

Mains electricity and fossil fuels (1)

Name: _____

What do you know about "mains electricity"? _____

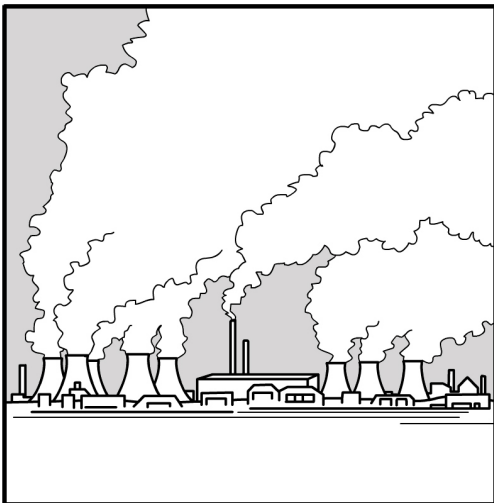
How are fossil fuels formed? _____

Name three types of fossil fuels : _____

What is the difference between renewable and non-renewable energy resources?

Mains Electricity and Fossil Fuels

All electricity comes from a main electricity supply called a power station. Power stations also need a source of energy to make electricity. In South Africa fossil fuels give our power stations energy.



DID YOU KNOW?

Uranium ore is a solid mined and converted to a fuel at nuclear power plants.

Uranium is not a fossil fuel, but it is a non-renewable fuel.

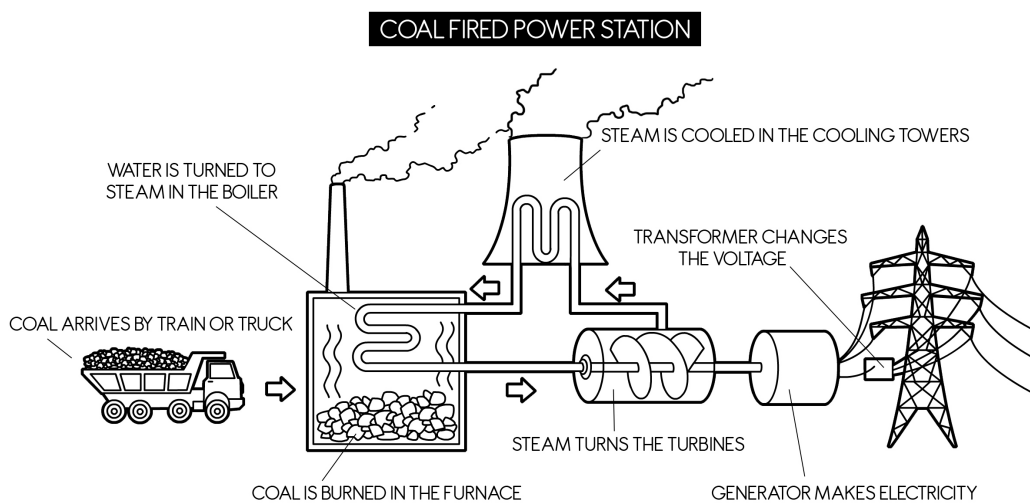
Fossil Fuels

A battery stores its energy, which, at later stage, can be changed and used as electrical energy. However, our homes, schools, shops and factories cannot run on battery energy alone because they cannot provide enough energy to sustain themselves. We rely on other sources for sustainable energy supply called fossil fuels.

Mains electricity and fossil fuels (2)

What are fossil fuels?

In South Africa, we use three main fossil fuels: coal, oil and natural gas. Fossil fuels are the remains of pre-historic organisms that lived long ago. So when coal is burned, it is actually the remains of pre-historic organisms! Fossil fuels are a non-renewable source of energy. This means that they cannot be replenished (made again) in a short period of time and come out of the ground. A renewable energy resource such as solar (sun heat) and wind are replenished naturally and do not come from the ground.



Look at the picture above and write down seven steps that trace the conversion of coal (non-renewable fossil fuel) into electricity that we use daily in our homes.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____

How fossil fuels are formed:

The earth a long time ago looked very different from the earth we know today. When these pre-historic animals and plants died, their bodies decayed (rotted) and the dead organisms were buried under layers of rock, mud, sand, foliage and water. With time, these layers built up, and the organisms were buried deeper and deeper



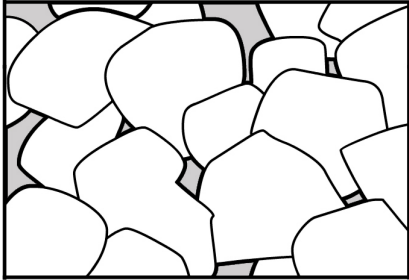
DID YOU KNOW?

