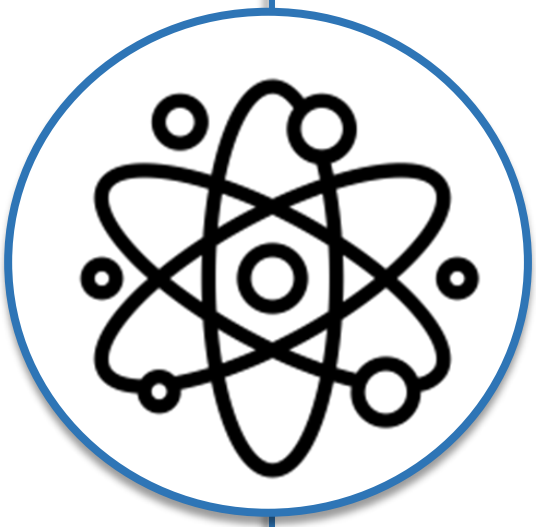
YEAR 7
PHYSICS
UNIT 1



In this topic you will discover some of the Physics Fundamentals. You will find out that different objects have different energies and properties depending on what that object is made up of and how it behaves. You will find out that these energies and properties can change depending on how different objects interact.

This will build on ideas covered in Y5 and Y6 about Solids, Liquids and Gases, the Earth and Space, Electricity and Light.

This will help you prepare for the rest of the Physics topics in KS3 and KS4 where you will look, in more detail, at the different types of energy transfer.

Name:

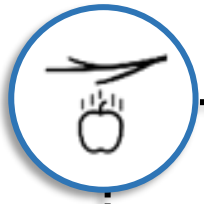
Class:

Teacher:

Expected Performance Level:

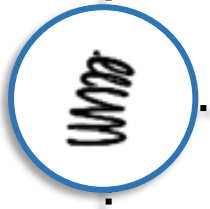
ENERGY STORES **Date:**

Energy can be stored in different ways. There are eight **ENERGY STORES**.



GRAVITATIONAL POTENTIAL

When objects are raised above the ground they store this energy.

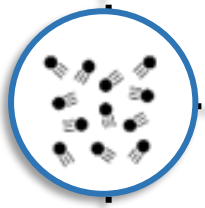


ELASTIC POTENTIAL

When objects are squashed or stretched they store this energy.

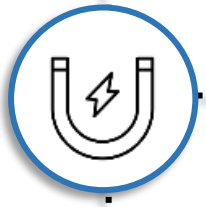
ELECTROSTATIC

When charged particles build up on an object they store this energy.



KINETIC

All moving objects store this energy.



MAGNETIC

Objects that are magnetic store this energy.

NUCLEAR

The energy stored in the nucleus of atoms and is released during nuclear reactions.

CHEMICAL

This energy is stored in the bonds between particles and is released when particles react.

HEAT

All hot objects store this energy.

ENERGY TRANSFERS **DATE:**

RETRIEVAL ACTIVITY

Choose from the board the energy store being described in each example.

	Question	Energy Store	Mark
1	A magnet.		
2	Objects raised above the ground have this energy.		
3	A stretched Slinky.		
4	The energy stored in food and fuel.		
5	Energy stored in hot objects.		
6	Energy stored in moving objects.		
7	Hair stuck to balloon.		
8	Energy stored in squashed or stretched objects.		
9	Energy stored in the nucleus of atoms.		
10	Man running.		
	Score		

ACTIVATE KNOWLEDGE

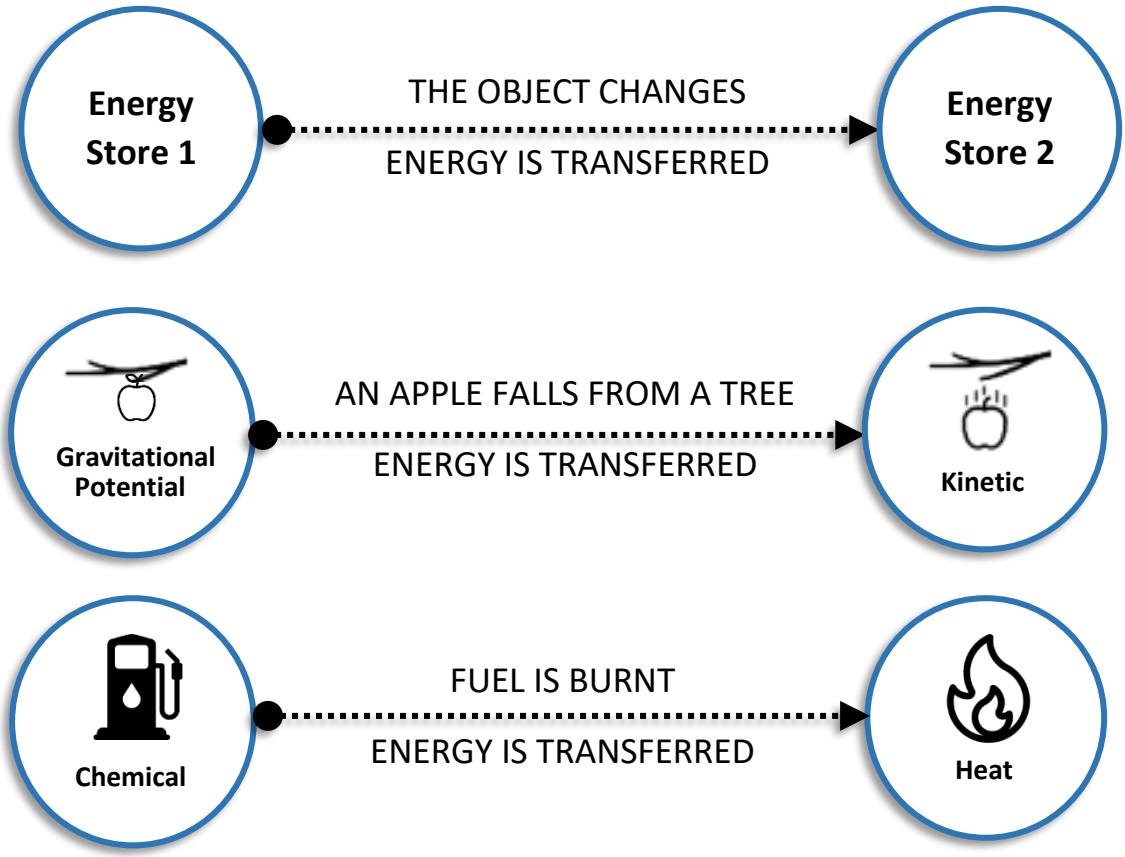
What energy store does an apple have when it is high up in a tree?

