



# Chapter 3: Coal and Petroleum

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## 1. Natural Resources

- **Definition:** Materials provided by nature that humans use.
- **Examples:** Air, water, soil, minerals, forests, fossil fuels.

### (i) Inexhaustible Resources

- Unlimited in supply → will not run out.
- Example: Sunlight, air, water (to some extent).

### (ii) Exhaustible Resources

- Limited in nature → can be used up.
- Example: Coal, petroleum, natural gas, minerals, forests.

### (iii) Renewable Resources

- Can be replenished in a short time.
- Example: Solar, wind, water, plants.

### (iv) Non-renewable Resources

- Cannot be replaced quickly → take millions of years.
  - Example: Coal, petroleum, natural gas.
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## 2. Coal

### Formation of Coal

- Formed from ancient plants buried under earth → pressure + heat over millions of years → carbon-rich fuel.

### Types of Coal (with % Carbon)

1. **Anthracite** → Hardest, highest carbon (~90%).
2. **Bituminous** → Most used, ~60–80% carbon.
3. **Lignite** → Brown, ~40% carbon.
4. **Peat** → Lowest quality, ~10–20% carbon.

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## Uses of Coal

- Fuel for cooking (earlier), trains, industries, thermal power plants.
- Source of coal products.

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## Destructive Distillation of Coal

- Heating coal in absence of air → produces many products.

### Main Products:

#### 1. Coke

- Almost pure carbon.
- Uses: Fuel in steel industry, extraction of metals.

#### 2. Coal Tar

- Thick, black liquid with 200+ chemicals.
- Uses: Paints, perfumes, plastics, explosives, dyes, naphthalene balls.

#### 3. Coal Gas

- Used as fuel for lighting and cooking (earlier).
- Now replaced by natural/petroleum gas.

#### 4. Ammonium Compounds

- From coal → used in fertilisers.

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## 3. Petroleum

### Formation of Petroleum

- Remains of tiny marine plants & animals buried under sea millions of years ago → heat + pressure → petroleum + natural gas.
- Found trapped between rock layers.

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### Obtaining Petroleum

- Drilled from oil wells.

- India: Assam, Gujarat, Mumbai High, Digboi.
  - Globally: Middle East (Saudi Arabia, Iraq, Iran, Kuwait), Russia, USA.
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### Refining of Petroleum

- Crude oil has many components.
  - At refineries (India: Barauni, Jamnagar, Digboi, Panipat).
  - Method: **Fractional Distillation** → separates petroleum into useful fractions based on boiling points.
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**Table: Constituents of Petroleum & Uses**

Fraction	Boiling Range	Carbon Atoms	Uses
Petroleum Gas	<40°C	C1–C4	LPG for cooking, fuel
Petrol (Gasoline)	40–200°C	C5–C12	Cars, scooters
Kerosene	200–250°C	C12–C15	Stoves, lamps, jet fuel
Diesel	250–350°C	C15–C18	Trucks, buses
Lubricating Oil	350–400°C	C18–C25	Lubricants, ointments
Paraffin Wax	>400°C	Solid hydrocarbons	Candles, polish
Bitumen	Residue	Very high C	Roads, waterproofing

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### Petrochemicals

- Chemicals from petroleum: plastics, detergents, synthetic fibres, rubber, medicines.
  - Backbone of modern industry.
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## 4. Natural Gas

- Found with petroleum deposits.
- Mainly methane (CH<sub>4</sub>).

- India: Tripura, Assam, offshore Mumbai, Krishna-Godavari basin.
  - Uses:
    - Domestic fuel (PNG).
    - CNG in vehicles.
    - Fertilisers, chemicals.
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## 5. Limitations of Fossil Fuels

- **Limited availability** → formed over millions of years, not renewable quickly.
  - **Air pollution** → burning releases CO<sub>2</sub>, SO<sub>2</sub>, causes acid rain & global warming.
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## 6. Conservation of Fossil Fuels


- Use public transport.
  - Energy-efficient appliances.
  - Switch to renewable energy (solar, wind).
  - Car-pooling.
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## 7. Technologia, Energy Crisis & Future

- Fossil fuels are depleting fast → causes **energy crisis**.
  - Technologia (“ester egg” ) like solar panels, electric vehicles, biofuels = future alternatives.
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## Example Questions with Explanations

### Q1. Why is fractional distillation necessary?

 Crude petroleum is a mixture of many components. Each has different boiling point & use. Fractional distillation separates them into useful fuels/products.

### Q2. Difference in formation of coal & petroleum.

- **Coal:** Formed from ancient plants (forests) buried underground.
- **Petroleum:** Formed from marine animals + plants buried under seabed.

**Q3. Why is coal gas replaced by petroleum gas in cooking?**

👉 Petroleum gas (LPG) is safer, easier to transport, cleaner burning than coal gas.

**Q4. Why does petroleum float on water?**

👉 Petroleum is less dense than water and insoluble, so it floats.

**Q5. Advantages of petroleum over coal as fuel.**

- Cleaner burning → less smoke.
- Higher calorific value.
- Easy to transport & use.

**Q6. Uses of coal & petroleum beyond fuel (esp. in India).**

- Coal: Steel industry (coke), tar for roads, dyes, perfumes.
- Petroleum: Plastics, fertilisers, detergents, medicines, synthetic fibres.

**Q7. Impact of burning coal vs petroleum on environment.**

- Coal → more smoke,  $\text{SO}_2$  (acid rain), ash residue.
  - Petroleum → less smoke, but releases  $\text{CO}_2$ .
- 👉 Coal is more harmful.

**Q8. Difference between exhaustible vs inexhaustible & renewable vs non-renewable.**

- Exhaustible: Can run out (coal, oil).
- Inexhaustible: Unlimited (air, sunlight).
- Renewable: Replaced quickly (plants, wind).
- Non-renewable: Take millions of years (coal, petroleum).

**Q9. Why is conservation of fossil fuels important today but not centuries ago?**

👉 Earlier → population small, demand less, resources abundant. Today → massive industrialisation, vehicles, high demand, shortage → urgent need for conservation.

**Q10. Is it possible to create fossil fuels in lab? Why not?**

👉 No. Fossil fuels require millions of years of heat, pressure, and natural processes. Labs cannot replicate such conditions in short time.