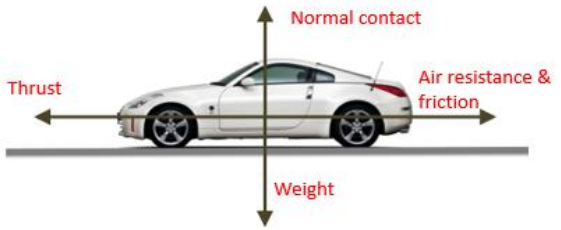
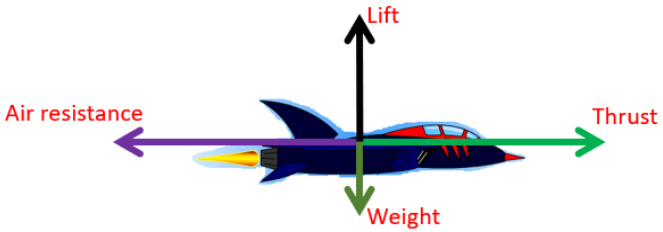
7PF Forces & Motion

Force diagrams should always include three pieces of information about each force:

1. **Direction** - Use arrows to state the direction of the force;
2. **Size** - The <u>longer</u> the arrow the bigger the force;
3. **Name** - Label your force arrow with a name of the force.





Forces are measured **Newtons (N)** using a **Newton meter**

Using forces to explain motion:

1. **Balanced forces** acting on an object will cause it to **stay stationary** or travel with **constant speed**
2. **Unbalanced forces** acting on an object will cause it to **accelerate, decelerate** or **change direction**

How to present calculations in physics:

1) Write down the values that you know;
2) Identify the value that you are trying to work out;
3) Write down the formula that you will use;
4) Substitute the known values into the formula;
5) Calculate your answer and write it down;
6) Underline your answer;
7) Include the correct unit.

- **d = 20m; t = 5s;**
- **v = ?;**
- **v = d/t**
- **v = 20/5**
- **v = <u>4 m/s</u>**

<u>Pressure</u>

Pressure is a measure of how spread out a force is. We calculate it by using:

$$p = F/A$$

p= pressure (Pa or N/m^2); F = Force (N); = Area (m^2).

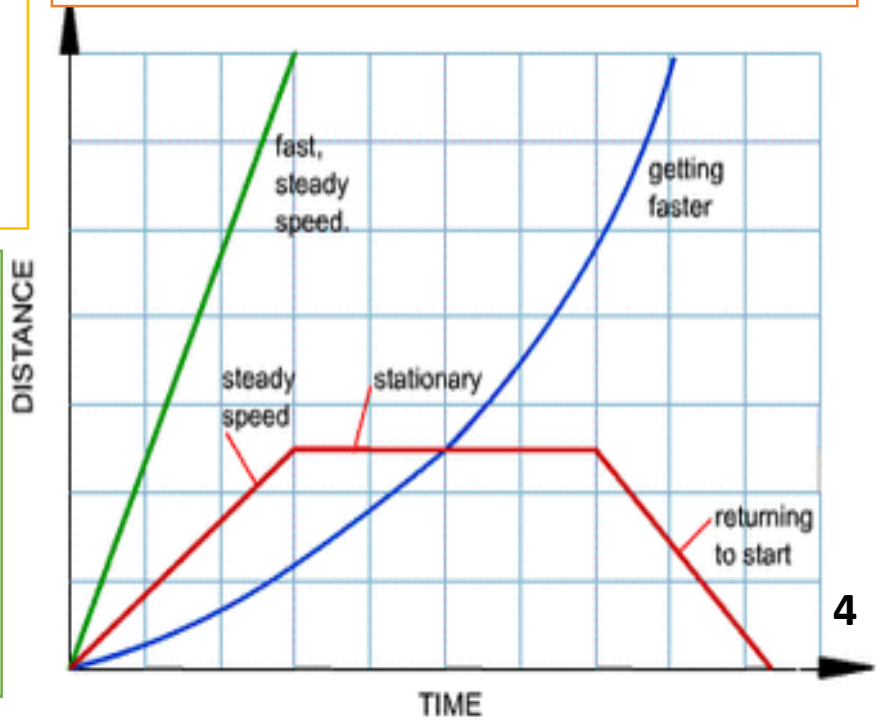
<u>Velocity and speed</u>

Speed is a measure of how quickly an object travels a given distance.