What energy store does an apple have as it falls through the air?

What happens to this energy store as the apple falls faster?

CONTENT

The energy store of an object can change. If something changes about the object the energy store also changes. Energy can be transferred from one store to another.



IMPORTANT NOTE: When energy stores change, no energy is lost or gained. All of the energy is transferred from one store to another.

NO ENERGY IS LOST — NO ENERGY IS GAINED

WHEN ENERGY IS TRANSFERRED

PARTICLES **DATE:**

RETRIEVAL ACTIVITY

What are the eight energy stores that these definitions are describing?

	Definition	Energy Store	Mark
1	When objects are raised above the ground, they store this energy.		
2	When objects are squashed or stretched they store this energy.		
3	When charged particles build up on an object, it stores this energy.		
4	All moving objects have this energy, no matter how big or small, from atoms to planets.		
5	Objects that have a magnetic field store this energy.		
6	This is the energy stored within the nucleus of atoms and is released during nuclear reactions.		
7	This energy is stored in the bonds between particles. It is released when particles react and bonds are broken.		
8	All hot objects store this energy.		
		Score	

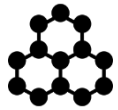
ACTIVATE KNOWLEDGE

What is a good way to remember the eight energy stores?

What energy store do moving objects have?

How could you increase this energy store of an object?

CONTENT



Particles

Everything in the world is made up of tiny particles that are too small to see.
The particles are constantly moving.
This means that particles have energy in their kinetic energy store.

Particles are arranged differently depending on how much the particles move and the forces between the particles.
We can organise the arrangement of particles into three groups called ‘states’.

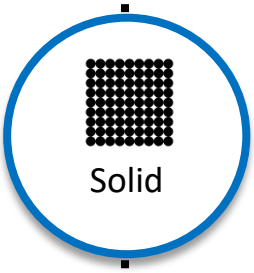
States of Matter

Solid

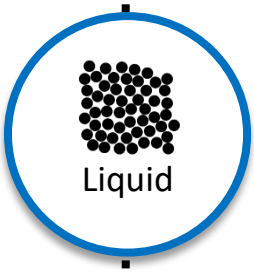
Liquid

Gas

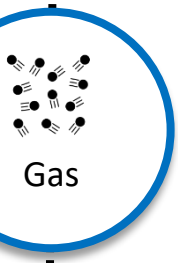
Water



Solid



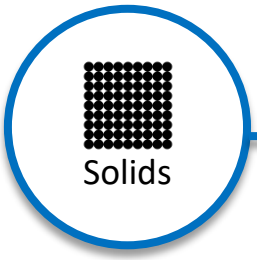
Liquid



Gas

Solid	Liquid	Gas
State Name: Ice	State Name: Water	State Name: Steam
Does it take the shape of the container? No	Does it take the shape of the container? Yes	Does it take the shape of the container? Yes
Does it spread out to fill the container? No	Does it spread out to fill the container? No	Does it spread out to fill the container? Yes
Can it be compressed? No	Can it be compressed? No	Can it be compressed? Yes

The movement and arrangement of the particles can explain these properties
Movement means how the particles move. Arrangement means how they fit together.

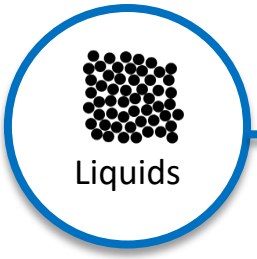


Movement

The particles in a solid **vibrate in a fixed position**.

Arrangement

The particles in a solid are **close together** in a **regular arrangement**.

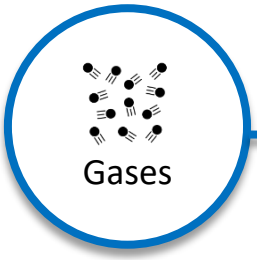


Movement

The particles in a liquid are **free to move over each other**.

