

(a) Pure metals found in nature

(b) Metal compounds with impurities found underground ✅

(c) Man-made compounds

(d) Refined metals

12. Which of the following is always true?

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(a) All ores are minerals ✅

(b) All minerals are ores

(c) All metals are ores

(d) All ores are compounds of gold

13. What is gangue?

(a) A pure metal

(b) A type of ore

(c) Impurities associated with minerals ✅

(d) A metallurgical process

14. Which term refers to the removal of gangue from ore?

(a) Reduction

(b) Refining

(c) Concentration ✅

(d) Smelting

15. Which method is based on difference in density of ore and gangue?

(a) Electromagnetic separation

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(b) Gravity separation ✅

(c) Bessemerization

(d) Electrolysis

16. In froth flotation, which substance is used to wet ore particles?

(a) Water

(b) Oil ✅

(c) Acid

(d) Air

17. What is the principle of electromagnetic separation?

(a) Difference in color

(b) Difference in solubility

(c) Difference in magnetic properties ✅

(d) Difference in size

18. What is the name of the purified ore obtained after concentration?

(a) Slag

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(b) Matte

(c) Concentrate ✅

(d) Gangue

19. What is roasting in metallurgy?

(a) Heating ore with water

(b) Heating ore in excess of air ✅

(c) Melting pure metal

(d) Freezing molten metal

20. What is formed during smelting that floats on the surface?

(a) Matte

(b) Slag ✅

(c) Gangue

(d) Blister copper

21. What is matte composed of in copper extraction?

(a) Pure copper

(b) Iron and slag

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(c) Cuprous sulphide and ferrous sulphide ✅

(d) Gold and silver

22. What is the main function of the Bessemer converter?

(a) Extract silver

(b) Cool the metal

(c) Further purify molten matte ✅

(d) Remove copper from water

23. What is blister copper?

(a) 100% pure copper

(b) 98% pure copper with bubbles on surface ✅

(c) Liquid slag

(d) Oxidized iron

24. In electrolytic refining of copper, which electrode is impure copper?

(a) Cathode

(b) Anode ✅

(c) Neutral

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(d) Electromagnet

25. What happens to the impurities like gold and silver during electrolysis?

(a) They burn away

(b) They dissolve in copper

(c) They form anode mud ✅

(d) They collect on the cathode

26. What is the key principle behind Solvay's process?

(a) High solubility of sodium chloride

(b) Low temperature of ammonia gas

(c) Low solubility of sodium bicarbonate at low temperature ✅

(d) Evaporation of brine

27. What are the main raw materials used in Solvay's process?

(a) Sodium chloride, limestone, ammonia ✅

(b) Sodium chloride, calcium oxide, sulphur

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(c) Ammonium nitrate, calcium carbonate, water