Different factors determine the fossil fuel that is formed:

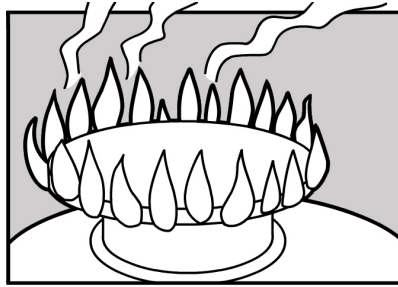
- Whether it is the remains of an animal or a plant
- Whether it is a combination of both animals and plants
- The length of time the remains have been buried for
- The temperature during the decomposition of the organism
- The amount of pressure exerted on the decaying matter

Mains electricity and fossil fuels (3)

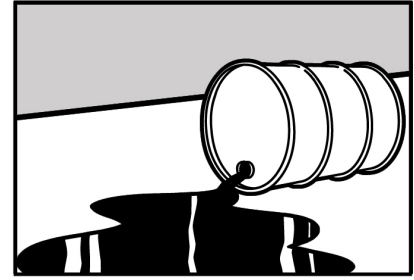
until they were pushed down with the pressure exerted on them, to the layers below. Over a long period of time, these plants and animals decomposed and formed fossil fuels like natural gas, oil and coal. Fossil fuels are actually a non-renewable energy source. The biological processes which make them, take millions of years, so they cannot be replaced within human time spans once they have gone.



Coal



Natural Gas



Crude oil

True or false:

1. Fossil fuels are the remains of pre-historic organisms that lived long ago _____
2. Fossil fuels are a renewable source of energy _____
3. Coal is used for electricity _____
4. In South Africa fossil fuels give our power stations energy _____
5. A renewable energy source is oil _____
6. Another word for 'decaying' is 'fresh' _____
7. The biological process of fossil fuels takes millions of years _____
8. The advantage of fossil fuels is that they are inexpensive _____

Research four disadvantages of fossil fuels:

To read up more about fossil fuels, go to:

http://www.fossil.energy.gov/education/energylessons/coal/gen_howformed.html

<http://www.discoveringfossils.co.uk/fossilfuels.htm>

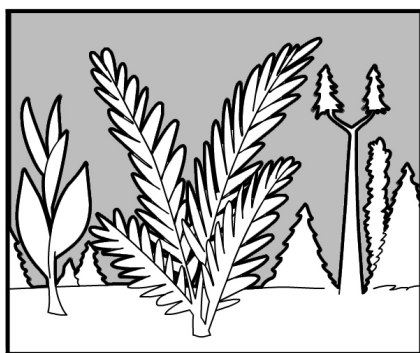
Coal energy

Name: _____

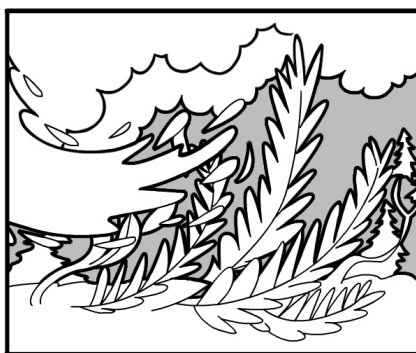
Coal

Coal is a black rock that is burnt to produce energy in power stations all over the world. Coal is a non-renewable energy source because it takes millions of years to form. That means the coal left in the ground is all there is and we cannot produce more. The energy in coal originally comes from energy from the sun.

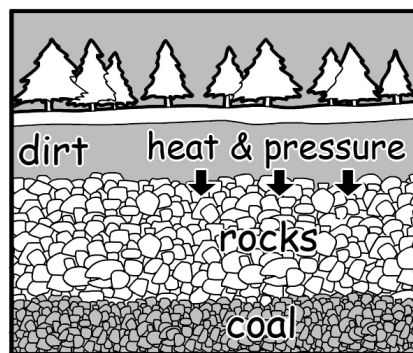
Plants on earth used the energy from the sun for photosynthesis and to grow. The energy was stored in leaves, flowers and stems of giant plants and ferns that died. When the plants died, they formed layers at the bottom of the swamps, trapping the energy.



