THE DUSTON SCHOOL
Knowledge itself is power
TDS 4-19

Year 7 Science Knowledge Booklet

Term 3

Name:	**Class:**
Homework 1 Due: 10th January	**Homework 2 Due: 24th January**
Homework 3 Due: 7th February	

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 do substances move?
How do substances move in and out of cells?
How can we investigate osmosis?
What do our osmosis investigation results show us?
How is active transport different to diffusion and osmosis?
In biology, what do we mean by levels of organisation?
How do we move?
How does air move in and out of the lungs?
What goes on in the lungs?
What happens at puberty?
What are the reproductive organs of humans?
What are periods?
How do mammals reproduce?
How do flowering plants reproduce?

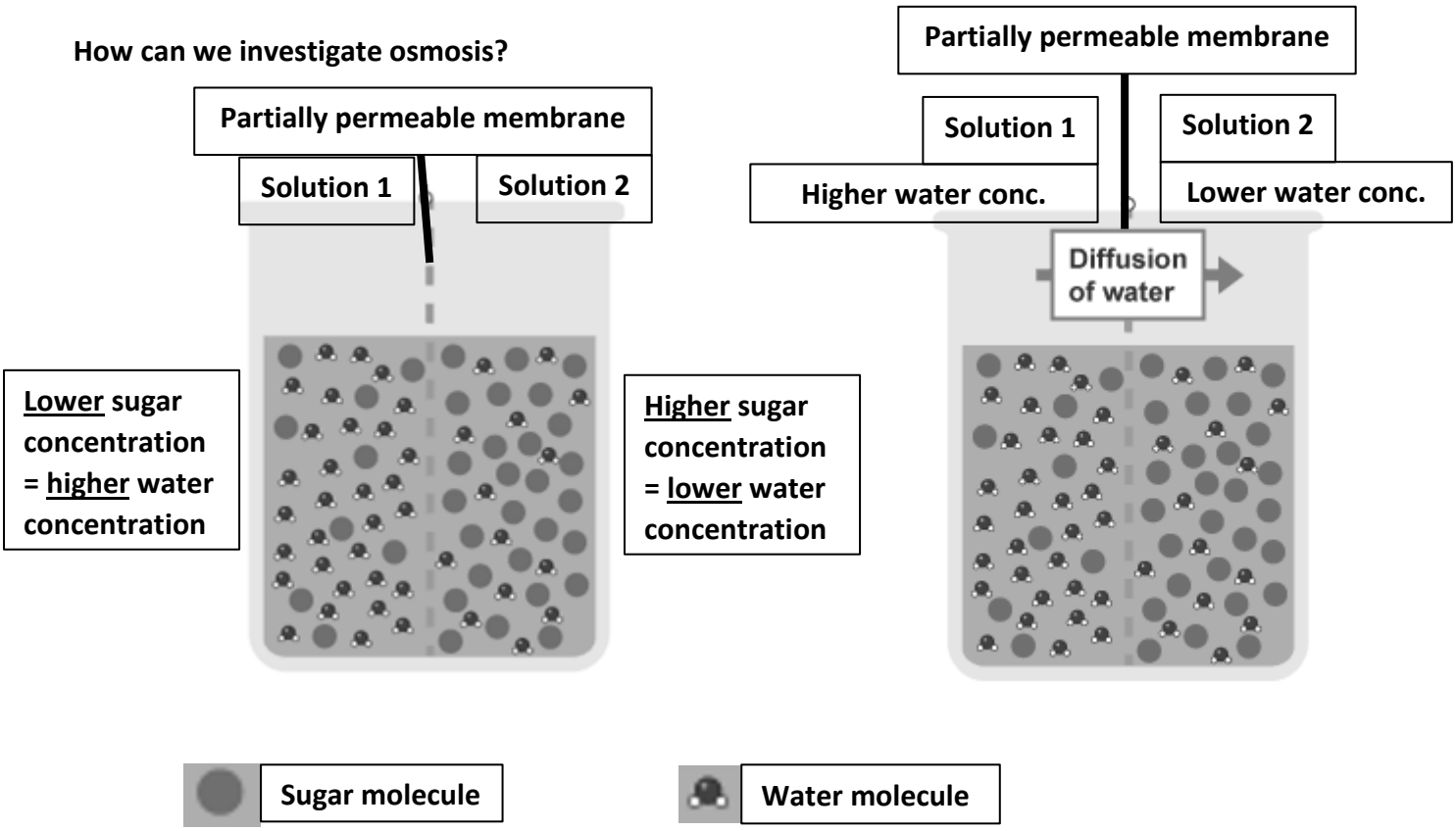
Key vocabulary

Diffusion	net **movement of particles** from an area of **higher concentration** to an area of **lower concentration**
Temperature	The **higher** the temperature, the faster diffusion happens
Concentration gradient	The **greater** the difference in concentration, the faster diffusion happens
Surface area	The **larger** the surface area, the faster diffusion happens
Diffusion pathway thickness	The **thinner** the diffusion pathway, the faster diffusion happens
Osmosis	The net movement of water molecules across a partially permeable membrane from a dilute (more water) to a concentrated (less water) solution
Flaccid	drooping through lack of water
Turgid	rigid with fluid, usually water
Active transport	movement of molecules across a **partially permeable membrane** moving **against** a concentration gradient (low to high), requires **energy** from **respiration**
Cell	building blocks of life
Tissue	groups of similar cells working together to perform a function
Organ	groups of tissues working together to perform a function
Organ system	groups of organs working together to perform a function
