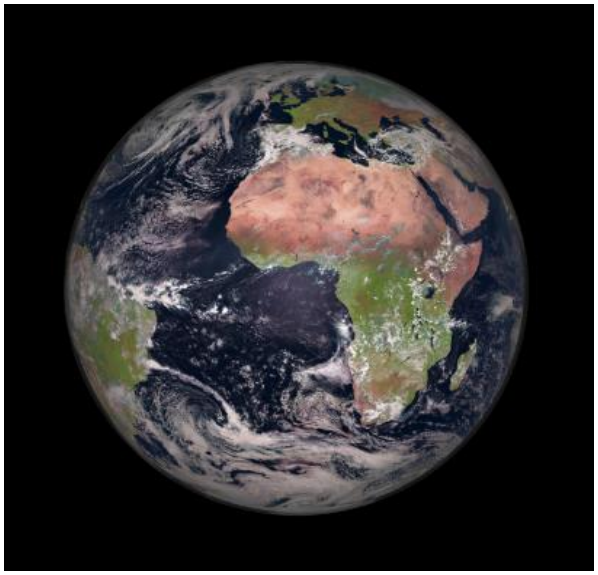
Kirkcaldy High School



BGE Science

Science and the Environment

Earth

Name:_____

Class:_____

Teacher:_____

Expectations and Outcomes Learner Evaluation

Topic: Earth

Experience and Outcomes	Date Completed (dd/mm/yy)	Evaluation How happy are you with it? (☺ ? ☹)
I can describe the different layers of the Earth.		
I can name the three different types of rock.		
I can describe how sedimentary rock forms.		
I can state the key features of sedimentary rocks.		
I can describe how igneous rock forms.		
I can state the key features of igneous rocks.		
I can describe how metamorphic rock forms.		
I can state the key features of metamorphic rocks.		
I can identify the three different types of weathering.		
I can contrast weathering and erosion.		
I can explain how the rock cycle works.		
I can explain where our electrical energy comes from.		
I can construct a bar graph to represent different sources of electrical energy.		
I can select relevant information from different sources.		
I can interpret the results of an experiment to compare different fuels.		
I can state what the terms fuel, combustion and exothermic mean.		
I can write an equation to show the products of combustion.		
I can state the elements that make up a hydrocarbon.		

I can carry out an experiment to show the effects of incomplete combustion		
I can state what fossil fuels are and how they are formed.		
I can describe some of the benefits and problems with the use of fossil fuels.		
I can explain how burning fossil fuels can lead to climate change.		
I can describe the processes of the carbon cycle.		
I can explain how to minimise my carbon footprint.		
I can name different sources of renewable energy.		
I can explain how electricity is generated using renewable energy sources		
I can evaluate the different methods of renewable energy generation.		
I can carry out an experiment to investigate the effect of distance from a light source on the output of a solar cell.		
I can design an investigation to find out the effect of different factors on the output of a solar cell.		
I can select the best renewable energy sources for different conditions.		
I can design an island powered by 100% renewable energy sources.		

Date: _____

The Earth

Starter

List the materials which are used to make a light bulb.

_____

Where do these materials come from?

_____

Learning Intentions

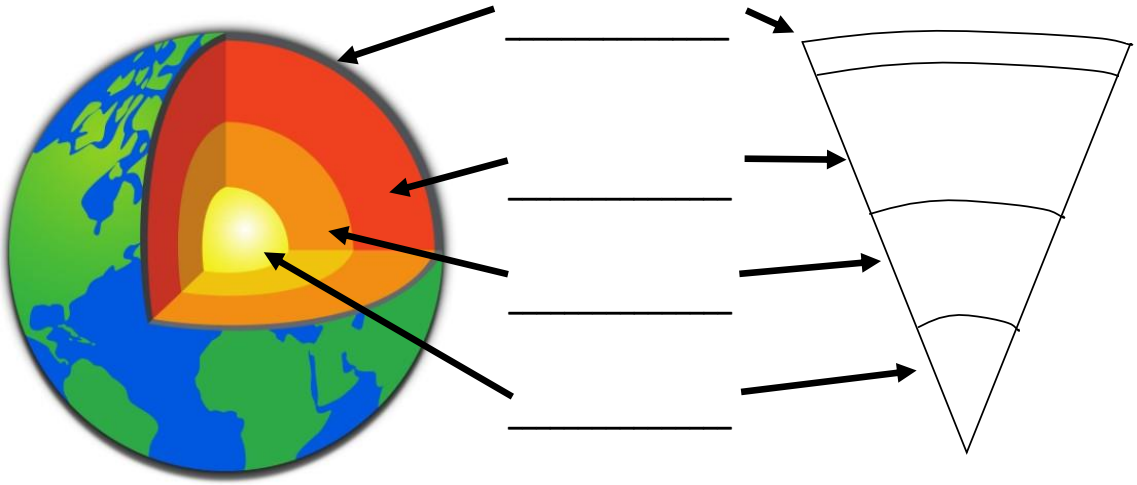
- To understand the formation of sedimentary rock.
- To know the characteristics of sedimentary rock.

Success Criteria

☐ I can describe the different layers of the Earth

☐ I can name the three different types of rock.

The Earth



The Earth

The Earth is made up of different _____.

The outer layer is called the _____, the _____ layer is the mantle.

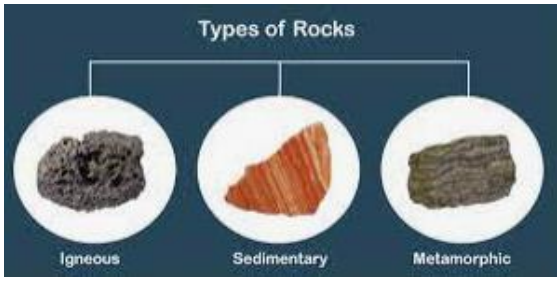
The inner layer is called the _____. This is made up of the _____ core and the _____core.

Activity: Watch the video and note down three facts

1. _____
2. _____
3. _____

The three main types of rock are:

1. _____
2. _____
3. _____



Date: _____

Sedimentary Rocks

Starter

1. What makes up the different layers of the Earth?

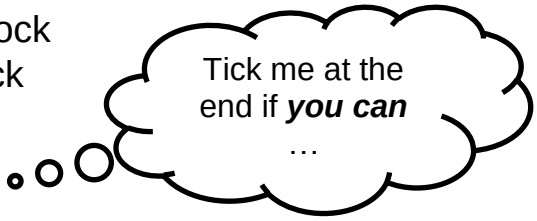
_____

2. State the names of the three different types of rock

_____

Learning Intentions

- To understand the formation of sedimentary rock
- To know the characteristics of sedimentary rock



Success Criteria

☐ I can describe how sedimentary rock forms.

☐ I can state the key features of sedimentary rocks.

Sedimentary Rocks

Sedimentary rocks are _____ and easy to recognise because they always contain _____.

They are quite soft and can _____ if squeezed hard and can be found in a range of different colours.

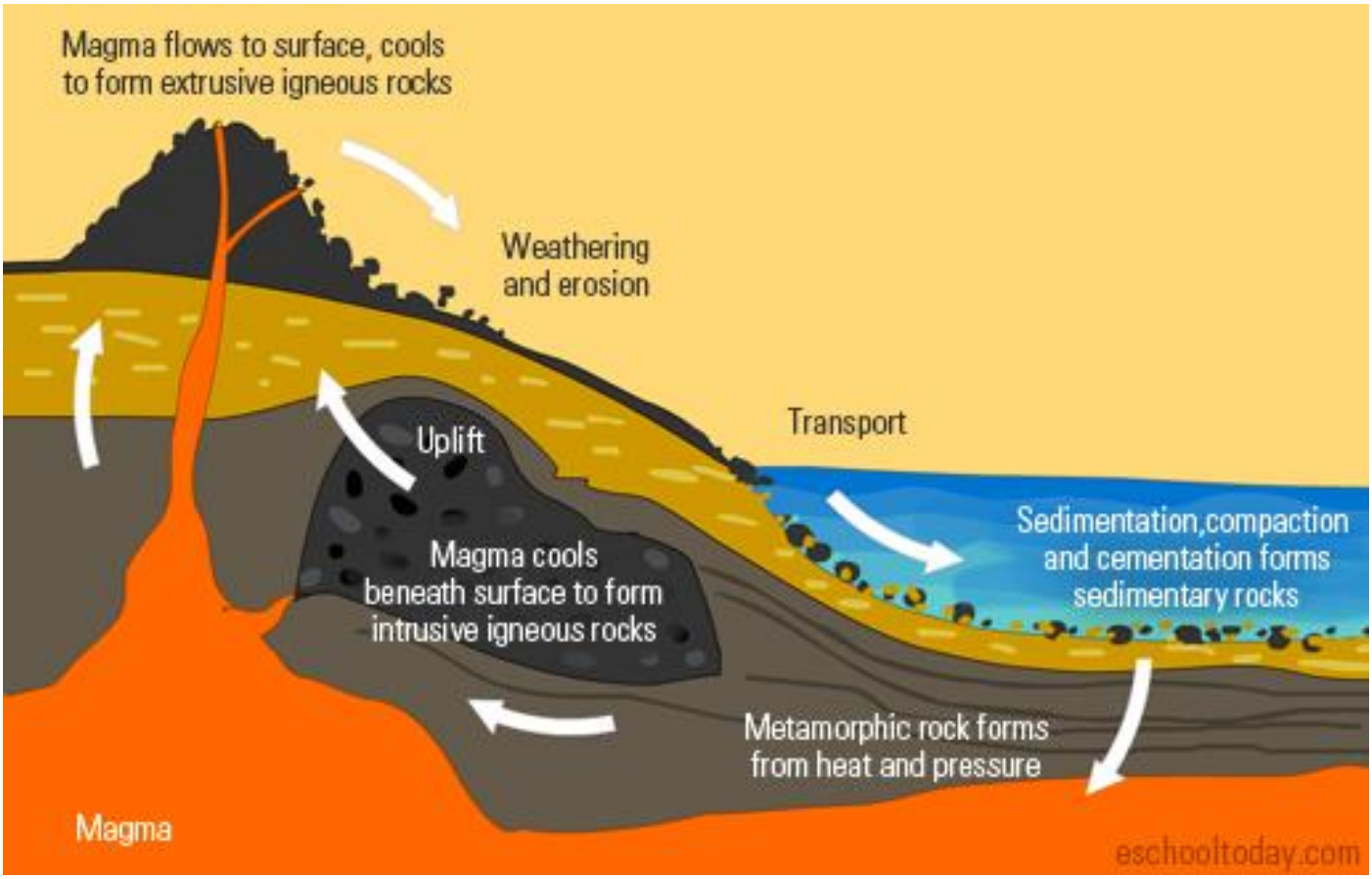
Sometimes _____ can be seen in this type of rock.

