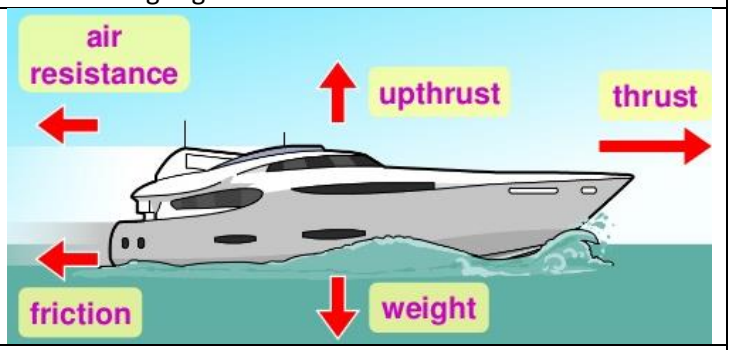
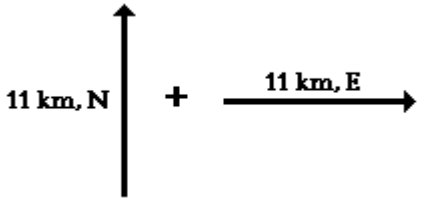
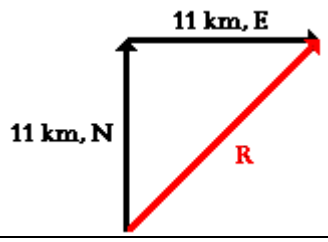
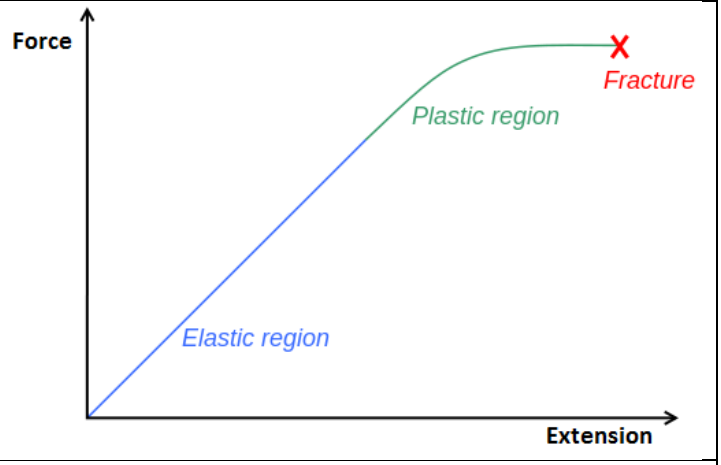
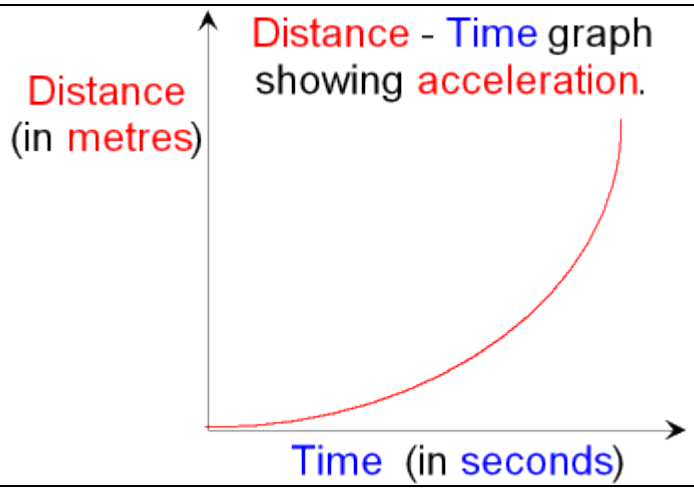
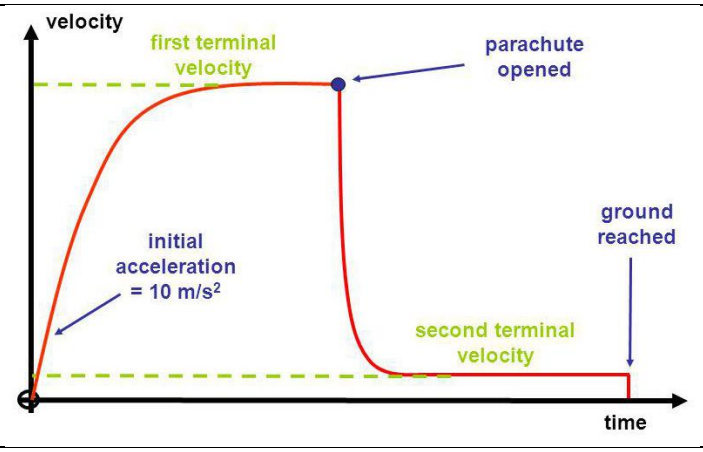
1	What is a scalar quantity?	It has magnitude (size) only. For example: time, voltage, energy.
2	What is a vector quantity?	It has a magnitude and a direction. For example: velocity, force, displacement.
3	We represent vectors with arrows. What do the length and direction of the arrow show?	The length represents the magnitude and the direction shows the direction of the vector.
4	What is a force?	A force is a push or pull that acts on an object due to the interaction with another object.
5	What is a contact force?	The objects are physically touching. For example: friction, air resistance, tension and normal contact force.
6	What is a non-contact force?	The objects are physically separated. For example: gravitational force, electrostatic force and magnetic force.
7	What is weight?	Weight is the force acting on an object due to gravity.
8	What causes the gravitational force close to the Earth?	The gravitational field around the Earth.
9	What does the weight of an object depend on?	The gravitational field strength at the point where the object is and the mass of the object.
10	What is the word equation for weight?	$\text{weight} = \text{mass} \times \text{gravitational field strength}$
11	What is the symbol equation for weight?	$W = m\,g$
12	What are the units of weight?	Newtons, N
13	What are the units of gravitational field strength?	Newtons per kilogram, N/kg
14	Where do we consider the weight of an object to act?	The centre of mass
15	How is mass related to weight?	Mass is proportional to weight ($m \propto W$)
16	What instrument do we use to measure weight?	A newtonmeter (a calibrated spring-balance)
17	What is a resultant force?	A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together