Cartilage	strong smooth tissue, reduces wear and tear on the end of bones
Antagonistic pairs	pairs of muscles working to move joints e.g. bicep and tricep
Respiratory system	**organs** & **tissues** that help your body **exchange gases** between the **air** and **blood**
Diaphragm	sheet of muscle involved in changing the air pressure of our lungs to move air in and out
Exchanging	to replace one thing with another

How do substances move?

Process	Descriptions	Substances moved	Energy required
Diffusion	Substances move from a **high** to a **low** concentration **down** a concentration gradient	Carbon dioxide, oxygen, water, food substances, wastes, e.g. urea	No
Osmosis	Water moves from a **high water** concentration (dilute) to a **lower water** concentration (concentrated) **across** a **partially permeable membrane** and down a concentration gradient	Water	No
Active transport	Substances move from a **low** to a **higher** concentration against a concentration gradient	Mineral ions into plant roots, glucose from the gut into intestinal cells, from where it moves into the blood	Yes

How can we investigate osmosis?



What do our osmosis investigation results show us?

$$\text{Percentage change} = \frac{change}{starting\ value} \times 100$$

In biology, what do we mean by levels of organisation?

Size	Level	Example
Smallest	Organelle	The nucleus in a dyed onion cell is an example
	Cell	Human red blood cell
	Tissue	Human muscle tissue
	Organ	Heart
	Organ system	Nervous system
Largest	Organism	Tree

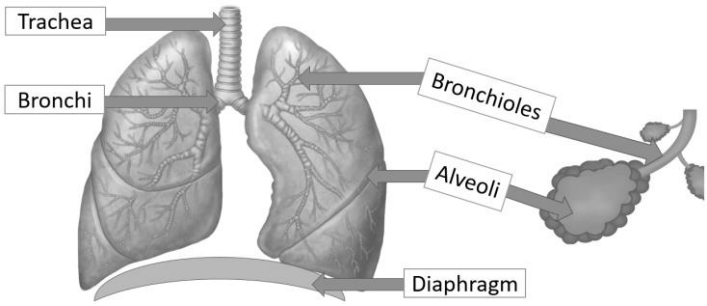
How do we move?

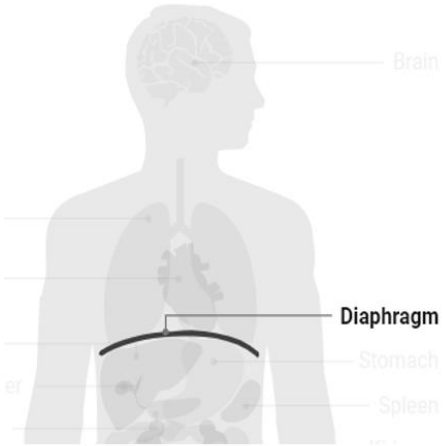
The main **<u>functions</u>** of the SKELETON:

1. **support** the body
2. **protect** vital organs
3. help the body **move**
4. **make** blood cells

Muscles need to work in pairs called **<u>antagonistic</u>** muscles to move joints.