(d) Sodium hydroxide, limestone, water

28. What is formed when carbon dioxide is passed through ammonical brine?

(a) Sodium chloride

(b) Sodium carbonate

(c) Sodium hydroxide

(d) Sodium bicarbonate ✅

29. What is the product obtained after calcination of sodium bicarbonate?

(a) Sodium chloride

(b) Sodium carbonate ✅

(c) Ammonium carbonate

(d) Calcium bicarbonate

30. Which of the following gas is reused in the Solvay's process?

(a) Oxygen

(b) Hydrogen

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(c) Ammonia ✅

(d) Nitrogen

31. What is the only waste product in Solvay's process?

(a) Calcium chloride solution ✅

(b) Ammonium nitrate

(c) Sodium hydroxide

(d) Lime water

32. What happens in the ammonia recovery tower?

(a) Ammonia is released as waste

(b) Ammonia is neutralized

(c) Ammonia is recovered from ammonium chloride ✅

(d) Ammonia is turned into sodium carbonate

33. Which city in Pakistan has an ICI plant producing sodium carbonate since 1944?

(a) Karachi

(b) Lahore

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(c) Khewra ✅

(d) Multan

34. Which industrial unit was established near Karachi in 1966?

(a) Punjab Soda Works

(b) Sindh Alkalies Limited ✅

(c) Balochistan Chemical Plant

(d) Pakistan Soda Factory

35. Why is Solvay's process considered eco-friendly?

(a) It uses toxic chemicals

(b) It produces no carbon dioxide

(c) It has only one harmless waste product ✅

(d) It consumes a lot of fuel

36. What is the percentage of nitrogen present in urea?

(a) 36.6%

(b) 46.6% ✅

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(c) 56.6%

(d) 66.4%

37. What are the two main raw materials used in the manufacture of urea?

(a) Ammonia and methane

(b) Carbon dioxide and nitrogen

(c) Ammonia and carbon dioxide ✅

(d) Nitrogen and hydrogen

38. What is the intermediate compound formed during the reaction of ammonia and carbon dioxide?

(a) Ammonium nitrate

(b) Urea

(c) Ammonium carbamate ✅

(d) Ammonium chloride

39. What percentage of urea is used as fertilizer?

(a) 50%

(b) 70%

(c) 90% ✅

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(d) 100%

40. Which is the largest urea manufacturing company in Pakistan by market share?

(a) Dawood Hercules

(b) Fauji Fertilizer Company ✅

(c) Engro Chemicals

(d) Bin Qasim Fertilizers

41. What is petroleum?

(a) A man-made chemical

(b) A mixture of water and sand

(c) A natural mixture of hydrocarbons found under Earth's crust ✅

(d) A type of natural gas

42. What is the process used to separate crude oil into useful products?

(a) Electrolysis

(b) Smelting

(c) Fractional distillation ✅

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(d) Crystallization

43. How was petroleum formed?

(a) By freezing water underground

(b) By chemical reactions in air

(c) By decomposition of dead plants and animals under pressure and heat ✅

(d) By reaction of rocks and gases

44. Why does crude oil float on water?

(a) It is heavier than water

(b) It is soluble in water

(c) It is lighter and insoluble in water ✅

(d) It reacts with water

45. What comes out first when drilling an oil well?

(a) Crude oil

(b) Water

(c) Natural gas under pressure ✅

(d) Asphalt

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Exercise Short Questions:

1. What role is played by pine oil in the froth flotation process?

Answer:

- Pine oil is used as a frothing agent.

It helps form froth by selectively wetting the ore particles. These oil-coated ore particles stick to the froth and float to the surface, while gangue settles down.

2. Name the various metallurgical operations.

Answer:

- The main metallurgical operations are:
- Concentration of ore (removal of gangue)
- Extraction of metal (reduction of ore)
- Refining of metal (purification)

3. How is roasting carried out?

Answer:

- Roasting is the process of heating the

concentrated ore in the presence of excess air.

- This converts the metal compounds (like sulphides) into oxides and removes volatile impurities as gases.

4. Explain process of electrorefining.

Answer:

1. Electrorefining is used to purify metals through electrolysis.
2. An impure metal is used as the anode
3. A pure metal strip is used as the cathode
4. Metal ions from the anode dissolve and deposit on the cathode as pure metal
5. Impurities settle down as anode mud

5. What are the advantages of Solvay's process?

Answer:

- **The major advantages are:**
  - Raw materials are cheap and easily available
  - Carbon dioxide and ammonia are reused

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- It is a pollution-free process
- Produces high-purity sodium carbonate
- Less fuel consumption as no solution evaporation is required

6. What is the principle of Solvay's process?

Answer:

- Solvay's process is based on the low solubility of sodium bicarbonate ($NaHCO_3$) in water.
- When carbon dioxide is passed through ammonical brine, sodium bicarbonate is formed and precipitates out.

7. What happens when ammonical brine is carbonated?

Answer:

Carbon dioxide is passed through ammonical brine:

First:

$$NH_3 + CO_2 + H_2O \Rightarrow NH_4HCO_3$$

Then:

$$NH_4HCO_3 + NaCl \Rightarrow NaHCO_3 + NH_4Cl$$

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8. How is $NaHCO_3$ converted to Na_2CO_3?

Answer:

Sodium bicarbonate is heated (calcined) to form sodium carbonate:

$2NaHCO_3 \Rightarrow Na_2CO_3 + CO_2 + H_2O$

9. How is ammonia recovered in the Solvay's process?

Answer:

Ammonia is recovered by reacting the leftover NH_4Cl with calcium hydroxide:

$2NH_4Cl + Ca(OH)_2 \Rightarrow 2NH_3 + CaCl_2 + 2H_2O$

10. How is ammonia prepared for the synthesis of urea?

Answer:

Ammonia is prepared by Haber's process:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

(Using high pressure, temperature, and iron catalyst)

11. Describe the formation of petroleum.

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Answer:

Petroleum was formed by the decomposition of dead plants and animals buried under Earth's crust millions of years ago. Due to high pressure, temperature, and bacterial action in the absence of air, these remains were converted into crude oil.

