Revision Guide

AQA GSCE Triple Physics Paper 2 Foundation

Name: Class:

10 Minutes on….

Scalar and Vector Quantities

Key Term	Definition
Scalar Quantities	A quantity with magnitude (size) only.
Vector Quantities	A quantity with both magnitude (size) and direction.

Representing Vector Quantities

A vector quantity may be represented by an arrow. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity.

Examples of Scalar Quantities	Examples of Vector Quantities
Temperature Mass Energy Distance Speed Density	Force Weight Displacement Velocity Acceleration Momentum

10 Minutes on….

Contact and Non-Contact Forces

Key Term	Definition
Scalar Quantities	A quantity with magnitude (size) only.
Vector Quantities	A quantity with both magnitude (size) and direction.
Forces	A push or pull that acts on an object due to the interaction with another object. It is a vector quantity.
Contact Forces	A force that acts when objects are physically touching.
Non-Contact Forces	A force that cats when objects are not touching.

Examples of Contact Force	Examples of Non-Contact Force
Friction Air Resistance Tension Normal Contact Force	Gravitational Force Electromagnetic Force Magnetic Force

Representing Forces

A vector quantity, such as force, can be represented by an arrow. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity.

10 Minutes on....

Gravity 1

Key Term	Definition
Weight	The force acting on an object due to gravity.

Quantity	Symbol	Unit
Weight	*W*	N
Mass	*m*	kg
Gravitational Field Strength	*g*	N/kg

Equation that links gravitational field strength, mass and weight.

Weight = Mass x Gravitational Field Strength

Calculate weight when...	Gravitational field strength is 10N/kg and mass is 5kg.	Gravitational field strength is 9.8N/kg and mass is 25kg.	Gravitational field strength is 9.81N/kg and mass is 750g.	Gravitational field strength is 10N/kg and mass is 986g.
Convert Units	-	-	750g = 0.75kg	986g = 0.986kg
Write down the formula.	W = m x g	W = m x g	W = m x g	W = m x g
Substitute Values	W = 5 x 10	W = 25 x 9.8	W = 0.75 x 9.81	W = 0.986 x 10
Do the Maths	50	245	7.3575	9.86
Round and add units.	50N	245N	7.36N	9.86N

10 Minutes on....

Gravity 2

Calculate mass when...	Gravitational field strength is 10N/kg and weight is 30N.	Gravitational field strength is 9.8N/kg and weight is 45N.	Gravitational field strength is 9.8N/kg and weight is 2kN.	Gravitational field strength is 10N/kg and weight is 77N.
Convert Units	-		2kN = 2000N	-
Write down the formula.	W = m x g	W = m x g	W = m x g	W = m x g
Substitute Values	30 = m x 10	45 = m x 9.8	2000 = m x 9.8	77 = m x 10
Rearrange	m = 30/10	m = 45/9.8	m = 2000/9.8	m = 77/10
Answer	3	4.5918367347	204.0816326531	7.7
Round and add units.	3kg	4.6kg	204kg	7.7kg

Calculate gfs when...	Weight is 700N and mass is 70kg.	Weight is 70N and mass is 650g.	Weight is 2kN and mass is 700kg.	Weight is 0.82kN and mass is 554g.
Convert Units	-	650g = 0.65kg	2kN = 2000N	0.82kN = 820N 554g = 0.554kg
Write down the formula.	W = m x g	W = m x g	W = m x g	W = m x g
Substitute Values	700 = 70 x g	70 = 0.65 x g	2000 = 700 x g	820 = 0.554 x g
Rearrange	g = 700 / 70	g = 70 / 0.65	g = 2000 / 700	g = 820 / 0.554
Answer	10	107.6923076923	2.8571428571	1,480.144404332
Round and add units.	10N/kg	108N/kg	2.9N/kg	1480N/kg

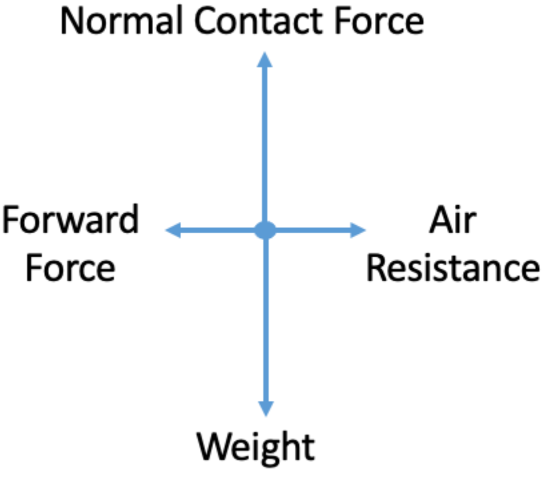
10 Minutes on….

Resultant Forces

Key Term	Definition
Resultant Force	The single force that could replace all the forces acting on an object, found by adding these together.

Resultant Force = 0

The size of the arrows represents the size of the force. The normal contact force is equal size and opposite direction to weight and air resistance is equal in size and opposite in direction to the forward force.



Calculating Resultant Force Along a Straight Line

To determine the size of a resultant force of two forces that act in a straight line you would complete some simple calculations. If two forces are acting in the same direction you would add the forces together. If the forces are acting in opposite directions, you would subtract the smaller force from the larger force.

10 Minutes on....

Work Done 1

Key Term	Definition
Work	Energy transferred by a force.

Quantity	Symbol	Unit
Work Done	*W*	J
Force	*F*	N
Distance	*s*	m

Equation that links distance, force and work done.
Work Done = Force x Distance

Converting from joules into newton-metres.
1 joule = 1 newton-metre.

Calculate work done when…	Force is 35N and the distance is 2m	Force is 72N and the distance is 1.5m	Force is 12N and the distance is 12cm	Force is 3.5kN and the distance is 30cm
Convert Units	-	-	12cm = 0.12m	3.5kN = 3500N 30cm = 0.3m
Write down the formula.	W = F x s	W = F x s	W = F x s	W = F x s
Substitute Values	W = 35 x 2	W = 72 x 1.5	W = 12 x 0.12	W = 3500 x 0.3
Do the Maths	70	108	1.44	1050
Round and add units.	70J	108J	1.4J	1050J

10 Minutes on.... Work Done 2

Calculate force when...	Work done is 320J and the distance is 1.2m	Work done is 1.3kJ and the distance is 2.7m	Work done is 44J and the distance is 8cm	Work done is 2.4kJ and the distance is 98cm
Convert Units	-	1.3kJ = 1300J	8cm = 0.008m	2.4kJ = 2400J 98cm = 0.98m
Write down the formula.	W = F x s	W = F x s	W = F x s	W = F x s
Substitute Values	320 = F x 1.2	1300 = F x 2.7	44 = F x 0.008	2400 = F x 0.98
Rearrange	F = 320 / 1.2	F = 1300 / 2.7	F = 44 / 0.008	F = 2400 / 0.98
Answer	266.6666666667	481.4814814815	5500	2,448.97959184
Round and add units.	267N	481N	5500N	2450N

Calculate distance when...	Work done is 25J and force is 18N	Work done is 55J and force is 22N	Work done is 2.7kJ and force is 700N	Work done is 92J and force is 0.1kN
Convert Units	-	-	2.7kJ = 2700J	0.1kN = 100N
Write down the formula.	W = F x s	W = F x s	W = F x s	W = F x s
Substitute Values	25 = 18 x s	55 = 22 x s	2700 = 700 x s	92 = 100 x s
Rearrange	s = 25 / 18	s = 55 / 22	s = 2700 / 700	s = 92 / 100
Answer	1.3888888889	2.5	3.8571428571	0.92
Round and add units.	1.39m	2.5m	3.9m	0.92m

10 Minutes on....

Forces and Elasticity 1

Key Term	Definition
Elastic Deformation	Material returns to its original shape and size after being stretched or squashed.
Inelastic Deformation	Material does not return to its original shape and size after being stretched or squashed.

Quantity	Symbol	Unit
Spring Constant	*k*	N/m
Force	*F*	N
Extension	*e*	m

Equation that links extension, force and spring constant.

Force = Spring Constant x Extension

Calculate force when...	Spring constant is 3N/m and extension is 1.2m	Spring constant is 8.2N/m and extension is 3.1m	Spring constant is 0.4N/m and extension is 45cm	Spring constant is 7.2N/m and extension is 13cm
Convert Units	-	-	0.45cm = 0.45m	13cm = 0.13m
Write down the formula.	*F = k x e*	*F = k x e*	*F = k x e*	*F = k x e*
Substitute Values	F = 3 x 1.2	F = 8.2 x 3.1	F = 0.4 x 0.45	F = 7.2 x 0.13
Do the Maths	3.6	25.42	0.18	0.936
Round and add units.	3.6N	25N	0.18N	0.94N

10 Minutes on….

Forces and Elasticity 2

Calculate spring constant when…	Force is 12N and extension is 2.3m	Force is 8.2N and extension is 50cm	Force is 1.9kN and extension is 5m	Force is 55N and extension is 25cm
Convert Units	-	50cm = 0.5m	1.9kN = 1900N	25cm = 0.25m
Write down the formula.	*F = k x e*	*F = k x e*	*F = k x e*	*F = k x e*
Substitute Values	12 = k x 2.3	8.2 = k x 0.5	1900 = k x 5	55 = k x 0.25
Rearrange	k = 12 / 2.3	k = 8.2 / 0.5	k = 1900 / 5	k = 55 / 0.25
Answer	5.2173913043	16.4	380	220
Round and add units.	5.2N/m	16.4N/m	380N/m	220N/m

Calculate extension when…	Force is 18N and spring constant is 4.5N/m	Force is 22N and spring constant is 9N/m	Force is 700N and spring constant is 6.2N/m	Force is 0.1kN and spring constant is 12N/m
Convert Units	-	-	-	0.1kN = 100N
Write down the formula.	*F = k x e*	*F = k x e*	*F = k x e*	*F = k x e*
Substitute Values	18 = 4.5 x e	22 = 9 x e	700 = 6.2 x e	100 = 12 x e
Rearrange	e = 18 / 4.5	e = 22 / 9	e = 700 / 6.2	e = 100 / 12
Answer	4	2.4444444444	112.9032258065	8.3333333333
Round and add units.	4m	2.4m	113m	8.3m

10 Minutes on….

Forces and Extension RP

A method to investigate the relationship between the force applied to a spring and its extension.

