

# Year 8 Science Knowledge Booklet

## Term 6

**Name:**

**Class:**

**Homework 1 Due: 10<sup>th</sup> June**

**Homework 2 Due: 24<sup>th</sup> June**

**Homework 3 Due: 8<sup>th</sup> July**





# Science Homework 1

Read all of this knowledge organiser. The work covered will be in the first knowledge quiz of the term.

## Big questions: How can the properties of different structures be compared?

How are different molecules held together?

What is the difference between simple and giant in chemistry?

How can metallic structures be made more useful?

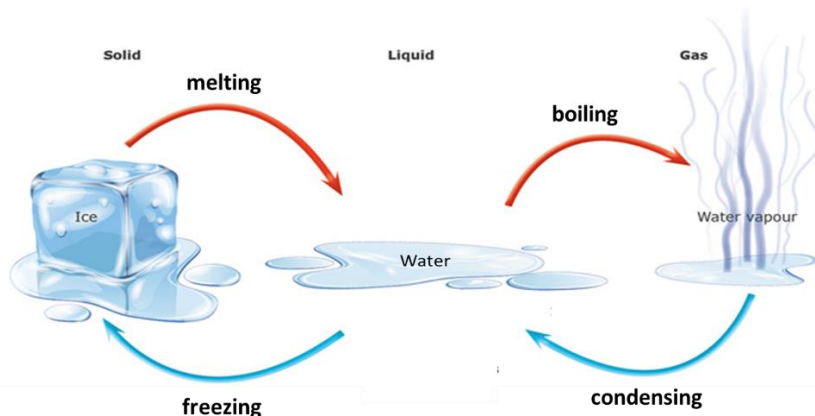
Why are artificial materials useful?

Why are carbon-based materials so different?

## Key vocabulary

<b>Atom</b>	Simple particle of an element that can exist
<b>Molecule</b>	A particle that consists of two or more atoms chemically bonded together
<b>Compound</b>	2 or more different elements bonded together in a fixed ratio
<b>Mixture</b>	2 or more different substances (elements/compounds), that are not chemical bonded together
<b>Element</b>	Made up of one type of atom only
<b>Intermolecular force</b>	Force of attraction between molecules
<b>Bond</b>	Electrostatic force of attraction between atoms
<b>Simple</b>	Specific number of atoms within a molecule
<b>Giant</b>	The bonding within the structure could go on infinitely
<b>Lattice</b>	Regular arrangement of atom/ions
<b>Delocalised electrons</b>	Electrons free to move throughout the whole structure
<b>Alloy</b>	Mixture of a metal and another element
<b>Property</b>	Feature or characteristic of a substance
<b>Melting point</b>	The temperature which a solid will change state to a liquid
<b>Polymer</b>	Polymers are large molecules made up of repeating units known as monomers. These monomers are joined together through chemical reactions, to form long chains.
<b>Ceramic</b>	Class of materials that are made by shaping and moulding raw materials and then heating them to high temperatures.
<b>Composite</b>	Composites are materials made from different types of materials. They are very useful because they combine two or more materials which have unique properties.

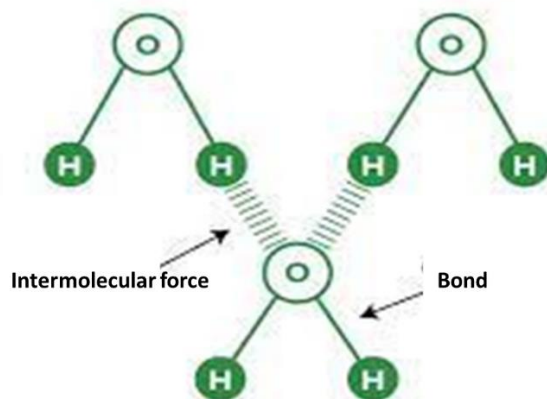
## How are different molecules held together?



Simple molecules are elements or compounds that have a specific number of elements present.

A bond is an attraction between atoms, and holds atoms together in a molecule.

An intermolecular force holds different molecules together.