Swamps with giant plants covered the earth



Water and dirt covered the plant remains



Rocks, dirt and sediment created pressure and heat to form coal deep in the ground.

Over thousands of years, water and dirt stacked on top of the dead plant debris, undergoing chemical and physical changes, which turned these remains into what we call coal.

What do you think will happen if we run out of coal?

KEY WORDS

non-renewable energy

chemical change

physical change

To see how we make electricity from coal visit:

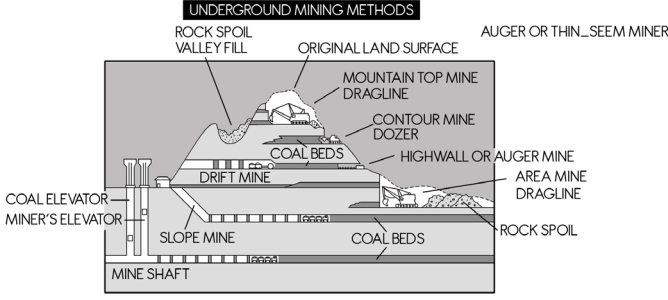
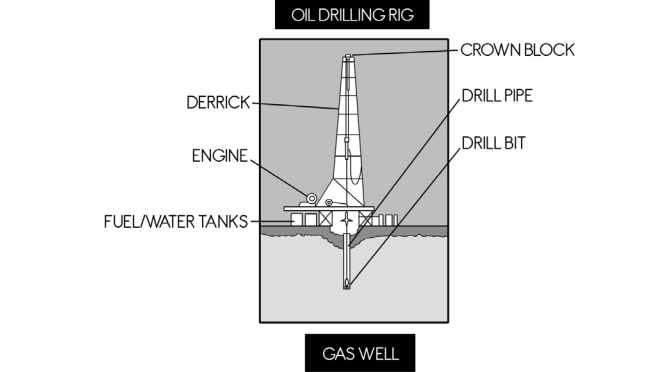
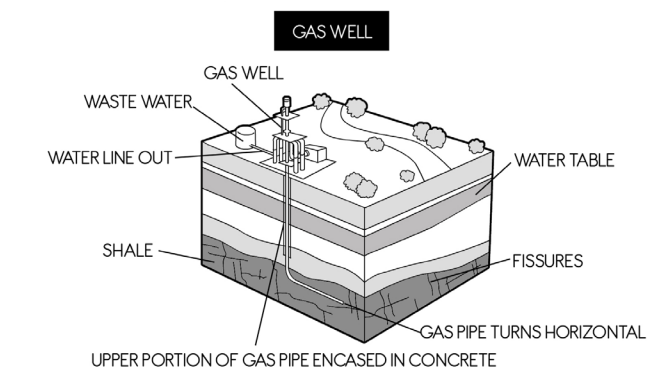
<http://www.fplsafetyworld.com/?ver=kkblue&utilid=fplforkids&id=16203>

How fossil fuels are mined

Name: _____

How are fossil fuels mined?

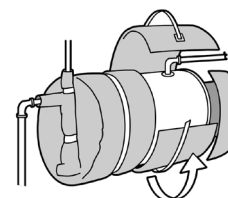
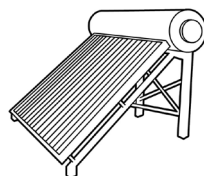
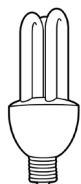
There are different ways fossil fuels are mined.

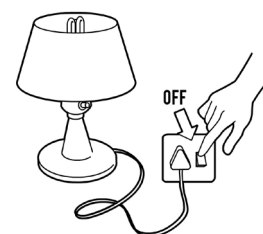
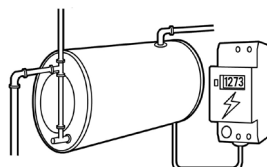
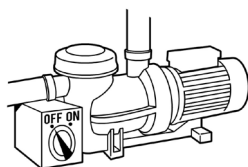
Fossil Fuel	Diagrammatic illustration of how fossil fuels are mined	We get fossil fuels by:
Coal		Digging into the rock and sand to reach the coal deposits stored under the surface, creating coal mines.
Oil		Drilling down through the rock. A hole is sunk using a drill so that the oil is reached and brought to the surface. This is normally done in the ocean.
Natural gas		Drilling down through the rock. A hole is sunk so that the natural gas is reached and brought to the surface. This can be done on land or in the ocean.