1
Set up equipment as shown in the diagram.

2.
Adjust the ruler so that the zero mark is at the same height as the top of the spring.

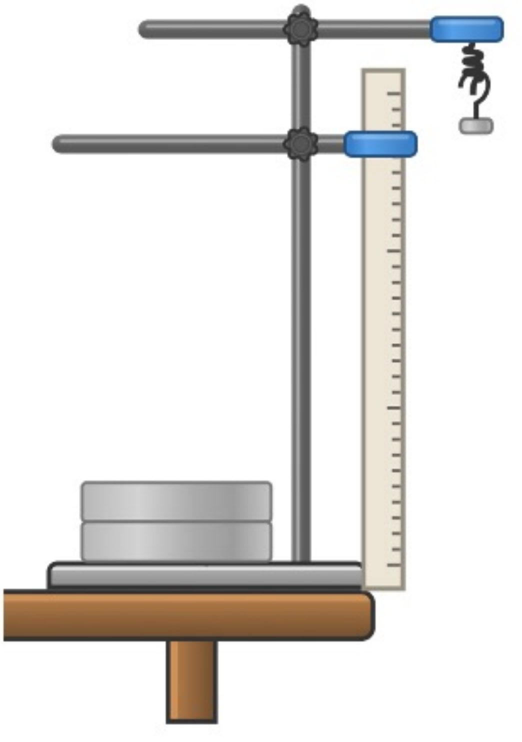
3.
Record the length of the spring when no weights are attached.

3.
Hook a 1N weight on the bottom of the spring.

4.
Record the new length of the spring.

5.
Add weights at 1N intervals recording the new length of the spring.

6.
Determine the extension of the spring when each weight is added by subtracting the original length from the recorded lengths.



Force Applied (N)	Length of Spring (cm)	Extension (cm)

10 Minutes on....

Moments, Levers and Gears

Identify what can cause an object to rotate.
A force or a system of forces can cause an object to rotate.

Key Term	Definition
Moment of a Force	Turning effect of a force

Quantity	Symbol	Unit
Moment of a Force	M	Nm
Force	F	N
Distance	d	m

Equation that links distance, force and moment of a force.

Moment = Force x Distance

What can be used to transmit the rotational effect of a force.
Simple levers and gears.

Calculate moment of a force when...	Force is 10N and distance is 10cm	Force is 1.2kN and distance is 0.8m	Force is 750N and distance is 135cm.
Convert Units	10cm = 0.1m	1.2kN = 1200N	135cm = 1.35m
Write down the formula.	$M = F \times d$	$M = F \times d$	$M = F \times d$
Substitute Values	M = 10 x 0.1	M = 1200 x 0.8	M = 750 x 1.35
Do the Maths	1	960	1012.5
Round and add units.	1Nm	960Nm	1013Nm

10 Minutes on….

Pressure in a Fluid 1

Pressure in Fluids
Liquids and gases are fluids. The pressure in fluids causes a force normal (at right angles) to any surface.

Quantity	Symbol	Unit
Pressure	*p*	Pa
Force	*F*	N
Area	*A*	m^2

Equation that links area, force and pressure.

Pressure = Force / Area

Calculate pressure when…	Force is 10N and area is $0.2m^2$	Force is 52.1N and area is $1.8m^2$	Force is 2.3kN and area is $2.8m^2$	Force is 66N and area is $0.45m^2$
Convert Units	-	-	2.3kN = 2300N	-
Write down the formula.	p = F / A	p = F / A	p = F / A	p = F / A
Substitute Values	p = 10 / 0.2	p = 52.1 / 1.8	p = 2300 / 2.8	p = 66 / 0.45
Do the Maths	50	28.9444444444	821.4285714286	146.6666666667
Round and add units.	50Pa	28.9Pa	821Pa	147Pa

10 Minutes on….

Pressure in a Fluid 2

Calculate force when…	Pressure is 250Pa and area is 3.8m^2	Pressure is 321Pa and area is 4.2m^2	Pressure is 34Pa and area is 0.38m^2	Pressure is 821Pa and area is 10m^2
Convert Units	-	-	-	-
Write down the formula.	p = F / A	p = F / A	p = F / A	p = F / A
Substitute Values	250 = F / 3.8	321 = F / 4.2	34 = F / 0.38	821 = F / 10
Rearrange	F = 250 x 3.8	F = 321 x 4.2	F = 34 x 0.38	F = 821 x 10
Answer	950	1,348.2	12.92	8210
Round and add units.	950N	1348N	13N	8210N

Calculate area when…	Pressure is 321Pa and force is 10N	Pressure is 13.1Pa and force is 9.8N	Pressure is 990Pa and force is 1.3kN	Pressure is 76.1Pa and force is 0.9N
Convert Units	-	-	1.3kN = 1300N	0.1kN = 100N
Write down the formula.	p = F / A	p = F / A	p = F / A	p = F / A
Substitute Values	321 = 10 / A	13.1 = 9.8 / A	990 = 1300 / A	76.1 = 0.9 / A
Rearrange	A = 10 / 321	A = 9.8 / 13.1	A = 1300 / 990	A = 0.9 /76.1
Answer	0.03115264798	0.7480916031	1.3131313131	0.01182654402
Round and add units.	0.0312m^2	0.75m^2	1.3m^2	0.0118m^2

10 Minutes on….

Pressure in a Fluid 3

Key Term	Definition
Upthrust	When a submerged object experiences a greater pressure on the bottom surface than on the top which creates a resultant force upwards.

Quantity	Symbol	Unit
Pressure	p	Pa
Height	h	m
Density	ρ	kg/m^3
G.F.S	g	N/kg

Equation that links density of a liquid, gravitational field strength , height of the column and pressure.

Pressure = Height of column x density of liquid x gravitational field strength

Calculate pressure when…	Height is 3m, density is 2.2kg/m³ and gravitational field strength is 10N/kg	Height is 3m, density is 2.8kg/m³ and gravitational field strength is 9.8N/kg	Height is 30cm, density is 12.9kg/m³ and gravitational field strength is 9.81N/kg	Height is 18cm, density is 8.1kg/m³ and gravitational field strength is 9.81N/kg
Convert Units	-	-	30cm = 0.3m	18cm = 0.18m
Write down the formula.	$p = h \times \rho \times g$	$p = h \times \rho \times g$	$p = h \times \rho \times g$	$p = h \times \rho \times g$
Substitute Values	p = 3 x 2.2 x 10	p = 3 x 2.8 x 9.8	p = 0.3 x 12.9 x 9.81	p = 0.18 x 8.1 x 9.81
Do the Maths	66	82.32	37.9647	14.30298
Round and add units.	66Pa	82Pa	38.0Pa	14.3Pa

10 Minutes on….

Pressure in a Fluid 4

For each of the questions below gravitational field strength is 9.81N/kg

Calculate height when…	Pressure is 250Pa and density is 2kg/m^3	Pressure is 321Pa and density is 2.2kg/m^3	Pressure is 3.4kPa and density is 7kg/m^3	Pressure is 821Pa and density is 8.2kg/m^3
Convert Units	-	-	3.4kPa = 3400Pa	-
Write down the formula.	p = h x ρ x g	p = h x ρ x g	p = h x ρ x g	p = h x ρ x g
Substitute Values	250 = h x 2 x 9.81	321 = h x 2.2 x 9.81	3400 = h x 7 x 9.81	821 = h x 8.2 x 9.81
Rearrange	250 = 19.62 h h = 250 / 19.62	321 = 21.582 h h = 321 / 21.582	3400 = 68.67 h h = 3400 / 68.67	821 = 80.4422 h h = 821 / 80.442
Answer	12.7420998981	14.8735056992	49.5121596039	10.2061112354
Round and add units.	13m	14.9m	49.5m	10.2m

Calculate density when…	Pressure is 321Pa and height is 1.2m	Pressure is 13.1Pa and height is 35cm	Pressure is 990Pa and height is 92cm	Pressure is 76.1Pa and height is 3.2m
Convert Units	-	35cm = 0.35m	92cm = 0.92	-
Write down the formula.	p = h x ρ x g	p = h x ρ x g	p = h x ρ x g	p = h x ρ x g
Substitute Values	321 = 1.2 x ρ x 9.81	13.1 = 0.35 x ρ x 9.81	990 = 0.92 x ρ x 9.81	76.1 = 3.2 x ρ x 9.81
Rearrange	321 = 11.772 ρ ρ = 321/11.772	13.1 = 3.4335ρ ρ = 13.1/3.4335	990 = 9.0252 ρ ρ = 990/9.0252	76.1 = 31.392 ρ ρ = 76.1/31.392
Answer	27.2680937819	3.8153487695	109.692859992	2.4241845056
Round and add units.	27.3kg/m^3	3.82kg/m^3	110kg/m^3	2.42kg/m^3

10 Minutes on….

Atmospheric Pressure

Key Term	Definition
Atmosphere	A thin later (relative to the size of the Earth) of air round the Earth.

Atmospheric Pressure

Atmospheric occurs due to the particles in the air colliding with surfaces. Each of these collisions is very small, however there are lots of these collisions every second.

Why atmospheric pressure varies with height above a surface.

Air molecules colliding with a surface create atmospheric pressure. The number of air molecules (and so the weight of air) above a surface decreases as the height of the surface above ground level increases. So as height increases there is always less air above a surface than there is at a lower height. So atmospheric pressure decreases with an increase in height.

10 Minutes on....

Distance and Displacement

Key Term	Definition
Scalar Quantities	A quantity with magnitude (size) only.
Vector Quantities	A quantity with both magnitude (size) and direction.
Distance	How far an object travels. It is a scalar quantity.
Displacement	The distance an object moves from its start point. It is a vector quantity.

Determining the displacement of an object.

Displacement includes both the distance an object moves, measured in a straight line from the start point to the finish point and the direction of that straight line.

10 Minutes on....

Speed 1

What can affect the speed at which a person runs/cycles
The speed someone walks runs or cycles at can depend on their age, the terrain, their fitness and the distance travelled.