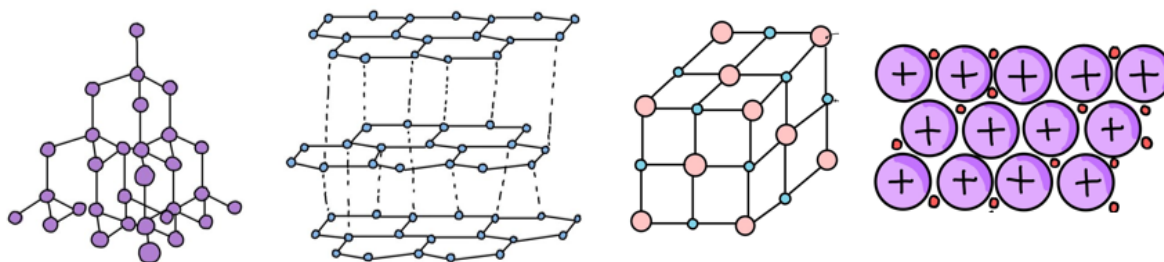


If a substance changes state, like going from a solid to a liquid; the forces holding the molecules together will break. The bonds will not.

A water molecule will still be two hydrogen atoms bonded to an oxygen atom; whether it is ice, water, or steam.

## What is the difference between simple and giant in chemistry?

Structures can also be giant. This means that the bonding within the structures could go on infinitely.



The diagrams above are examples different giant structures.

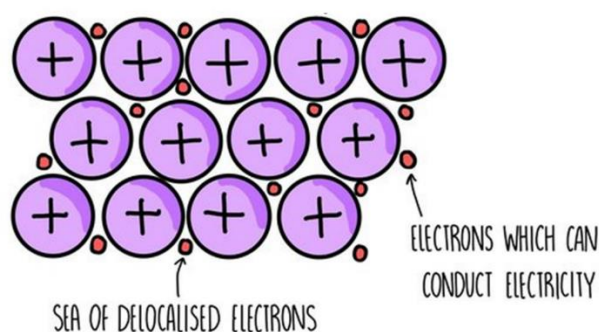
They can also be described as having a lattice structure.

Properties of giant structures

- High melting point – requires a lot of energy to break the bonds
- Some conduct electricity as solids – contains delocalised electrons

If it doesn't conduct electricity as a solid, but will when the substance is dissolved, it has a different charged particle that can move.

**How can metallic structures be made more useful?**



Structure of a metal

An alloy is a mixture made of a metal and another element. This is to change the properties of the metal to make it more useful – eg. Make it stronger.

In metals the atoms are arranged tightly in rows. The rows can slide over each other and this makes the metal soft. Sudden pressure, however, can cause cracks to form across the rows, making the pure metal brittle. When another metal is added, its atoms help to strengthen the first metal. It does this by holding the parts of the metal together, so stopping its rows from sliding over each other.



Alloy compared to pure metal structures



## Science Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Questions in *italics* are from older work.

Key knowledge question	Your answer
What holds atoms together in a molecule?	
What holds different molecules together in a solid?	
Why do simple molecules have low melting points?	
Why do metals conduct electricity?	
Why is graphite soft?	
How many bonds are made by each carbon atom in diamond?	
Why are alloys stronger than metals?	
What natural polymer is made from amino acids?	
What is a molecule?	
What does the term lattice mean?	
Is carbon dioxide a simple molecule or giant structure?	

