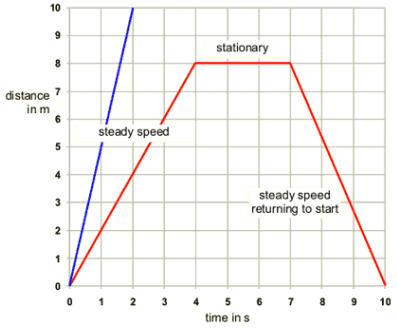
Physics 2

Distance Time graphs

To work out the speed use the gradient of the graph

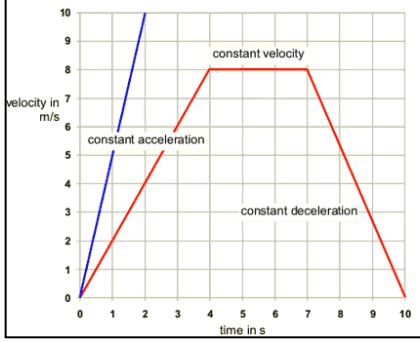


Speed =Distance / Time

Velocity is speed **with a direction**

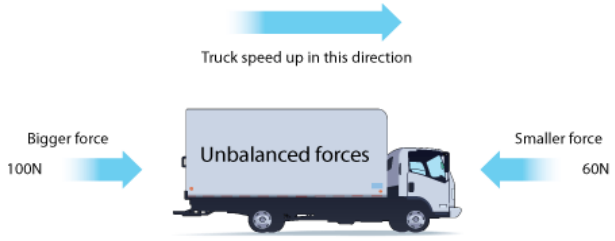
Velocity Time graphs

To work out the **acceleration** use the gradient of the graph.



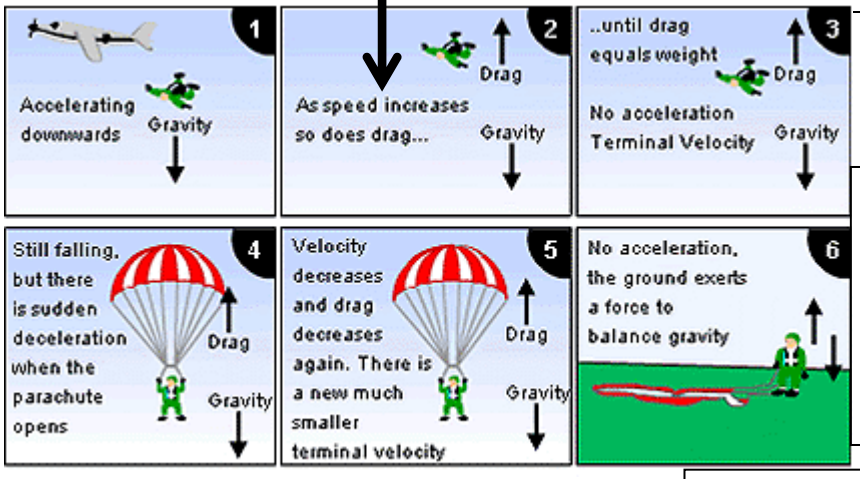
The area under the graph equals the distance travelled

A **resultant force** is the overall force on an object, it there is a resultant force then there will be a change in velocity. The resultant force below is 40N to the right



The car below is moving as there is no resultant force, its velocity will remain the same.

Terminal Velocity – the maximum speed of a falling object, it is reached when the resultant force is zero.



Weight –force due to the pull of gravity. Depends on the strength of gravity. Gravity on Earth is 10N/kg

Mass - the amount of stuff in an object , it never changes

Stopping Distance=Thinking Distance +Braking Distance

Thinking –affected by speed and drivers reactions e.g. Drugs + tiredness

Braking –affected by speed, brakes, tyres and grip(road surface +weather)

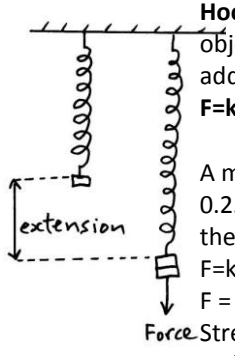
Work = Force(N) x Distance (m)
Done

A football is kicked 12 m with a force of 70N how much energy is transferred?