Arrangement

The particles in a liquid are **close together** in a **random arrangement.**



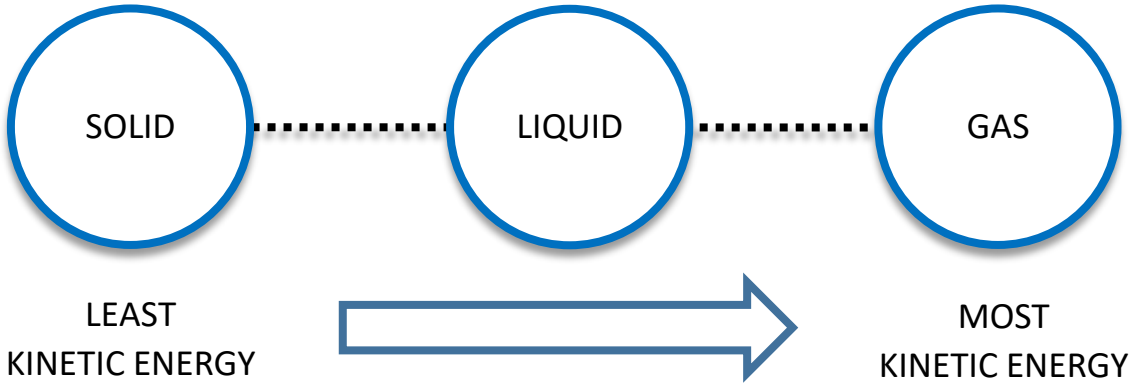
Movement

The particles in a gas move at **random speeds** in **random directions**.

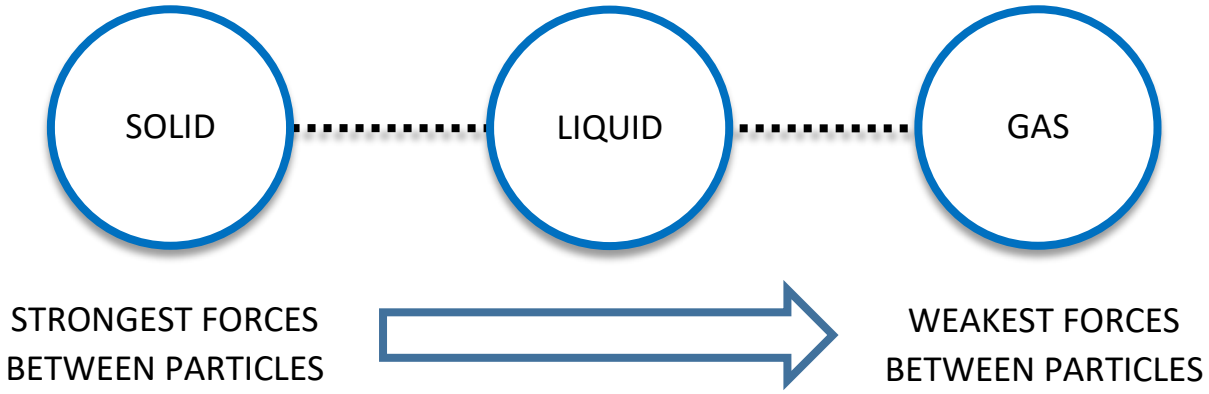
Arrangement

The particles in a liquid are **far apart** in a **random arrangement.**

The particles have different movements because they have different amounts of energy in their kinetic energy store.



The particles have different arrangements because of how strong the forces are between the particles.



CHANGE OF STATE (HEATING) **DATE:**

RETRIEVAL ACTIVITY

	Question	Answer	Mark
1	What energy store do all moving particles have?		
2	All objects are made up of tiny what?		
3	What are the three states of matter?		
4	What state of matter has particles that are close together in a regular arrangement?		
5	What state of matter has particles that are far apart in a random arrangement?		
6	What state of matter has particles that are close together in a random arrangement?		
7	Draw liquid particles		
8	What state of matter has particles that vibrate in a fixed position?		
9	What state of matter has particles that move in random speeds and random directions?		
10	List the states of matter in order, from least to most kinetic energy.		
	Score		