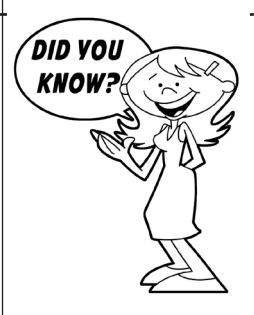
Cost of electricity (1)

Name: _____

Electricity is a very expensive resource, therefore we must try and save it wherever we can. Write down six ways to save electricity in your home. Look at the pictures below to give you a hint.







Electricity is expensive because:

- The infrastructure required to deliver and produce electricity is costly. Infrastructure means coal mines, trucks, power stations, substations, wiring and employment of labour
- All the buildings, vehicles, materials and processes have to be maintained continually and this costs money. If we do not maintain our infrastructure, we simply won't have enough electricity.
- Some appliances use a lot more energy than others. For example, a geyser uses a lot of electricity to heat the water.

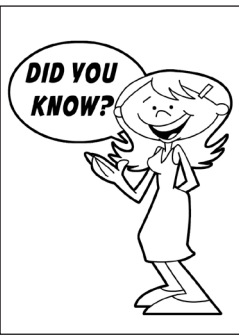
KEY WORDS:

infrastructure resource maintain expensive

Most homes today have a pre-paid electrical meter installed. In older homes, a worker from the council will come and read the meter to ascertain how much electricity your household has used. Electricity is expensive and:

The more electricity we use —————> the more we pay —————> the more fossil fuels (like coal) we use up.

Cost of electricity (2)



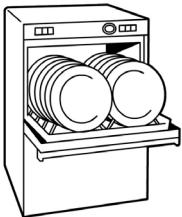
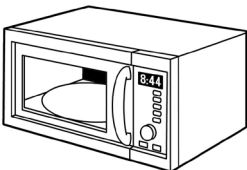


Electricity is measured in kilowatts (kW). One kilowatt (kW) = 1000 watts. We can calculate the cost of running a household appliance using wattage.

1. Use this formula to estimate an appliance's energy use:
 $(\text{Wattage} \times \text{Hours Used Per Day}) \div 1000 = \text{Daily Kilowatt/hour (kWh) consumption.}$
2. Multiply this by the number of days you use the appliance during the year for the annual consumption in kWh per year.

3. An example of the annual electricity consumption of a personal computer:
 $(120 \text{ Watts}) \times 4 \text{ hours/day} \times 365 \text{ days/year} \div 1000$
 $= 394 \text{ kWh} \times 11 \text{ cents/kWh}$
 $= R43.34/\text{year}$

Now calculate the annual consumption of the following household appliances:

TYPICAL WATTAGES OF HOUSEHOLD APPLIANCES	CALCULATIONS
<p>Clock radio: 10 Watts</p> 	
<p>Tumble dryer: 1800 -5000 Watts</p> 	
<p>Dishwasher: 1200 -2400 Watts</p> 	
<p>Microwave: 750 -1000 Watts</p> 	

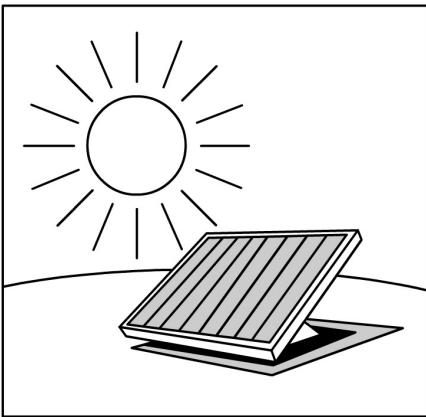
Renewable ways to generate electricity (1)