Quantity	Symbol	Unit
Distance	*s*	m
Speed	*v*	m/s
Time	*t*	s

Example	Typical Value of Speed
Walking	1.5m/s
Running	3 m/s
Cycling	6 m/s
Sound in Air	330 m/s

Equation that links distance travelled, speed and time.

Distance Travelled = Speed x Time

Calculate distance travelled when...	Speed is 3m/s and time is 3s	Speed is 0.8m/s and time is 15s	Speed is 2.2m/s and time is 1min	Speed is 3m/s and time is 2mins
Convert Units	-	-	1min = 60s	2min = 120s
Write down the formula.	s = v x t	s = v x t	s = v x t	s = v x t
Substitute Values	s = 3 x 3	s = 0.8 x 15	s = 2.2 x 60	s = 3 x 120
Do the Maths	9	12	132	360
Round and add units.	9m	12m	132m	360m

10 Minutes on....

Speed 2

Calculate speed when...	The distance travelled in 10s is 25m	The distance travelled in 22s is 78m	The distance travelled in 2s is 32cm	The distance travelled in 10mins is 2km
Convert Units	-		32cm = 0.32m	10mins = 600s 2km = 2000m
Write down the formula.	s = v x t	s = v x t	s = v x t	s = v x t
Substitute Values	25 = v x 10	78 = v x 22	0.32 = v x 2	2000 = v x 600
Rearrange	v = 25 / 10	v = 78 / 22	v = 0.32 / 2	v = 2000 / 600
Answer	2.5	3.5454545455	0.16	33.3333333333
Round and add units.	2.5m/s	3.5m/s	0.16m/s	33m/s

Calculate time when...	Speed is 10m/s and the distance travelled is 2m	Speed is 1.5m/s and the distance travelled is 45cm	Speed is 4.2m/s and the distance travelled is 10m	Speed is 330m/s and the distance travelled is 33km
Convert Units	-	45cm = 0.45m	-	33km = 33,000m
Write down the formula.	s = v x t	s = v x t	s = v x t	s = v x t
Substitute Values	2 = 10 x t	0.45 = 1.5 x t	10 = 4.2 x t	33000 = 330 x t
Rearrange	t = 2/10	t = 0.45/1.5	t = 10/4.2	t = 33000/330
Answer	0.2	0.3	2.380952381	100
Round and add units.	0.2s	0.3s	2.4s	100s

10 Minutes on....

Velocity

Key Term	Definition
Scalar Quantities	A quantity with magnitude (size) only.
Vector Quantities	A quantity with both magnitude (size) and direction.
Velocity	Speed in a given direction.
Acceleration	The rate of change of velocity.
Speed	The rate at which something moves. It is a scalar quantity.

Objects travelling in a circle

When an object is travelling in a circle its direction is always changing. This means that velocity is constantly changing. Acceleration is the rate of change of velocity. Therefore, if an object changes direction while travelling at a constant speed, then velocity changes and so acceleration can occur.

10 Minutes on....

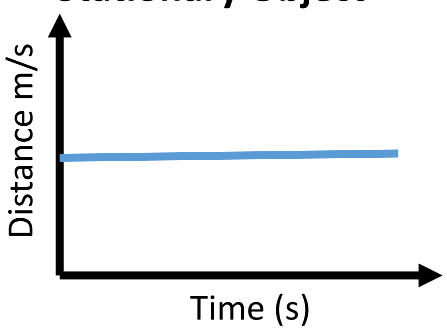
Distance-Time Relationship

Key Term	Definition
Distance-Time Graph	A way of representing the distance travelled by an object moving along a straight line.

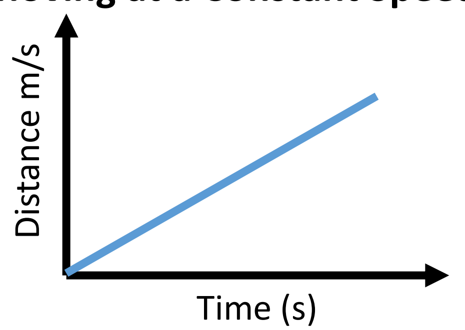
Calculating the speed of an object from a distance-time graph.
To determine the speed of an object using a distance time graph you would determine the gradient of the line. To do this find the difference in distance (y axis) and divide this by the difference in time (x-axis)

Distance-Time graph sketches.

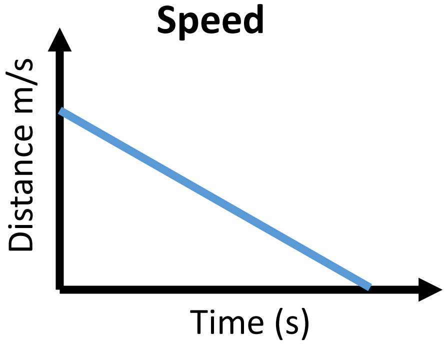
Stationary Object



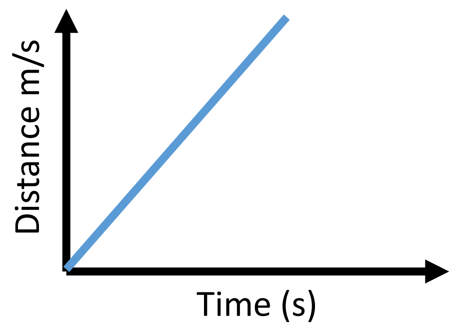
Moving at a Constant Speed



Returning to Start at a Constant Speed



Moving at a Faster Constant Speed



10 Minutes on....

Acceleration 1

Key Term	Definition
Decelerating	An object slowing down.

Quantity	Symbol	Unit
Acceleration	*a*	m/s^2
Change in Velocity	*Δv*	m/s
Time Taken	*t*	s

Equation that links acceleration, change in velocity and time taken

Acceleration = Change in Velocity / Time Taken

Calculate accelerat-ion when...	Change in velocity is 12m/s over 3s	Change in velocity is 0.5m/s over 42ms	Change in velocity is 18m/s over 2.8s	Change in velocity is 17.1m/s over 1.2s
Convert Units	-	42ms = 0.042s	-	-
Write down the formula.	a = *Δv* / *t*	a = *Δv* / *t*	a = *Δv* / *t*	a = *Δv* / *t*
Substitute Values	a = 12 / 3	a = 0.5/ 0.042	a = 18 / 2.8	a = 17.1 / 1.2
Do the Maths	4	11.9047619048	6.4285714286	14.25
Round and add units.	$4m/s^2$	$12m/s^2$	$6.4m/s^2$	$4m/s^2$

10 Minutes on....

Acceleration 2

Key Term	Definition
Terminal Velocity	The maximum speed of an object that is reached when the forces on the moving object are balanced.

Quantity	Symbol	Unit
Final Velocity	v	m/s
Initial Velocity	u	m/s
Acceleration	a	m/s^2
Distance	s	m

Equation that links acceleration, distance, final velocity and intimal velocity.

Final velocity^2 – initial velocity^2 = 2 x acceleration x distance

Calculate acceleration when...	The initial velocity is 2m/s and the final velocity after 20m is 5m/s	The initial velocity is 7m/s and the final velocity after 10m is 5m/s	The initial velocity is 1m/s and the final velocity after 22m is 4m/s	The initial velocity is 5m/s and the final velocity after 1km is 15m/s
Convert Units	-	-	-	1km = 1000m
Write down the formula.	$v^2 - u^2 = 2 \times a \times s$	$v^2 - u^2 = 2 \times a \times s$	$v^2 - u^2 = 2 \times a \times s$	$v^2 - u^2 = 2 \times a \times s$
Substitute Values	$5^2 - 2^2 = 2 \times a\ 20$	$5^2 - 7^2 = 2 \times a\ 10$	$4^2 - 1^2 = 2 \times a\ 22$	$15^2 - 5^2 = 2 \times a\ 1000$
Rearrange	25-4 = 40 a a = 21 / 40	25-49 = 20 a a = -24 / 20	16-1 = 44 a a = 15/ 44	225-25 = 2000 a a = 200/ 2000
Answer	0.525	-1.2	0.3409090909	0.1m/s
Round and add units.	$0.53 m/s^2$	$-1.2 m/s^2$	$0.34 m/s^2$	$0.1 m/s^2$

10 Minutes on….

Newtons 1st Law

Key Term	Definition
Newtons First Law	A law of motion that states an object remains in the same state of motion unless a resultant force acts on it.
Resultant Force	The single force that could replace all the forces acting on an object, found by adding these together.
Inertia (HT)	The tendency of objects to continue in their state of rest or of uniform motion.

Applying Newtons First Law to predict what will happen to the motion of an object when the resultant force is 0:

When stationary

If the resultant force is 0 and the object is stationary, then the object will continue to remain stationary.

When moving

If the resultant force is 0 and the object is moving, then the object will continue to move at the same speed and direction. Therefore, the object will continue to move with the same velocity.

10 Minutes on....

Newtons 2nd Law 1

Key Term	Definition
Newtons Second Law	A law of motion that states the acceleration of an object is proportional to the resultant force acting on the object and inversely proportional to the mass of the object.