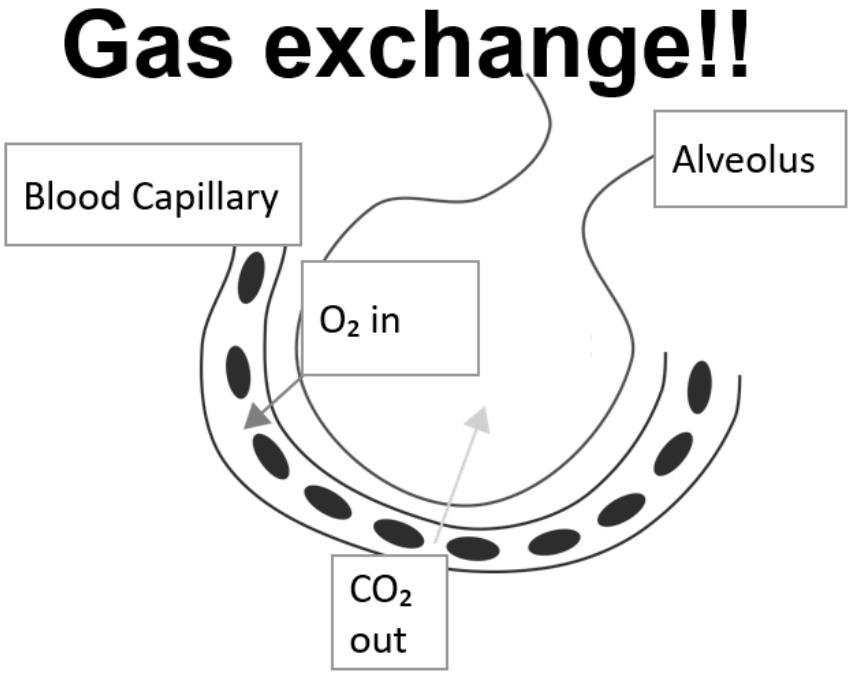
How does air move in and out of the lungs?





- **Diaphragm** → sheet of muscle
- Diaphragm **<u>relaxed</u>** → **No difference** in pressure
- Diaphragm **<u>contracts</u>** → **pulls down**, pressure is lowered in the chest. Air rushes into the lungs (from a higher pressure to a lower pressure) until it balances (reaches equilibrium)

What goes on in the lungs?



Alveoli are adapted for their function in a few ways:

- **folded shape** → so larger surface area for gas exchange
- **only 1 cell thick walls** → easier for diffusion of gases across them
- **moist surface** → gases dissolve and diffuse across them
- **really good blood supply** → surrounded by capillaries (fine blood vessels) to transport gases

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.

Key knowledge question	**Your answer**
Describe the 3 adaptions of gas exchange surfaces	
Describe the function of the placenta and umbilical cord	
Give an example of active transport in plants	
Give the definition of active transport	
Give the definition of osmosis	
How long is an average human pregnancy?	
Name the gametes for animals and plants	
State happens on day 14 of the menstrual cycle?	
State the function of the testes	
The monthly hormonal cycle of female humans is called the _____ cycle.	
Two muscles working in pairs are called?	
What 4 things does your skeleton/ bones do?	
What do we call 2 or more different tissues working together to carry out a function?	