12. What is refining of petroleum and how is it carried out?

Answer:

Refining is the process of separating crude oil into useful components by fractional distillation. Crude oil is heated up to 400°C, and different fractions condense at different levels in the fractionating column based on their boiling points.

13. Give a use of kerosene oil.

Answer:

Kerosene oil is used as fuel for cooking and lighting, especially in rural areas.

14. Describe the difference between diesel oil and fuel oil.

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Answer:

Diesel oil is used in vehicles like buses and trucks, while fuel oil is used in boilers and furnaces for industrial heating purposes.

15. Write down the names of four fractions obtained by the fractional distillation of residual oil.

Answer:

The four fractions are:

1. Lubricants
2. Paraffin wax
3. Asphalt
4. Petroleum coke

16. What is the difference between crude oil and residual oil?

Answer:

Crude oil is the original petroleum extracted from the earth, while residual oil is the heaviest portion left after fractional distillation of crude oil.

17. Which petroleum fraction is used in dry

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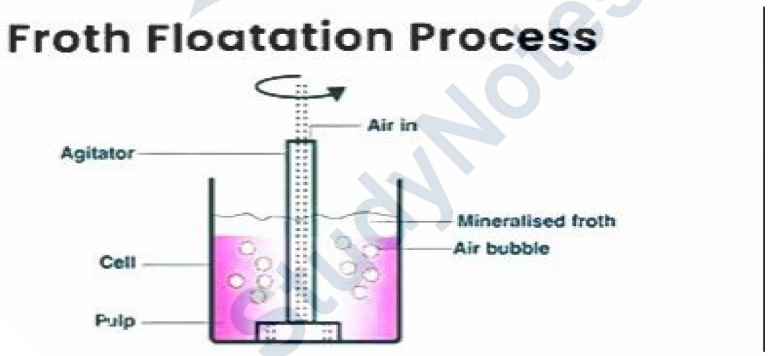
cleaning?

Answer:

Petroleum ether is used in dry cleaning as a solvent.

Exercise Long Questions:

🌟 Q1. Describe in detail the various processes involved in the concentration of ore. Explain your answer with the help of diagrams.



🔹 Definition of Concentration of Ore:

Concentration (or benefaction) is the process of removing unwanted earthy impurities (gangue) like

sand, clay, and other minerals from the ore to obtain a higher percentage of the metal.

🔹 Major Methods of Concentration:

1. Gravity Separation (Hydraulic Washing):

- Based on the difference in densities of ore and gangue.
- Crushed ore is washed with a stream of water.
- Heavier ore particles settle down while lighter impurities are washed away.

Used for: Ores like tin (SnO_2).

2. Froth Flotation Process:

- Used for sulphide ores (e.g., ZnS, PbS).
- Crushed ore is mixed with water and frothing agents like pine oil.
- Air is blown ⇒ Froth forms ⇒ Sulphide ore sticks to froth ⇒ Froth rises and is skimmed off.

📌 **Role of Pine Oil:** Helps in forming froth by attracting ore particles.

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3. Magnetic Separation:

- Based on magnetic properties of ore and impurities.
- A magnetic separator is used.
- Magnetic ore sticks to the belt, non-magnetic gangue falls off.

Used for: Iron ore (Fe_3O_4).

4. Chemical Method (Leaching):

- Used when ore is soluble in a suitable solvent.
- **Example**: Bauxite (Al_2O_3) is treated with NaOH.
- Impurities remain undissolved and are filtered out.

📘 **Summary:**

The method of concentration depends on the type of ore. Concentration increases the efficiency of extraction in later stages.

