1. Forces

A force is a **push** or a **pull** that changes the **shape**, **speed** or **direction** of an object.
You cannot see forces but you can see the effects of them.

The unit of force is the **Newton (N)** named after Sir Isaac Newton. We measure force using a piece of equipment called a Newton metre.

2. Types of Force

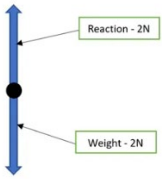
Forces can be divided into two types: contact and non-contact.

1. **Contact forces** (e.g. push) are caused when two objects are in contact.
2. **Non-contact forces** (e.g. magnetism) do not require the objects to be in contact for the force to occur.

Examples of forces include **push, pull, friction, air resistance, water resistance, thrust, upthrust, reaction, weight, magnetism, gravity, lift and tension.**

3. Force Diagrams

To show the forces acting on a body we use a free body force diagram. A **free body force diagram** shows all of the forces that are acting on the body. It has arrows that show the direction the force acts. The larger the arrow, the larger the force. A free body force diagram should always have labelled arrows.



4. Balanced Forces

When the forces acting in opposite directions are the same magnitude (size) we say the forces are **balanced**. The resultant force (overall force) is 0N.
This means one of two things:

1. The object is stationary (not moving)
2. The object is moving at a constant speed

Duck floating still on the water

Submarine at constant speed and depth

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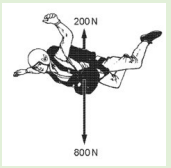
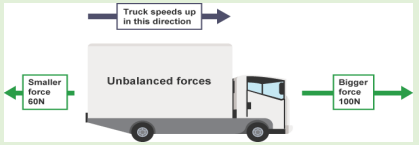
Forces

5. Unbalanced Forces

If the forces are **unbalanced** on an object there are two things that could happen:

1. If the object is stationary, then it will move in the direction of the resultant force
2. If the object is moving, then the object will speed up or slow down in the direction of the resultant force

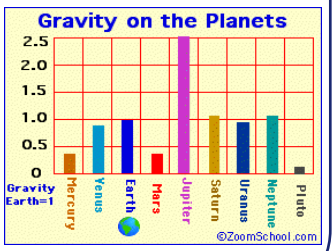




6. Weight on different planets

As planets have different masses, a person's weight would be different depending which planet they were on.

For example, a person's weight on Earth is 1000N. If that same person was on Jupiter, their weight would be 2500N.



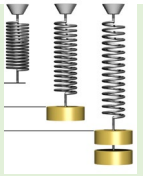
7. Hooke's Law

The extension of an elastic object is directly proportional to the force applied.

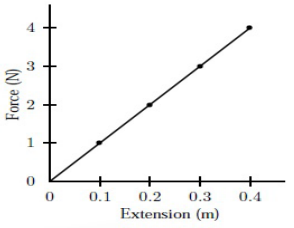
e.g. Force applied = 10N, extension = 5cm

doubles doubles

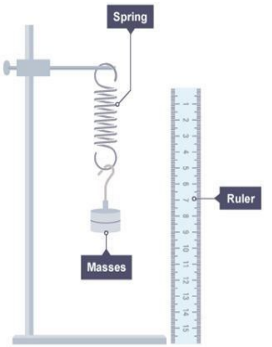
Force applied = 20N, extension = 10cm



7. Hooke's Law



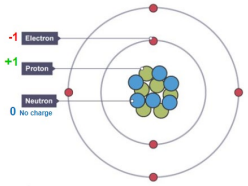
The **extension** of a spring (m) is **directly proportional** to the **force** applied (N).



1. Structure of the Atom

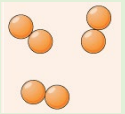
- An atom is made up of three subatomic particles: protons, electrons and neutrons.
- Protons and neutrons are found in the nucleus of the atom (in the centre).
- Electrons are found orbiting the nucleus in shells.
- Protons have a positive charge.
- Electrons have a negative charge.
- Neutrons have a no charge.

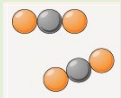
In an atom, there are equal numbers of protons and electrons because the positive and negative charges need to balance.



2. Elements and Compounds

Elements are substances made up of one type of atom. All the elements are found listed in the Periodic Table





Compounds contain two or more elements that are chemically joined to each other. **Compounds** are formed by chemical reactions.

Examples of elements	Examples of compounds
Carbon (C)	Carbon dioxide (CO_2)
Oxygen (O_2)	Water (H_2O)

3. Chemical Symbols and Formulae

Each element is coded for by a formulae. Most elements have a formula which is the first letter of its name (e.g. C for Carbon and H for Hydrogen). Other formulae are the first two letters of the element name (eg. Li for Lithium and Ne for Neon).

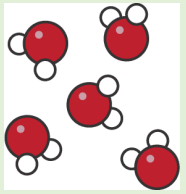
Naming Compounds:

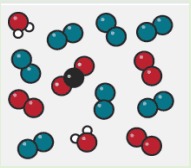
Lithium Hydroxide - (Lithium, Hydrogen + Oxygen) – Li OH
Lithium Nitrate – (Lithium, Nitrogen + Oxygen) - $LiNO_3$
Lithium Carbonate – (Lithium, Carbon + Oxygen) - $Li CO_3$
Lithium Sulphate – (Lithium, Sulphur + Oxygen) - $Li SO_4$

4. Pure vs Impure

Pure Substances

A substance made up of **one type** of particle e.g. hydrogen gas or oxygen gas.