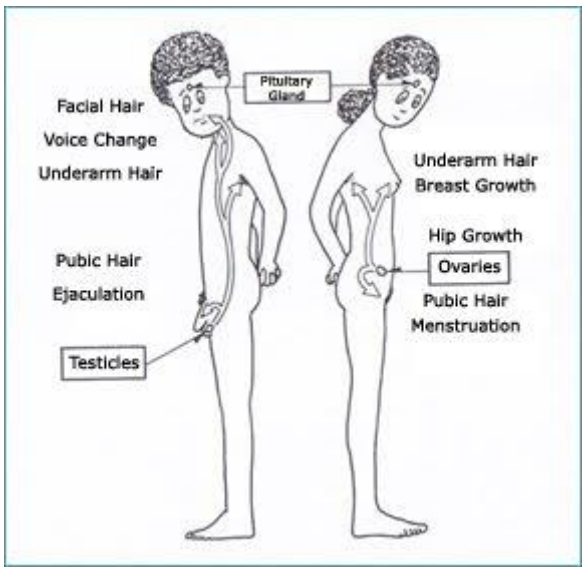
Key vocabulary

Adolescence	**changing from a child to an adult**
Puberty	**physical changes that the body goes through during adolescence**
Hormones	**chemical messengers, transported via the bloodstream to targeted cells**
Gamete	**sex cell**
Male reproductive system	**produces male sex hormones, sperm cells and insert sperm cells into females**
Sperm cell	**male sex cell (animals only)**
Female reproductive system	**produces female sex hormones, egg cells and grow a baby**
Egg cell / Ova	**female sex cell (plants and animals)**
Semen	**mixture of sperm cells with fluid released by male sex glands**
Fertilisation	**fusing of the sperm and egg cell nuclei in the female oviduct**
Zygote	**fertilised egg**
Contraception	**the deliberate use of artificial methods or other techniques to prevent pregnancy**
Period	**part of the menstrual cycle, where uterus lining thickens, breaks down then leave the body if the egg is not fertilised**
Menstruation	**scientific term for period**
Mammal	**warm blooded, females normally birth live babies and feed them by making milk e.g. breastmilk in humans**
Sexual intercourse	**sexual contact between individuals involving penetration**
Sexual reproduction	**production of new organisms by combining genetic information from 2 individuals of different sexes**
Implantation	**attachment of a fertilised egg to the uterus wall at the start of pregnancy**
Embryo	**zygote (fertilised egg) divides rapidly until it forms a ball of cells called an embryo**
Chromosome	**found in the nucleus of a cell, carries genetic information in the form of genes**
Ovulation	**release of a mature egg cell (ova)**
Pollen	**male sex cell in plants**
Pollination	**pollen grains transfer from the plant's male part to the female part**
Self-pollination	**pollen and egg cell are from the same plant**
Cross-pollination	**Pollen and egg cell are from different plants**

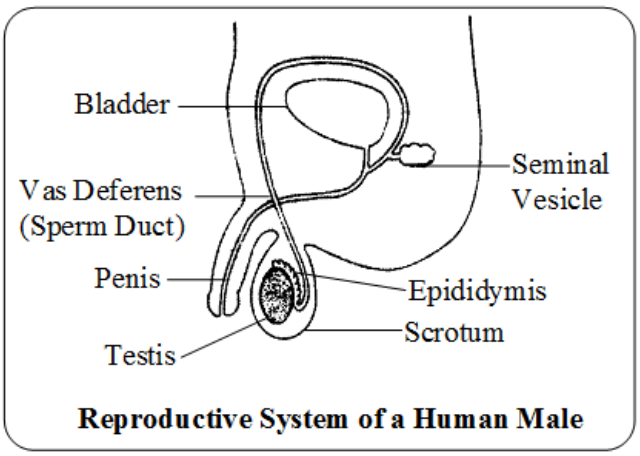
What happens at puberty?

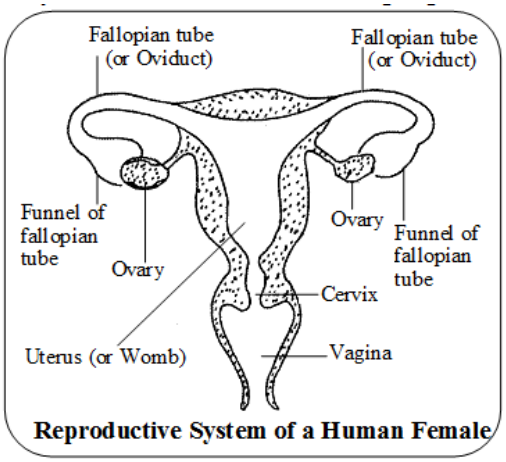
Female stages	Age at the start	Noticeable changes
1	**After the 8th birthday**	**None**
2	**From age 9–11**	**Breast "buds" start to form; pubic hair starts to form**
3	**After age 12**	**Acne first appears; armpit hair forms; height increases at its fastest rate**
4	**Around age 13**	**First period arrives**

Male stages	Age at the start	Noticeable changes
1	After the 9th or 10th birthday	None
2	Around age 11	Pubic hair starts to form
3	Around age 13	Voice begins to change or “crack”; muscles get larger
4	Around age 14	Acne may appear; armpit hair forms

