Year 9 – Forces and Motion Knowledge Organiser
Spring 2

The Knowledge

	Topic:	Forces introduction (P.11)
1	Scalar quantities have only _____	magnitude
2	Vector quantities have ____ and ___	magnitude and direction
3	Magnitude is another word for_____	Size
4	State 3 scalar quantities	Distance, speed, time
5	State 3 vector quantities	Displacement, velocity, acceleration
6	How can you show the size of a vector on a diagram?	Use an arrow.
7	What is the name of the type of force that occurs when the objects are physically touching?	Contact forces
8	What is the name of the type of force that occurs when the objects are separated?	Non-contact
9	Which type of force is magnetic force?	Non-contact
10	Which type of force is weight?	Non-contact
11	Which type of force is tension?	Contact
12	Which type of force is upthrust?	Contact
13	Define "weight"	The force acting on an object due to gravity
14	Define "gravitational field strength"	The pull of the Earth on an object
15	What is the equation for calculating weight?	Weight (N))= Mass (Kg) X Gravitational Field Strength (N/Kg)
	Topic:	**Scalar and vector quantities (P.12)**
1	A _____ force is a single force that has the same effect as all the original forces acting together.	resultant
2	What two things happens to objects if the forces acting on them are balanced?	Stay still or constant speed
3	State two effects on an object if the forces acting upon it are unbalanced?	Accelerate/decelerate/change direction/squash or stretch
4	To calculate the resultant force in one direction you _____ the forces acting up/down or left/right.	subtract
5	What is the name given to a diagram that shows the forces acting upon an object	Free body diagram
6	Weight can be measured using a _____	Newton meter or spring balance
7	The point at which all the mass of an object acts is called_____	the centre of mass
8	Resolve the forces means turn two forces into_____	one force/resultant force
9	To work out the centre of mass of a regular shape, you should _____	draw the lines of symmetry
10	To work out the centre of mass of an irregular shape, you should _____	do the plumb line experiment
11	Which type of force occurs when air pushes you back?	Air resistance
12	What are the four forces acting on an accelerating boat?	Weight, thrust, upthrust, water resistance
13	State the units for weight	Newtons (N)
14	State the units for mass	Kilograms (kg)
15	State the units for gravitational field strength	Newtons per kilogram (N/Kg)
	Topic:	**Speed and velocity (P.13)**
1	What is the difference between distance and displacement?	Distance = scalar, displacement = vector
2	Define "speed"	Distance covered in a given time
3	What is the equation linking displacement, velocity and time?	displacement = velocity x time s (m) = v (m/s) x t (s)
4	State three factors that may affect the speed a person walks	Age, terrain, fitness
5	State the typical speed for a person walking	1.5m/s
6	State the typical speed for a person running	3m/s
7	State the typical speed for a person cycling	6m/s
8	State the typical speed for a person driving on a motorway	30m/s
9	State the typical speed for an aeroplane	250m/s
10	State the speed of sound in air	330m/s

11	State the speed of light in air	300,000,000m/s
12	Describe the motion of an object traveling in a circle	Constant speed, changing velocity
13	Which piece of equipment is used to measure time?	Stopwatch
14	How is speed calculated for non-uniform motion?	Average speed (m/s) = distance (m) / time (s) s = d / t
15	Define "velocity"	Speed in a given direction
	Topic:	**Distance and velocity-time graphs (P.14)**
1	State the axes in a distance time graph	X axis = time, Y axis = distance
2	Describe what is meant by a flat horizontal line (——) on a distance-time graph?	The object is stationary
3	Describe what is meant by a straight diagonal line (/) away from the x-axis on a distance-time graph?	Object is moving at a constant speed AWAY from start
4	Describe what is meant by a straight diagonal line (\) towards the x-axis on a distance-time graph?	Object is moving at a constant speed back TOWARDS the start
5	How do you calculate the speed of an object using a distance-time graph if the speed is constant?	Calculate gradient (ΔY/ΔX)
6	If an object is not travelling at a constant speed, how will this motion be shown on a distance time graph?	A curve
7	How do you calculate the speed of an object using a distance time graph if the speed is not constant (the line is a curve!)?	Draw a tangent & calculate gradient
8	What does a steeper line on a distance-time graph represent?	An object moving faster
9	Describe the axes on a velocity-time graph	X-axis = time, Y-axis = velocity
10	Describe what is meant by a flat horizontal line (——) on a velocty-time graph?	The object is moving at a constant velocity
11	Describe what is meant by a straight diagonal line (/) away from the x-axis on a velocity-time graph?	Object is accelerating
12	Describe what is meant by a straight diagonal line (\) towards the x-axis on a velocity-time graph?	Object is decelerating
13	What do you calculate when you calculate the area under a velocity-time graph? (HT only)	Total distance travelled
14	How do you calculate acceleration (if it is constant - a straight line) from a velocity time graph?	Calculate gradient (ΔY/ΔX)
15	How do you calculate acceleration (if it is changing - a curved line) from a velocity time graph?	Draw a tangent & calculate gradient
	Topic:	**Falling objects and Newton's laws (P.15)**
1	State the equation to calculate uniform acceleration when given velocity and distance	(final velocity)^2 - (initial velocity)^2 = 2 x acceleration x distance v2-u2=2as
2	What is the acceleration of an object free falling due to gravity close to the Earth?	9.8m/s2
3	What are the two forces acting upon a falling object?	Weight and air resistance
4	Describe the motion of an object as it begins to fall through a fluid	It accelerates (weight is bigger than air resistance)
5	As an object continues to fall through a fluid, the weight remains the same, describe what happens to the air resistance as the object gains speed?	Air resistance increases
6	What is the term that given to describe the motion of an object when it's weight and the air resistance acting upon it are equal?	Terminal velocity
7	Describe what happens to the forces acting upon a parachuter when they open their parachute	Air resistance ↑, weight stays constant
8	According to Newton's First Law, what will affect an object's velocity?	A resultant force
9	According to Newton's First Law, if the resultant force acting upon a stationary object is zero, what will happen?	The object remains stationary
10	According to Newton's First Law, if the resultant force acting upon a moving object is zero, what will happen?	Moves with at same velocity
11	What is the term given to the tendancy of an object to continue in their state of rest or uniform motion? (HT only)	Inertia
12	Which objects have a large inertia? (HT only)	Objects with a large mass

