Success For All

100% sheet

Year 10
Forces

AQA FORCES – part 2

Observing and recording motion

Aeroplane banks to change direction	Velocity changes.
Car travelling around a bend	Constant speed, direction changes.
Satellite orbiting the Earth	Constant speed, direction changes.

Changing velocity	***Objects in a circular motion, change direction but keep a constant speed***

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Velocity	***The speed of an object with direction***	Vector

Speed of sound 330m/s.

Speed = distance ÷ time — v = s ÷ t

Speed	***How fast an object moves***	Scalar
Displacement	***Includes the distance and direction an object moves***	vector
Distance	***How far an object moves***	scalar

Car on motorway	***30m/s***	Walking	***1.5m/s***
Train	***60m/s***	Running	***3m/s***
Jet plane	***200m/s***	Cycling	***6m/s***

Speed is rarely constant.

Describing motion

Distance-time graph	***Shows how far an object moves along a straight line***
Speed of object	***Use the gradient of graph***

Gradient = vertical ÷ horizontal

Accelerating objects	***It takes time for objects to reach top speed***	Draw a tangent to the curve, work out gradient.

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Distance travelled	***Area under the graph shape***

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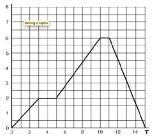
Velocity-time graph	***Shows speed of an object***
Accelerating	***Object getting faster***
Decelerating	***Object slowing down***

Acceleration = change in velocity ÷ time taken

Acceleration	***Change in velocity***	Vector



Constant acceleration
(final velocity) ^{2} – (initial velocity) ^{2} = 2 X acceleration X distance $V^2 - u^2 = 2 \times a \times s$

Falling objects

Falling objects accelerate due to gravity.	In no air resistance, objects accelerate at 9.8m/s²	Air resistance slows falling objects down.

Terminal velocity	***Weight of an object is balanced by resistive forces***	Object moves at a constant velocity. Resultant force = 0.

PHYSICS ONLY

Parachuting	***Size of air resistance depends on area of object and speed***

Larger the area, the larger the air resistance.

Larger the speed, the larger the air resistance.

Forces, acceleration and Newton's Laws of motion

Inertia	***When objects continue in the same state of motion***

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Speed or direction only changes if a resultant force acts on the object

Newton's first Law	***Balanced forces***	When the resultant force on an still object = 0, the object is stationary. When the resultant force on a moving object = 0, the object is at a constant speed.
Newton's second Law	***Unbalanced forces***	When the resultant force is greater than 0, the object accelerates. It could speed up, slow down or change direction.
Newton's third Law	***Equal and opposite forces***	When two objects interact the forces exerted are equal and in an opposite direction.

Acceleration is proportional to resultant force.

Acceleration is inversely proportional to mass.

Force = mass X acceleration

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Inertial mass	***How difficult it is to change the velocity of an object***

Inertial mass = force ÷ acceleration

If the mass is large, to change velocity a big force is needed.

Forces and braking

Frictional forces decelerate a moving object and bring it to rest.

Speed affects both thinking and braking distances.

Typical reaction time = 0.7s

Thinking distance	***Distance travelled whilst the driver reacts***
Braking distance	***Distance travelled whilst the car is stopped by the brakes***
Stopping distance	***Total thinking and braking distances***

Factors affecting stopping distances		
	Drivers reaction times	Drinking alcohol, taking drugs, tired.
	Braking distances	Weather conditions, worn brakes or tyres, road surface, size of braking force.

Braking and kinetic energy	***Work done by braking force, reduces kinetic energy***	Kinetic energy decreases, temperature of brakes increases due to frictional forces.

Momentum

Is a vector

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Momentum = mass X velocity

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Conservation of momentum
When two objects collide, the momentum they have before the collision = the momentum they have after the collision
Closed system = no external forces acting on it.

Changes in momentum
Force is applied to stop momentum
If momentum changes slowly, the force applied is small so less damage.

Crumple zones

PHYSICS HIGHER ONLY

Speed / velocity	***Metres per second (m/s)***
Distance	***Metres (m)***
Time	***Seconds (s)***
Acceleration	***Metres per second squared (m/s²)***
Force	***Newton (N)***
Mass	***Kilogram (Kg)***
Momentum	***Kilograms metres per second (Kgm/s)***