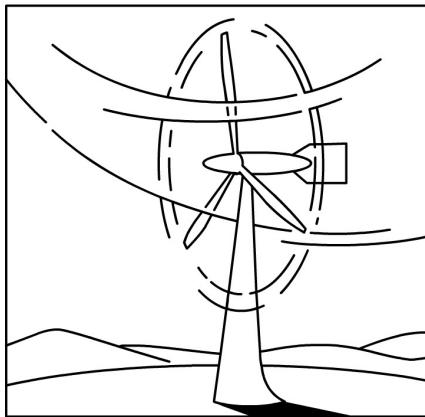
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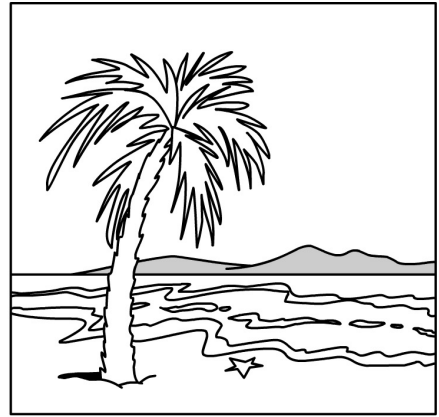
There are two main types of energy: renewable energy and non-renewable energy. Non-renewable energy comes from fossil fuels such as coal and gas. But what do we do when those resources run out? Scientists and engineers around the world are looking for ways to harness energy from renewable resources. A renewable energy resource is opposite to a non-renewable resource, meaning that it will not run out and it can be used over and over again.

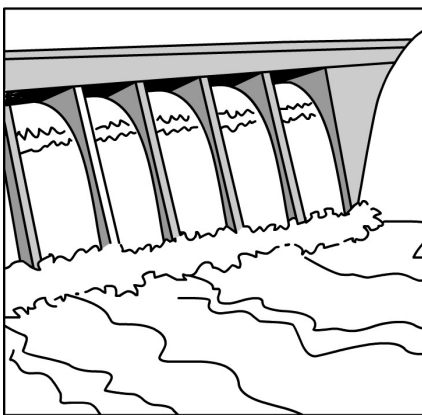
Renewable energy sources include sunlight, wind, tides and plant growth. The energy comes from natural processes that occur over and over again.

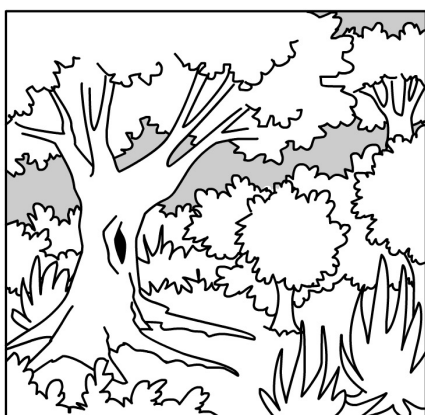
Look at the pictures below and record which renewable resource each one provides:

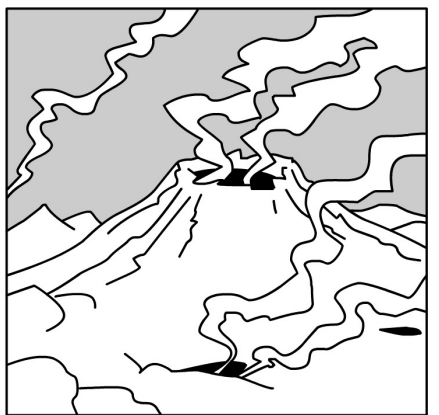












CLUES

solar energy (sun), wind, ocean (tides and waves), hydropower (waterfalls/dams), biomass (energy from plants), geothermal (energy from steam underneath the surface of the earth)

Renewable ways to generate electricity (2)

Sun, wind and water are used as sources of energy.

Solar panels: are popular and can be fitted to a home, but this resource of renewable energy is only available on sunny days.

Wind: energy is collected with a windmill or wind-turbine which can be big and noisy.

Hydroelectric power stations: these harness the energy in water stored in high dams, but it is only possible to do this in areas where there are high mountains and rivers.

Fun Activity: A renewable versus non-renewable energy resource activity.

1. Get into groups of 4 to discuss and research the advantages and disadvantages of renewable and non-renewable energy resources. You can use the library and the internet to find information. Document your findings as follows:

	Advantages	Disadvantages
Non-renewable resources:		
Renewable resources		

2. Make a poster recording your findings.

KEY LEARNING POINTS

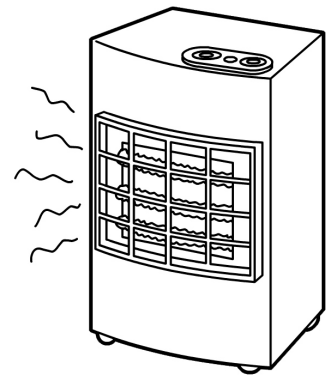
- Most of our electricity comes from fossil fuels: coal, oil and natural gas
- Fossil fuels are the remains of dead plants and animals from millions of years ago
- The energy in fossil fuels originally comes from the Sun
- Electricity is expensive due to the infrastructure required to produce and deliver it, so we must look for ways to be energy efficient
- Fossil fuels are non-renewable energy resources
- Illegal connections are dangerous
- Resources which are renewable and can be used to generate electricity are wind power, solar power and hydropower.