Examples of sedimentary rocks include sandstone, mudstone and limestone.

Mudstone

Sandstone

Limestone



Steps in the formation of sedimentary rocks:

Sedimentary rocks are formed from particles of _____ shells and rocks. These particles are called _____.

The sediment sinks to the _____ of the sea bed.

Layers of sediment build up over _____.

Increasing _____ hardens the sediment into _____.

Word Bank

Bottom sediment rock pressure time sand

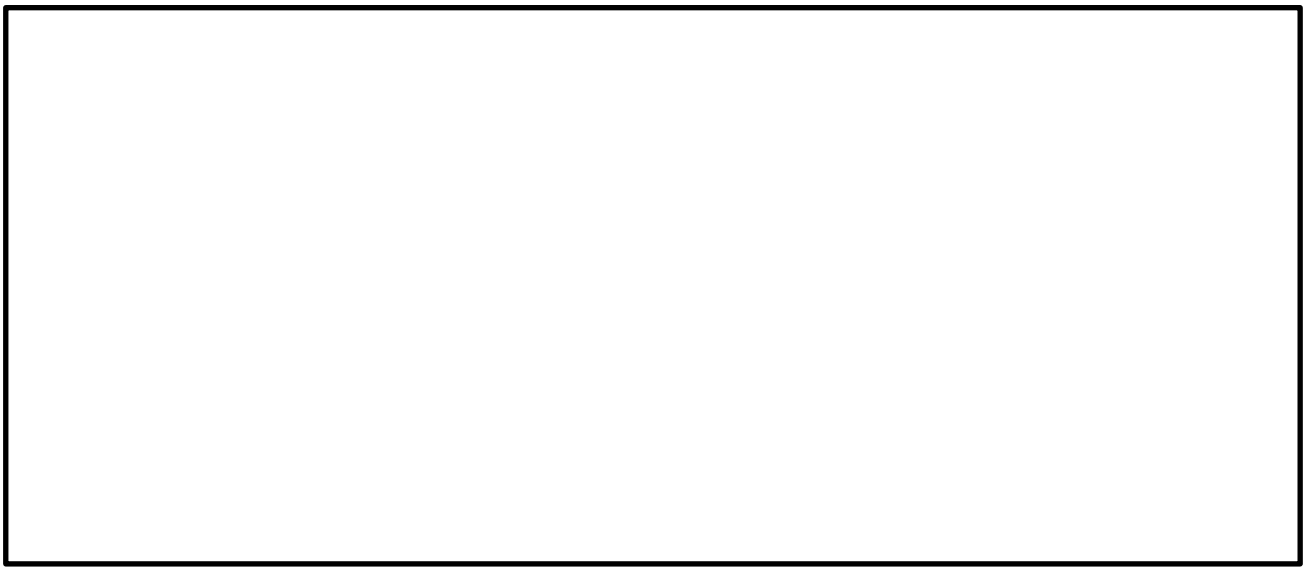
Sedimentary Rock Formation

Aim:

_____

_____

Method:



Conclusion:

_____

_____

_____

_____

Date: _____

Igneous Rocks

Starter

Complete the Conclusion to the sedimentary rocks experiment.

Learning Intentions

- To understand the formation of igneous rock
- To know the characteristics of igneous rock

Tick me at the end if ***you can*** …

Success Criteria

☐ I can describe how igneous rock forms

☐ I can state the key features of igneous rocks

Igneous Rocks

Igneous rocks are formed when magma (molten rock) cools and solidifies.

They are very _____ and may look grainy or _____.

_____ igneous rocks are formed when lava that has erupted from a volcano cools very quickly. These form _____ crystals.

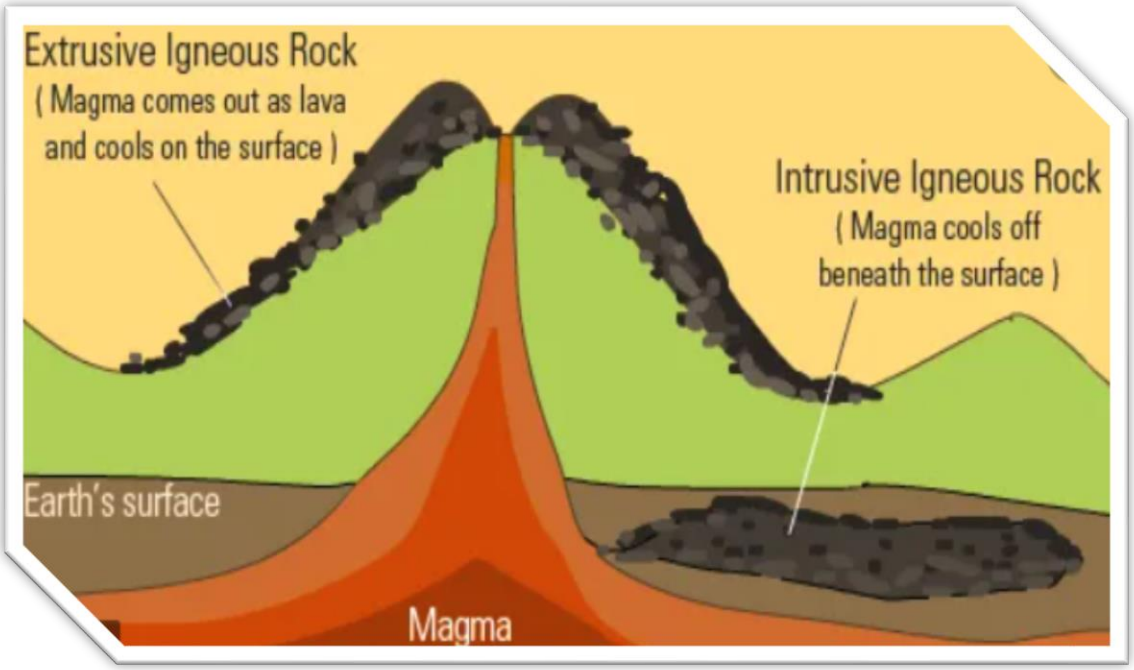
_____ igneous rocks are formed when magma that has not reached the surface cools _____. These form larger crystals.

Examples of igneous rocks include granite, pumice and obsidian.

Granite

Pumice

Obsidian



Igneous Rock Formation

Aim:

_____

Method:

Conclusion:

_____

_____

_____

_____

Date: _____

Metamorphic Rocks

Starter: True or False?

1. The crust is the deepest layer of the Earth.
2. Sedimentary rock is harder than igneous rock.
3. Fossils are found in igneous rock.

Learning Intentions

- To understand the formation of metamorphic rock
- To know the characteristics of metamorphic rock

Success Criteria

❑ I can describe how metamorphic rock forms

❑ I can state the key features of metamorphic rocks

Tick me at the end if ***you can*** …

Metamorphic Rocks

Metamorphic rocks are formed from other _____ that are changed because of _____ and _____.

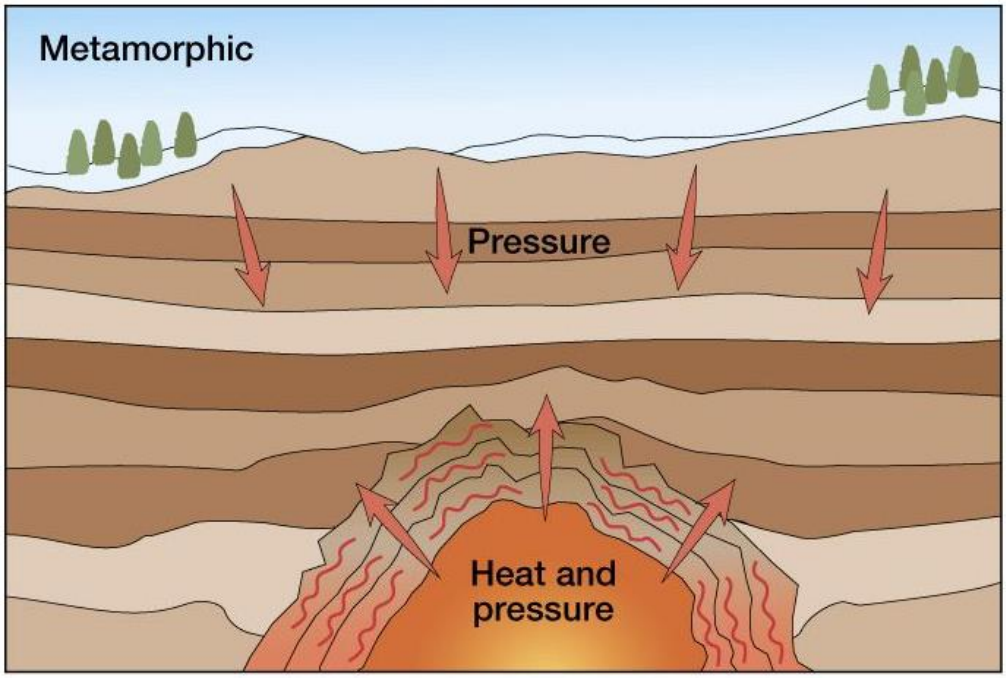
They do not melt but are changed _____.

Examples of sedimentary rocks include marble, slate and gneiss.

Marble

Slate

Gneiss



Metamorphic Rock Formation

Aim:

_____

Method:

Conclusion:

_____

_____

_____

Date: _____

Weathering, Erosion and the Rock Cycle

Starter

Name and classify each of the rock stars:

A _____

B _____

C _____

D _____

Learning Intentions

- To know the different types of weathering.
- To understand the difference between weathering and
- To understand the rock cycle.