Quantity	Symbol	Unit
Resultant Force	*W*	N
Mass	*m*	kg
Acceleration	*a*	m/s^2

Equation that links acceleration, mass and resultant force

Resultant Force = Mass x acceleration

Calculate resultant force when...	Mass is 37kg and acceleration is $2.2m/s^2$	Mass is 44kg and acceleration is $3.8m/s^2$	Mass is 751g and acceleration is $2.2m/s^2$	Mass is 5g and acceleration is $25m/s^2$
Convert Units	-	-	751g = 0.751kg	5g = 0.005kg
Write down the formula.	F = m x a	F = m x a	F = m x a	F = m x a
Substitute Values	F = 37 x 2.2	F = 44 x 3.8	F = 0.751 x 2.2	F = 0.005 x 25
Do the Maths	81.4	167.2	1.6522	0.125
Round and add units.	81.4N	167N	1.65N	0.13N

10 Minutes on….

Newtons 2nd Law 2

Calculate mass when…	The force is 25N and the acceleration is 2.2m/s²	The force is 18N and the acceleration is 3.8m/s²	The force is 1.8kN and the acceleration is 12m/s²	The force is 42.1N and the acceleration is 10.8m/s²
Convert Units	-		1.8kN = 1800N	-
Write down the formula.	F = m x a	F = m x a	F = m x a	F = m x a
Substitute Values	25 = m x 2.2	18 = m x 3.8	1800 = m x 12	42.1 = m x 10.8
Rearrange	m = 25 / 2.2	m = 18 / 3.8	m = 1800 / 12	m = 42.1 / 10.8
Answer	11.3636363636	4.7368421053	150	3.8981481481
Round and add units.	11kg	4.7kg	150kg	3.90kg

Calculate accelera-tion when…	Mass is 82.3kg and force is 100N	Mass is 7kg and force is 12N	Mass is 82g and force is 14N	Mass is 351g and force is 1.71kN
Convert Units	-		82g = 0.082kg	351g = 0.351kg 1.71kN = 1710N
Write down the formula.	F = m x a	F = m x a	F = m x a	F = m x a
Substitute Values	100 = 82.3 x a	12 = 7 x a	14 = 0.082 x a	1710 = 0.351 x a
Rearrange	a = 100 / 82.3	a = 12 / 7	a = 14 / 0.082	a = 1710/ 0.351
Answer	1.2150668287	1.7142857143	170.7317073171	4,871.794871795
Round and add units.	1.22m/s²	1.7m/s²	171m/s²	4871m/s²

10 Minutes on....

Forces and Acceleration RP 1

A method to investigate the effect of varying the force on the acceleration of an object.

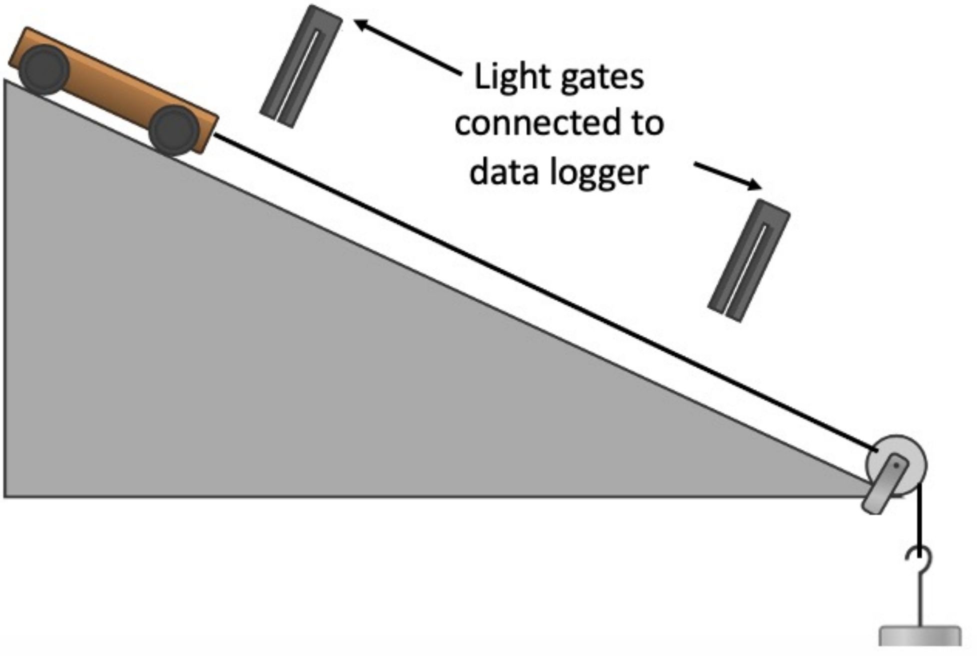
1
Set up equipment as shown in the diagram and connect 2 light gates to the data logger.

2
Add a 1N weight to the pulley and release the trolley.

3
Light gates A and B will determine the velocity at each point and use this to calculate the acceleration between the 2 points.

4
Record the acceleration when 1N is added.

5
Repeat by adding more weights at 1N intervals.



10 Minutes on….

Forces and Acceleration RP 2

A method to investigate the effect of varying the mass of an object on its acceleration.

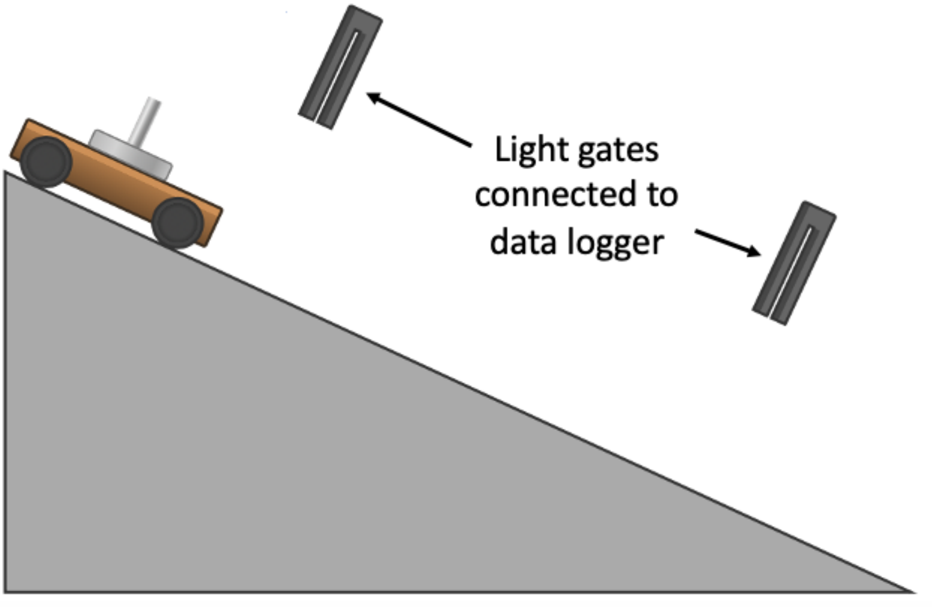
1
Set up equipment as shown in the diagram and connect 2 light gates to the data logger.

2
Add a 1N weight to the trolley and release it.

3
Light gates A and B will determine the velocity at each point and use this to calculate the acceleration between the 2 points.

4
Record the acceleration when 1N is added.

5
Repeat by adding more weights to the trolley at 1N intervals.



10 Minutes on….

Newtons 3rd Law

Key Term	Definition
Newtons Third Law	A law of motion that states that when ever two objects interact, the forces they exert on each other are equal and opposite.

Interacting Objects	Forces
An object on a table.	The object pushes down on the table while the table pushes back up on the object with an equal force in the opposite direction.
A car tyre on a road.	The tyre pushes the road backwards while the road pushes the tyre forwards with an equal force in the opposite direction.
The moon orbiting the earth.	The Earth pulls the moon and the moon pulls the Earth with an equal force in the opposite direction.
A hammer hitting a nail.	A hammer pushes down on a nail while the nail pushes back up on the hammer with an equal force in the opposite direction.
A boat propeller in water.	The boat propeller pushes water backwards while the water pushes the propeller forwards with an equal force.
A child on pogo stick.	The child's weight pushes down on the pogo stick while the pogo stick pushes up on the child with an equal force.

10 Minutes on….

Stopping Distance

Key Term	Definition
Stopping Distance	The sum of the distance a vehicle travels during the drivers thinking distance and braking distance.
Thinking Distance	The distance a vehicle travels during the driver’s reaction time.
Braking Distance	The distance a vehicle travels under the braking force.
Reaction Time	The length of time taken for a person or system to respond to a given stimulus or event. A typical reaction time is between 0.2 and 0.9s.

The relationship between speed of a vehicle and its braking distance.

For a given braking force the greater the speed of the vehicle, the greater the stopping distance.

10 Minutes on....

Reaction Time

Key Term	Definition
Thinking Distance	The distance a vehicle travels during the driver's reaction time.
Reaction Time	The length of time taken for a person or system to respond to a given stimulus or event. A typical reaction time is between 0.2 and 0.9s.

Drivers Reaction Time

A driver's reaction time can be affected by tiredness, drugs and alcohol. Distractions may also affect a driver's ability to react.

Method to Find Reaction Time	Computer	Ruler Drop
Description	Sit in front of a tablet computer. When the tablet makes a sound, touch the tablet screen as quickly as possible. Record the reaction time shown on the tablet. Repeat the steps above another two times.	Hold a metre rule so the bottom of the rule is level with the top of the other student's thumb. Let go of the metre rule. The other student catches the metre rule. Record the position of the student's thumb on the metre rule. Convert the position on the metre rule to a reaction time using a conversion table. Repeat the above steps another two times.
Advantages and Disadvantages	The computer timer has a higher resolution. Easy to press a button	The ruler could slip through the hand causing inaccurate readings.

10 Minutes on....

Factors Affecting Braking Distance 1

Factor That Affects Braking Distance	Explanation
Wet Road	When the roads are wet the friction between the road and the tyres is reduced. This means that when the brakes are applied the braking distance will be further. There is also a risk that the driver may lose control of the vehicle.
Icy Conditions on the Road	When the roads are icy the friction between the road and the tyres is also reduced. This means that when the brakes are applied the braking distance will be further. There is also a risk that the driver may lose control of the vehicle.
Vehicles Brakes	If vehicle brakes are in a poor condition, then the friction between the brakes and the tyres will be less. This will mean that the vehicle will decelerate at a slower rate and so the vehicle will travel further.
Vehicles Tyres	When tyres become worn the friction between the road and the tyres is reduced. This means that when the brakes are applied the braking distance will be further.
More Mass In the Vehicle	Vehicles that have more mass will have a larger breaking distance. This is because the braking friction has to work for a greater distance to remove the larger amount of kinetic energy.

How the distance required for road vehicles to stop in an emergency varies depending on speed.
When braking in an emergency the faster the vehicle is travelled the bigger the braking distance will be.

10 Minutes on….

Factors Affecting Braking Distance 2

How brakes work.

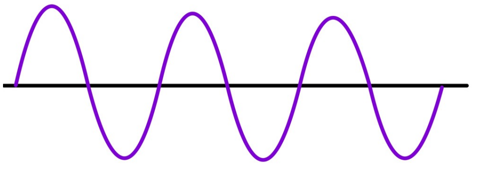
When a force is applied to the brakes of a vehicle, work done by the friction force between the brakes and the wheel reduces the kinetic energy of the vehicle and the temperature of the brakes increases. The greater the speed of a vehicle the greater the braking force needed to stop the vehicle in a certain distance.