W=f xd
W=70 x12
W =840J

Gravitational potential energy –energy due to height.
Gravitational energy =mass x g x height
(g is 10N/kg on Earth)

Kinetic energy – energy due to movement
Kinetic energy = ½ x mass x speed^2
A car of mass 650 kg is travelling at 50m/s, calculate its kinetic energy.
KE= ½ x mass x speed^2
KE= ½ x 650 x 50^2
KE = 812 500J



Hooke's Law – the extension of an elastic object is directly proportional to force (you add more weights it stretches more).

F=k xe **k-spring constant**
e-extension(m)

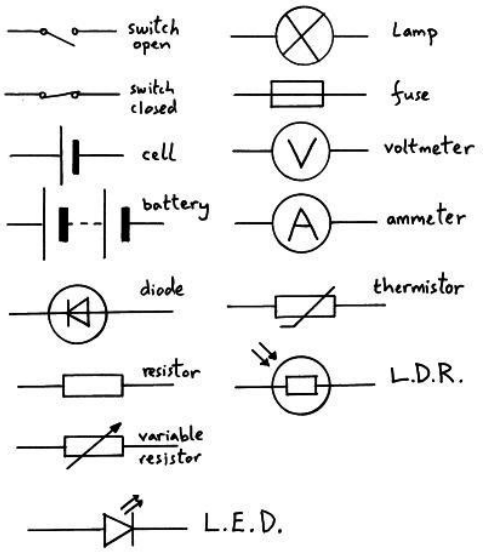
A mass hung from a spring makes it extend 0.25m. The spring constant is 20N/m. What is the force
F=k x e
F = 20 x 0.25 F= 5N
Stretch an elastic object too much and it won't go back to its original shape

Power- the rate at which energy is transferred, it is measured in Watts.

Power = energy tranferred / time P =E/t (PET!)

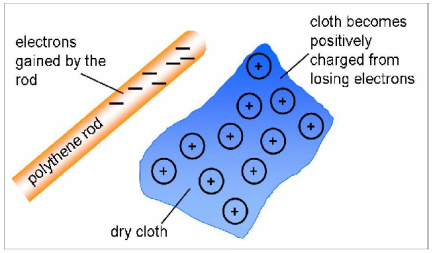
A car motor transfers 4800J of useful energy in 2 minutes, what is the power poutput
2minutes=120 seconds
P = E/t
P= 4800/120
P = 40W

Power is easy just think PET!



Car Safety cars are designed to increase the time over which momentum changes so that this reduces the force on the passengers.
Crumple zones – increase impact time so decreasing the force produced by the change in momentum.
Seat belts – increase the time taken to stop so reducing the force.
Air bags – increase the time taken to stop so reducing the force.

Static electricity – builds up when materials are rubbed together.
Opposites attract
Like charge repel

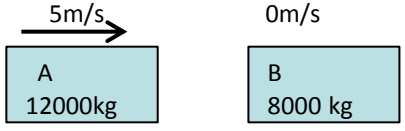


	Series	Parallel
Paths	One	More than one
Current	The same everywhere	Shared between branches
Potential Difference	Shared between components	Same across all components
Resistance	Adds up, the total resistance is the m of all the resistances	More goes through the past of least resistance

Current –the flow of electric charge around a circuit, measured in amps (A) using an ammeter connected in series
Potential Difference – the driving forces that pushes the current round the circuit measured in volts (V) using a voltmeter connected in parallel.
Resistance- anything in the circuit which slows the flow donw measured in ohms (Ω).

Momentum (kg m/s) = mass (kg) x velocity (m/s)
In collisions and explosions momentum is conserved so the momentum before is the same as the momentum after.

Two railway carriages collide and move off together. Carriage A has a mass of 12,000 kg and moves at 5 m/s before the collision. Carriage B has a mass of 8,000 kg and is stationary before the collision. What is the velocity of the two carriages after the collision?