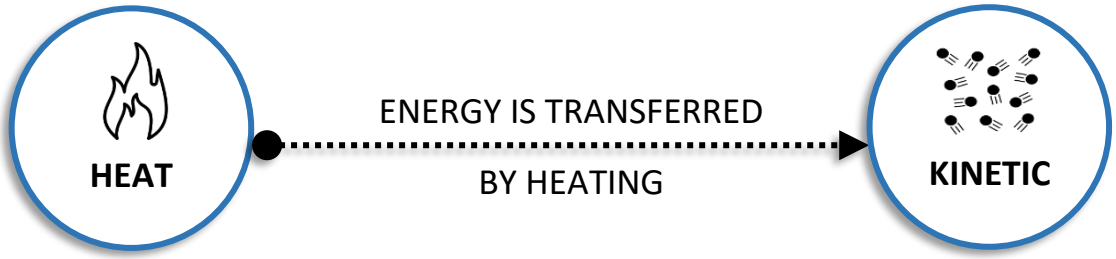
ACTIVATE KNOWLEDGE

1. Why do all particles store kinetic energy?

2. Why do solid particles have the least kinetic energy stored and particles in a gas have the most?

CONTENT

Change of State HEATING



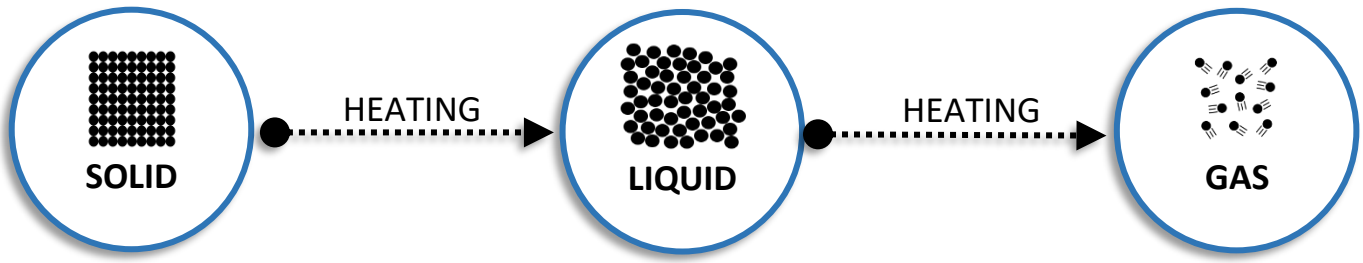
HEAT ENERGY STORE OF THE HOT OBJECT E.G. BUNSEN BURNER

KINETIC ENERGY STORE OF THE PARTICLES E.G. IN WATER

When substances are HEATED, energy is transferred to the kinetic energy store of the particles. We say that energy has been transferred by HEATING

When energy is transferred to the particles, they MOVE faster.

If the particles move too much, the forces between the particles WEAKEN This can cause the substance to CHANGE STATE



When a solid changes state into a liquid, we call this MELTING

When a liquid changes state into a gas, we call this BOILING

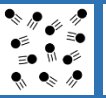
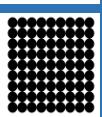
Temperature is … THE AVERAGE KINETIC ENERGY PER PARTICLE IN A SUBSTANCE.

The temperature that a solid melts is called… MELTING POINT

The temperature that a liquid boils is called… BOILING POINT

CHANGE OF STATE (COOLING) **DATE:**

RETRIEVAL ACTIVITY

	Question	Answer	Mark
1	What state is shown in the diagram? 		
2	What state is shown in the diagram? 		
3	What state is shown in the diagram? 		
4	What state has particles that are close together in a random arrangement?		
5	What state has particles that are close together in a regular arrangement?		
6	What state has particles that are far apart in a random arrangement?		
7	Which state has the strongest forces between the particles?		
8	Which state has the weakest forces between the particles?		
9	What is the name of the change of state when a solid changes to a liquid?		
10	What is the name of the change of state when a liquid changes to a gas?		
	Score		

ACTIVATE KNOWLEDGE

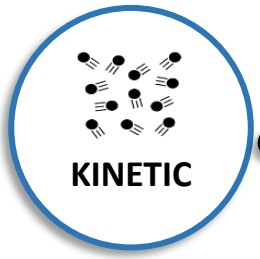
When substances are ……., energy is transferred to the kinetic energy store of the particles. We say that energy has been transferred by ……

When energy is transferred to the particles, they …… faster.

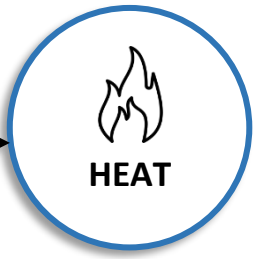
If the particles move too much, the forces between the particles …….. This can cause the substance to …… ……..

CONTENT

Change of State COOLING



ENERGY IS TRANSFERRED BY HEATING



KINETIC ENERGY STORE OF THE PARTICLES E.G. IN WATER

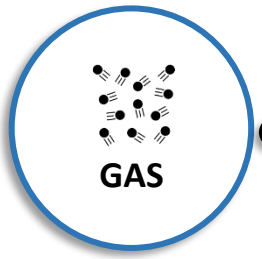
HEAT ENERGY STORE OF THE SURROUNDINGS E.G. THE AIR OR YOUR HAND

When substances are COOLED , energy is transferred to the heat energy store of the surroundings. We say that energy has been transferred by HEATING

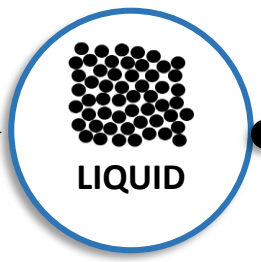
When energy is transferred away from the particles, they MOVE slower.