The dangers caused by large decelerations.

The greater the braking force the greater the deceleration of the vehicle. Large decelerations may lead to brakes overheating and/or loss of control.

10 Minutes on....

Transverse and Longitudinal Waves

Type of Wave	Diagram	Example
Transverse		Ripples on the surface of water.
Longitudinal		Sound Waves

Difference between transverse and longitudinal waves.
In longitudinal waves the vibrations are parallel to the direction of the waves travel, while in transverse waves the vibrations are at right angles to the direction of wave travel.

Longitudinal waves shows areas of compression and rarefaction while transverse waves do not.

Finally longitudinal waves are unable to travel through a vacuum as they need a medium to travel through. Transverse waves do not require a medium to travel and so therefore can travel through a vacuum.

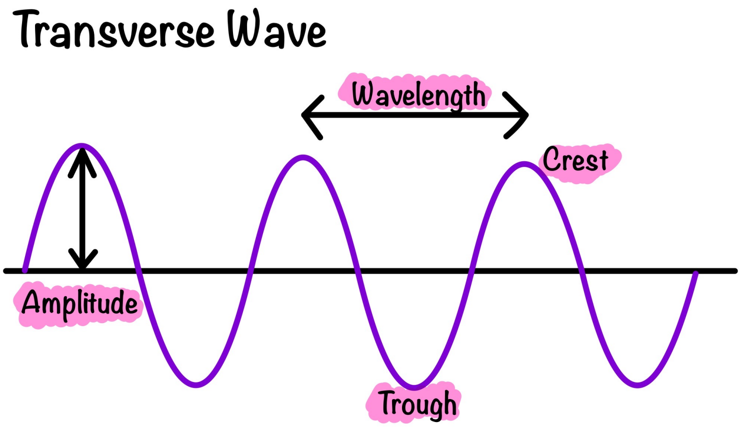
Proveing that when we see a water wave it is the wave moving and not the water itself.
To prove that it is the wave moving through water and not the water moving itself you could place a floating object such as a rubber duck on the surface of the water. You would observe the duck moving up and down as the waves pass but staying in the same place if the water doesn't move.

10 Minutes on....

Properties of Waves 1

Key Term	Definition
Amplitude	The maximum displacement of a point on a wave away from its undisturbed position.
Wavelength	The distance from a point on one wave to the equivalent point on the adjacent wave.
Frequency	The number of waves passing a point each second.
Wave Speed	The speed at which the energy is transferred through a medium.

Diagram of a transverse wave.



Quantity	Symbol	Unit
Period	T	s
Frequency	f	Hz
Wave Speed	v	m/s
Wavelength	λ	m

Equation that links frequency and period.

Period = 1 / Frequency

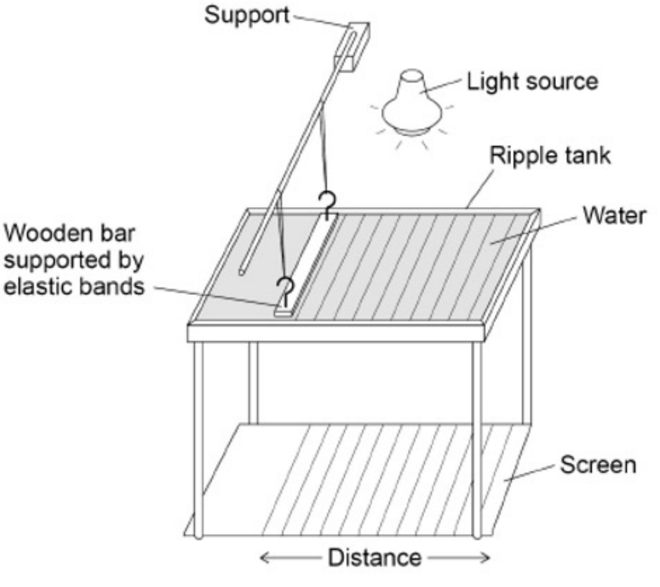
Equation that links frequency, wavelength and waves peed.

Wave Speed = Frequency x Wavelength

10 Minutes on….

Waves RP 1

A method to measure the frequency, wavelength and speed of waves in a ripple tank



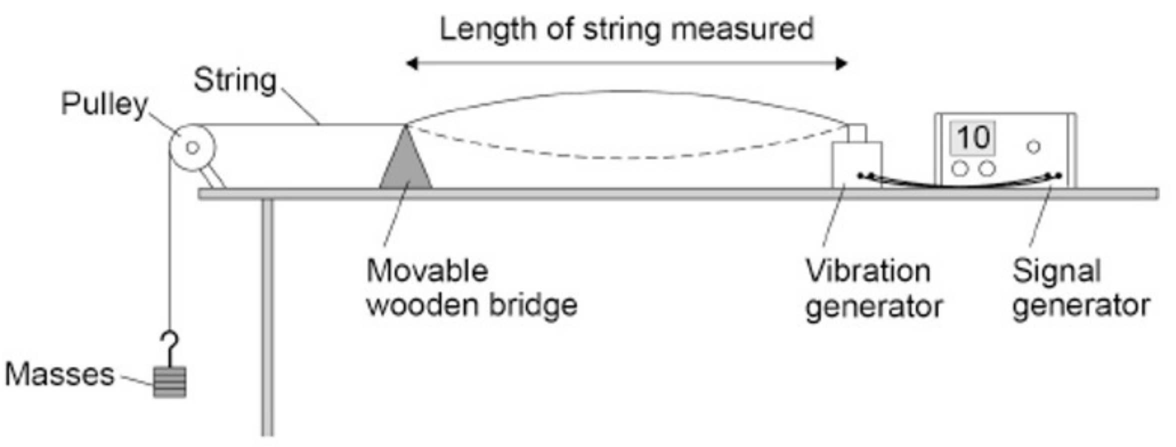
Set up equipment as shown in the diagram.

Frequency	Use a stopwatch and count the number of waves passing a point in a fixed time period. Then divide the time by the number of waves to determine the time for one wave. To then determine frequency use the equation: $f = 1/T$
Wavelength	Use a camera to freeze the image and use a metre rule to measure the distance between two wavefronts. Count the number of waves between the wavefronts. To then find the wavelength divide the distance by the number of waves.
Velocity	Determine a mean value of frequency and a mean value of wavelength. Use these in the equation wave speed = frequency x wavelength. OR Measure the time it takes one wavefront to travel the length of the screen. Measure the length of the screen and use the equation: speed = distance / time to determine the speed.

10 Minutes on....

Waves RP 2

A method to measure the frequency, wavelength and speed of waves in a solid.



1. Set up equipment as shown in the diagram.

2. Switch on the signal generator and vibration generator so the string vibrates up and down and move the wooden bridge until a clear wave pattern is formed between the wooden bridge and the vibration generator.

Frequency	Record the frequency of the wave from the signal generator.
Wavelength	Use a meter ruler to measure the distance between the wooden bridge and the vibration generator. Count the number of loops in the wave pattern between the wooden bridge and the signal generator. To determine the wavelength, divide the distance measured by the number of waves counted.
Velocity	Determine a mean value of frequency and a mean value of wavelength. Use these in the equation wave speed = frequency x wavelength.

10 Minutes on....

Properties of Waves 2

Calculate the period when...	The frequency is 12Hz.	The frequency is 225Hz	The frequency is 2kHz	The frequency is 3.1kHz
Convert Units	-	-	2kHz = 2000Hz	3.1kHz = 3100Hz
Write down the formula.	T = 1 / f	T = 1 / f	T = 1 / f	T = 1 / f
Substitute Values	T = 1/12	T = 1/225	T = 1/2000	T = 1/3100
Do the Maths	0.08333333333	0.004444444444	0.0005	0.0003225806452
Round and add units.	T = 0.083s	T = 0.00444s	T = 0.0005s	T = 0.00032s

Calculate the frequency when...	The period is 2s	The period is 0.8s	The period is 55ms	The period is 41ms
Convert Units	-	-	55ms = 0.055s	41ms = 0.041s
Write down the formula.	T = 1 / f	T = 1 / f	T = 1 / f	T = 1 / f
Substitute Values	2 = 1 / f	0.8 = 1 / f	0.055 = 1 / f	0.041 = 1 / f
Rearrange	f = 1/2	f = 1/0.8	f = 1/0.055	f = 1/0.041
Do the Maths	0.5	1.25	18.1818181818	24.3902439024
Round and add units.	f = 0.5Hz	f = 1.3Hz	f = 18Hz	f = 24Hz

10 Minutes on....

Properties of Waves 3

Calculate the wave speed when...	The frequency is 12Hz and wavelength is 0.5m	The frequency is 17Hz and wavelength is 0.2m	The frequency is 35Hz and wavelength is 15cm	The frequency is 1.2kHz and wavelength is 2mm
Convert Units	-	-	15cm = 0.15	1.2kHz = 1200Hz 2mm = 0.002
Write down the formula.	v = f x λ	v = f x λ	v = f x λ	v = f x λ
Substitute Values	v = 12 x 0.5	v = 17 x 0.2	v = 35 x 0.15	v = 1200 x 0.002
Do the Maths	6	3.4	5.25	2.4
Round and add units.	v = 6m/s	v = 3.4m/s	v = 5.3m/s	v = 2.4m/s

Calculate the wavelength when...	Wave speed is 5m/s and frequency is 100Hz	Wave speed is 12m/s and frequency is 500Hz	Wave speed is 5m/s and frequency is 2.8kHz	Wave speed is 75m/s and frequency is 3.1kHz
Convert Units	-	-	2.8kHz = 2800Hz	3.1kHz = 3100Hz
Write down the formula.	v = f x λ	v = f x λ	v = f x λ	v = f x λ
Substitute Values	5 = 100 x λ	12 = 500 x λ	5 = 2800 x λ	75 = 3100 x λ
Rearrange	λ = 5/100	λ = 12/500	λ = 5/2800	λ = 75/3100
Do the Maths	0.05	0.024	0.001785714286	0.02419354839
Round and add units.	λ = 0.05m	λ = 0.024m	λ = 0.0018m	λ = 0.024m