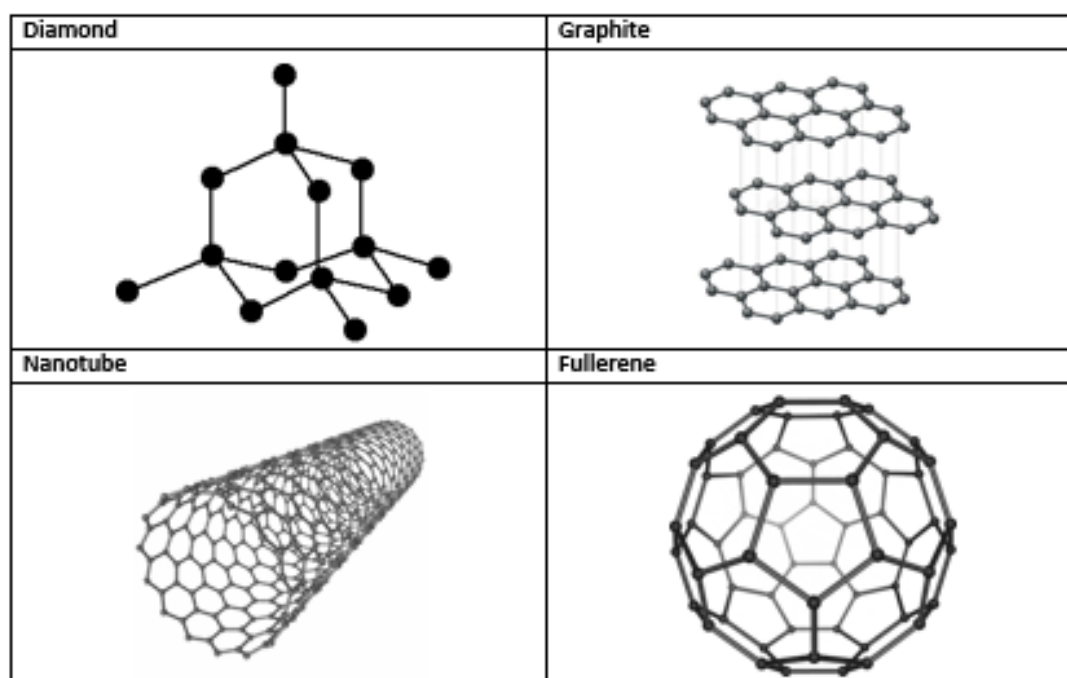
### Why are artificial materials useful?

- Polymer** - Polymers are large molecules made up of repeating units known as monomers. These monomers are joined together through chemical reactions, to form long chains.
- Ceramic** - Class of materials that are made by shaping and moulding raw materials and then heating them to high temperatures.
- Composite** - Composites are materials made from different types of materials. They are very useful because they combine two or more materials which have unique properties.

There are both natural and synthetic polymers

Natural Polymers	Synthetic Polymers
Silk	Nylon
Wool	Polyethylene
Cellulose	Polyester
Proteins	Teflon

### Why are carbon-based materials so different?



#### Diamond

In diamond, each carbon atom makes 4 bonds. This makes diamonds incredibly strong.

#### Graphite

In graphite, each carbon atom makes 3 bonds. This means that there is 1 electron free from each carbon atom.

The bonding of the carbon atoms in graphite is very similar to the bonding in the nanotube and the fullerene, where each carbon makes 3 bonds.

They all conduct electricity because the structures contain delocalised electrons

<b>Key knowledge question</b>	<b>Answer</b>
What holds atoms together in a molecule?	Bonds
What holds different molecules together in a solid?	Intermolecular forces
Why do simple molecules have low melting points?	Because intermolecular forces don't require much energy to break
Why do metals conduct electricity?	They contain delocalised electrons
Why is graphite soft?	The layers are held together by weak intermolecular forces and will slide
How many bonds are made by each carbon atom in diamond?	4
Why are alloys stronger than metals?	The layers are disrupted by different sized molecules and won't slide over as easily
What natural polymer is made from amino acids?	Proteins
What is a molecule?	A particle that consists of two or more atoms chemically bonded together
What does the term lattice mean?	Regular arrangement of atoms/ions
Is carbon dioxide a simple molecule or giant structure?	Simple

Space**Big questions:****Where is the Earth in Space?****What is the scale of objects in the Solar System?****What is the scale of objects outside the Solar System?****What causes day and night?****What causes the seasons?****Key vocabulary**

<b>The Big Bang</b>	The Big Bang theory is the prevailing cosmological description of the development of the universe
<b>Circular motion</b>	The movement of an object along the circumference of a circle or rotation along a circular path.
<b>Galaxy</b>	A system of millions or billions of stars, together with gas and dust, held together by gravitational attraction.
<b>Gravity</b>	The force that attracts a body towards the centre of any other physical body having mass.
<b>Light year</b>	A unit of astronomical distance equivalent to the distance that light travels in one year, which is $9.4607 \times 10^{12}$ km (nearly 6 million million miles).
<b>Moon</b>	A natural satellite orbiting a planet.
<b>Orbit</b>	The curved path of a celestial object or spacecraft round a star, planet, or moon.
<b>Planet</b>	A celestial body that is in orbit around the Sun.
<b>Satellite</b>	Something orbiting the earth or another planet.
<b>Solar system</b>	The Solar System is the gravitationally bound system of the Sun and the objects that orbit it.
<b>Universe</b>	The universe is all of space and time and their contents, including planets, stars, galaxies, and all other forms of matter and energy.