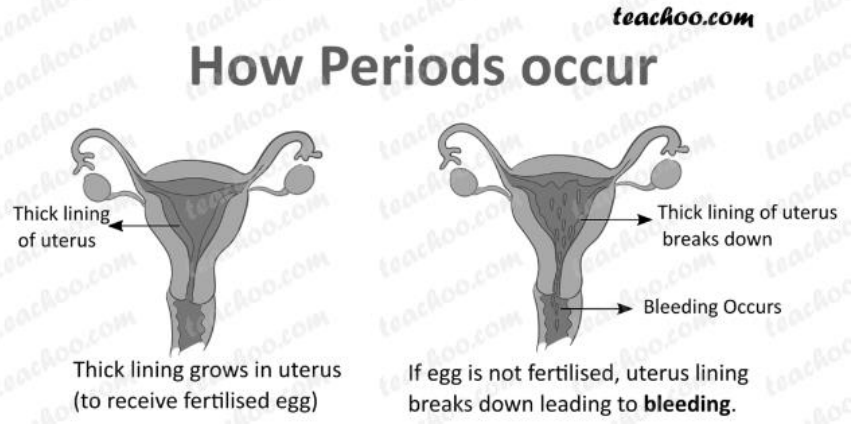


What are the reproductive organs of humans?

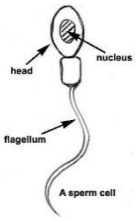


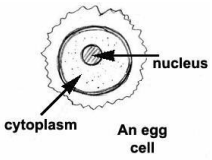


What are periods?



How do mammals reproduce?





Sperm cell – Male Gamete

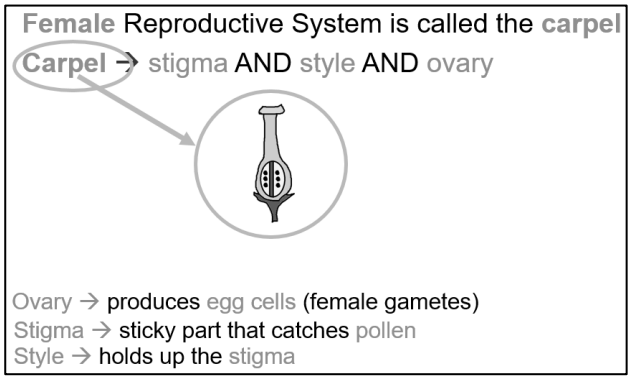
- smaller
- can swim / mobile
- made constantly
- millions of sperm released each ejaculation

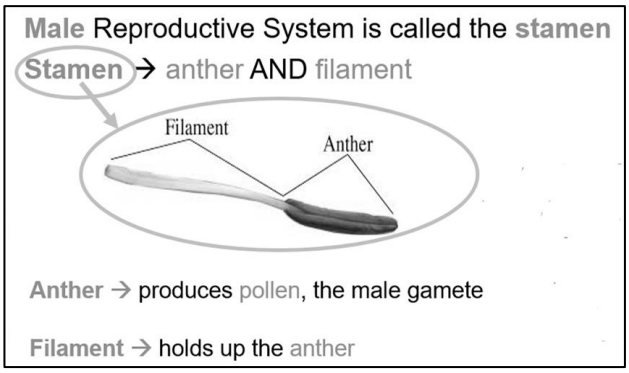
Egg cell – Female Gamete

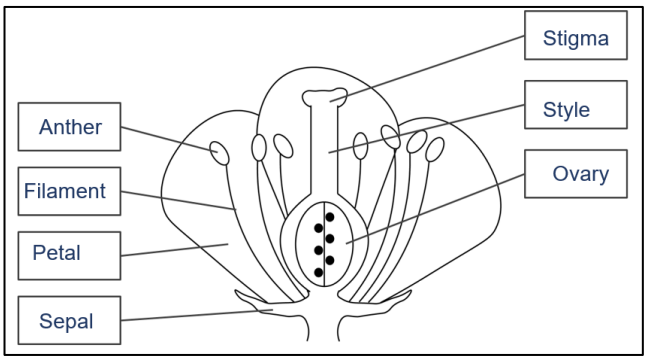
- larger
- must be moved by cilia
- made before birth, only mature during puberty
- only 1 egg released per month

Fertilisation → fusing of sperm **nucleus** and egg **nucleus**
Only 1 sperm enters the egg!

How do flowering plants reproduce?