18	Draw and label the forces acting on a travelling boat:	
19	What does it mean to "resolve a force"?	A single force can be resolved into two components acting at right angles to each other. The two component forces together have the same effect as the single force.
20	Find the resultant force R of these two forces: 	 $11^2 + 11^2 = R^2$ $242 = R^2$ $15.6 = R$
21	What do it mean that "work is done"?	When a force causes an object to move through a distance work is done on the object. So a force does work on an object when the force causes a displacement of the object.

22	What is the word equation for work done?	work done = force × distance (moved along the line of action of the force)
23	What is the symbol equation for work done?	$W = F\,s$
24	What is the unit of work done?	Joules, J
25	What is the equivalent unit?	1 Joule = 1 Newton-metre
26	When work is done against friction, what happens to the object?	It causes a rise in temperature of the object.
27	Why must more than one force be applied to change the shape of an object?	A single force would cause the object to move.
28	What is Hooke's Law?	The extension of an elastic object, such as a spring, is directly proportional to the force applied, provided that the limit of proportionality is not exceeded.
29	What is the word equation for Hooke's Law?	$\text{Force} = \text{spring constant} \times \text{extension}$
30	What is the symbol equation for Hooke's Law?	$F = k\,e$
31	What are the units of spring constant?	N/m
32	How can we apply the equation to compression of an elastic object?	The relationship is the same, where "e" is in compression of the object.
33	What is elastic potential energy related to?	A force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring.
34	When work is done to stretch a spring, how much elastic potential energy is stored?	Provided that the spring is not inelastically deformed, the work done on the spring and the elastic potential energy stored are equal.