If the particles move too little, the forces between the particles STRENGTHEN

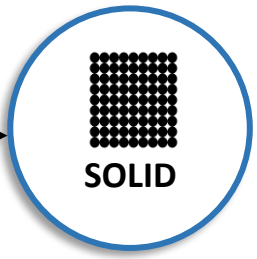
This can cause the substance to CHANGE STATE



COOLING



COOLING



When a liquid changes state into a solid, we call this FREEZING

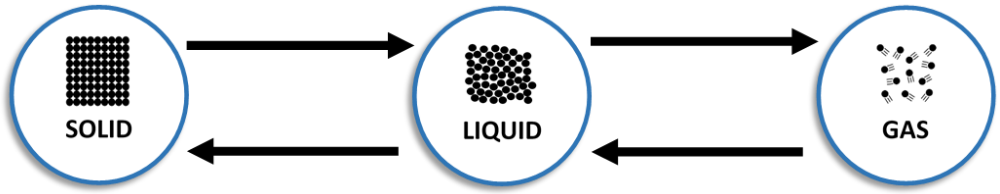
When a gas changes state into a liquid, we call this CONDENSING

FORCES **DATE:**

RETRIEVAL ACTIVITY

1. Label each arrow with the correct change of state below. (4)

Boiling, Freezing, Melting, Condensing



2. Match the correct arrangement and movement of particles below (6)

Far apart in a random arrangement	☐	☐ **SOLID** ☐	☐	Random speeds in random directions
Close together in a regular arrangement	☐	☐ **LIQUID** ☐	☐	Free to move over each other
Close together in a random arrangement	☐	☐ **GAS** ☐	☐	Vibrate in a fixed position

Score / 10

ACTIVATE KNOWLEDGE

What are the eight energy stores?

G

E

E

K

M

~~U~~

N

C

H

CONTENT

Forces

Forces can cause **energy** to be transferred from one store to another.

Forces can cause energy to be transferred by changing the **energy stored** in an object.

Forces can change three things about an object:

- shape
- speed
- direction

Objects don't need to be touching for forces to occur. There are two types of forces.

Contact Force

Contact forces occur when objects are **physically touching**.

Non-Contact Force

Contact forces occur when objects are **not physically touching**.

Drawing Forces

When drawing forces we use arrows to represent the size (length of the arrow) and direction (direction of the arrow) the force acts in.

NON-CONTACT FORCES **DATE:**

RETRIEVAL ACTIVITY

	Question	Answer	Mark
1	What energy is stored in fuel and food?		
2	What energy is stored in moving objects?		
3	What energy is stored in hot objects?		
4	What energy is stored in stretched objects?		
5	What change of state is melting?	To	
6	What change of state is boiling?	To	
7	What change of state is condensing?	To	
8	What change of state is freezing?	To	
9	What is the boiling point of water?		
10	What is the freezing point of water?		
	Score		

ACTIVATE KNOWLEDGE

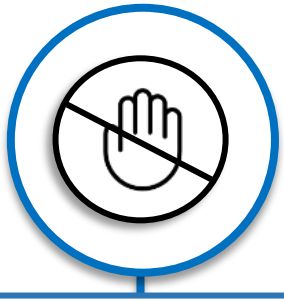
What three things can a force change about an object?

What is a contact force?

What is a non-contact force?

How do we represent forces as diagrams?

CONTENT



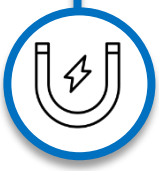
Non-Contact Forces

Forces that occur when objects are **not physically touching**.

Forces can be measured using a **Newtonmeter**.

There are three non-contact forces

GRAVITATIONAL FORCE



MAGNETIC FORCE

ELECTROSTATIC FORCE

GRAVITATIONAL FORCE

The force caused by gravity where objects of mass are pulled together.

Examples

Apple falling from a tree

Moon orbiting the Earth

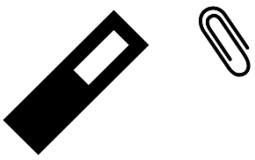
Earth orbiting the Sun

MAGNETIC FORCE

The force that causes magnetic objects to be attracted (pulled together) or repelled (pushed apart).

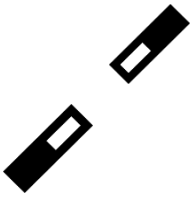
Examples

Attracting a paper clip



Magnets attracting

Magnets repelling



ATTRACT

Opposite poles

REPEL

Same poles

ELECTROSTATIC FORCE

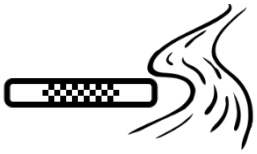
The force that causes charged objects to be attracted (pulled together) or repelled (pushed apart).

Examples

Attracting a ballon to hair

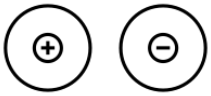
Hair standing up

Bending water with plastic



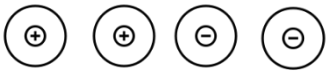
ATTRACT

Opposite charges



REPEL

Same charges



OUR PLANET IN SPACE **DATE:**

RETRIEVAL ACTIVITY

	Question	Answer	Mark
1	What three things can a force change about an object?		
2	Which state of matter has the strongest force between particles?		
3	Which state of matter has particles with the most kinetic energy?		
4	Which state of matter has particles close together in a regular arrangement?		
5	Which state of matter has particles that move at random speeds and directions?		
6	Which state of matter has particles that are close together but free to move?		
7	What is the change of state called when a solid changes to a liquid?		
8	What is the change of state called when a liquid changes to a gas?		
9	What unit do we measure forces in?		
10	What piece of equipment is used to measure forces?		
	Score		

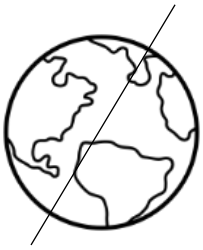
ACTIVATE KNOWLEDGE

GRAVITATIONAL FORCE

CONTENT

THE EARTH

The Earth Facts:
- The Earth is a planet.
- The Earth is 4.5 billion years old.
- The Earth spins at 1000 mph.