13	According to Newton's 2nd Law state what is the relationship between acceleration and force?	Directly proportional
14	According to Newton's 2nd Law state what is the relationship between acceleration and mass?	Inversely proportional
15	Write Newton's Second Law as an equation	Resultant force (N) = mass (kg) x acceleration (m/s^2) F = ma
	Science Knowledge Organiser	
	Year:	**9**
	Term:	**Sp2**
	Topic:	**Stopping distances (P.17)**
1	Define "stopping distance"	Thinking distance + braking distance
2	Define "thinking distance"	The distance travelled during the drive's reaction time
3	Define "braking distance"	The distance travelled under the braking force
4	What are the typical values for reaction time	0.2-0.9 seconds
5	State 4 factors that effect a driver's reaction time	Tiredness, alcohol, drugs, distractions
6	State 3 factors that may effect braking distance	Adverse weather conditions (ice/snow/wet), worn tyres, worn brakes
7	What happens to a vehicles braking distance when a car is travelling faster?	Increases
8	Which force causes a car to slow down?	Friction (between brakes and wheels)
9	Describe the energy transfers that occur when a force is applied to a car's brakes	Kinetic energy of car -> thermal energy in the brakes
10	Why is a car travelling at high speed stopping suddenly dangerous?	Need larger braking force -> large deceleration
11	State 2 dangers of large decelerations	Overheating brakes and skidding car
12	Define "adverse"	Bad
13	What is 'inertial mass' (HT only)	A measure of how hard it is to change an object's velocity
14	Define "inertial mass"	The ratio of force over acceleration
15	What does this symbol mean? "~"	Approximately
	Topic:	**Momentum (HT only) and Moments (separate only) (P.18)**
1	Define "momentum" (HT only)	Momentum = mass x velocity p = m v (kg m/s) (kg) (m/s)
2	Define "conservation of momentum" (HT only)	Total momentum before an event = total momentum after event
3	State the equation to calculate change in momentum (HT only)	$F = (m \Delta v) / \Delta t$ when $(m \Delta v)$ is Δp
4	State the relationship between force and momentum (HT only)	Force equals rate of change of momentum
5	Describe how safety features including seat belts, gym crash mats and cycle helmets work (linking to momentum) (HT only)	Increase time -> decrease rate of change of momentum -> decrease force
6	What causes an object to rotate? (separate only)	Forces
7	Give 2 examples of forces causing rotation (separate only)	Pushing down on a door handle, pushing a door shut (due to hinge)
8	Define "moment" (separate only)	The turning effect of a force
9	Define "moment" using an equation (separate only)	moment = force x distance M = F x d (Nm) (N) (m)
10	Describe the moments in a balanced object (separate only)	Total clockwise moment = total anticlockwise moment
11	What are gears and levers used for? (separate only)	Transmit and multiply rotational forces
12	0	0
13	0	0
14	0	0
15	0	0
	Topic:	**Static electricity (separate only) (P.20)**
1	Which force generates static electricity?	Friction

2	Which particles are transferred between surfaces?	Electrons
3	What charge will an object have if it gains electrons?	Negative
4	What charge will an object have if it loses electrons?	Positive
5	In which group of materials does static electricity occur?	Insulators
6	State the wire that disperses the static charge safely	Earthing wire
7	How do objects become positively charged?	By losing electrons
8	How do objects become negatively charged?	By gaining electrons
9	What will happen if two objects with similar charges are brought together?	Repel
10	What will happen if two objects with different charges are brought together?	Attract
11	How can you tell if an object is charged?	Repels another object
12	What happens when negative charge build up in an insulator?	A spark
13	State one use for static electricity	Photocopiers and spray painting cars
14	How do you draw the electric field pattern for an isolated charged sphere with a positive charge?	Arrows facing out
15	How do you draw the electric field pattern for an isolated charged sphere with a negative charge?	Arrows facing in
	Topic:	**RP: Forces, mass and acceleration (P7) (P.47)**
1	Which equation links force, mass and acceleration?	F = ma
2	The first experiment is looking at the relationship between force, and acceleration. What would be the IV?	Force
3	The first experiment is looking at the relationship between force, and acceleration. What would be the DV?	Acceleration
4	The first experiment is looking at the relationship between force, and acceleration. What would be the CV?	Mass
5	What do you mark on the work bench during experiment 1?	20cm intervals
6	Which piece of equipment is used to measure the 20cm intervals?	Ruler
7	What is recorded when the car passes over each 20cm interval?	The time
8	Which piece of equipment accurately records time?	Light gates
9	How do you change the force acting on the trolley?	Add more weight to the end of the string that is pulling the trolley
10	The first experiment is looking at the relationship between mass and acceleration. What would be the IV?	Mass of the trolley
11	The first experiment is looking at the relationship between mass and acceleration. What would be the DV?	Acceleration of the trolley
12	The first experiment is looking at the relationship between mass and acceleration. What would be the CV?	Force applied to the trolley
13	How do you change the mass of the trolley?	Add a weight to the top of it
14	What is the expected relationship for mass and acceleration?	Inversely proportional
15	What is the expected relationship for force and acceleration?	Directly proportional