Oil and natural gas (1)

Name: _____

Name four things that oil is used for:

What are these natural gases being used for?



Oil: A dark, thick liquid which is used to make petrol to burn in vehicles. Crude oil (petroleum) is the only commercial nonrenewable fuel that is naturally in liquid form.

Natural gas: Is colourless and is used in homes for heating and cooking food. These days, gas fireplaces are also very popular.

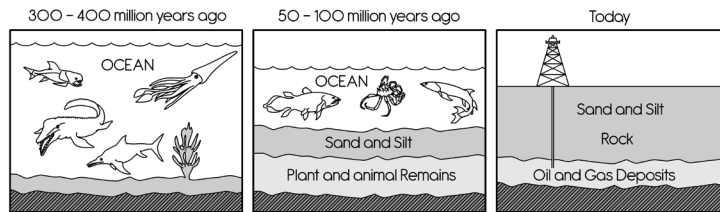
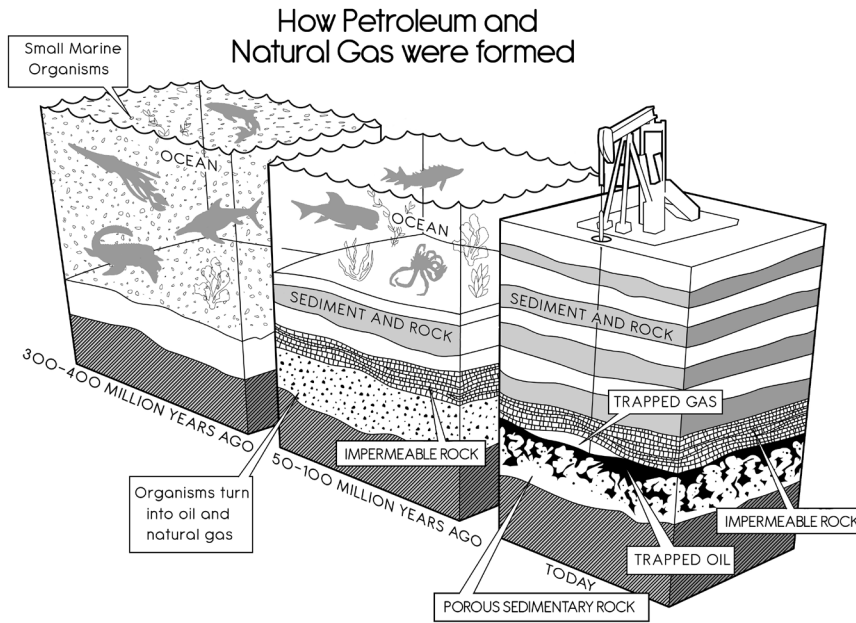
Oil and natural gas are formed from organisms that lived in the oceans many years ago. When these organisms died, they floated to the bottom of the river bed or ocean floor and were covered by mud and sand (silt).

Over time, the mud and sand changed into rock and the pressure from the rock and water pushed down on the remains of the dead plants and animals.

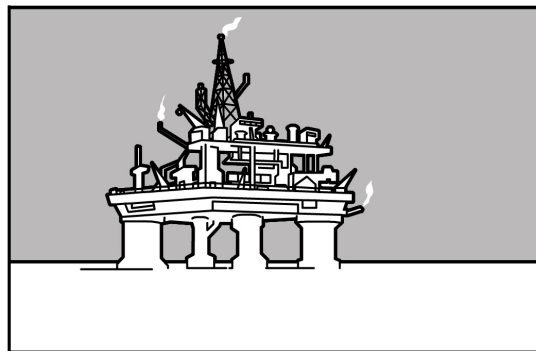
Over many years, as dead organisms have been exposed to extreme heat and pressure, these changed into a thick, viscous (sticky) black liquid called **crude oil** or transformed into natural gas. In the ocean, tiny bubbles of natural gas formed.