We calculate speed by using:

Speed (m/s) = distance (m) / time (s)

Velocity is the same as speed, but tells us the direction we are travelling in as well (ie forwards or backwards).



Names for types of force:

- Air resistance
- Friction
- Lift
- Magnetic force
- Normal contact
- Tension
- Thrust
- Upthrust
- Water resistance
- Weight

<u>Mass, weight and gravity</u>

Mass is a measure of how much matter an object is made up of. It is measured in **kilograms** (**kg**).

Weight is the force of gravity pulling on every kg of mass. It is measured in **Newtons** (**N**).
We can calculate weight by using:

$$W = m \times g$$

W = weight (N); m = mass (kg); g = gravitational field strength (N/kg)

Gravitational field strength of Earth is 10N/kg

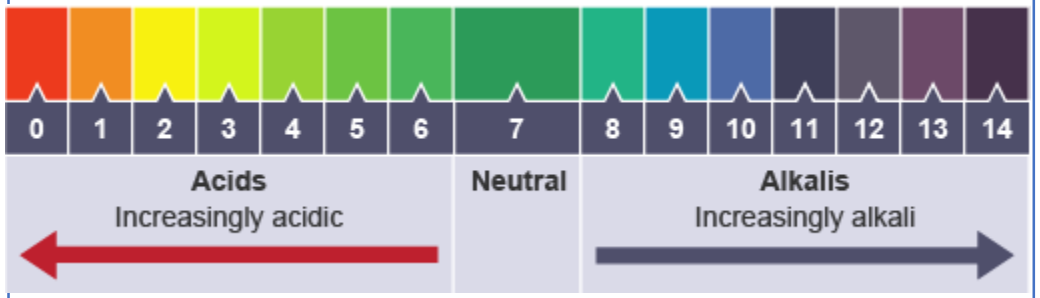
7CC Chemical Reactions

The pH scale

Solutions can be **acidic**, **alkaline** or **neutral**:

- **Acidic solutions** form when **acids** dissolve in water;
- **Alkaline solutions** form when **alkalis** dissolve in water;
- Solutions that are neither acidic nor alkaline are **neutral**
- Pure water is neutral.

Universal indicator can tell us how strong acidic or alkaline a solution is. This is measured using the **pH scale**, which runs from pH 0 to pH 14:



- **The closer to pH 0** you go, the **more strongly acidic** it is;
- **The closer to pH 14** you go, the **more strongly alkaline** it is.

Conservation of mass

Total mass of reactants = **Total mass** of products

We say that **mass is conserved** in a chemical reaction.

Oxidation reactions

An example of an oxidation reaction is where metals react with oxygen to make metal oxides.

metal + oxygen → metal oxide

E.g. magnesium + oxygen → magnesium oxide

Another example is a combustion reaction, where we burn fuels in oxygen:

Fuel + oxygen → carbon dioxide + water

We can represent theses reactions using **WORD EQUATIONS**

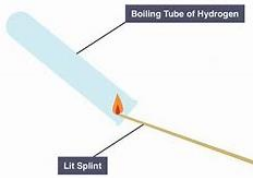
The substances that react together are called the **reactants**
The substances that are formed in the reaction are called the **products**
The → shows that we are making something new

Reacting metals with acids

metal + acid → metal salt + hydrogen

E.g. zinc + hydrochloric acid → zinc chloride + hydrogen

To test if **hydrogen is produced**, hold a **lit splint** to the gas and listen for it to **burn with a squeaky pop**.



Hazard signs to be aware of when dealing with acid and alkalis:

Corrosive

Irritant

Neutralisation

When an acid reacts with an alkali (or **base**), a **neutral** salt solution is formed. This is called **neutralisation**.

acid + alkali → salt + water

eg sodium hydroxide + hydrochloric acid → sodium chloride + water

Naming salts

The name of a salt has two parts:

- The first name comes from the **metal** in the alkali used.
- The second name comes from the **acid** that was used.

From an alkali containing potassium, eg potassium hydroxide

Potassium nitrate

From the acid "NITRIC ACID"

Acid used	Second name of salt
hydrochloric acid	chloride
sulfuric acid	sulfate
nitric acid	nitrate

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Uut** ununtrium 113	[289] **Fl** flerovium 114	[289] **Uup** ununpentium 115	[293] **Lv** livermorium 116	[294] **Uus** ununseptium 117	[294] **Uuo** ununoctium 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number