Impure Substances

A substance made up of **mixtures** of different types of particle e.g. bottled water.

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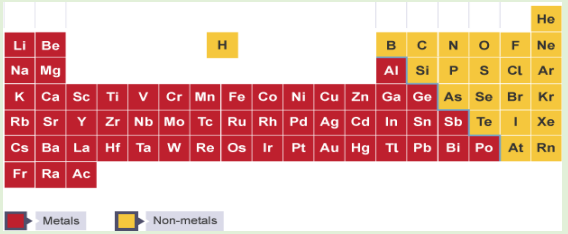
Atoms and Elements

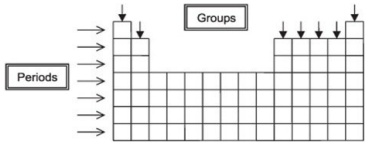
5. The Periodic Table

All the different elements are arranged on the periodic table. The elements are arranged in order of increasing atomic number. On the periodic table, we can see the metal elements on the left and non-metal elements on the right.



6. Patterns in the Periodic Table

Elements are arranged on the periodic table in groups and periods. Horizontal rows are called periods and vertical columns are called groups.



Groups are labelled 1-7 from left to right, with last group being called either group 0. Elements in the same group have similar properties, e.g., group 1 elements are all very reactive.

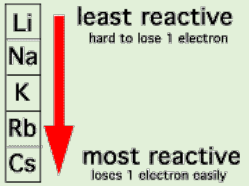
7. Metals and Non-Metals

Metals are grouped together because they all have similar properties.

Physical properties of metals:

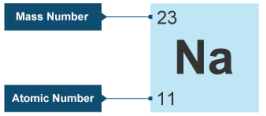
Shiny
Strong
Malleable (can bend)
High melting and boiling point
Conduct heat well
Conduct electricity well

Chemical properties of Group 1 metals



8. Atomic Number and Mass Number

This is the total of protons+neutrons



This is the number of protons

Sodium has 11 protons, 11 electrons and 23-11=12 neutrons.

1. A healthy diet

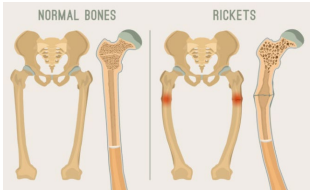
To keep healthy, it is vital to eat a **balanced diet**. This means eating foods that contain **nutrients** in the correct amount.

2. An unhealthy diet

An imbalanced or poor diet can contain too much or too little of a particular nutrient. If you have too little of a particular nutrient, we say that you have a **deficiency** in that nutrient. Deficiency can cause you to feel poorly.

3. Consequences of an unhealthy diet

- iron deficiency can cause anaemia, where there are too few red blood cells
- iodine deficiency can cause a swelling in the neck called goitre
- vitamin A deficiency can cause blindness
- vitamin C deficiency causes scurvy, which makes the gums bleed
- vitamin D deficiency causes rickets, which makes the legs bow outwards in growing children



4. Nutrients

Nutrient	Use in the body	Good sources
Carbohydrates	To provide energy	Cereals, bread, pasta, rice
Protein	For growth and repair	Fish, meat, eggs, beans, pulses
Lipids	To provide energy and store energy in the body and insulate it against the cold	Butter, oil, nuts
Minerals	Needed in small amounts to maintain health	Salt, milk (for calcium), liver (for iron)
Vitamins	Needed in small amounts to maintain health	Fruit, vegetables, dairy foods
Dietary fibre	To provide roughage to help keep the food moving through the gut	Vegetables, bran
Water	Needed for cells and body fluids	Water, fruit juice, milk

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Nutrition and digestion

5. Digestion

Digestion: process by which food molecules are broken down to be absorbed by the body.

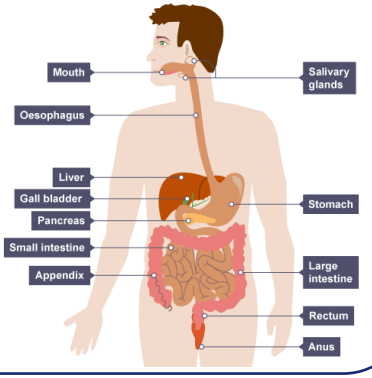
Chemical digestion: *enzymes* break down food into smaller molecules.

Mechanical digestion: the food is manually broken down; e.g. by the mouth when chewing.

Why do we need to digest our food?
The food we eat contains nutrients. However these nutrients cannot be absorbed and used by the body unless the food is broken down.

6. Digestive system

The digestive system is made up of a group of organs that work together to break down food.



7. Digestive system function

The mouth: Brakes down food mechanically and chemically by enzymes.
The stomach: Food mixes with the stomach acid and enzymes. The stomach is a muscular bag which churns the food, breaking it down into small pieces.
The intestines: Food passes through into the small intestine, where more enzymes are released, breaking down food into small nutrients. The large intestine is the site of water reabsorption into the body.
The rectum: The faeces is passed into the rectum and is excreted from the body through the **anus.**

ENZMYES – *substances that speed up the rate of digestion in the mouth, stomach and small intestine.*

8. Diffusion of nutrients

Digested food molecules, which are small, are absorbed in the **small intestine**, through structures called **villi**. This means that they pass through the wall of the small intestine and into our bloodstream.