🌟 **Q2. Explain the Process of Roasting with Reference to Copper**

Answer:

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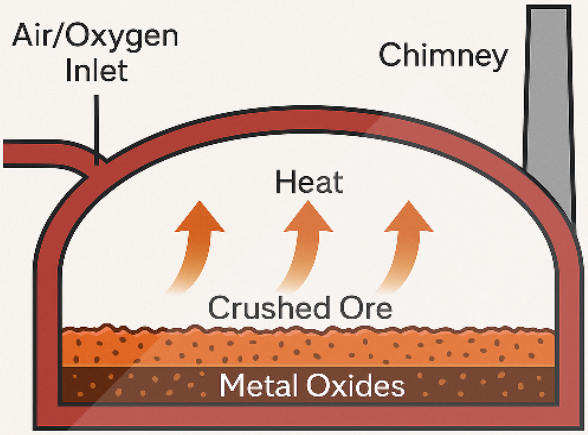

Roasting

❖ Definition of Roasting:

Roasting is a metallurgical process in which the sulphide ores of metals are heated in the presence of excess air or oxygen at high temperatures below their melting points.

➡ This process helps to:

Convert sulphide ores into oxides

Remove volatile impurities (e.g. sulfur, arsenic, moisture)

🔷 🔹 Copper Ore Used:

Copper mainly occurs as:

Copper Pyrite ($CuFeS_2$) – most important copper

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ore.

🔷 🔹 Roasting Process of Copper Pyrite:

🔸 1. Heating in Excess Air:
The crushed copper pyrite is heated in a reverberatory furnace in the presence of excess air.

🔸 2. Partial Oxidation:
The sulphide part of the ore ($CuFeS_2$) is oxidized.

🔸 3. Formation of Copper Sulphide and Iron(II) Oxide:
$2CuFeS_2 + O_2 \rightarrow Cu_2S + 2FeS + SO_2\uparrow$

🔸 4. Further Oxidation of Iron Sulphide:

$2FeS + 3O_2 \rightarrow 2FeO + 2SO_2\uparrow$

🔸 5. Oxidation of Copper Sulphide (optional/partial):

$Cu_2S + O_2 \rightarrow 2CuO + SO_2\uparrow$

> ⚠ During roasting, sulfur is removed as SO_2 gas (Sulfur dioxide), which can be collected and used in

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the manufacture of sulphuric acid (H_2SO_4).

🔷 🔹 Purpose of Roasting:

✅ To convert copper sulphide into copper oxide, which is easier to reduce.

✅ To remove volatile impurities like sulfur, arsenic, and moisture.

✅ To make the ore porous, which improves the efficiency of further reactions.

🔷 🔹 Apparatus Used:

Reverberatory Furnace

Or Fluidized Bed Furnace (modern method)

🧪 Summary of Chemical Reactions:

$$2CuFeS_2 + O_2 \rightarrow Cu_2S + 2FeS + SO_2\uparrow$$

$$2FeS + 3O_2 \rightarrow 2FeO + 2SO_2\uparrow$$

$$Cu_2S + O_2 \rightarrow 2CuO + SO_2\uparrow$$

🌟 Q3: Write a Detailed Note on Ammonia Solvay's Process

❖ Introduction:

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Solvay's process is an industrial method for manufacturing sodium carbonate (Na_2CO_3), also known as washing soda. It was developed by Ernest Solvay in the 1860s. It is economical and widely used because raw materials are cheap and available in abundance.

- Raw Materials Used:

1. Sodium chloride (NaCl) – common salt
2. Ammonia (NH_3)
3. Carbon dioxide (CO_2)
4. Water (H_2O)

- Basic Principle:

The Solvay process is based on the low solubility of sodium bicarbonate ($NaHCO_3$) in water. When ammonical brine is treated with CO_2, $NaHCO_3$ precipitates. Upon heating, it gives sodium carbonate.

🔷 Main Steps in Solvay's Process:

✅ 1. Preparation of Ammonical Brine:

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Common salt (NaCl) is dissolved in water to make a brine solution. Then, ammonia gas is passed through this solution to form ammonical brine.

📘 **Equation:**

$NaCl + NH_3 + H_2O \Rightarrow$ Ammonical Brine

✅ 2. Carbonation:

Carbon dioxide gas is passed through the ammonical brine in a carbonating tower. This leads to the formation of ammonium bicarbonate (NH_4HCO_3), which reacts with sodium chloride to form sodium bicarbonate ($NaHCO_3$) – a white precipitate.