These bubbles were trapped under the rocks and with time, some of the oil and natural gas worked its way upwards through the rock to the Earth's crust and into rock formations called **caprocks**. Most of our oil and natural gas is collected from these caprocks.

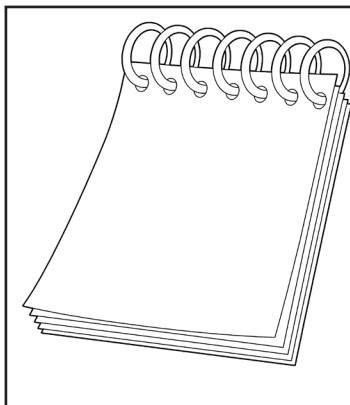
Oil and natural gas (2)



PETROLEUM AND NATURAL GAS FORMATION



Describe what you see in the picture:



REVISION EXERCISE:
How is natural gas formed?

Energy and change: poster project

Name: _____

Poster Project:

Design a poster that illustrates the following:

1. How coal is formed as a fossil fuel
2. How we obtain coal from the ground
3. How coal is used to bring electricity to our homes through the power stations

Remember to label your drawings carefully to make the process clear.

Word Search- Find the following words in the word search below:

FOSSIL FUELS	RENEWABLE	OIL	GAS	COAL	PRE-HISTORIC
ORGANISMS	PHOTOSYNTHESIS	MAINS ELECTRICITY			NON –RENEWABLE
	ENERGY	POWER STATION			

O	Q	M	R	A	M	V	Z	Y	P	I	K	B	G	P	C	X	Z	A	Q	O	K	F	B	V	W	E	F	D	J
R	W	J	N	D	F	R	A	T	B	H	Q	I	P	R	F	E	B	H	I	L	I	M	D	S	W	Y	T	H	I
G	E	B	R	C	H	M	F	Q	X	Z	O	T	U	E	R	E	U	I	M	N	O	L	Q	R	I	P	N	V	C
A	R	G	W	S	G	N	O	Z	R	F	G	T	M	H	Q	U	Y	T	R	N	B	V	H	I	K	O	L	M	C
N	T	F	T	Q	F	H	S	Z	A	V	E	Q	O	I	Y	U	I	K	M	N	O	P	R	F	N	W	R	E	S
I	Y	J	E	W	H	Y	S	V	N	M	Z	A	Q	S	T	R	N	U	I	M	L	K	B	G	D	E	U	I	R
S	U	D	Y	E	E	R	I	T	R	E	W	Q	W	T	Y	U	I	N	B	C	V	F	G	H	J	R	I	O	O
M	I	S	R	S	Q	E	L	B	N	B	F	E	H	O	U	N	I	K	O	L	P	R	E	S	B	S	S	D	E
S	O	E	I	F	E	Q	F	D	F	E	R	T	G	R	H	T	T	G	Q	E	S	H	T	U	N	T	U	I	L
M	P	U	O	T	P	J	U	M	K	N	I	O	P	I	G	E	F	H	F	G	A	Q	E	R	T	A	I	N	B
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N	S	E	L	V	O	B	L	Q	W	A	Z	X	E	S	T	R	Y	G	A	S	B	V	N	H	U	I	E	R	W
B	D	R	K	W	L	M	S	B	C	F	G	H	R	E	T	U	U	T	E	W	I	R	T	J	I	O	I	K	E
V	F	U	D	E	K	K	V	G	H	J	I	K	O	L	P	W	D	R	B	N	Y	S	B	N	H	N	T	R	N
C	G	F	G	N	I	I	Q	E	W	E	R	R	E	T	Y	I	J	N	V	G	E	T	N	I	O	L	P	C	E
X	H	D	S	U	N	J	Q	E	W	V	B	Y	I	M	T	E	N	E	R	G	Y	M	K	I	J	I	K	L	R
Z	J	W	F	R	C	O	A	L	T	Y	U	G	F	H	U	I	K	L	N	B	B	R	E	H	T	I	K	M	N
L	K	R	C	J	V	H	A	D	E	R	T	H	M	K	I	L	R	T	H	I	O	L	N	M	K	O	L	P	O
K	L	B	B	I	E	T	A	W	E	R	T	Y	Y	U	I	M	I	K	M	L	O	T	E	D	G	H	I	K	N
M	A	I	N	S	E	L	E	C	T	R	I	C	I	T	Y	F	D	E	R	T	Y	U	I	N	B	J	F	H	L