## Where is the Earth in Space?

The Solar System consists of the Sun, with planets and smaller objects such as asteroids and comets in orbit around it. The planets in our solar system are:

**Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune**

Other than the planets, what other objects are in the Solar System?

- The Sun
- The Moon
- Moons orbiting other planets (e.g. Europa, Titan)
- Dwarf planets (Pluto, Ceres)
- Asteroids
- Comets
- 

## What is the scale of objects in the Solar System?

Jupiter and Saturn are more than 1000 times the size of Earth.

Uranus and Neptune are more than 400 times the size of Earth.

Venus is approximately the same size as Earth.

Mars is approximately 1/2 the size of Earth.

Mercury is approximately 1/3 the size of Earth.

Planet	Distance from Sun (million km)	Atmosphere	Weather	Mean Temperature (°C)
Mercury	58	Very thin	Moon-like, no weather	167
Venus	108	Very thick	Extreme global warming	464
Earth	150	Thick	Temporal/good balance	15
Mars	228	Very thin	Dust storms	-20
Jupiter	779	Very thick	Stormy	-110
Saturn	1434	Very thick	Stormy	-167
Uranus	2873	Thick	Extremely cold	-195
Neptune	4495	Thick	Cold, dark, windy	-200



## Science Homework 3

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Key knowledge question	
Earth is in which galaxy?	
Put these in size order, largest first - galaxy, planet, star, universe	
Roughly how far away is the Sun?	
What equation links mass, gravity and weight?	
What is a light year?	
What is the unit of gravitational field strength?	
What is the unit of mass	
What is the unit of weight?	
Which force keeps the planets in orbit?	
Which planets are called the inner rocky planets?	

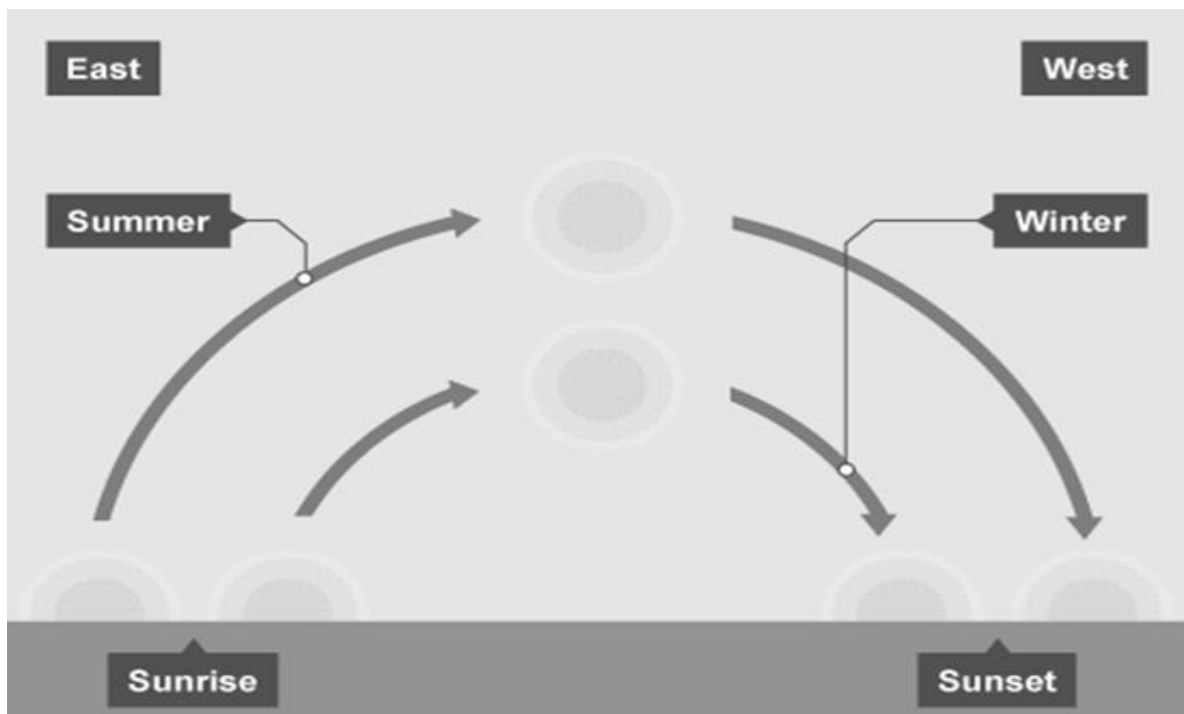
## What is the scale of objects outside the Solar System?