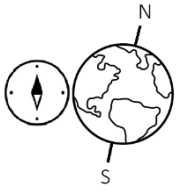
The Earth takes 24 hours to spin all the way around its axis. This is one day.
It is day time for the side of the Earth that faces the sun.
It is night time for the side of the Earth that faces away from the Sun.
The Earth has one moon that orbits due to gravitational force.

The Earth's axis is tilted. This causes parts of the Earth the have seasons.

When the North Pole is pointing towards the Sun it will be Spring/Summer in the Northern Hemisphere.

When the is North Pole is pointing away from the Sun it will be Autumn/Winter in the Northern Hemisphere.

The Earth's centre is made of iron which is magnetic
Compasses use the Earth's magnetic force.
The Earth's poles are like giant poles on a magnet.
A compass points to the Earth's North pole.



THE SOLAR SYSTEM

A solar system is a star with planets in orbit around it.
Stars have so much mass that they have a very strong gravitational force which keeps planets in orbit.

The sun is at the centre of our solar system. The time it takes a planet to orbit the sun is called a year. It takes the Earth 365 days to orbit the Sun. All of the planets in our solar system orbit the Sun at different distances, therefore, they have different lengths of year.

Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune

ELECTRICAL ENERGY TRANSFER **DATE:**

RETRIEVAL ACTIVITY

	Question	Answer	Mark
1	What three things can a force change about an object?		
2	What do we call forces between objects that aren't touching?		
3	What happens when North and South poles of magnets come together?		
4	What happens when North and North poles of magnets come together?		
5	What happens when South and South poles of magnets come together?		
6	What happens when positive and negative charges are brought together?		
7	What is at the centre of a solar system?		
8	What force causes the moon to orbit the Earth?		
9	What planet is closest to the Sun in our solar system?		
10	Why does the sun have a bigger gravitational force than Earth?		
	Score		

ACTIVATE KNOWLEDGE

A pupil has a battery powered fan, when switched on the fan spins around.

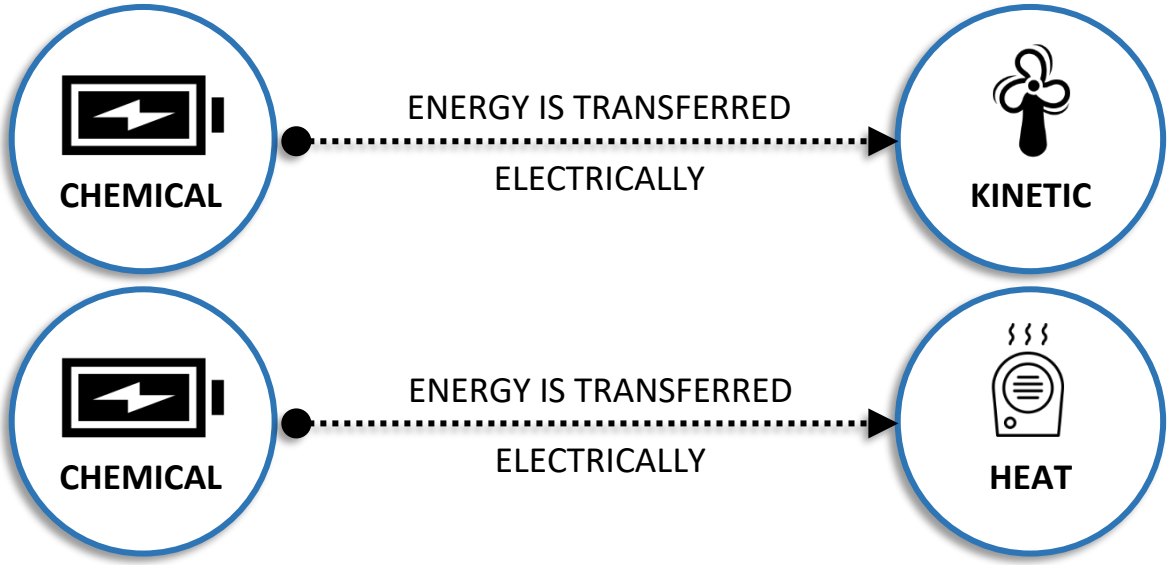
a) What energy is stored in the battery?

b) What energy is stored in the fan?

CONTENT

ELECTRICAL TRANSFER

Electricity can cause energy to be transferred from one store to another. We say that energy has been transferred electrically from one store to another.