Pollination → transfer of pollen grains **from** the **anther** to the **stigma**

Key knowledge question	**Your answer**
Describe the 3 adaptions of gas exchange surfaces	Short diffusion pathway (thin surface), Large concentration gradient maintained (eg blood supply), large SA
Describe the function of the placenta and umbilical cord	Placenta- exchange of nutrients, oxygen and waste between mothers and fetus' blood.
Give an example of active transport in plants	Mineral ions entering roots
Give the definition of active transport	Movement of particles from an area of low concentration into an area of high concentration, across a partially permeable membrane, involving energy
Give the definition of osmosis	Movement of WATER from dilute solution to concentrated solution across a partially permeable membrane
How long is an average human pregnancy?	40 weeks (9 months)
Name the gametes for animals and plants	Animal- sperm and egg, Plant- Pollen and egg/ ovule
State happens on day 14 of the menstrual cycle?	Ovulation/ egg released from ovary
State the function of the testes	Produce sperm and testosterone
The monthly hormonal cycle of female humans is called the _____ cycle.	The menstrual cycle
Two muscles working in pairs are called?	Antagonistic
What 4 things does your skeleton/ bones do?	Structure, movement, protection, making blood cells
What do we call 2 or more different tissues working together to carry out a function?	An organ

Big questions

How do we recognise chemical reactions?

How do scientists represent chemical reactions?

How do scientists represent chemicals?

What happens to mass in chemical reactions?

How does temperature change in chemical reactions?

What happens when fuels burn?

Does the type of combustion matter?

Do all fuels release the same amount of energy?

What are decomposition reactions?

Key vocabulary

Chemical formulae	Shows the elements present in a molecule in the exact proportions. CO_2 means 1 carbon atom 2 oxygen atoms bonded together.
Chemical Reactions	When atoms are rearranged to form a new product.
Combustion	An exothermic chemical reaction where an element or compound is reacted with oxygen forming new compounds.
Conservation of mass	Where the total mass of the reactants is equal to the total mass of products. Atoms cannot be gained or lost in a reaction.
Crude oil	A mixture of hydrocarbons. it is a very viscous black liquid.
Decomposition	A chemical reaction where one substance is broken down into two or more substances.
Endothermic	A reaction where energy is taken in from the surroundings, they get colder.
Exothermic	A reaction where energy is released to the surroundings, they get warmer.
Hydrocarbon	A compound containing only carbon and hydrogen atoms.
Incomplete combustion	When there is a limited oxygen supply so only partial oxidation is achieved.
Products	The new chemicals made after a chemical reaction.
Reactants	The starting chemicals in a reaction.

How do we recognise chemical reactions?

- Changes can be chemical changes instead of physical changes.
- Chemical changes occur in chemical reactions.
- Unlike physical changes chemical changes make new substances and they are generally irreversible.
- Making toast is a good example of a chemical change. You start with bread and end up with toast. It is a different colour and you cannot turn the toast back into bread. The reaction is irreversible.

The four ways in which to recognise a chemical reaction has occurred are:

- Colour change (new substance)
- Bubbles (gas produced)
- Irreversible (mostly but not always)
- Energy change

How do scientists represent chemical reactions?

In chemical reactions starting chemical called reactants are turned into new chemicals called products. Scientists represent chemical reactions using **word equations**.

Reactants → products

carbon + oxygen → **carbon dioxide**

Reactants
- always go on the **LEFT** of the arrow (equation)

→ The arrow means is turned into, it does not mean equal to / the same as (=)

Reactants
- always go on the **RIGHT** of the arrow (equation)

You will notice that like maths the word “and” is not used. A plus / addition sign (+) is used instead. The plus sign can be in the reactants, the products or both. There can be several plus signs, it all depends on how many chemicals are reacted or produced.

How do scientists represent chemicals?

In chemical formulae **a chemical symbol (letter)** tells you of the **types of element in the chemical**.
Some elements just have one letter, e.g. C, N, S
There are only 26 letters in the alphabet though and there are over 100 elements this means that most elements have two letters. The first letter is always a capital letter and the second letter is always lower case.

For example:

B – Boron

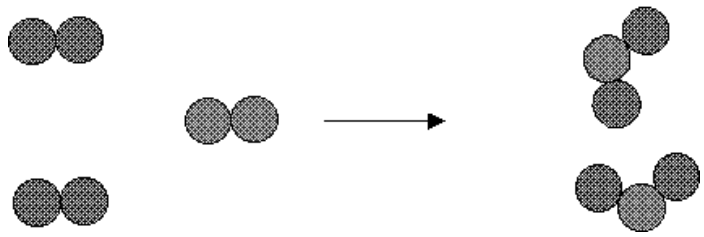
Be – Beryllium

- The chemical symbols for each element can be found in the periodic table.
- In chemical formulae **the number** is always written as a **subscript** (through/below) the line.
- **The number** informs you of the **number of atoms**.
- If there is a letter but not a number it means that there is one atom of the element is present.

