



Dr. Bbosa Science

Sponsored by
The Science Foundation College
Uganda East Africa
Senior one to senior six
+256 778 633 682, 753 802709
Based On, best for science

digitalteachers.co.ug



Nurture your dreams

S3 New Curriculum chemistry

Theme: Fuels and energy

Chapter 5 – Fossil fuels



Fossil fuels are **natural energy sources** formed from the remains of ancient plants and animals that were buried and compressed over millions of years. The three main types of fossil fuels are:

- **Coal** – A solid fuel made primarily of carbon, used for electricity generation and industrial processes.
- **Oil (Petroleum)** – A liquid fuel refined into gasoline, diesel, and other products for transportation and industry.
- **Natural Gas** – A gaseous fuel composed mostly of methane, used for heating, electricity, and fuel for vehicles.

Fossil fuels are **non-renewable** because they take millions of years to form and are being consumed much faster than they can replenish. Fossil fuels are used as fuel because they produce heat when burned. They are cheap and easy to use.

Extraction of fossil fuels

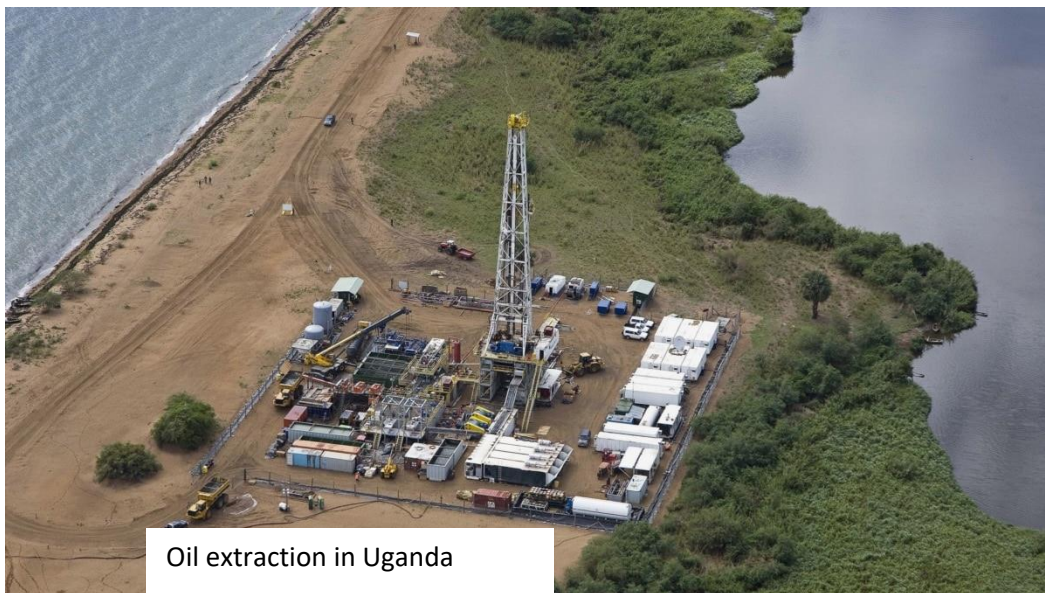
The extraction of fossil fuels involves several processes to **locate, drill, mine, and refine** these natural energy sources. The method used depends on the type of fossil fuel:

1. Coal Extraction

- **Surface Mining** (Open-pit or strip mining) – Used when coal deposits are close to the surface. Large machines remove layers of soil and rock to expose the coal.
- **Underground Mining** – Used for deeper deposits. Miners dig tunnels to reach the coal seam and transport it to the surface.

2. Oil Extraction

- **Drilling** – Wells are drilled into underground reservoirs where crude oil is trapped.
- **Offshore Drilling** – Platforms are built to extract oil from underwater reserves, often in oceans.
- **Hydraulic Fracturing (Fracking)** – High-pressure water, sand, and chemicals are injected into rock layers to release trapped oil.



Oil extraction in Uganda

3. Natural Gas Extraction

- **Conventional Drilling** – Similar to oil extraction, wells are drilled into gas reservoirs.
- **Fracking** – Used to extract gas from shale rock by breaking it apart with high-pressure fluid.
- **Liquefaction** – Natural gas is sometimes cooled into liquid form for easier transport.

After extraction, fossil fuels are processed and refined to remove impurities and produce usable fuels like gasoline, diesel, and electricity.

Ways of refining crude fossil fuel

Refining crude fossil fuels involves separating and processing the raw mixture into useful products like gasoline, diesel, and jet fuel. The key refining processes include:

1. Fractional Distillation: Crude oil is heated in a large distillation column, where different components separate based on their boiling points. Lighter fractions like gasoline rise to the top, while heavier ones like asphalt settle at the bottom.

2. Cracking This process **breaks down** large hydrocarbon molecules into smaller, more valuable ones:

- **Thermal Cracking** – Uses heat to break down heavy molecules.
- **Catalytic Cracking** – Uses a catalyst to speed up the process and produce more gasoline.

3. Hydroprocessing

- **Hydrotreating** – Removes impurities like sulfur, nitrogen, and metals, making fuels cleaner.
- **Hydrocracking** – Uses hydrogen to break down heavier fractions into lighter fuels.

4. Reforming: This process modifies the molecular structure of hydrocarbons to improve fuel quality. It's used to **increase octane levels** in gasoline, making it more efficient.

5. Alkylation: Combines smaller hydrocarbons to produce high-quality gasoline with better combustion properties.

6. Blending: Refined fuels are mixed to meet specific requirements, like different octane levels for gasoline or winter vs. summer fuel blends.

7. Coking: Converts the heaviest fractions into **petroleum coke**, a carbon-rich byproduct used in industrial processes.

Each of these refining steps helps optimize crude fossil fuels for different uses, from vehicle fuel to plastics production.

Uses of fossil fuel

Fossil fuels play a crucial role in modern society, powering various industries and everyday life. Here are some of their key uses:

1. Energy Generation

- **Electricity Production** – Power plants burn coal, oil, or natural gas to generate electricity.
- **Heating** – Homes and industries use natural gas for heating and cooking.

- **Transportation** – Cars, trucks, airplanes, and ships rely on gasoline, diesel, and jet fuel.

2. Industrial Applications

- **Manufacturing** – Factories use fossil fuels to power machines and production lines.
- **Chemical Production** – Used to make plastics, fertilizers, synthetic fibers, and pharmaceuticals.



Plastic products

- **Steel & Cement Making** – Coal and oil help in high-temperature processes like steel refining and cement production.

3. Agriculture

- **Fertilizers & Pesticides** – Many are derived from petroleum-based chemicals.
- **Machinery Fuel** – Tractors and other farming equipment run on fossil fuel-powered engines.

4. Commercial & Domestic Uses

- **Cooking & Heating** – Natural gas and propane are commonly used in homes and restaurants.
- **Backup Power** – Diesel generators provide emergency electricity for hospitals, data centers, and remote areas.

5. Lubrication & Maintenance

- **Engine Oils & Greases** – Petroleum-based lubricants keep machinery running smoothly.

6. Transportation Infrastructure

- **Road Construction** – Asphalt (a petroleum product) is essential for paving roads.

Please obtain free notes, exams and marking guides of Physics, chemistry, biology, history, from digitalteachers.co.ug website.

Thanks

Dr. Bbosa Science