ELECTRICAL CURRENT

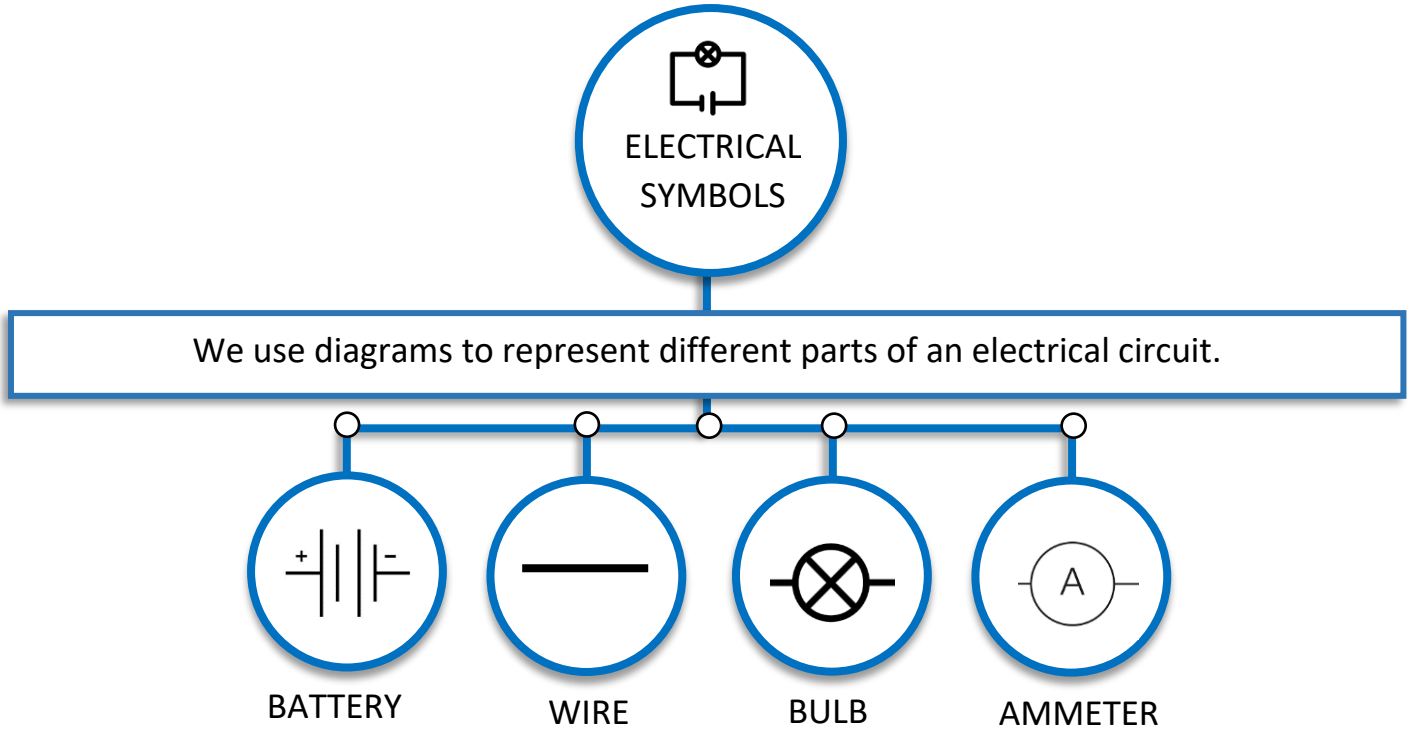
Energy is transferred electrically by tiny charged particles called electrons.

These particles transfer energy from one part of an electrical circuit to another.

The amount of charged particles that that flow is called electrical current.

We measure electrical current in Amps (A).

We measure electrical current using an ammeter.

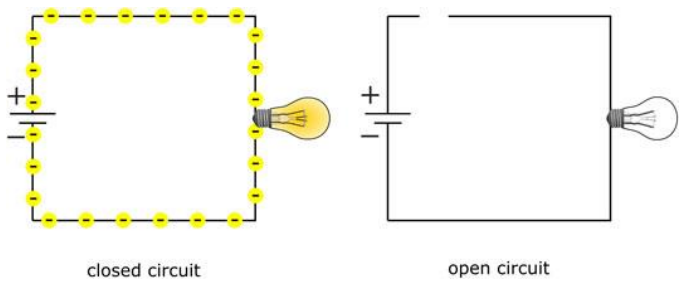

ELECTRICAL SYMBOLS
We use diagrams to represent different parts of an electrical circuit.
+
-
A
BATTERY
WIRE
BULB
AMMETER

CONDUCTORS AND INSULATORS **DATE:**

RETRIEVAL ACTIVITY

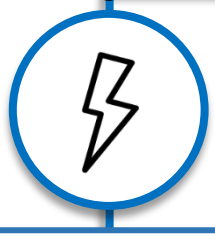
	Question	Answer	Mark
1	What tiny charged particles transfer energy electrically?		
2	What units do we measure electrical current in?		
3	Draw the electrical symbol for a bulb.		
4	Draw the electrical symbol for a battery.		
5	Draw and electrical symbol for an ammeter.		
6	What does an ammeter measure?		
7	Complete the order of planets in our solar system:	- Mercury - - - - - - - Neptune	
	Score		

ACTIVATE KNOWLEDGE



CONTENT

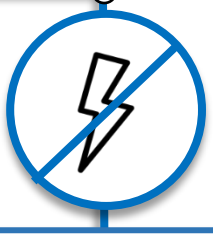
For energy to be transferred electrically through a material, the electrons in the material must be able to move.



CONDUCTORS

Definition
Materials that are good at transferring energy electrically.