📘 **Equations:**

$NH_3 + CO_2 + H_2O \Rightarrow NH_4HCO_3$

$NH_4HCO_3 + NaCl \Rightarrow NaHCO_3\,' + NH_4Cl$

✅ 3. Filtration and Heating (Calcination):

The precipitated $NaHCO_3$ is filtered and then heated strongly. It decomposes to form sodium carbonate (Na_2CO_3), carbon dioxide, and water.

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📘 **Equation:**

$2NaHCO3 \Rightarrow Na2CO3 + CO2 + H2O$

✅ 4. Ammonia Recovery:

Ammonia is recovered from the ammonium chloride (NH_4Cl) solution using slaked lime ($Ca(OH)_2$). The ammonia is reused in the process.

📘 **Equation:**

$2NH4Cl + Ca(OH)2 \Rightarrow 2NH3 + CaCl2 + 2H2O$

🔹 Advantages of Solvay Process:

- Raw materials are cheap and easily available
- No harmful byproducts
- Ammonia is recycled
- Used worldwide for producing sodium carbonate

🔹 Uses of Sodium Carbonate:

- Used in glass industry
- Used in soap and detergent industry
- Used in paper and textile industries

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- Used in softening of hard water

🌟 **Q4: Write a Note on Fractional Distillation of Petroleum.**

❖ **Definition of Petroleum:**

Petroleum is a dark brownish-black oily liquid found beneath the Earth's crust. It is a mixture of hydrocarbons along with impurities like water, salts, and sand. It is lighter than water and insoluble in it.

🧪 **What is Fractional Distillation?**

Fractional distillation is a technique used to separate crude oil (petroleum) into different useful components (fractions) based on their boiling points.

> Each fraction contains a mixture of hydrocarbons with a similar boiling point range.

⚙ **Process of Fractional Distillation of Petroleum**

1. Heating Crude Oil

- Crude oil is first heated in a furnace up to about 400°C.

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- The oil partially vaporizes and then enters the fractionating tower.

2. Fractionating Tower

- A tall vertical column made of iron or steel.
- It is cooler at the top and hotter at the bottom.
- The vapors rise and condense at different levels depending on their boiling points.

3. Separation of Fractions

- Fractions with high boiling points condense lower in the tower.
- Fractions with low boiling points condense higher up the tower.
- Each level collects a specific fraction.

📊 Main Fractions of Petroleum

- Fraction Name Boiling Point Range Use
- Petroleum Gas Below 40°C LPG, fuel for heating
- Petrol (Gasoline) 40–120°C Fuel in cars
- Kerosene Oil 120–180°C Jet fuel, cooking

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- Diesel Oil 180–250°C Fuel in trucks, buses
- Fuel Oil 250–350°C Industrial boilers
- Lubricating Oil 350–400°C Grease, lubricants
- Residue (Bitumen) Above 400°C Roads (asphalt), roofing

📘 **Summary:**

Fractional distillation is a key process in the petroleum industry. It allows us to utilize crude oil efficiently by separating it into valuable products used in fuels, lubricants, construction, and many other industries.

🌟 **Q5: How is urea manufactured? Explain with flow sheet diagram.**

❖ **Introduction:**

Urea is one of the most commonly used nitrogenous fertilizers. It contains about 46% nitrogen, which is essential for the healthy growth of crops. Urea is manufactured industrially by reacting ammonia (NH_3) and carbon dioxide (CO_2)

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under specific temperature and pressure.

⚙ Raw Materials:

- Ammonia (NH_3)
- Carbon dioxide (CO_2)

These are by-products of the ammonia manufacturing industry (Haber's process).

🧪 Manufacturing Process:

✅ Step 1: Formation of Ammonium Carbamate

In the first step, ammonia reacts with carbon dioxide at high pressure and moderate temperature to form ammonium carbamate.

Chemical Reaction:

$2NH_3 + CO_2 \Rightarrow NH_2COONH_4$

This is an exothermic reaction.

Conditions: 180–200°C and 150–200 atm pressure.

✅ Step 2: Formation of Urea

The ammonium carbamate then dehydrates (loses water) to form urea and water.

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Chemical Reaction:

$NH_2COONH_4 \Rightarrow NH_2CONH_2 + H_2O$

This is a reversible and endothermic reaction.

📌 **Important Conditions:**

Temperature: 180°C – 200°C

Pressure: 150 – 200 atm

No catalyst is used — the process is pressure and temperature driven.