Momentum of A before = 12000x 5 =60000
Momentum of B before = 8000 x0 =0
Total momentum before = 60000kg m/s

After the collision the momentum is still 60000 and the new mass is 20000 (12000 + 8000)
Momentum = mass x velocity
60000 = 20000 x v
V=3 m/s

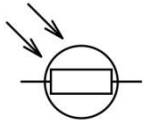
Current –the amount of charge that flows every second
Current = $\frac{\text{charge}}{\text{time}}$ I=Q/t
600 C of charge pass through a cell in 5 minutes. How much current flows?
5 minutes =300s
I=Q/t
I= 600/500= 1.2 A

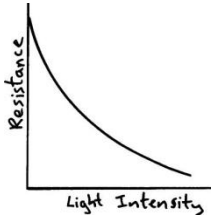
Potential difference is the work done per unit charge.
P.D =$\frac{\text{work done}}{\text{charge}}$ V=w/q

Fuses- put in electrical appliances to keep you safe/
-Normally a current flows through the fuse
-If too much flows, the fuse gets too hot
-The fuse breaks and breaks the circuit stopping the current flowing.
Power = current x potential difference P= I x V
A hair dryer is rated at 230V and 1000w which size fuse should be used?

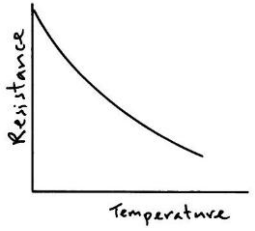
P= I x V
1000= I x 230
I= 1000/230= 4.3 A. The fuse should be rated a little higher so a 5A fuse should be used

Light dependent resistor (LDR) a resistor that depends on the brightness of light.
Used in outdoor lighting





Thermistor – a temperature dependent resistor. In hot conditions resistance drops, used in thermostats.



Background radiation- radiation that we are always exposed to

Natural – cosmic rays, rocks and radon gas.

Artificial –nuclear weapons tests, nuclear accidents and medical sources

Particle	Mass	Charge
Proton	1	+1
Neutron	1	0
Electron	Negligible (1/1000)	-1

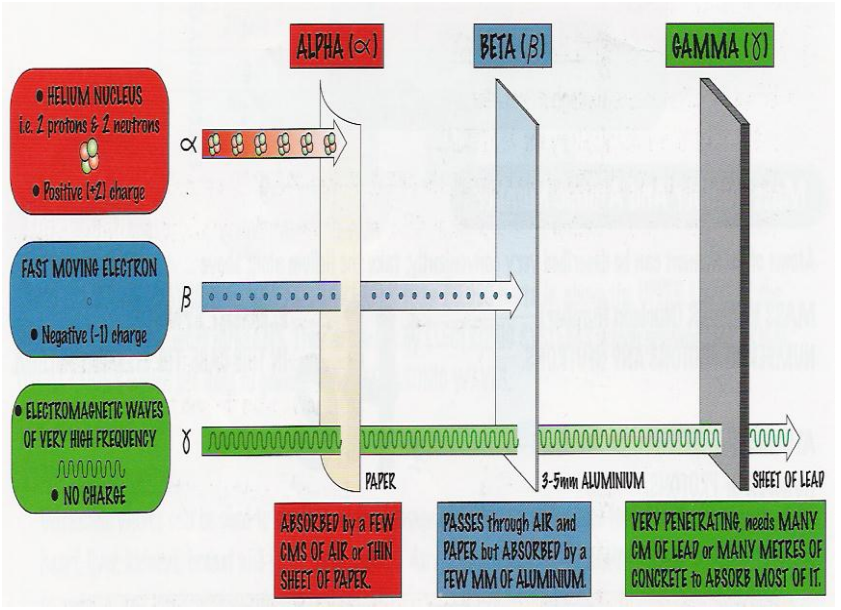
The mass number tells you the number of protons and neutrons

The atomic number tells you the number of protons

$^{12}_{6}C$

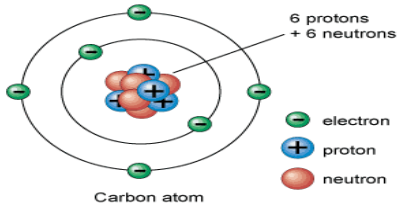
Isotopes are different forms of the same element, they have the same number of protons but different numbers of neutrons.