Tick me at the end if ***you can*** …

Success Criteria

- ❑ I can identify the three different types of weathering.
- ❑ I can contrast weathering and erosion.
- ❑ I can explain how the rock cycle works.

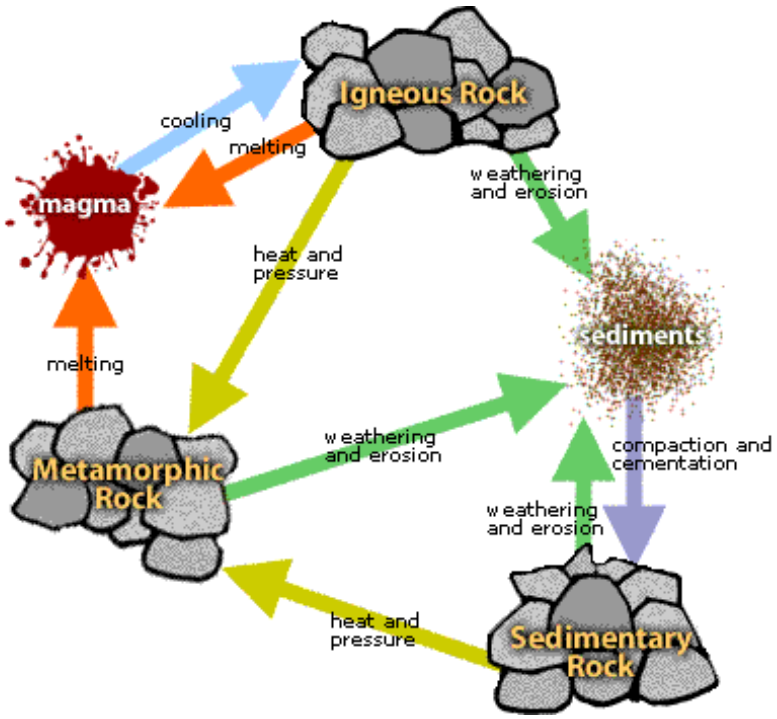
Weathering, Erosion and the Rock Cycle

Rocks gradually wear away in a process called _____. This involves the weakening and breaking up of rocks.

There are three different types of weathering _____,

_____ and _____ weathering.

_____ is the carrying away of weathered material.



The processes of _____, erosion, heat, _____, melting and _____ can change rocks from one type to another. We call this continuous cycle of change the rock cycle.

Igneous rocks can erode into small particles that are deposited and become _____ rocks.

Sedimentary rocks, under high heat and pressure, can transform into _____ rocks.

Metamorphic rocks can melt to magma which, when cooled, becomes _____ rock.

Word Bank	
Igneous	weathering
pressure	metamorphic
sedimentary	cooling

Date: _____

Sources of Fuel

Starter

1. What do you think is meant by a “fuel”?

   _____

2. Why is fuel important in our everyday lives?

   _____

Learning Intentions

- To understand where our electrical energy comes from.
- To construct a bar graph showing different sources of electrical energy.
- To use a range of different sources to extract relevant information.

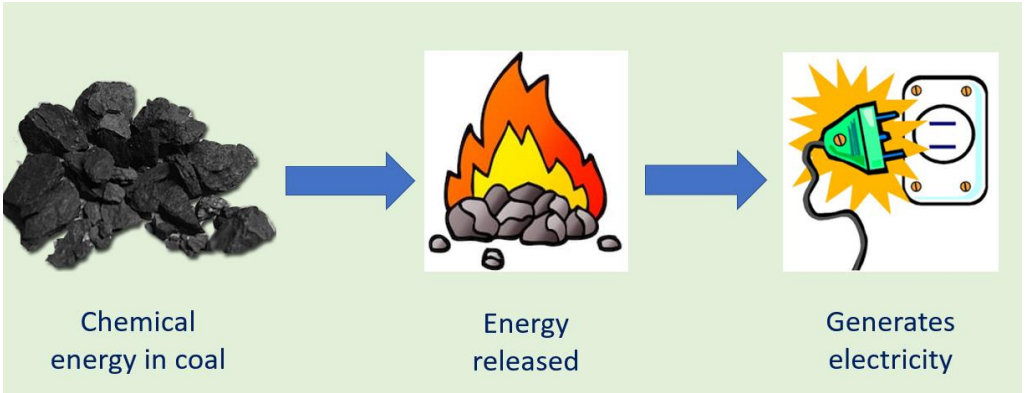
Success Criteria

Tick me at the end if ***you can*** …

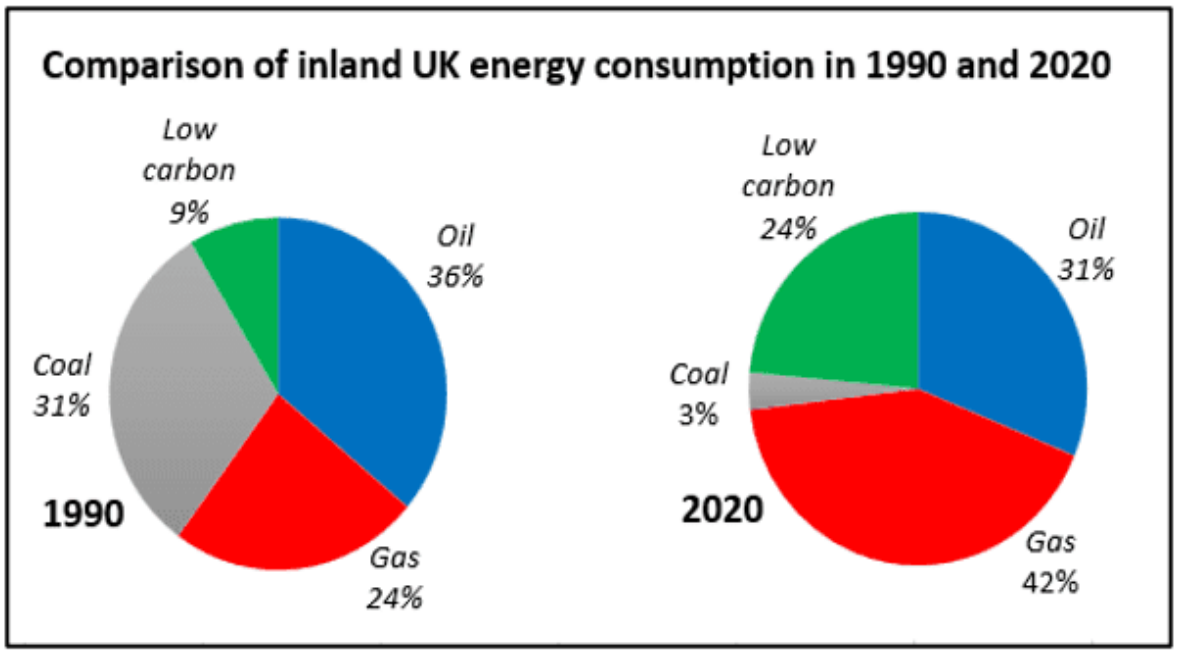
- ❑ I can explain where our electrical energy comes from.
- ❑ I can construct a bar graph to represent different sources of electrical energy.
- ❑ I can select relevant information from different sources.

Sources of Fuel

A fuel is a material such as _____, _____ or _____ that is burned to release energy**.**



Activity: Use the pie charts to answer the questions below:



1. Which energy source saw the greatest decrease between 1990 and 2020?

   _____

2. Which energy source saw the greatest increase between 1990 and 2020?

   _____

3. What do you think Low carbon means?

   _____

4. Why do you think energy consumption changed so much between 1990 and 2020?

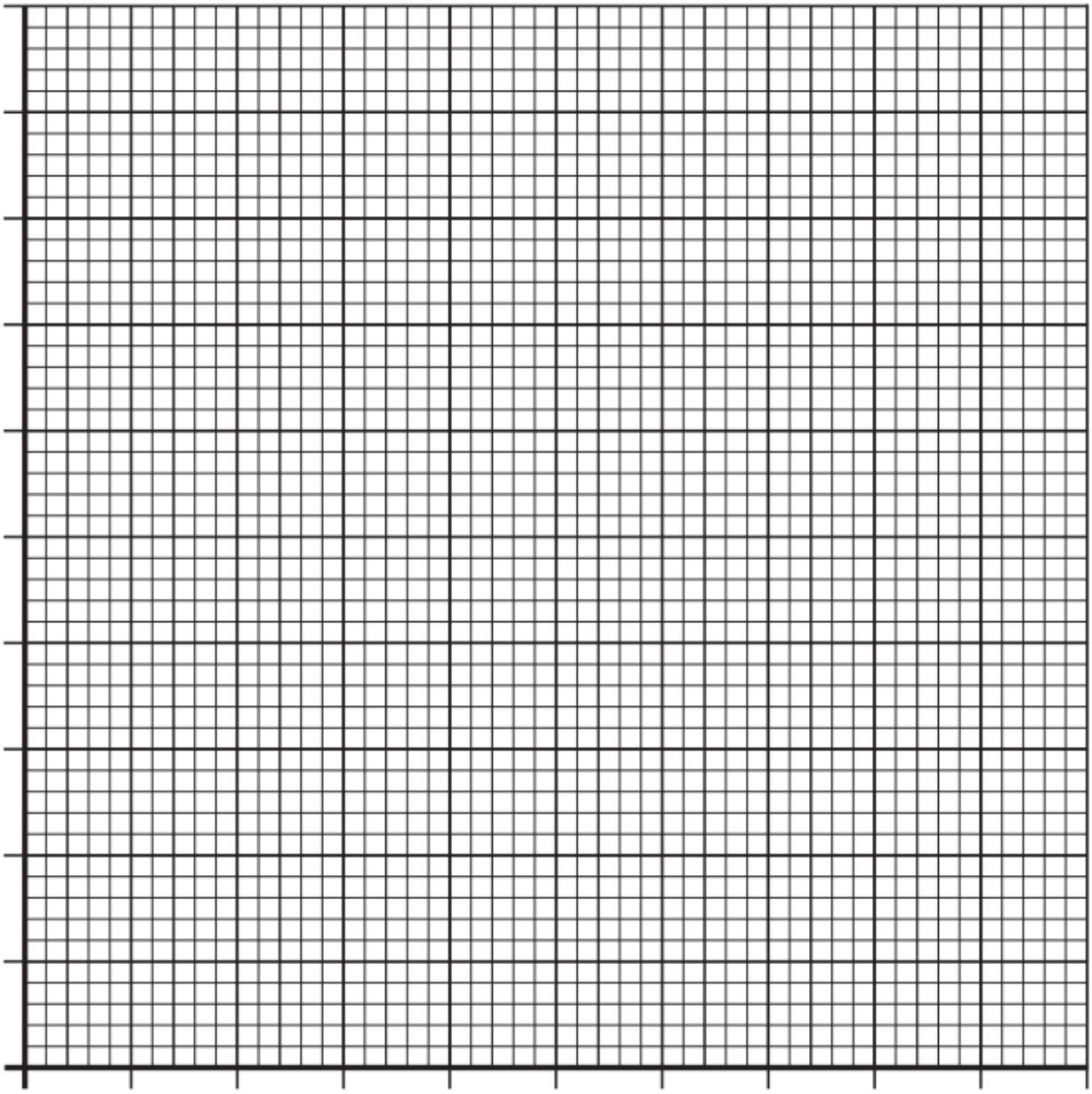
   _____

Activity: Present the information in the table below as a bar chart:

Where does the UK's electricity come from? (2019)

Energy Source	Percentage %
Gas – fired power stations	41
Renewables	28
Nuclear plants	23
Coal-fired power stations	1
Electricity imports	7

Graph paper for bar chart:

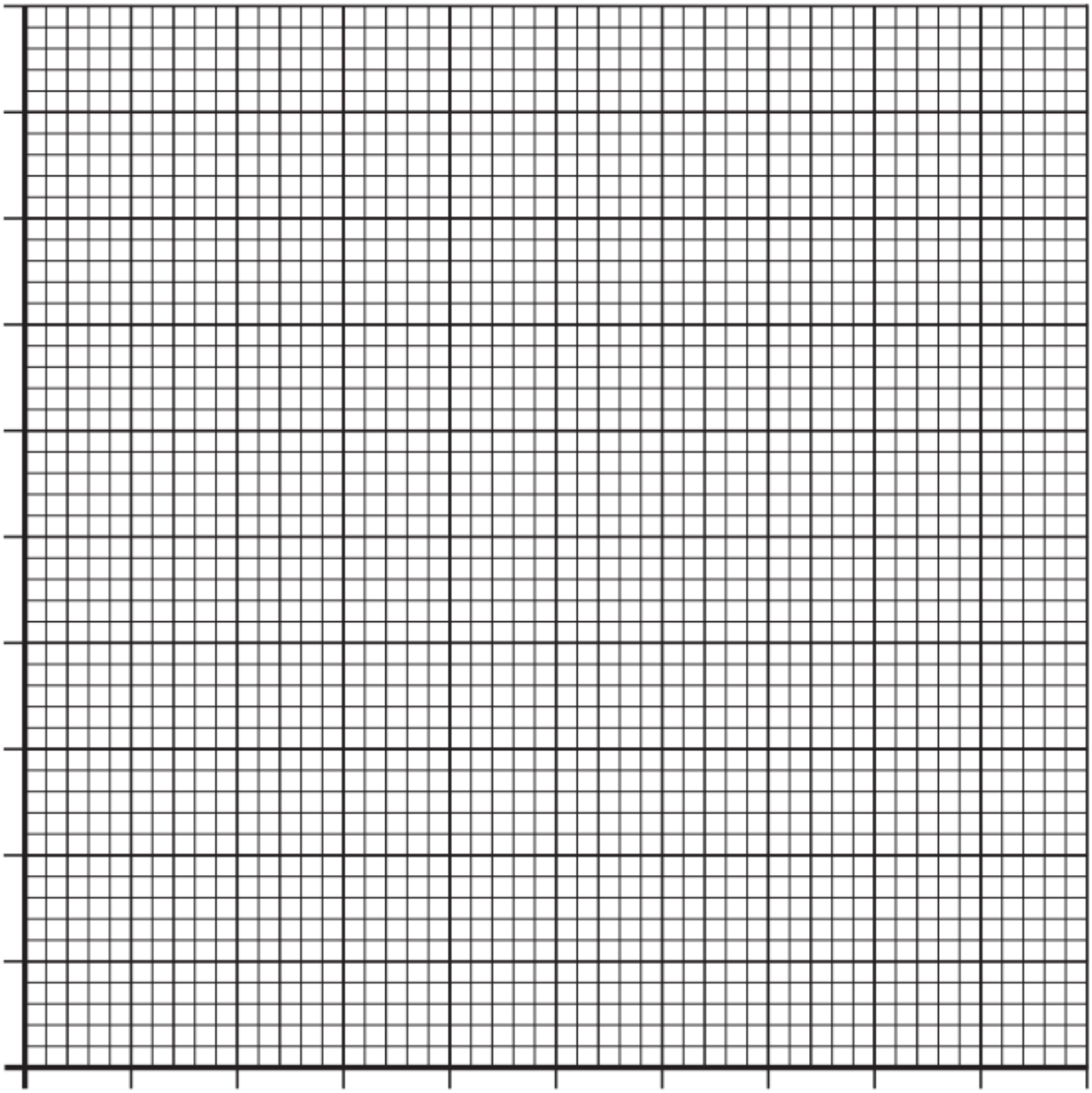


Extension Activity: Present the information in the table below as a bar chart:

What does Scotland use its energy to do?

Sector	Percentage %
Heat	50
Transport	25
Electricity	24
Other	1

Graph paper for bar chart:



Date: _____

Comparing Fuels

Starter

1. Name 3 things we use fuels for.

   _____

2. What substance do fuels react with to produce energy?

   _____

Learning Intentions

- To compare different types of fuel by practical experimentation.
- To know the terms fuel, combustion and exothermic.

Tick me at the end if ***you can*** …

Success Criteria

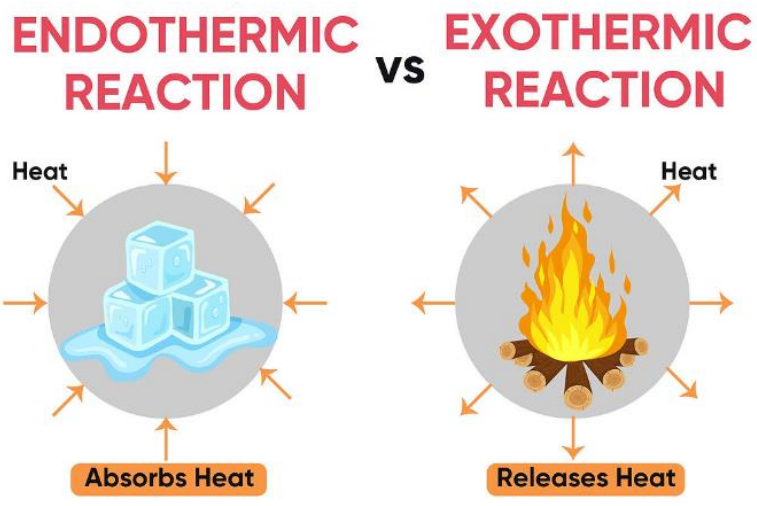
- ❑ I can interpret the results of an experiment to compare different fuels.
- ❑ I can state what the terms fuel, combustion and exothermic mean.

Comparing Fuels

Fuels burn in _____ to release _____.

The burning of fuels is known as a _____ reaction.

Reactions that give out energy are called _____ reactions.



Comparing Fuels

Aim:

_____

Method:

Results:

	paraffin	**ethanol**
Did it light easily?		
Did it produce soot?		
Temperature at start (°C)		
Temperature after 1 minute (°C)		
Change in temperature (°C)		

Conclusion:

_____

_____

_____

_____

_____

Date: _____

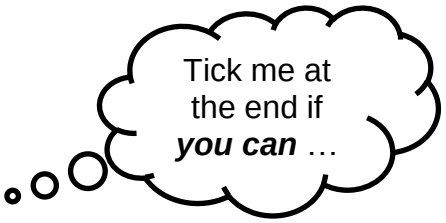
Combustion

Starter: Identify and correct the errors in the statements below:

1. When a substance burns, it reacts with carbon dioxide to produce energy.
2. A substance burning in the presence of oxygen is known as a combination reaction

Learning Intentions

- To know the products of combustion.
- To know the elements that make up a hydrocarbon.
- To understand the effects of incomplete combustion.



Success Criteria

- ❑ I can write an equation to show the products of combustion.
- ❑ I can state the elements that make up a hydrocarbon.
- ❑ I can carry out an experiment to show the effects of incomplete combustion

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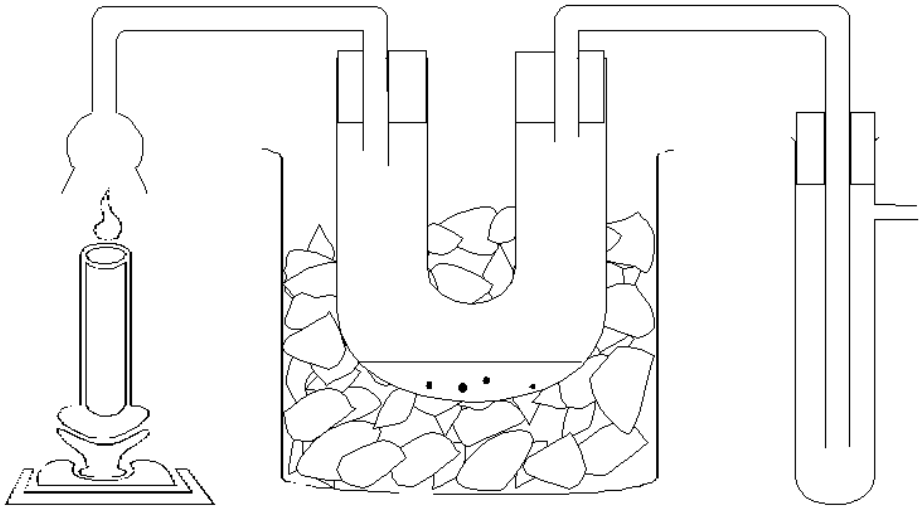
Combustion

Activity: Your teacher will now carry out a demonstration to show the products of combustion. Label the diagram below.