🌟 **Q6: How crude oil is refined? Explain two important fractions of petroleum along with their usage.**

❖ **Introduction:**

Crude oil (خام تیل) is a dark, viscous liquid found deep inside the Earth's crust. It is a complex mixture of hydrocarbons, which includes alkanes, cycloalkanes, and aromatic compounds. Since crude oil is not directly usable, it needs to be refined into useful components known as fractions.

⚙ **Refining of Crude Oil:**

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The process of refining involves separating the crude oil into different useful products on the basis of their boiling points. This is done by a method called:

🔬 Fractional Distillation

🧪 Process of Fractional Distillation:

✅ Step 1: Heating the Crude Oil

- Crude oil is first heated to about 400°C in a furnace.
- It turns into a mixture of vapors and liquids.

✅ Step 2: Entry into Fractionating Column

- The hot mixture is passed into a fractionating column.
- The column is tall and vertically arranged, with temperature decreasing from bottom to top.
- It contains many trays at different heights to collect different fractions.

✅ Step 3: Separation by Boiling Points

- Different hydrocarbons condense at different

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heights, depending on their boiling points.

- Lighter fractions rise to the top and condense there.
- Heavier fractions condense lower in the column.

🧱 Two Important Fractions and Their Uses:

Petrol (Gasoline):

Boiling Point: 40°C – 100°C

Usage:

- Used as fuel in cars and motorcycles.
- Highly flammable and produces energy quickly.

Diesel Oil:

- **Boiling Point**: 250°C – 350°C

Usage:

- Used in heavy vehicles like buses and trucks.
- Also used in generators and machinery.

🌟 **Q7: Write a note in detail on Smelting and Bessemerization, giving a specific example.**

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❖ Introduction:

Metallurgy is the process of extracting pure metals from their ores. Two important steps in the extraction of metals — especially copper and iron — are:

1. Smelting
2. Bessemerization

These steps are used after concentration and roasting to convert metal ores into pure metal.

🔥 1. Smelting:

Definition:

Smelting is a chemical process in which roasted ore is reduced using a reducing agent (like carbon or carbon monoxide) to extract molten metal from the ore.

⚙ Purpose of Smelting:

- To remove the oxygen from metal oxides.
- To separate metal from impurities (gangue) by forming slag.

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🧪 **Example**: Smelting of Copper Ore (Cu_2O and FeS mixture)

Roasted copper ore mainly contains copper(I) oxide (Cu_2O) and iron(II) sulfide (FeS). During smelting, these compounds react to produce copper metal.

🔁 Chemical Reactions:

$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2\uparrow$$

- Cu_2O is reduced by Cu_2S to form pure copper (Cu).
- Sulfur dioxide (SO_2) gas is released as a by-product.

🔹 Role of Flux:

To remove silica (SiO_2) impurities, limestone ($CaCO_3$) is used as a flux.

$$CaCO_3 \rightarrow CaO + CO_2\uparrow$$
$$CaO + SiO_2 \rightarrow CaSiO_3 \text{ (Slag)}$$

Slag (calcium silicate) is removed from the surface.

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⚒ 2. Bessemerization:

Definition:

Bessemerization is a process in which air is blown through molten metal to remove impurities by oxidation.

⚙ Where It Is Used:

- Commonly used in the purification of copper and iron.
- It removes sulfur (S), arsenic (As), antimony (Sb), and iron (Fe) impurities.

🧪 **Example**: Purification of Copper:

Impurities like FeS and Cu_2S are oxidized when hot air is blown through molten mass.

🔁 Chemical Reactions:

$2FeS + 3O_2 \Rightarrow 2FeO + 2SO_2$

$FeO + SiO_2 \Rightarrow FeSiO_3$ (Slag)

$Cu_2S + O_2 \Rightarrow 2Cu + SO_2$

- **Iron oxide** (FeO) reacts with silica to form slag ($FeSiO_3$).

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- Cu_2S is oxidized to pure copper.
- SO_2 gas escapes.

📘 **Summary:**

- Smelting and bessemerization are essential metallurgical steps in the extraction of copper and other metals.
- Smelting reduces the ore to metal.
- Bessemerization removes impurities using oxidation.
- These processes are efficient, cost-effective, and widely used in industries for metal purification.

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Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been

carefully selected to support effective learning and inspire students to engage with the topic more deeply.

Author: Muhammad Asghar

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