10 Minutes on....

Reflection of Waves

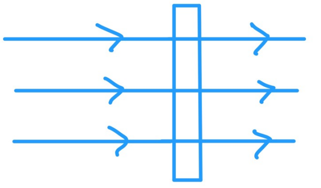
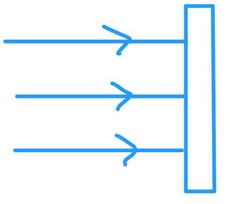
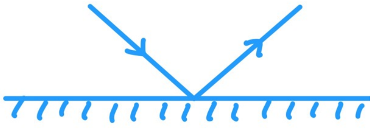
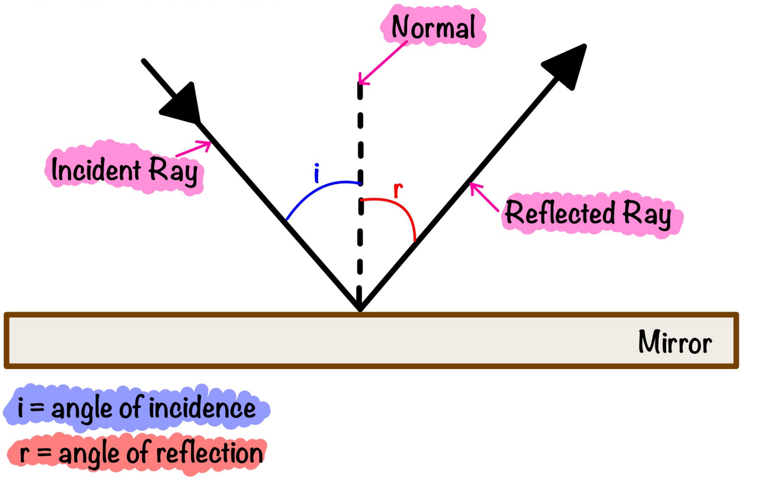
Key Term	Definition	Diagram
Transmit	When a wave passes through a material.	
Absorb	When a wave is taken into a material.	
Reflect	When a wave changes direction at a boundary and remains in the incident medium	

Diagram to illustrate the reflection of a wave at a surface.

Law of Reflection



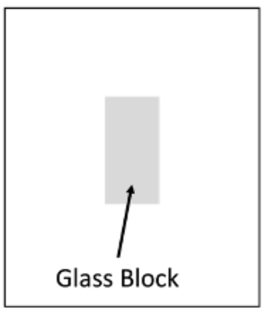
The angle of incidence = The angle of reflection

10 Minutes on….

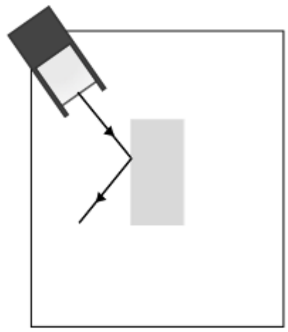
Reflection of Light RP

A method to investigate the reflection of light by different types of materials.

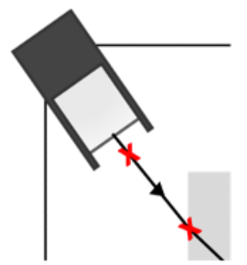
1.
Place a block on a piece of paper and draw around it.



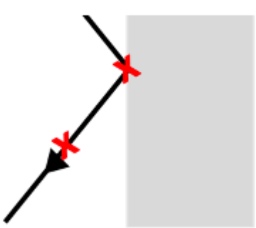
2.
Shine a ray of light through the block.



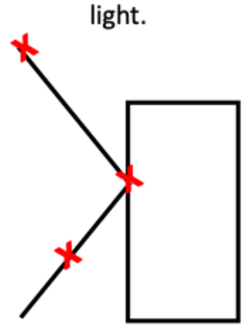
3.
Mark the ray of light close to the point it leaves the ray box and where it hits the block.



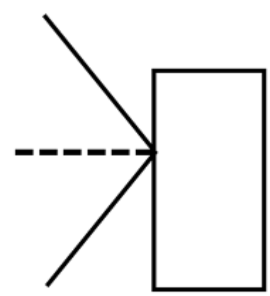
4.
Mark along the reflected ray of light.



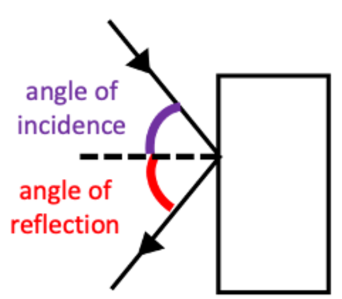
5.
Join the points together to show the path of the light.



6.
Draw the normal lines at 90° to the surface.



7
Use a protractor to measure the angle of incidence and angle of reflection.



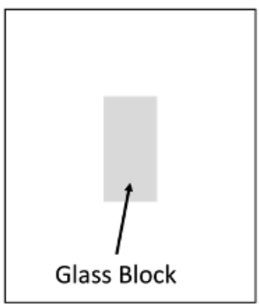
8
Shine the light from the ray box at different angles by increasing the angle of incidence at 10° intervals.

10 Minutes on....

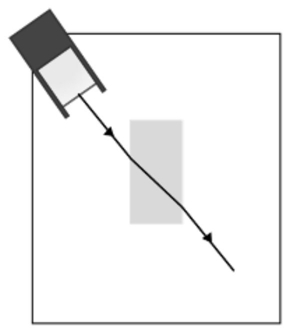
Refraction of Light RP

A method to investigate the refraction of light by different types of materials.

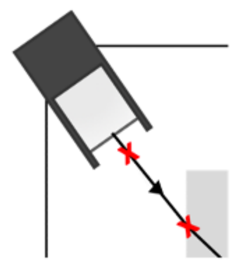
1.
Place a block on a piece of paper and draw around it.



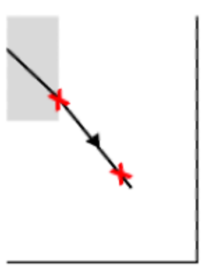
2.
Shine a ray of light through the block.



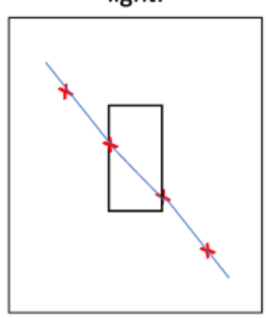
3.
Mark the ray of light close to the point it leaves the ray box and where it enters the block.



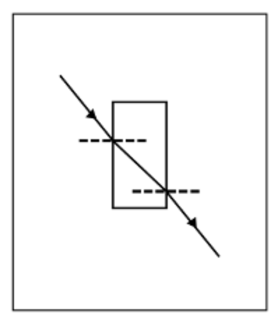
4.
Mark the ray of light at the point it leaves the block and further along this ray of light.



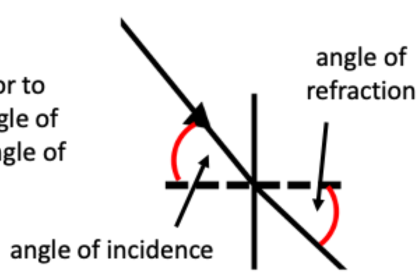
5.
Join the points together to show the path of the light.



6.
Draw the normal lines at 90° to the surface.



7
Use a protractor to measure the angle of incidence and angle of refraction.



8
Shine the light from the ray box at different angles by increasing the angle of incidence at 10° intervals.

10 Minutes on....

Types of Electromagnetic Waves

Key Term	Definition
Electromagnetic Waves	Transverse waves that transfer energy from the source to the waves to an absorber.

Grouping waves in the electromagnetic spectrum.

The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. Going from long to short wavelength (or from low to high frequency) the groups are: radio, microwave, infrared, visible light (red to violet), ultraviolet, X-rays and gamma rays.

Diagram to model the electromagnetic spectrum.

Long Wavelength → Short Wavelength

Radio waves	Microwaves	Infrared	Visible Light	Ultraviolet	X-Rays	Gamma Rays

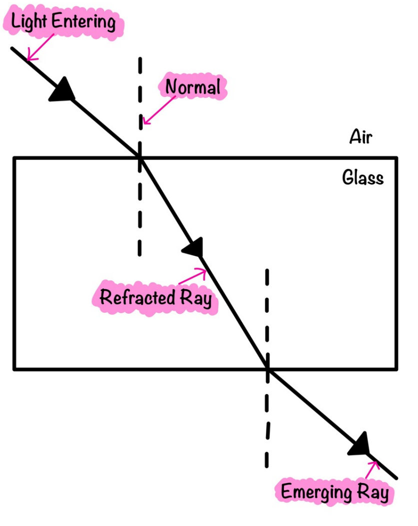
Low Frequency → High Frequency

10 Minutes on….

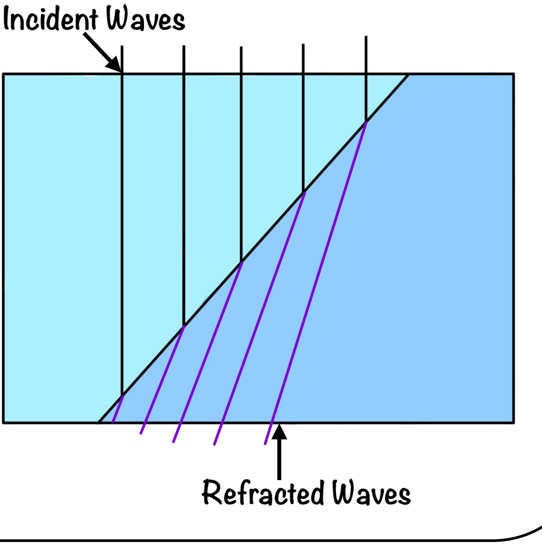
Properties of EM Waves 1

Key Term	Definition
Transmit	When a wave passes through a material.
Absorb	When a wave is taken into a material.
Refract	The change of direction of a wave when it travels from one medium to another.

Diagram to model the refraction of a wave at the boundary between two different medias.
When light enters glass, it slows down and so changes direction. It bends towards the normal. When light leaves the glass and enters air it speeds up and so bends away from the normal.