Limewater turns _____ showing that _____ _____ has been produced. The fuel must contain _____.

_____ is seen forming in the utube. The fuel must contain hydrogen. Fuels that contain only _____ and _____ are called hydrocarbons.

Incomplete Combustion

Aim:

_____

Method:

Results:

	Air Hole Open	Air Hole Closed
Colour of flame		
Heat		
Soot production on tile		
Type of combustion		

Conclusion:

_____

_____

_____

_____

_____

Date: _____

Fossil Fuels

Starter:

1. What type of rock can fossils be found in?
2. Why do we refer to some fuels as fossil fuels?

Learning Intentions

- To know how different fossil fuels are formed.
- To analyse the benefits and problems of fossil fuels.
- To explain how burning fossil fuels can lead to climate change.

Tick me at the end if ***you can***

Success Criteria

- ❑ I can state what fossil fuels are and how they are formed.
- ❑ I can describe some of the benefits and problems with the use of fossil fuels.
- ❑ I can explain how burning fossil fuels can lead to climate change.

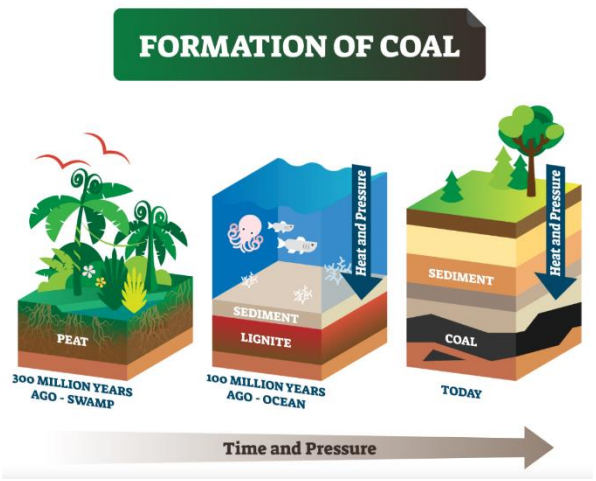
Fossil Fuels

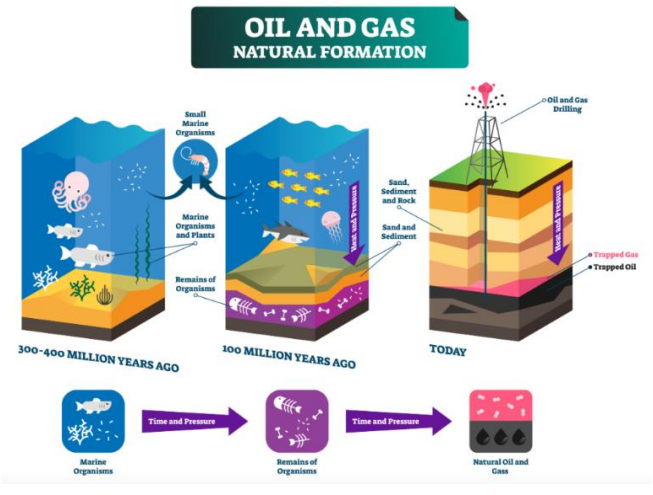
Crude _____, _____ and _____ are _____ fuels. They formed over millions of years from the remains of dead _____.

Coal was formed from dead _____ and _____.

Crude oil and gas were formed from dead _____ _____.

Fossil fuels are described as a _____ resource as they take a long time to form and are not easily _____.





Activity: Watch the video and make notes to complete the table below:

_____

_____

_____

Benefits of using fossil fuels	**Problems with using fossil fuels**

Plenary: Complete the sentences below using the words in the word bank:

When fossil fuels burn, they release gases such as _____ _____ and _____ into the atmosphere.
Excess concentrations of these gases lead to _____ _____ as they trap the heat from the sun.
Along with the greenhouse gases, the higher temperatures can disrupt the _____ _____, causing further warming and climate change.

<u>Word Bank</u>

carbon dioxide global warming

carbon dioxide methane

Date: _____

The Carbon Cycle

Starter:

List as many problems as you can think of with the use of fossil fuels.

_____

_____

Learning Intentions

- To understand the processes of the carbon cycle.
- To explain what carbon footprint is.

Success Criteria

- ❑ I can describe the processes of the carbon cycle.
- ❑ I can explain how to minimise my carbon footprint.

The Carbon Cycle

Activity: Read through the passage below and answer the questions.

Use a highlighter or coloured pen to pick out key words and sentences.

Carbon is the chemical backbone of all life on Earth. All of the carbon we currently have on Earth is the same amount we have always had. When new life is formed, carbon forms key molecules like protein and DNA. It's also found in our atmosphere in the form of carbon dioxide or CO2.

The carbon cycle is nature's way of reusing carbon atoms, which travel from the atmosphere into organisms in the Earth and then back into the atmosphere over and over again.

Most carbon is stored in rocks and sediments, while the rest is stored in the ocean, atmosphere, and living organisms. These are the reservoirs, or sinks, through which carbon cycles. The ocean is a giant carbon sink that absorbs carbon. Marine organisms from marsh plants to fish, from seaweed to birds, also produce carbon through living and dying.

Over millions of years, dead organisms can become fossil fuels. When humans burn these fuels for energy, vast amounts of carbon dioxide are released back into the atmosphere. This excess carbon dioxide changes our climate — increasing global temperatures, causing ocean acidification, and disrupting the planet’s ecosystems.

1. Which key molecules of life does carbon form?

---

2. What is the carbon cycle?

---

3. Where is most carbon stored?

---

4. Name two words used to describe a place where carbon is stored.

---

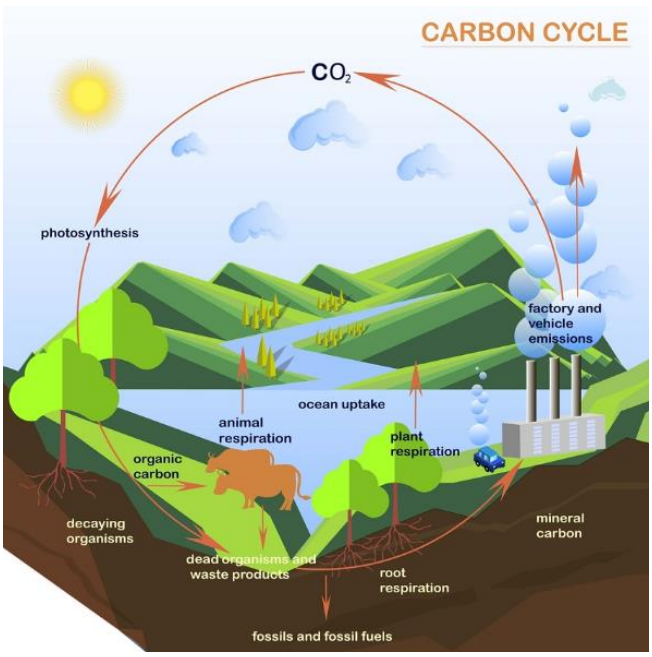
5. After millions of years, what can dead organisms form?

---

6. How is the carbon stored in these fuels returned to the atmosphere?

---

7. Name 3 problems caused by excess carbon dioxide (CO2) in our atmosphere.



Carbon Footprint

A _____ _____ is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our _____. It is usually quoted in _____ of carbon dioxide generated per _____. We can reduce our carbon footprint by _____ less, using _____transport, reducing _____ waste and choosing products that have been sourced _____.

Date: _____

Renewable Energy Sources

Starter:

How can we generate energy without using fuel?

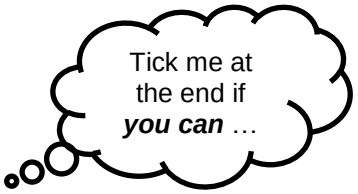
_____

_____

Learning Intentions

- To know different examples of renewable energy sources.
- To understand how electricity is generated from renewable sources.
- To compare and contrast different methods of renewable energy generation

Success Criteria



- ❑ I can name different sources of renewable energy.
- ❑ I can explain how electricity is generated using renewable energy sources.
- ❑ I can evaluate the different methods of renewable energy generation.

Renewable Energy Sources

_____ energy comes from sources that _____ _____ run out when we use them.

If we use _____ power to generate _____, we do not reduce the amount of wind that blows or that can be used in the future.

Non-renewable	Renewable

Renewable Energy Sources

Renewable Energy Source	How it Works	Advantages	Disadvantages
	1) light energy from the sun is converted to electrical energy by solar cells. 2) Heat energy from the sun heats cold water running through solar panels.		
	The wind pushes the blades of wind turbines round, giving them kinetic energy. The wind turbines change that to electrical energy.		
	In mountain areas where there is a high rainfall, dams are built to store water. Running some stored water down the dam over turbine blades gives them kinetic energy and they turn a generator which produces electrical energy.		
	Plants are grown then harvested. The plant material can be burned or turned into alcohol which can also be burned.		
	Waves on the sea cause Salter's Ducks to rock up and down (kinetic energy). They change this to electrical energy.		
	In countries like Iceland where there are many hot underground rocks, cold water is pumped down into the hot rocks and heated. It is then pumped up to the surface.		

Date: _____

Solar Cells

Starter:

1. Solar energy is the energy we get from the Sun. Describe how we use the Sun as a source of energy _____

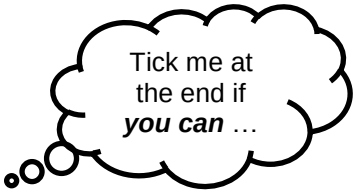
   _____
2. State one advantage of solar energy _____

   _____
3. State one disadvantage of solar energy _____

   _____

Learning Intentions

- To investigate the effect of distance from a light source on the output of a solar cell.



Success Criteria

- ❑ I can carry out an experiment to investigate the effect of distance from a light source on the output of a solar cell.

Solar Cells

A _____ cell (photovoltaic cell) changes _____ energy into _____ energy.