What happens to mass in chemical reactions?

There are the same numbers and types of atoms in the reactants and products.

In chemical reactions the atoms stay the same but just swap places. Every atom has mass. Since the number of atoms stays the same the mass also stays the same. This is called **CONSERVATION OF MASS,** which means **the total mass of the reactants = the total mass of the products.**



How does temperature change in chemical reactions?

Of the four ways to recognise a chemical reaction the only one that ALWAYS happens is an energy change / energy transfer. Think of wood burning. The chemical energy store in the wood is transferred (changed to) a thermal / heat energy store. Waves transfer light energy and sound energy.

There are two main types of thermal energy transfer in chemical reactions.

Exothermic reactions releases heat energy, which causes the surroundings to warm up.

Endothermic reactions take in heat energy, which causes the surroundings to cool down.

Science Homework 3

Try to answer all of these key knowledge questions. Then check your answers using the answer 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
A chemical reaction starts with reactants and ends with?	
Combustion is the reaction of something with which gas?	
Complete this equation for the complete combustion of carbon – carbon + oxygen →	
How many atoms are there in a molecule of H_2O?	
Is freezing a physical or chemical change?	
Name 3 things we might see if a chemical reaction is happening.	
What do we call a chemical reaction where energy is given out?	
What do we call a compound containing only hydrogen and carbon?	
What do we call a reaction that takes in energy?	
What do we know about the mass of chemicals before and after they have reacted?	
What is a chemical reaction?	
What word describes a reaction where something is broken down into 2 or more products?	
Osmosis is the movement of water across what?	
What is diffusion?	
What is the function of the cell membrane?	

What happens when fuels burn?

A fuel is something that can be combusted (burned) to release energy.

Combustion is an exothermic reaction of the fuel with oxygen.

Does the type of combustion matter?

There are two types of combustion (burning): complete combustion and incomplete combustion.

- Complete combustion occurs when there is an ample supply of oxygen.
- Incomplete combustion occurs when there is not enough oxygen to fully react with the fuel.

Complete combustion of many fuels produces carbon dioxide. Carbon dioxide is a greenhouse gas, it absorbs heat energy in our atmosphere. The increase in carbon dioxide in our atmosphere has been caused by humans burning fossil fuels for transport and to produce electricity. Carbon dioxide is a major contributor to the global climate change crisis. Other greenhouse gases include methane.

What are decomposition reactions?

All reactions involve a change of energy.

Most chemical reactions are exothermic. These reactions include oxidation, combustion and respiration; all of which release heat energy and result in an increase in temperature.

Some chemical reactions are endothermic they absorb energy.

Photosynthesis absorbs light energy.

Decomposition reactions absorb heat energy.

Decomposition reactions start with one larger product and produce two or more simpler reactants.

Types of decomposition reaction include: electrolysis and thermal decomposition.

Key knowledge question	**Answer**
A chemical reaction starts with reactants and ends with?	Products
Combustion is the reaction of something with which gas?	Oxygen
Complete this equation for the complete combustion of carbon - carbon + oxygen →	carbon + oxygen → carbon dioxide
How many atoms are there in a molecule of H_2O?	3
Is freezing a physical or chemical change?	Physical
Name 3 things we might see if a chemical reaction is happening.	A colour change, a temperature change, a gas produced (fizzing)
What do we call a chemical reaction where energy is given out?	Exothermic reactions
What do we call a compound containing only hydrogen and carbon?	A hydrocarbon
What do we call a reaction that takes in energy?	Endothermic
What do we know about the mass of chemicals before and after they have reacted?	It is conserved (they are the same)
What is a chemical reaction?	When atoms are rearranged to form new products
What word describes a reaction where something is broken down into 2 or more products?	Decomposition
Osmosis is the movement of water across what?	*A partially permeable membrane*
What is diffusion?	*The movement of particles from an area of high concentration to an area of lower concentration*
What is the function of the cell membrane?	*To control what enters or leaves the cell*