35	What is the word equation for elastic potential energy?	$\text{elastic potential energy} = 0.5 \times \text{spring constant} \times \text{extension}^2$
36	What is the symbol equation for elastic potential energy?	$E_e = \frac{1}{2}ke^2$
37	What does the graph look like of force against extension when forces are applied to a spring?	
38	How can the spring constant be extracted from this graph?	The spring constant is equal to the gradient of the graph.
39	How can the elastic potential energy be extracted from this graph?	The area under the graph.
40	In the required practical related to Hooke's Law, why should the extension of the spring be 0 m when no force is applied?	With no force applied, the spring is unstretched so has no extension. Any other value would be a measurement of length, not extension.
41	What is the name for the turning effect of a force?	The turning effect of a force is called the moment of the force.
42	What is the word equation for the moment of a force?	$\text{moment of a force} = \text{force} \times \text{distance}$
43	What is the symbol equation for the moment of a force?	$M = F\,d$
44	What is the unit of moment of a force?	Newton-metres, Nm

45	Where should the distance be measured?	The distance, d, is the perpendicular distance from the pivot to the line of action of the force, in metres, m.
46	When an object is balanced, what can be said about the moments?	If an object is balanced, the total clockwise moment about a pivot equals the total anticlockwise moment about that pivot.
47	What is the role of a lever?	Levers amplify the force applied.
48	What is the role of a gear?	Gears change the force or rotational speed of a system.
49	What is a fluid?	A liquid or a gas.
50	What does the pressure in fluids cause?	The pressure in fluids causes a force normal (at right angles) to any surface.
51	What is the word equation for the pressure in fluids?	$\text{pressure} = \frac{\text{force normal to a surface}}{\text{area of that surface}}$
52	What is the symbol equation for the pressure in fluids?	$p = \frac{F}{A}$
53	What are the units of pressure?	Pascals, Pa
54	What is the word equation for the pressure due to a column of liquid?	$\text{pressure} = \text{column height} \times \text{density of liquid} \times \text{gravitational field strength}$
55	What is the symbol equation for the pressure due to a column of liquid?	$p = h \rho g$
56	Why does the pressure at a point in a liquid increase with height of the column and density of liquid?	There is a greater mass of water above the point, applying a compression force.
57	Where does upthrust come from?	A partially (or totally) submerged object experiences a greater pressure on the bottom surface than on the top surface. This creates a resultant force upwards; the upthrust.
58	What is the atmosphere?	The atmosphere is a thin layer (relative to the size of the Earth) of air round the Earth.
59	How does the atmosphere change?	The atmosphere gets less dense with increasing altitude.
60	What causes atmospheric pressure?	Air molecules colliding with a surface create atmospheric pressure.
61	Why does atmospheric pressure decrease with an increase in height?	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.
62	What is distance?	Distance is a scalar quantity that describes how far an object moves.
63	What is displacement?	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. Displacement is a vector quantity.
64	What is the typical walking speed?	1.5 m/s
65	What is the typical running speed?	3 m/s
66	What is the typical cycling speed?	6 m/s
67	What is the typical train speed?	100 km/h
68	What is the typical plane speed?	900 km/h
69	What may cause changes in the speed that a person can walk, run or cycle?	Age, terrain, fitness, distance travelled.
70	What is the typical value for the speed of sound in air?	330 m/s
71	What piece of equipment can be used to measure distance?	Ruler, trundle-wheel

72	What piece of equipment can be used to measure time?	Stop watch, light gates
73	What the the word equation for calculating speed?	$\text{distance travelled} = \text{speed} \times \text{time}$
74	What the the symbol equation for calculating speed?	$s = v\,t$
75	How is velocity different from speed?	Velocity is speed in a given direction.
76	Why does motion in a circle involve changing velocity?	Moving in a circle involves constantly changing direction, so that means a changing velocity even when speed is constant.
77	How can speed be calculated from a distance-time graph?	The gradient
78	What does an accelerating object look like on a distance-time graph?	
79	How can the speed of an accelerating object be found from a distance-time graph at a particular time?	Draw a tangent to the curve at that time and find the gradient of the tangent.