Solar Cells

Aim:

_____

_____

Variables:

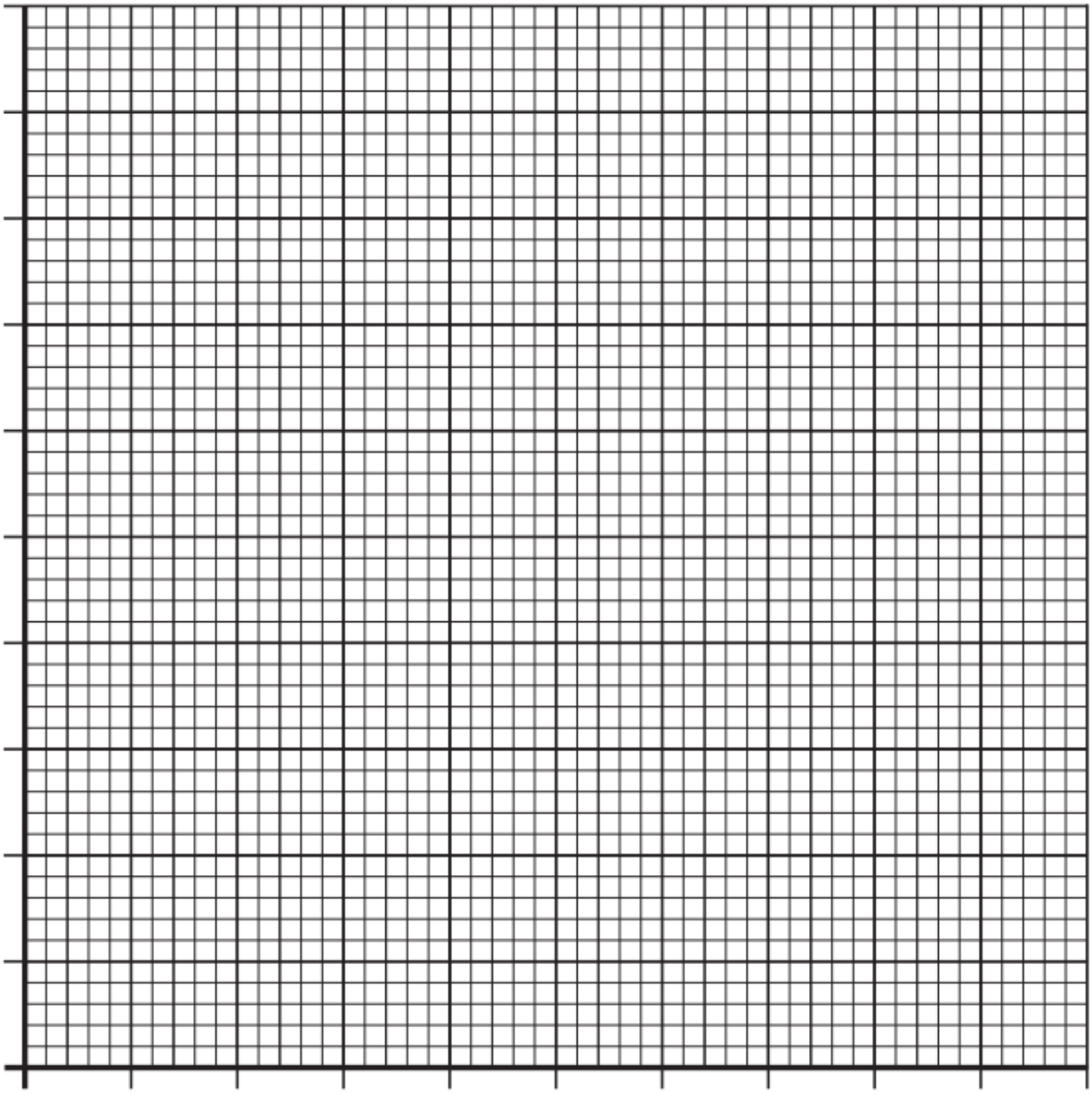
- Independent variable _____
- Dependent variable _____
- Control variables _____

Method:

Results:

Distance (cm)	Output of solar cell (V)
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	

Graph paper for scatter graph:



Conclusion:

_____

_____

Evaluation:

_____

_____

Date: _____

Solar Cell Investigation

Starter:

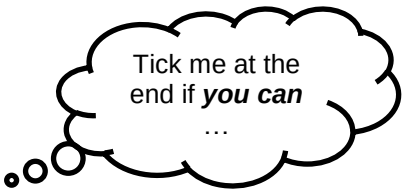
Wave	1	Water stored behind a dam is released and flows down pipes. This moving water turns a turbine and a generator, generating electricity.
Solar	2	Moving air turns the blades of a turbine generating electricity.
Hydroelectric	3	Crops or waste materials are burned to heat water. The water turns to steam which turns a turbine and a generator, generating electricity.
Biomass	4	Moving water turns turbines and a generator, generating electricity.
Wind	5	When light shines on photovoltaic cells, light energy is transformed into electrical energy.
Tidal	6	The regular motion of water turns a turbine and a generator, generating electricity.
Geothermal	7	The heat energy stored in the earth's crust heats water. The water turns to steam which turns a turbine and generator, generating electricity.

Learning Intentions

- To investigate the effect of different factors on the output of a solar cell.

Success Criteria

- ❑ I can carry out an investigation to find out the effect of different factors on the output of a solar cell.



Solar Cell Investigation

Overall Aim:

_____

_____

Method 1:

Method 2:

Results:

1.

Brightness of lamp (V)	Output of solar cell (V)
2	
4	
6	
8	
10	
12	

2.

Thickness of cloud (sheets)	Output of solar cell (V)

3.

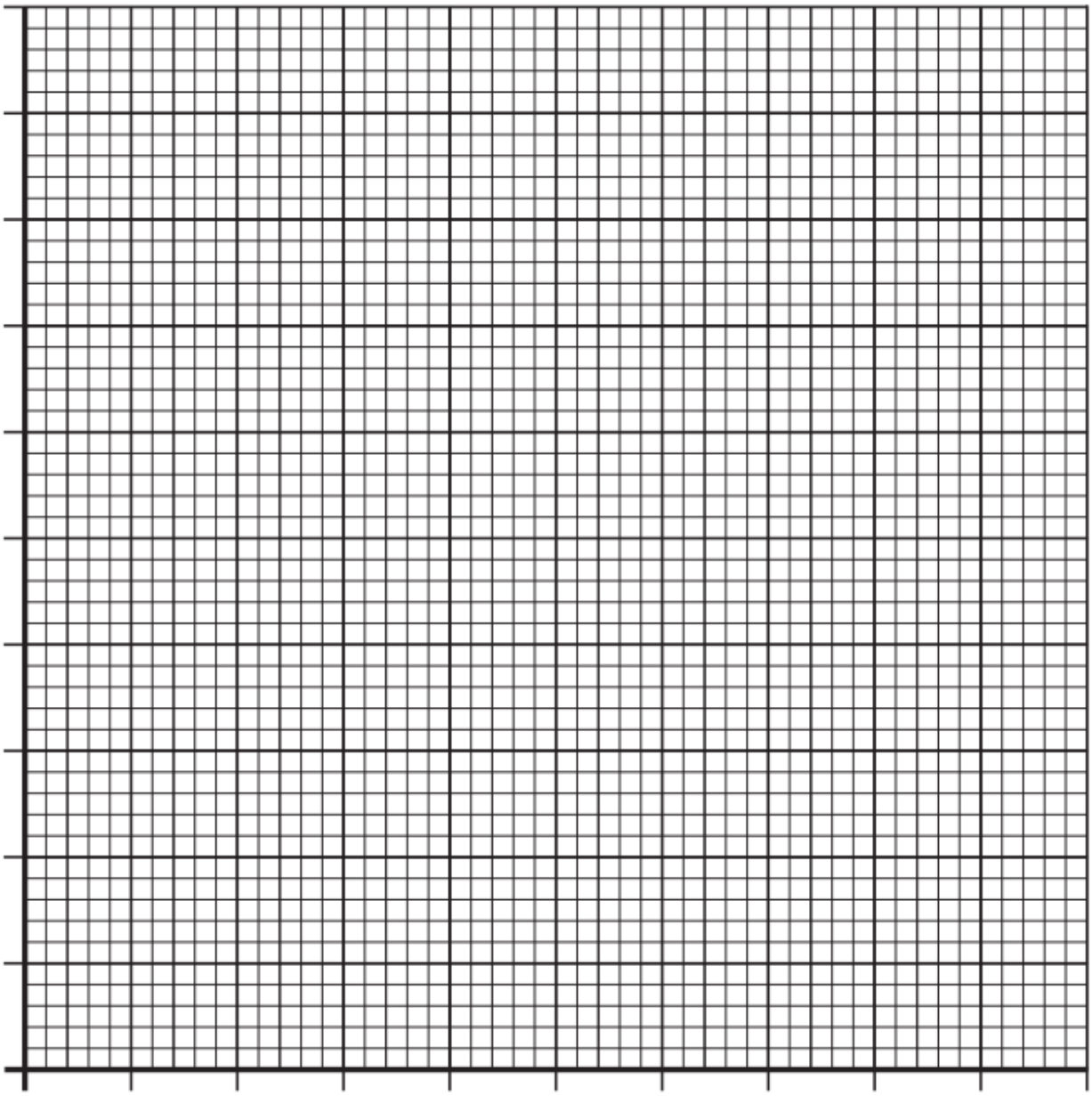
Area of cell covered (%)	Output of solar cell (V)
0	
25	
50	
75	
100	

4.