Examples
Metals, Copper, Graphite

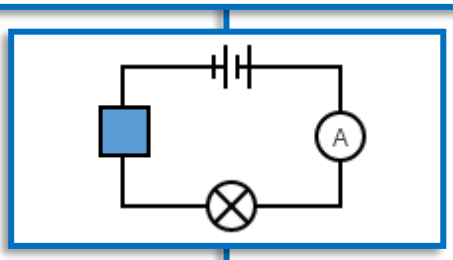


INSULATORS

Definition
Materials that are bad at transferring energy electrically.

Examples
Plastic, Rubber, Wood, Paper

METHOD TO IDENTIFY CONDUCTORS AND INSULATORS



1. Plug in the power supply, turn on and turn to 12V.

2. Plug a wire into the red terminal of the power pack.

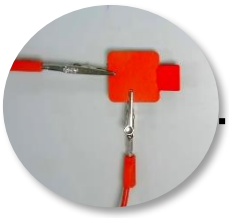
3. Plug the other end of this wire into a bulb and plug a second wire into the other side of the bulb.

4. Plug the other end of this wire into the red terminal of the ammeter.

5. Plug a wire into the black terminal of the ammeter.

6. Plug the other end of this wire into a crocodile clip.

7. Attach another crocodile clip into a wire and plug the other end of this wire into the power pack.



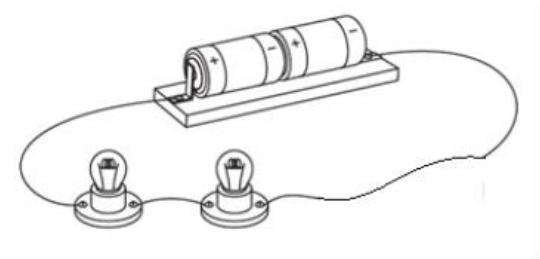
8. Attach different materials to the crocodile clips and take measurements.

WAVES **DATE:**

RETRIEVAL ACTIVITY

1. The diagram shows a circuit with a battery and two bulbs.

a) Draw a circuit diagram for this set up. (3)



b) What component could we add to this circuit to measure the electrical current? (1)

c) Draw the circuit symbol for this piece of equipment. (1)

2. The wires in a circuit are made from copper (metal) because electrical energy can easily transfer through this material.

a) What is the name given to these materials? (1)

b) Why would wires not work if they were made from plastic or wood? (2)

Score / 8

ACTIVATE KNOWLEDGE

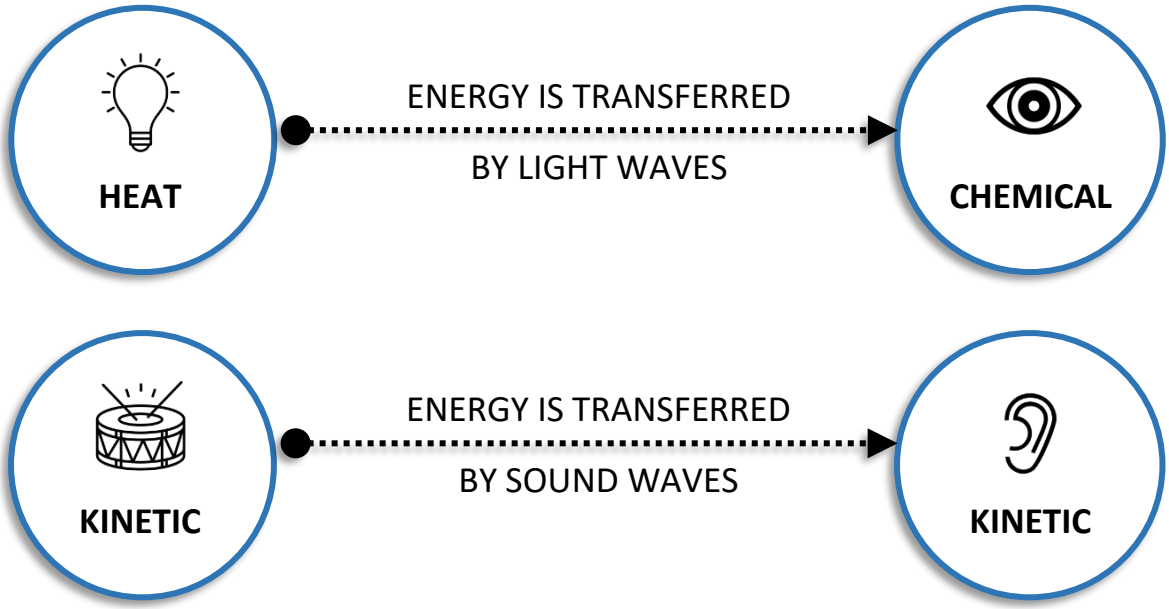
How can energy be transferred between the energy stores?

CONTENT

WAVES

Waves can cause energy to be transferred from one store to another. We say that energy has been transferred by waves from one store to another.

There are many different types of waves. We are going to focus on light and sound.



Waves transfer energy without any particles moving from one place to another. Some waves need particles to travel through but not all do.

LIGHT

How light waves travel

Light does not need particles to travel

The speed of light

300,000,000 m/s

SOUND

How sound waves travel

Sound needs particles to travel

The speed of sound

330 m/s