80	What is the word equation for acceleration?	$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$
81	What is the symbol equation for acceleration?	$a = \frac{v}{t}$
82	What are the units of acceleration?	m/s^2
83	How can acceleration be determined from a velocity-time graph?	The gradient of a velocity-time graph.
84	What does the area under a velocity-time graph represent?	The distance or displacement of the object.
85	What is the word equation for uniform acceleration?	$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$
86	What is the symbol equation given on the Physics equation sheet for uniform acceleration?	$v^2 - u^2 = 2\,a\,s$
87	What the acceleration of objects near the Earth's surface falling freely under gravity?	$9.8\ m/s^2$
88	What is terminal velocity?	An object falling through a fluid initially accelerates due to the force of gravity. Eventually the resultant force will be zero and the object will move at its terminal velocity.

89	Draw and label a velocity-time graph look like for a parachuting person.	
90	State Newton's First Law:	An object at rest will remain at rest and a moving object will continue moving at constant velocity as long as no resultant force acts on the object.
91	What is needed for velocity of an object to change?	An unbalanced/resultant force
92	What is inertia?	The tendency of objects to continue in their state of rest or of uniform motion is called inertia.
93	State Newton's Second Law:	The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object.
94	What is the word equation for Newton's Second Law?	$\text{Resultant force} = \text{mass} \times \text{acceleration}$
95	What is the symbol for proportionality?	$\propto$
96	What is inertial mass?	A measure of how difficult it is to change the velocity of an object. It is defined as the ratio of force over acceleration.
97	What is the symbol that indicates an approximate value or approximate answer?	~
98	State Newton's Third Law:	Whenever two objects interact, the forces they exert on each other are equal and opposite.
99	What is the stopping distance of a vehicle?	It is the sum of the distance the vehicle travels during the driver's reaction time (thinking distance) and the distance it travels under the braking force (braking distance).
100	For a given braking force, how does stopping distance change with speed of the vehicle?	For a given braking force the greater the speed of the vehicle, the greater the stopping distance.
101	What is a typical human reaction time?	0.2 - 0.9 s
102	What can affect a driver's reaction time?	Tiredness, drugs and alcohol. Distractions may also affect a driver's ability to react.
103	How can human reaction times be measured?	There are some computer programs which measure reaction times. Another method is to drop a ruler and compare where on the ruler it is caught.
104	What factors may affect the braking distance of a vehicle?	The braking distance of a vehicle can be affected by adverse road and weather conditions (such as wet and icy) and poor condition of the vehicle (such as the brakes and tyres).
105	What physical changes to the vehicle happen when brakes are applied?	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.

106	In order to stop a vehicle within a certain distance, how does the speed of the vehicle affect the necessary braking force?	The greater the speed of a vehicle the greater the braking force needed to stop the vehicle in a certain distance.
107	What are the dangers of large braking forces needed to slow down fast moving vehicles?	The greater the braking force the greater the deceleration of the vehicle. Large decelerations may lead to brakes overheating and/or loss of control.
108	What is the word equation for momentum?	$\text{momentum} = \text{mass} \times \text{velocity}$
109	What is the symbol equation for momentum?	$p = m v$
110	What are the units of momentum?	kg m/s
111	What is the principle of conservation of momentum?	In a closed system, the total momentum before an event is equal to the total momentum after the event.
112	What happens to momentum when a force acts on an object that is moving or able to move?	A change in momentum occurs, where the force is the rate of change of momentum.
113	What is the word equation that dictates the change in momentum when a force is applied?	$\text{Force} = \frac{\text{mass} \times \text{change in velocity}}{\text{time taken}}$
114	What is the symbol equation that dictates the change in momentum when a force is applied?	$F = \frac{m\Delta v}{\Delta t}$
115	What does an air bag have to do with the rate of change of momentum?	It increases the time over which the momentum changes to reduce the force on the passenger.