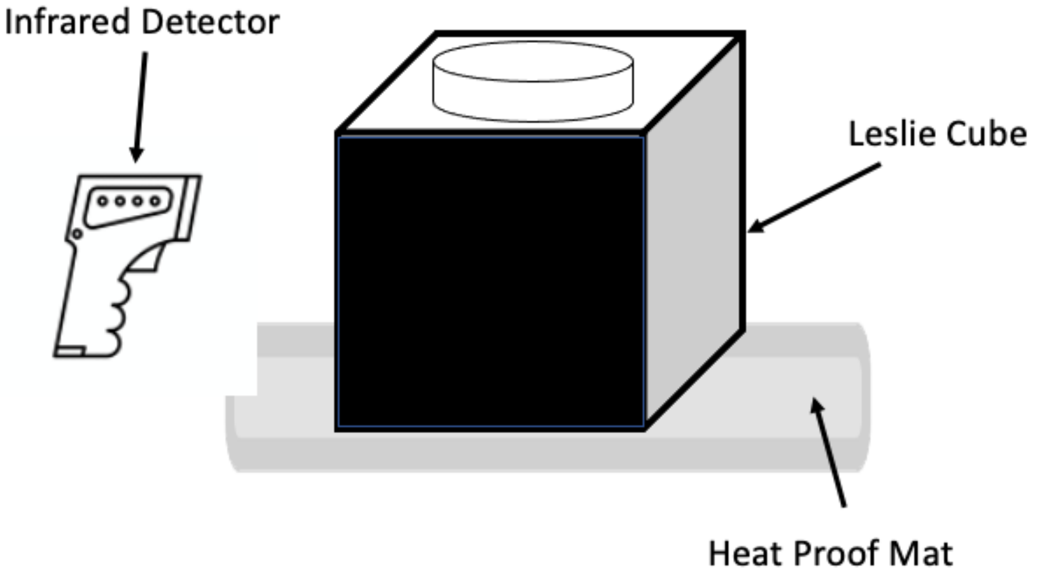
Wave front diagram to explain refraction.
When a wave crosses a boundary at a non-zero angle to the boundary each wave front experiences a change in speed and direction. In this diagram the wave has slowed down and so the refracted waves are closer together and at a smaller angle to the boundary than the incident wavefronts.



10 Minutes on….

Infrared Radiation RP

A method to investigate the amount of infrared radiation radiated by different surfaces.



1
Place the Leslie Cube on a heat proof mat.

↓

2
Fill the Leslie Cube with very hot water and replace the lid.

↓

3
Use an infrared detector to record the amount of radiation from each surface. The detector should be the same distance from each surface.

↓

4
Construct bar chart to display the results.

10 Minutes on….

Properties of EM Waves 2

Key Term	Definition
Radiation Dose	It is a measure of the risk of harm resulting from an exposure of the body to radiation.

How radio waves can induce oscillations in an electrical circuit.

Radiowaves can be produced by oscillations in electrical circuits. When radio waves are absorbed, they may create an alternating current with the same frequency as the radio wave itself, this means that radio waves can induce oscillations in an electrical circuit.

How gamma rays originate.

Changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range. Gamma rays originate from changes in the nucleus of an atom.

The harm EM waves can cause.

Ultraviolet waves can cause skin to age prematurely and increase the risk of skin cancer. X-rays and gamma rays are ionising and can cause the mutation of genes and can cause cancer.

Converting sieverts into millisievert.

Sieverts are the unit for radiation dose. 1000 millisieverts is equal to 1 sievert. To convert sieverts into millisieverts multiply by 1000.

10 Minutes on….

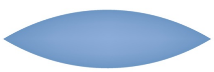
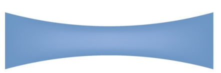
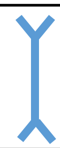
Uses of EM Waves

Electromagnetic Wave	**Use**
Radio Wave	Television and Radio
Microwaves	Satellite Communication, Cooking Food
Infrared	Electrical Heaters, Cooking Food, Infrared Cameras
Visible Light	Fibre Optic Communications
Ultraviolet	Energy Efficient Lamps, Sun Tanning
X-Rays and Gamma Rays	Medical Imaging and Treatments

10 Minutes on....

Lenses 1

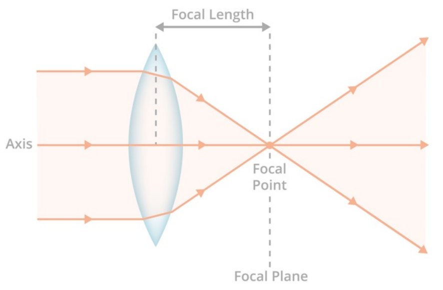
Key Term	Definition
Real Image	An image that is formed where the rays of light are focused that can be projected onto a screen.
Virtual Image	An image that appears to come from behind the lens.
Focal Length	The distance from the lens to the principal focus.

Lens	Diagram	Symbol	Type of Image Produced
Convex			Real of Virtual
Concave			Virtual

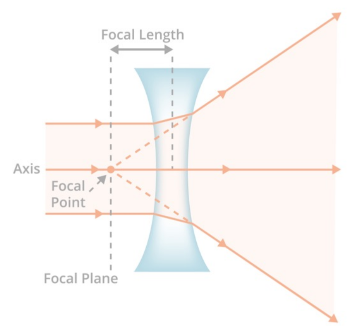
Similarities and differences between convex and concave lenses.

A convex lens is thicker in the middle than it is at the edges. Parallel light rays that enter the lens converge. They come together at a point called the principal focus. A concave lens is thinner in the middle than it is at the edges. This causes parallel rays to diverge. They separate but appear to come from a principle focus on the other side of the lens.

Convex Lens



Concave Lens



10 Minutes on....

Lenses 2

Key Term	Definition
Magnification	When an object is made that is larger or smaller than its actual size. It is a ratio and so has no units.

Quantity	Unit
Magnification	-
Image Height	mm or cm
Object Height	mm or cm

Equation that links image height, object height and magnification.

Magnification = Image Height / Object Height

Calculate Magnificat-ion when...	Image height is 12mm and object height is 2mm	Image height is 2cm and object height is 5mm	Image height is 4.5cm and object height is 12mm	Image height is 7cm and object height is 0.1mm
Convert Units	-	2cm = 20mm	4.5cm = 45mm	7cm = 70mm
Write down the formula.	Mag = Image Height/Object Height	Mag = Image Height/Object Height	Mag = Image Height/Object Height	Mag = Image Height/Object Height
Substitute Values	Mag = 12 /2	Mag = 20 /5	Mag = 45 /12	Mag = 70 /0.1
Do the Maths	6	4	3.75	700
Round and add units.	6	4	3.8	700

10 Minutes on....

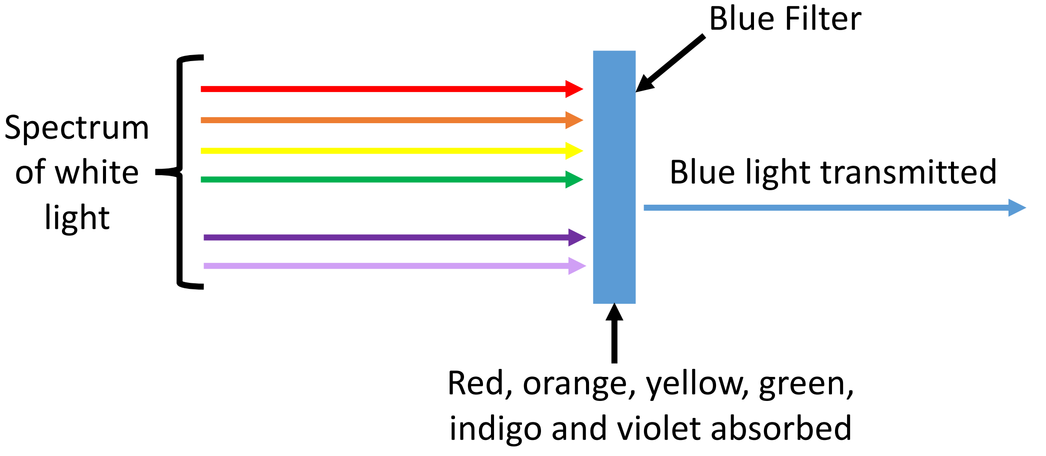
Visible Light

Key Term	Definition
Specular Reflection	Reflection from a smooth surface.
Diffuse Reflection	Reflection from a rough surface.

How colour filters work.

Colour filters work by absorbing certain wavelengths (and colour) and transmitting other wavelengths (and colour).

A diagram to model how colour filters work



Explain why an opaque object has a particular colour.
The colour of an opaque object is determined by which wavelengths of light are more strongly reflected. Wavelengths that are not reflected are absorbed. If all wavelengths are reflected equally the object appears white. If all wavelengths are absorbed the objects appears black.

10 Minutes on....

Emission and Absorption of IR

Key Term	Definition
Perfect Black Body	An object that absorbs all of the radiation incident on it. It does not reflect or transmit any radiation. They are the best possible emitter.
Bodies	Objects

The relationship between the temperature of an object and the amount of infrared radiation it radiates in a given time.

All bodies, no matter what temperature, emit and absorb infrared radiation. The hotter the body, the more infrared radiation it radiates in a given time. The intensity and wavelength distribution of any emission depends on the temperature of the body.

10 Minutes on….

Perfect Black Bodies

Scenario	Explanation in Terms of Infrared Radiation
A body is at a constant temperature.	The body is absorbing radiation at the same rate at which is it emitting radiation.
The temperature of a body is increasing	The body absorbs radiation faster than it emits radiation.

10 Minutes on....

Poles Of A Magnet

Key Term	Definition
Magnet Poles	The place on a magnet where the magnetic forces are strongest.
Permanent Magnet	A substance that produces its own magnetic field.
Induced Magnet	A material that becomes a magnet when it is placed in a magnetic field.

What happens when two magnetic poles are brought together.

When two magnets are brought close together, they exert a force on each other. Two like poles repel each other. Two unlike poles attract each other. Attraction and repulsion between two magnetic poles are examples of non-contact force.

Comparing permanent and induced magnets.

An induced magnet is only magnetic when it is in a magnetic field, while a permanent magnet is always magnetic. When an induced magnet is removed from a magnetic field it loses all of its magnetism quickly, while this does not happen for a permanent magnet.