All have 6 protons but
Carbon 12 = 6 neutrons
Carbon 13 =7 neutrons
Carbon 14 = 8 neutrons



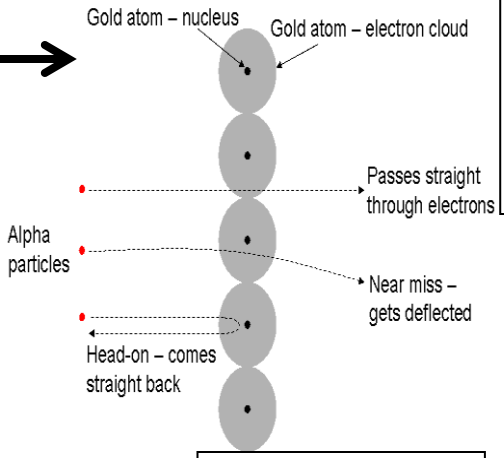
Radiation is a random process. Radiation is ionising, meaning it affects the atomic structure of atoms which can lead to cancer. Alpha is the most ionising as it is the largest.

Atomic Structure

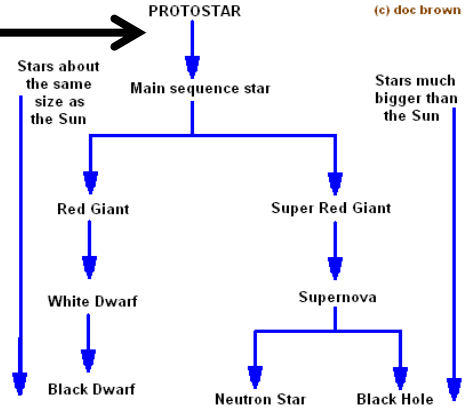


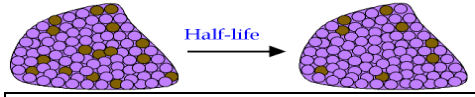
Rutherford scattering alpha particles were fired at thin gold foil. Found the following.

1) Most alpha particles went straight through **showing most of an atom is empty space.**
2) Very few alpha particles would come straight back **showing most of the mass of the atom was in the centre in a small nucleus.**
3) Some alpha particles were slightly deflected **showing that it was a positive nucleus(as alpha is positive and like charges repel)**



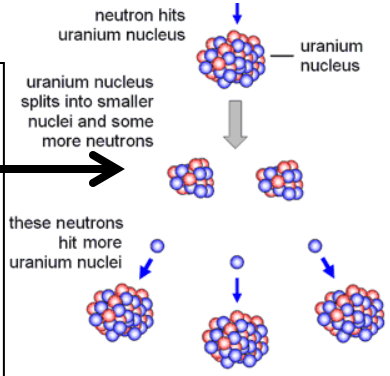
Life cycle of a star – a star is made from dust and gas pulled in by gravity to make a protostar. Nuclear fusion then creates heat and light during which it is a main sequence star the forces of gravity (inwards) and nuclear fusion (outwards) are balanced. The hydrogen runs out and then the cycle depends on the size of the star.

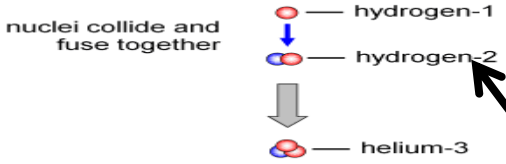




Half life – the average time for the number of nuclei in a radioactive sample to half.
The radioactivity of a sample is 300 after 120minutes it is 75 what is its half life?
After one half life = 300/2= 150
Two half lives =150/2= 75
So 120mins = two half lives. One half life must be 60mins

Nuclear fission- this uses uranium or plutonium and results in a chain reaction. Used in nuclear power stations but cost of building and decommissioning station is high, also radioactive waste





Nuclear Fusion- Small atomic nuclei are joined to make a larger nucleus. It releases a lot of energy, all the energy in stars comes from fusion.

Uses of radioactivity
Smoke detectors- alpha source causes ionisation and a current, smoke stops the radiation and alarm sounds
Tracers in medicine use beta or gamma so pass out the body and short half life so decays quickly
Sterilising food and medical instruments gamma used with a long half life so it does not need replacing