Light years

- The distances between objects in space are huge:
- The distance from one star to another in a galaxy is millions of times more than the distance between the planets in the solar system.
- The distance from one galaxy to another is millions of times more than the distance between the stars in a galaxy.
- This means that the numbers used to describe distances in space become very difficult to understand and to write down.
- To get around this problem, scientists use the light year as the unit of astronomical distance. It is the distance travelled by light in one year.

## What causes day and night?

- The half of the Earth facing the Sun is in daylight.
- During the day, the Sun appears to move through the sky.
- Remember that this happens because the Earth is spinning on its axis.
- The half facing away from the Sun has no sunlight and so becomes night-time.

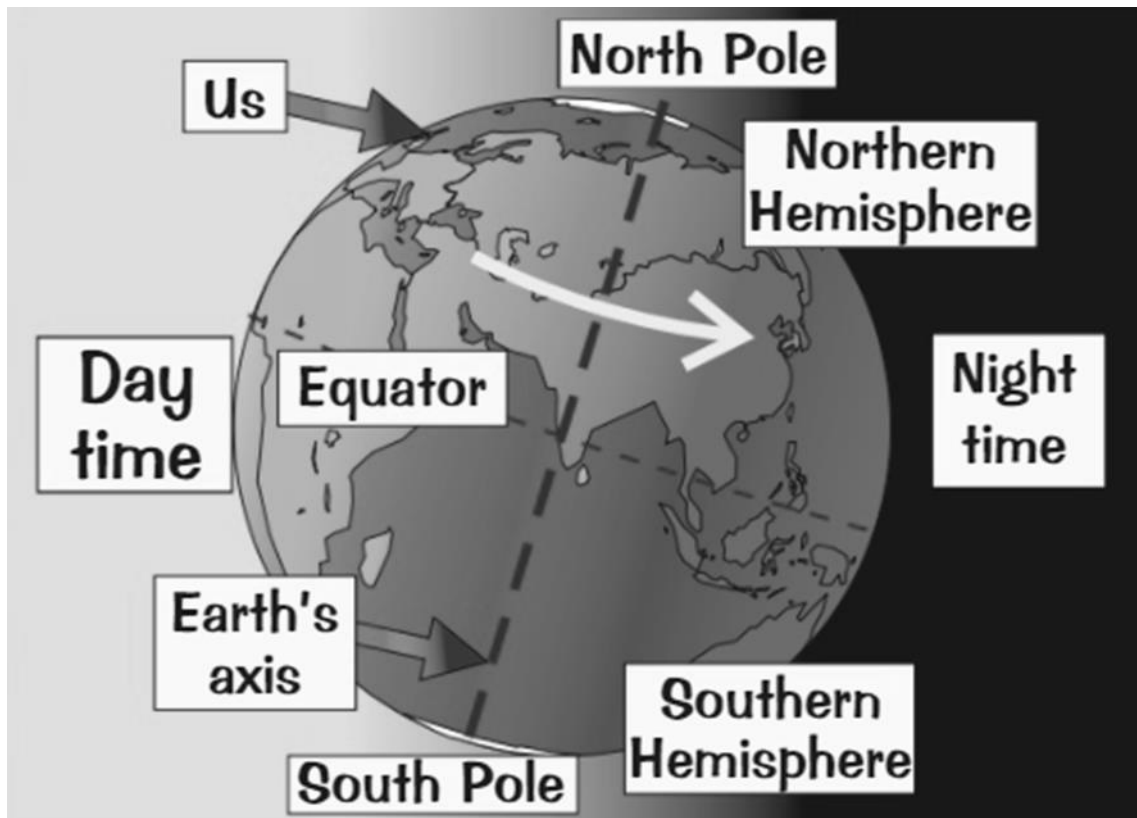


## What causes the seasons?

What is a year?

