

LESSON NOTES

Subject: Basic Science

Year/Level: **9**

Week 26

Strand	<b>3: ENERGY</b>
Sub Strand	<b>3.1 : ENERGY SOURCE AND TRANSFER</b>
Content Learning Outcome	<b>*Investigate</b> different sources of energy. <b>*Appreciate</b> the value of the sun as the main source of light and heat.

Renewable and Non-renewable energy

Renewable energy sources

- energy that comes from natural resources such as:
  - ❖ sunlight
  - ❖ wind
  - ❖ falling water
  - ❖ tides
  - ❖ geothermal heat
  - ❖ biofuel.
  
- Advantage of using renewable energy:
  - ❖ renewable, therefore sustainable and energy supply will never run out.
  - ❖ Facilities used generally require less maintenance than the generators.
  - ❖ As fuel is derived from natural and available resources, the cost of operation is reduced.
  - ❖ produces little or no waste products such as carbon dioxide or other chemical pollutants
  - ❖ has minimum impact on the environment.
  
- Disadvantage of renewable energy:
  - ❖ difficult to generate the quantities of electricity that are as large as those produced by traditional fossil fuel generators therefore we need to reduce the amount of energy we use or simply build more energy facilities.
  - ❖ reliability of supply.
    - ✓ relies on the weather for its source of power.
    - ✓ For example:
      - 1) Hydro-generators need rain to fill dams to supply flowing water
      - 2) Wind turbines need wind to turn the blades
      - 3) Solar collectors need clear skies and sunshine to collect heat and make electricity.
    - ✓ When these resources are unavailable so is the capacity to make energy from them.
    - ✓ This can be unpredictable and inconsistent

## Non-renewable energy sources




- **Coal, oil and gas** are called “**fossil fuels**” because they have been formed from the organic remains of prehistoric plants and animals.
- Crude oil (called “petroleum”) is easier to get out of the ground than coal, as it can flow along pipes.
- cheaper to transport.
  
- **Natural gas:**
  - ❖ provides around 20% of the world’s consumption of energy
  - ❖ being burnt in power stations
  - ❖ used by many people to heat their homes in countries that have very cold nights during winter.
  - ❖ easy to transport along pipes
  - ❖ gas power stations produce comparatively little pollution.
  
- **Fossil fuels:**
  - ❖ not a renewable energy resource.
  - ❖ consumption of fossil fuels has nearly doubled every 20 years since 1900.
  - ❖ also used to make plastics and many other products.
  
- **Coal**
  - ❖ formation of coal needs anaerobic environment.
  - ❖ swampy, heavily vegetated environment is therefore ideal for forming coal.
  - ❖ Much of the coal we are using today were formed between 300 - 400years ago, a period referred to as the Carboniferous period as conditions then were ideal for coal formation.
  
  - ❖ **How is it formed?**
    - ✓ Trees and other plant matter that fall into pools are quickly covered with mud.
    - ✓ This mud prevents air and fresh water from attacking the chemical structure of the sugar chains.
    - ✓ Over time the plant matter is compressed as more and more mud is deposited on top of it.
    - ✓ The weight of all this extra mud eventually squeezes the water, sap and other liquids out of the plant matter, leaving just the sugar chains squashed together.
  
- Environments on earth are constantly changing.
- When the wet swamp eventually changes into a different environment, like grassland, the old plant matter is now well buried.
- It can no longer be reached by the oxygen in the air.
- With more time and more compression, this plant matter goes through a series of transformations.



## Formation of Oil

- formed in a similar way to coal.
- Millions of years ago , small plants and animals that lived in the seas sank down to the sea-bed when they died.
- They were crushed under layers of mud , and gradually turned into **oil**.
- As oil formed it gave off **natural gas**.
- The oil and gas flowed upwards until they reached layers of hard rock and became trapped under the rock.

## Coal Formation

The following diagrams show the stages on the formation of coal and their fuel content.

Stage	Diagram	Descript
Peat		<ul style="list-style-type: none"> <li>● Low value fuel</li> </ul>
Brown Coal		<ul style="list-style-type: none"> <li>● Peat turns to Lignite</li> <li>● Fuel is drier and higher in energy content than peat</li> <li>● Can contain up to 70% moisture</li> </ul>
Black Coal		<ul style="list-style-type: none"> <li>● Further compression and aging of the brown coal results in black coal, a denser and drier fuel than brown coal.</li> <li>● Black coal, also called bituminous coal, is valued as a household fuel source and is also used to manufacture coke for the steel industry.</li> <li>● It is however a far rarer resource than brown coal.</li> </ul>

Anthracite		<ul style="list-style-type: none"> <li>● Anthracite forms by further compression and heating of black coal.</li> <li>● Glossy and almost metallic in appearance.</li> <li>● Has very high fuel content than black coal due to more C-C bonds.</li> <li>● Used primarily in homes and other heating</li> <li>● Purer source of carbon than other types of coal.</li> </ul>
Graphite		<ul style="list-style-type: none"> <li>● Graphite is the final stage of this forming fossil fuels process of compression and heating.</li> <li>● All impurities are driven off leaving hexagonal rings of carbon bonded to each other in two dimensional sheets.</li> <li>● This type of bonding is incomplete and results in one free electron per carbon atom. These free electrons form "seas" between the sheets of carbon atoms, allowing graphite to conduct electricity.</li> <li>● These electrons also give graphite its shine and slippery feel.</li> <li>● Graphite is not generally used as a fuel as it is very difficult to ignite since it has a high activation energy. Instead it is used as an industrial lubricant and also a major component in pencil</li> </ul>

...STAY SAFE... 