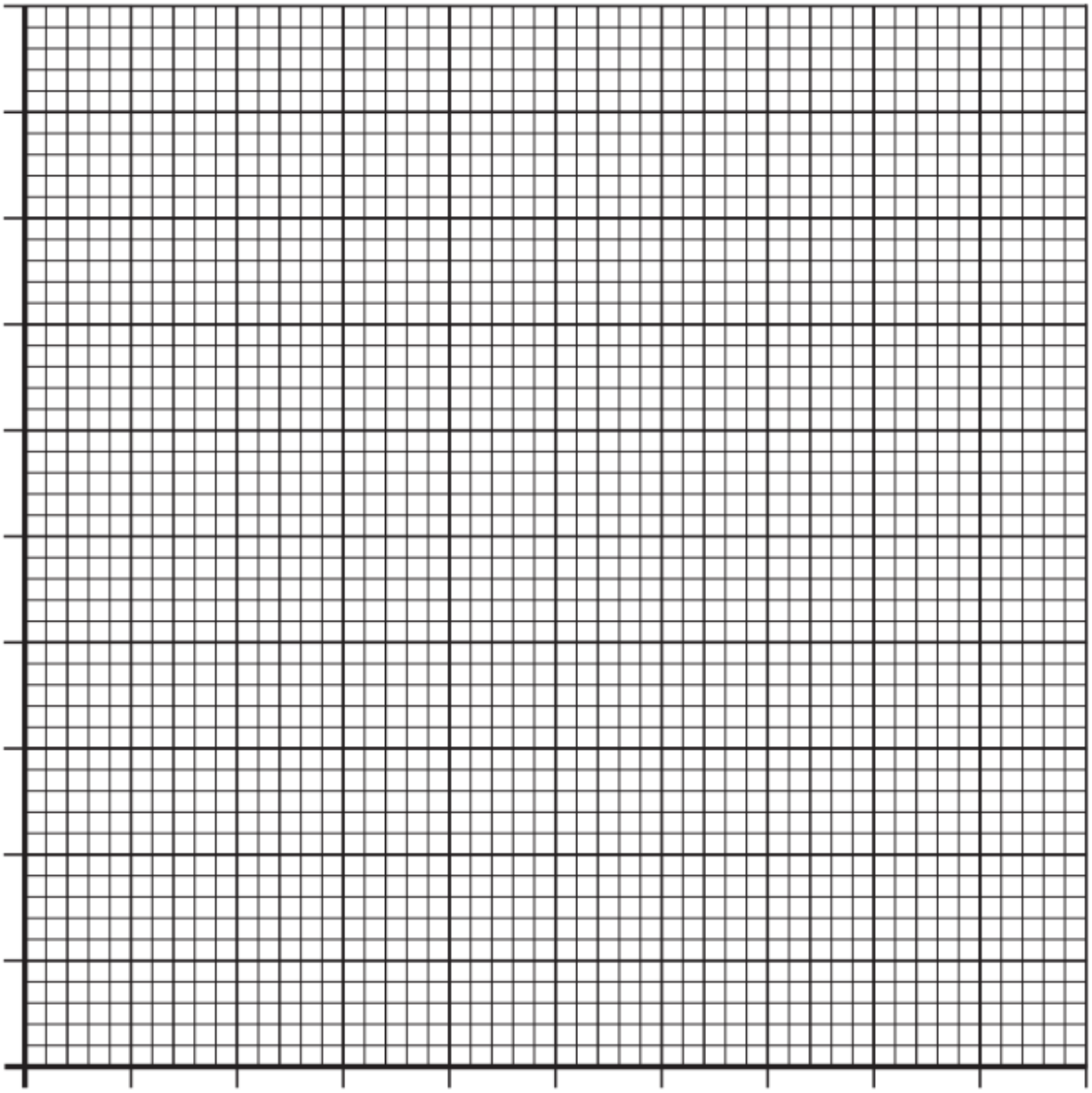
Angle between lamp and solar cell (˚)	Output of solar cell (V)
90	

Graph paper for scatter graphs:

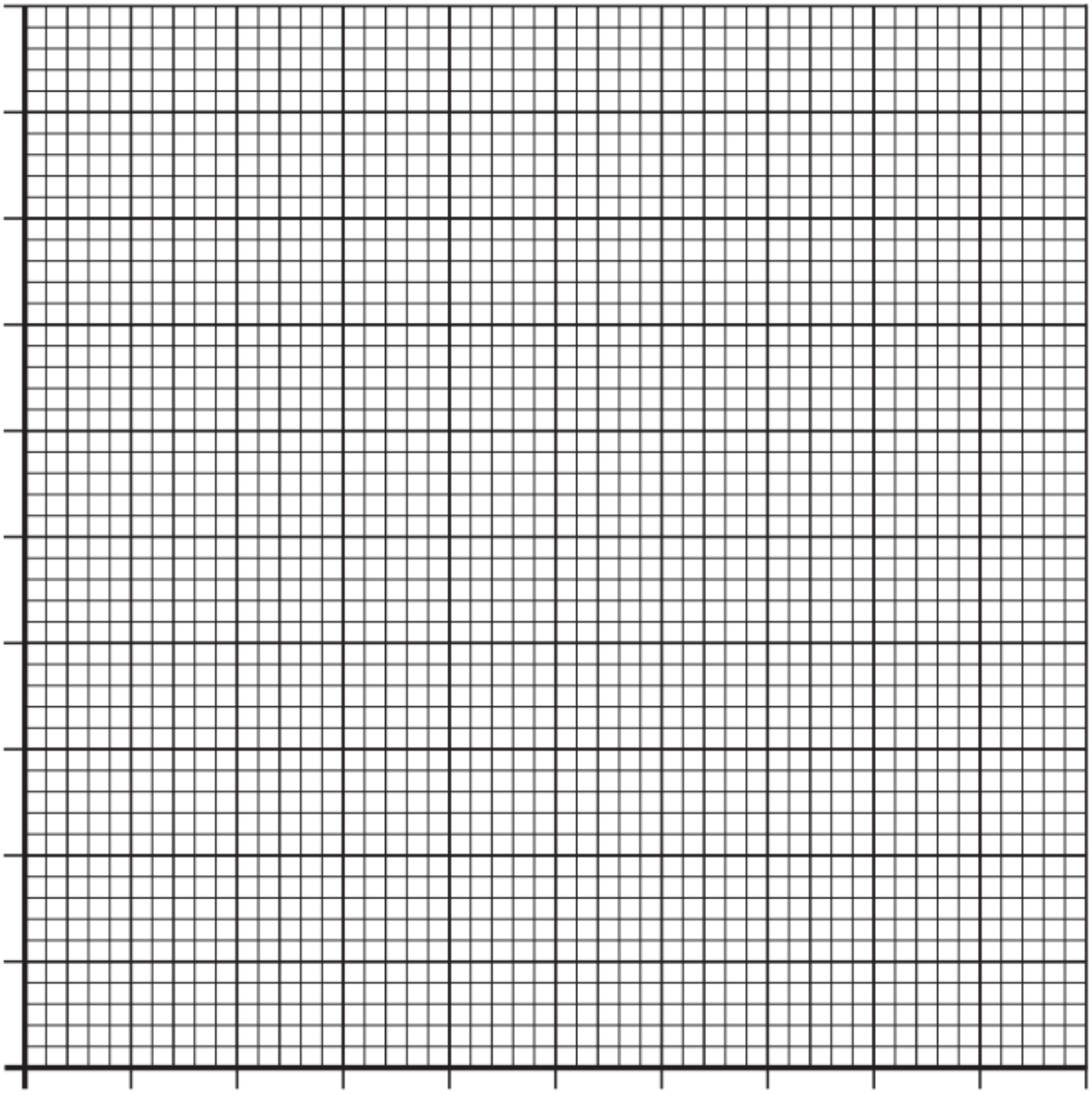
1. **Brightness of Lamp**



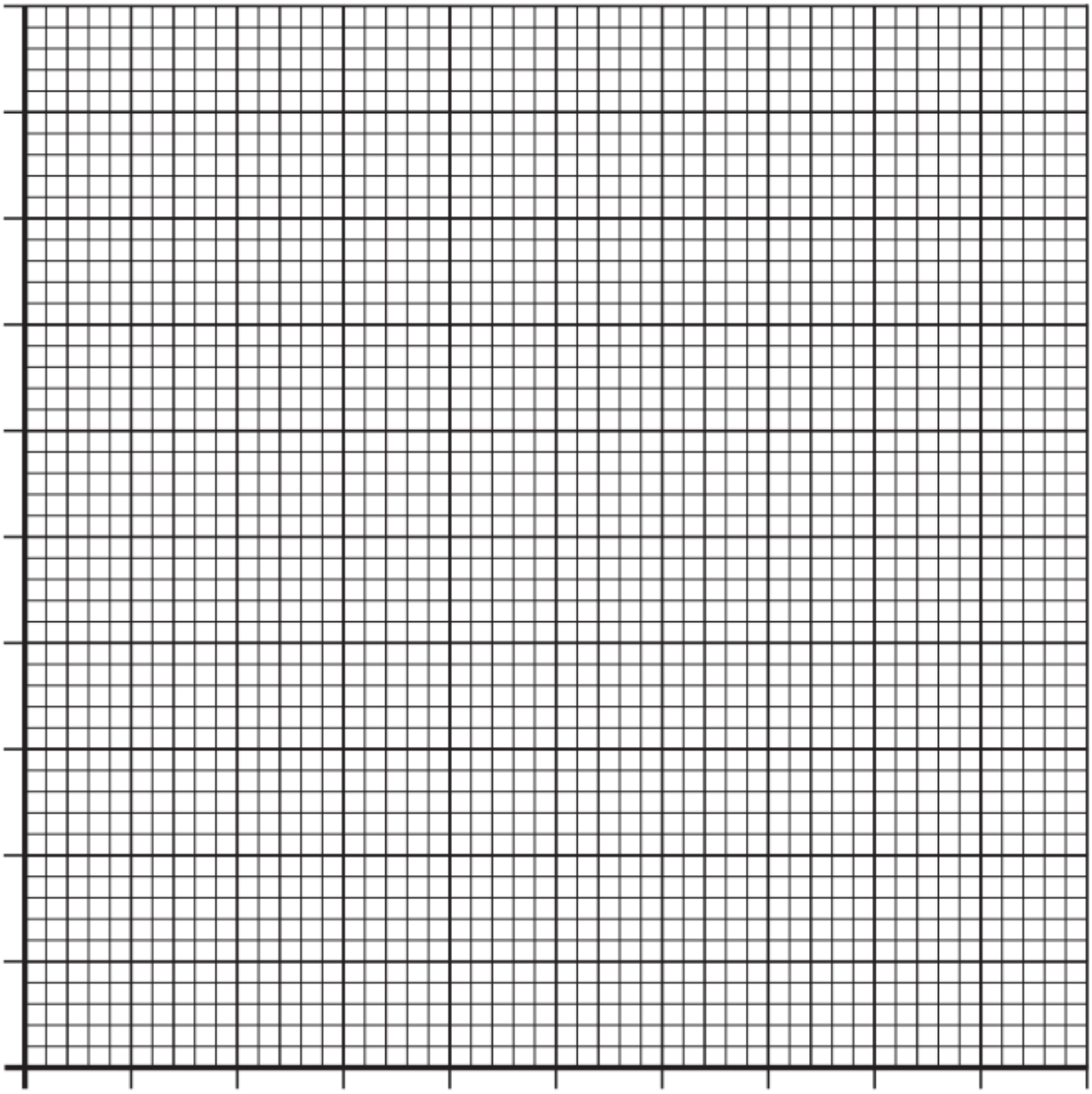
2. Thickness of Cloud (sheets)



3. Area of Cell Covered



4. Angle of Lamp



Conclusions:

1. Brightness of Lamp	
2. Thickness of Cloud	
3. Area of Cell Covered	
4. Angle of Lamp	

Overall Conclusion	Which of the factors investigated has the biggest effect on the output of the solar cell? Include evidence from your results in your answer. What do solar cell installers need to consider most when installing the solar cells?