- A planet's year is the time it takes to make one complete orbit around the Sun.
- The Earth goes once round the Sun in one Earth year, which takes 365 Earth days\*.

\* Its actually  $365\frac{1}{4}$  days. The extra  $\frac{1}{4}$  day is sorted out every leap year.



Due to Earth's tilted axis, we get different seasons (winter, spring, summer and autumn).

### Summer

When it is summer in the UK, the northern hemisphere is tilted towards the Sun

The northern hemisphere spends more time in sunlight than it does in darkness (longer days), so the surface heats up.

The Sun's rays cover a smaller area of land, so energy transferred is focused on that area.

### Winter

When it is winter in the UK, the northern hemisphere is tilted away from the Sun

The northern hemisphere spends less time in sunlight than it does in darkness (shorter days)

The Sun's rays cover a larger area of land, so energy transferred is spread out over that area

<b>Key knowledge question</b>	<b>Answer</b>
Earth is in which galaxy?	The Milky Way
Put these in size order, largest first - galaxy, planet, star, universe	Universe, galaxy, star, planet
Roughly how far away is the Sun?	150 million kilometres
What equation links mass, gravity and weight?	Weight = mass x gravitational field strength
What is a light year?	A measure of distance, it is the distance travelled by light in one year.
What is the unit of gravitational field strength?	Newtons per kilogram (N/kg)
What is the unit of mass	Kilograms (kg)
What is the unit of weight?	Newtons (N)
Which force keeps the planets in orbit?	Gravity
Which planets are called the inner rocky planets?	Mercury, Venus, Earth and Mars

**Wider reading**

Scientists have created an entirely new material that can't be explained, they say.

The material can be made like plastic, but conducts electricity like a metal. The discovery goes against what scientists would expect to see, and could lead to new kinds of breakthroughs, researchers say.

Read more at: [https://news.yahoo.com/scientists-create-entirely-material-t-150710218.html?guccounter=1&guce\\_referrer=aHR0cHM6Ly93d3cuZ29vZ2xllmNvbS8&guce\\_referrer\\_sig=AQAAACsZQf OQoc2qIAe4W pInQUkc0aDfP0QaNBz4ggQ34jBbRANUR2CEF8UcUDNRljPeC8Z eoYG33AP 5Rlv6ugPsCyn3bWIkHsRDgv P5djVwEwt1UzVbf4jAqOCIs wag-Y5PzDhzBU-DJggUJsZ4t-v7uvVED40woSpkii68KnTx](https://news.yahoo.com/scientists-create-entirely-material-t-150710218.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xllmNvbS8&guce_referrer_sig=AQAAACsZQf OQoc2qIAe4W pInQUkc0aDfP0QaNBz4ggQ34jBbRANUR2CEF8UcUDNRljPeC8Z eoYG33AP 5Rlv6ugPsCyn3bWIkHsRDgv P5djVwEwt1UzVbf4jAqOCIs wag-Y5PzDhzBU-DJggUJsZ4t-v7uvVED40woSpkii68KnTx)

**How to get the most out of your knowledge organiser:**

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.
- There are several different things you can do
  - Look, cover, write, check, correct
  - Read through the organisers
  - Mind maps
  - Key spellings
  - Make a glossary
  - Missing out key words
  - Questions/answers answers/questions
  - Flash cards
  - Revision clock learning
  - Mnemonics

**Science Learning Tools and wider study:**

The Oak Academy – Online Science lessons

BBC Bitesize KS3 science

You tube channels:

Fuse school

Ted talks

Free science lessons

Primrose Kitten

Shows on Netflix

Our planet

Tiny creatures

A life on our planet