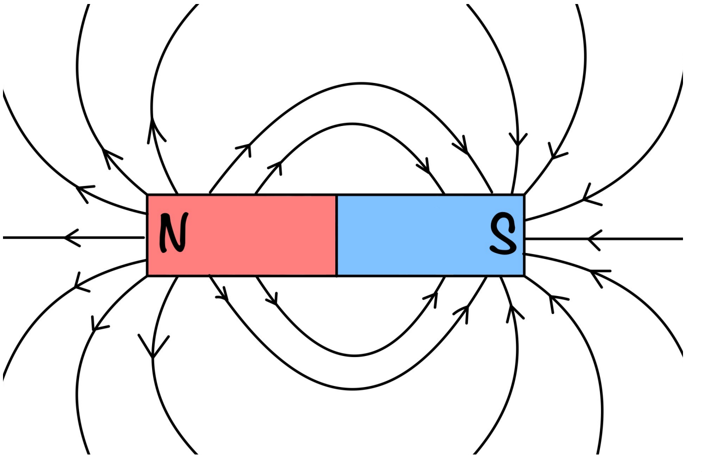
10 Minutes on.... Magnetic Field

Key Term	Definition
Magnetic Field	The region around a magnet where a force acts on another magnet or magnetic material.

What the strength of a magnetic field depends on.

The strength of a magnetic field depends on the distance from the magnet. The field is strongest at the poles of the magnet.

A diagram to show the magnetic field lines around a bar magnet.



A method using a compass to plot the magnetic field lines around a bar magnet.

Place the magnet on a piece of paper and draw around it. Mark the north and south poles. Place the compass by a pole of the magnet. Make a dot at the tip of the compass needle and then move the compass tail to this dot. Make another dot at the tip and repeat until the compass reaches the other pole of the magnet. Draw a line through the dots and add an arrow to show the direction of the field line. Repeat for different starting positions at the poles.

10 Minutes on….

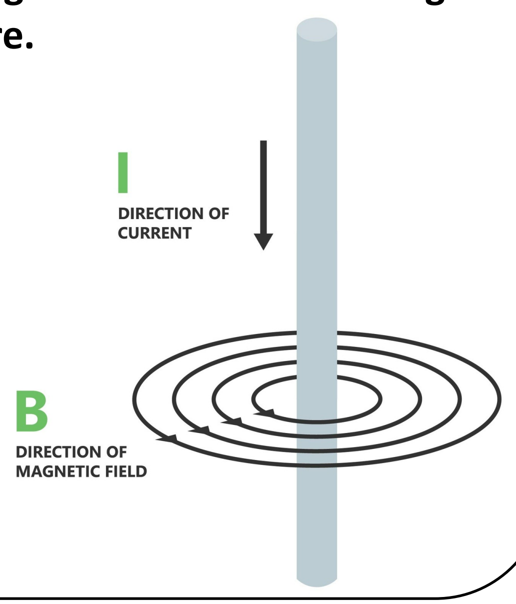
Electromagnetism

Key Term	Definition
Solenoid	A straight coil of wire which can carry an electric current to create a magnetic field. The magnetic field inside a solenoid is strong and uniform.
Electromagnet	A solenoid with an iron core.

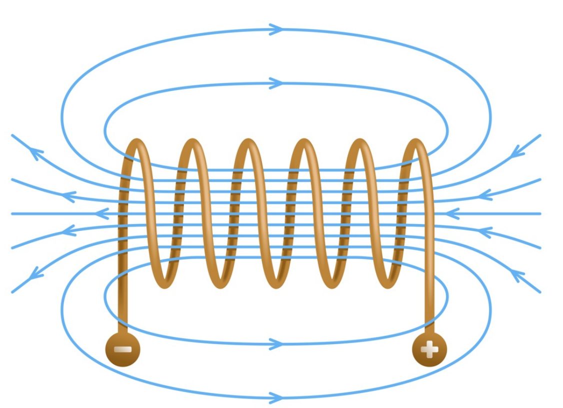
How a magnetic field is produced and how its strength can be increased.

A magnetic field is produced when a current flows through a conducting wire. The strength of the magnetic field depends on the current through the wire and the distance from the wire. To increase the strength of the field you could shape the wire to form a solenoid. If you were to add an iron core to the solenoid this would increase the strength even further.

Magnetic field for a straight wire.



Magnetic field for a solenoid.



10 Minutes on....

Our Solar System

Key Term	Definition
Milky Way	The galaxy that our solar system is part of.

Structure of our solar system.

Within our solar system there is one star, the Sun, plus the eight planets and the dwarf planets that orbit around the Sun. Natural satellites, the moons that orbit planets, are also part of the solar system.

How our sun formed.

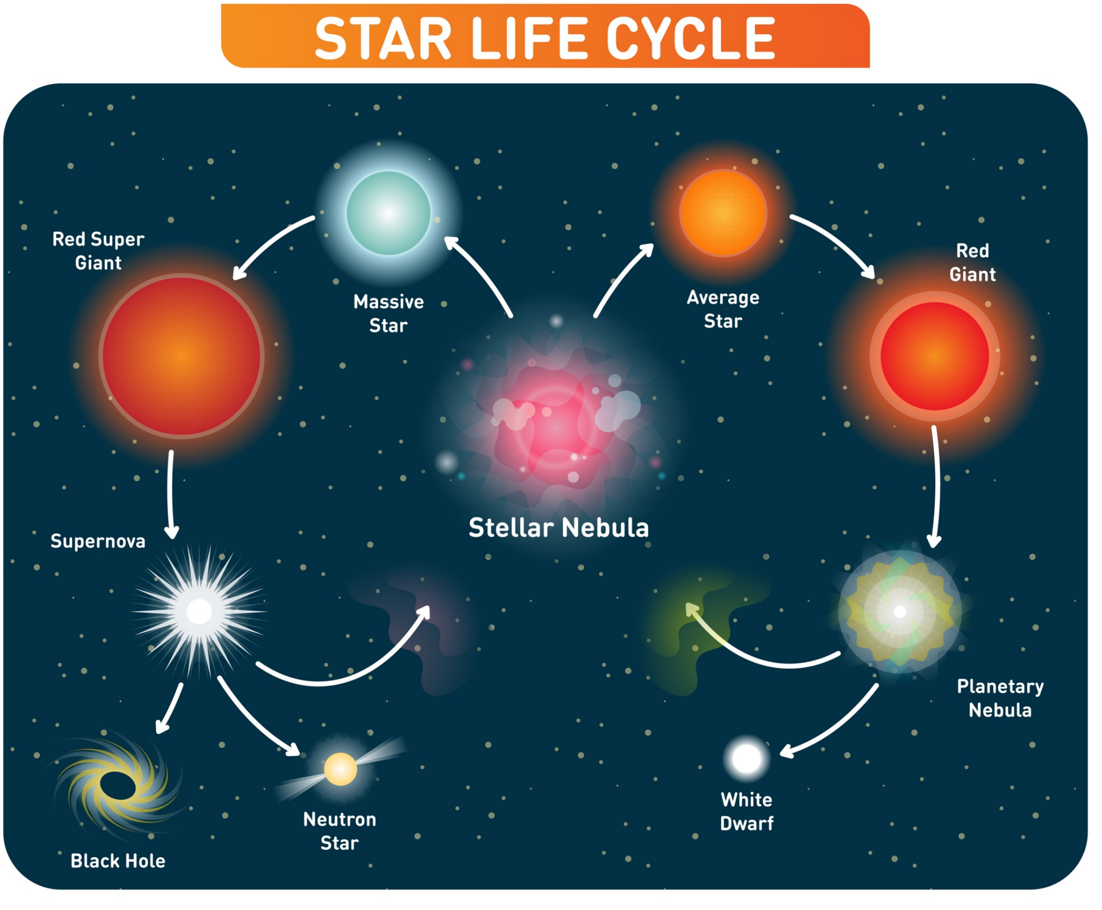
The sun was formed from a cloud of dust and gas, known as a nebula, that was pulled together by gravitational attraction. The Sun is very large and so there were very large gravitational forces pulling the dust inwards. Hydrogen atoms started to fuse together and the fusion releases energy creating high temperatures which create high pressures. The fusion reaction led to an equilibrium between the gravitational collapse of a star and the expansion of the Sun due to the fusion energy.

10 Minutes on....

Life Cycle of a Star

Key Term	Definition
Nebula	Cloud of Gas and Dust
Supernova	The explosion of a massive star that distributes the elements throughout the universe.

A diagram to model the life cycle of a star,



10 Minutes on….

Orbital Motion

Key Term	Definition
Orbital Motion	Motion of an object in an orbit around a fixed point.
Satellite	Anything that orbits a celestial body such as a star, planet and moon.

How planets and satellites to maintain their circular orbits.
For an object to remain in a steady circular orbit around an object it needs to be going at the right speed. This is because an object orbiting another maintains its orbit if there is a balance between its velocity and the gravitational pull of the object it is orbiting.

Object	Description
Planet	A natural satellite that orbits a star.
Moon	A natural satellite that orbits a planet. Some planets can have multiple moons.
Artificial Satellites	Objects that are placed into orbit by humans. They can be used for telecommunications, satnav and weather forecasts.

Why the velocity of a satellite changes at it orbits the Earth.
The force of gravity causes the satellite to accelerate. The acceleration causes a change in direction. The velocity changes because direction changes.

10 Minutes on….

Red Shift

Key Term	Definition
Red Shift	The observed increase in the wavelength of light from the most distant galaxies.
Big Bang Theory	A theory that suggests that the universe began from a very small region that was extremely hot and dense.
Dark Energy	An unknown form of energy that is thought to cause the Universe to expand faster all of the time.
Dark Matter	An unidentified form of matter that would explain why some galaxies are rotating faster than their visible mass would cause.

Scientific evidence for the Big Bang Theory.

Galaxies show a red-shift. The more distance the galaxy the bigger the red-shift. This proves that galaxies are moving away from Earth and that also more distant galaxies are moving away faster. This suggests the all of the Universe was once in one place.

Another source of evidence to support the Big Bang Theory is the presence of cosmic microwave background radiation that fills the universe. It is believed that it is the remains of radiation produced shortly after the Big Bang which is now thinly spread across the whole Universe.