Date: _____

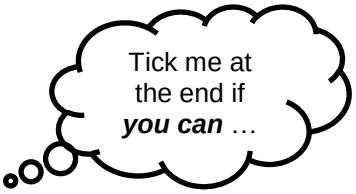
Energy Island

Starter:

1. List 2 renewable and 2 non-renewable energy sources.
2. Give an advantage and a disadvantage for each.

Learning Intentions

- To analyse the best renewable energy sources for different environmental conditions.
- To design an energy network of different renewable energy sources.



Success Criteria

- ❑ I can select the best renewable energy sources for different conditions.
- ❑ I can design an island powered by 100% renewable energy sources.

Energy Island

Activity: Design an island with a continuous energy supply generated entirely from renewable energy sources.

Climate and Natural Resources

- The island has sunny days but cold nights.
- The wind blows most days but not in the summer.
- The hot springs are at a temperature of 80ºC.
- There are no fossil fuels on the island and it is 500km to the mainland.

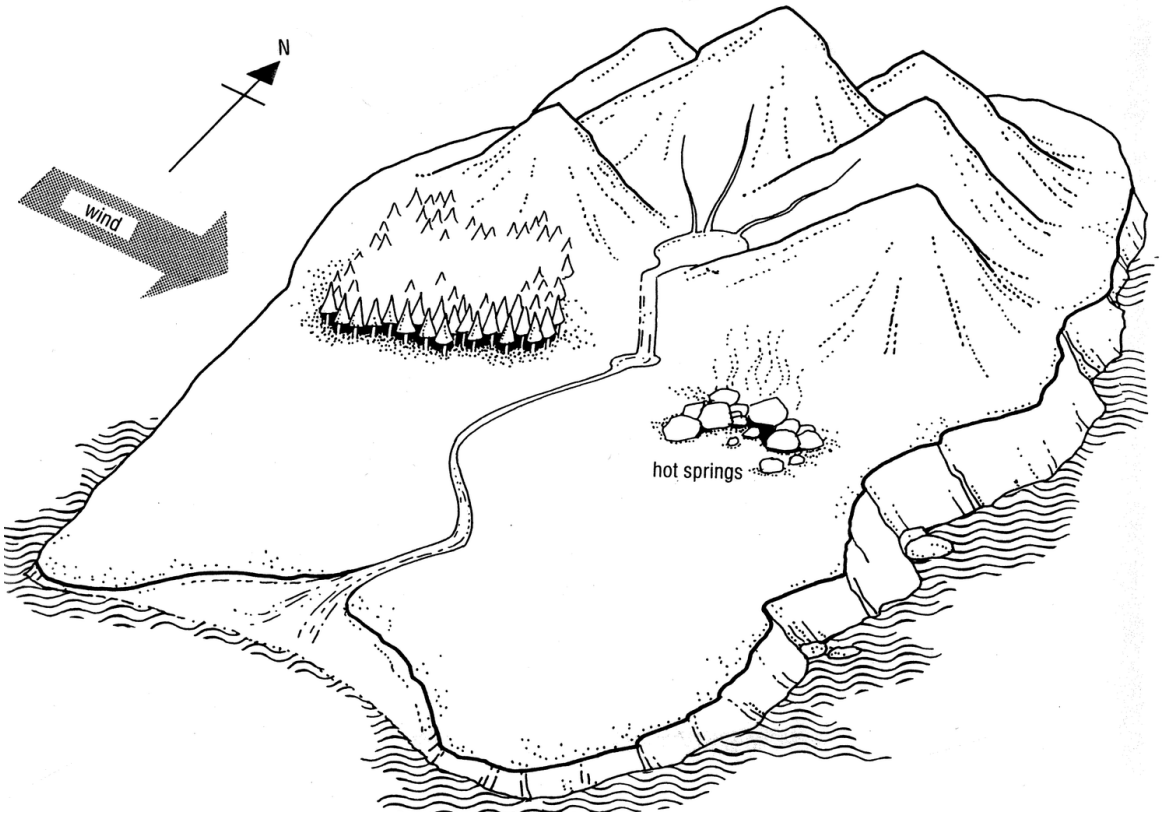
Requirements

You must design a way of supplying:

- hot water for washing
- energy for cooking food
- continuous electricity for a refrigerator to keep medicines in (must be kept cool at all times).

Use this box and the diagram below to plan your energy supply. Work in teams to:

1. Make sure all requirements are met
2. Decide how many power stations you will have
3. Decide where the power stations will be located
4. Decide where the settlement/camp will be located
5. Give your island a name.



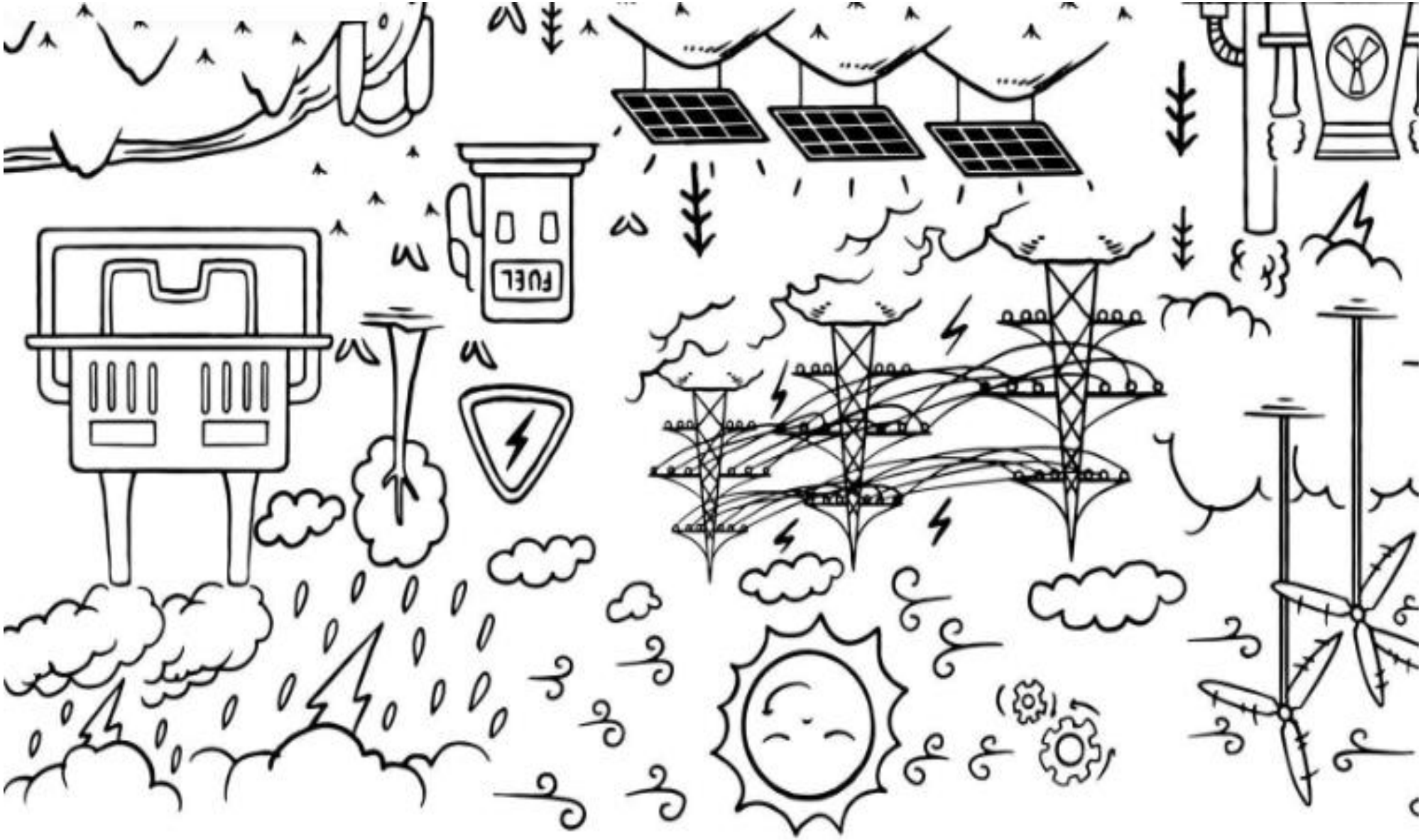
Extension Activities

Energy

T C N E I O A B O V R O U O K
I O T D N I W O O S E S Y V E
R T L R E L E C T R I C I T Y
E R E B E Y Y O N S G S W C W
E N E A D I U F R I E D R R G
Y I O T O R B T L O T T R R S
R I T T E A S G R R R G N Y Y
F N R E R F A W W G R A W T N
N B V R A R V L O C R S S C O
E N Y Y G R E N E I R C Y B O
Y R Y R O E F O O D S N U S L
T K T A W I I W O R K N S S L
A E O Y T N Y D I E C S R D I
A T D E U B C Y Y E I W O R O
U C S O L A R E W O P K P S T

SAVE
OIL
GAS
FOOD
ENERGY
SUN
POWER
SOLAR
BATTERY
WORK
WIND
ELECTRICITY

Draw a comic strip on one of the topics. Ask your teacher for ideas.


FUEL