Year 9 Autumn Term – P2 – Motion and Forces (Physics)

Section A: Key Vocabulary	
Keyword	**Definition**
balanced forces	When the forces in opposite directions on an object are the same size so that there is a zero resultant force
braking distance	The distance travelled by a vehicle while the brakes are working to bring it to a halt
centripetal force **(H)**	A force that causes objects to follow a circular path.
crumple zone	A vehicle safety device in which part of the vehicle is designed to crumple in a crash, reducing the force of the impact
deceleration	slowing down – a negative acceleration
equilibrium	When a situation is not changing because all the things affecting it balance out.
gravitational field strength	A measure of how strong the force of gravity is somewhere.
inertial mass	The mass of an object found from the ratio of force divided by acceleration
momentum	The mass of an object multiplied by its velocity
reaction time	The time taken to respond to a stimulus.
resultant force	The total force that results from two or more forces acting upon a single object
stimulus	Something outside the body that can be detected by the body

Maths skills in Science

Weight equation

The weight of an object can be calculated using the following equation:

weight = mass × gravitational field strength
(N) (kg) (N/kg)

This is often written as: $W = m \times g$

Worked examples

What is the weight of a 90 kg astronaut on the surface of the Earth?

$W = m \times g$

$W = 90\text{ kg} \times 10\text{ N/kg}$

$= 900\text{ N}$

A space probe has a weight of 3000 N on the Earth. What is its mass?

$m = \frac{W}{g}$

$= \frac{3000\text{ N}}{10\text{ N/kg}}$

$= 300\text{ kg}$

Newton's second law : Force Equation

The force needed to accelerate a particular object can be calculated using the equation:

force = mass × acceleration
(N) (kg) (m/s^2)

This is often written as $F = m \times a$

Worked example

A motorcycle has a mass of 200 kg. What force is needed to give it an acceleration of 7 m/s^2?

$F = m \times a$

$= 200\text{ kg} \times 7\text{ m/s}^2$

$= 1400\text{ N}$

Work Done Equation

work done = force × distance moved in the direction of the force
(J) (N) (m)

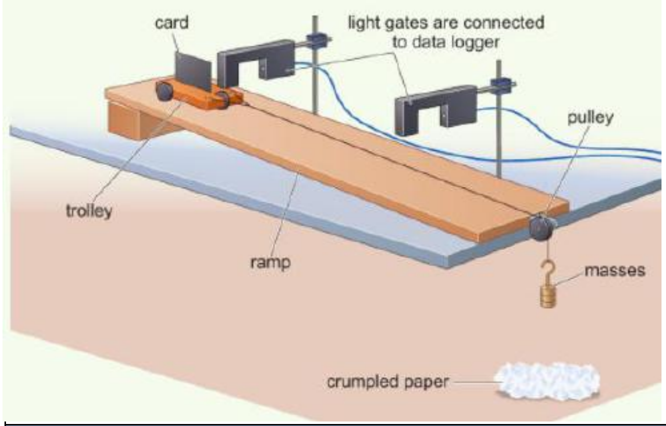
Kinetic Energy Equation

kinetic energy = $\frac{1}{2}$ × mass × $(\text{speed})^2$
(J) (kg) $(m/s)^2$

Section C: Core Practical and Newton's Laws

Core Practical: Investigating acceleration

Investigate the relationship between force, mass and acceleration by varying the masses added on trolleys



Newton's first and second law

Newton's first law: If a body is at rest or moving at a constant speed in a straight line, it will remain at rest or keep moving in a straight line at constant speed unless it is acted upon by a force.

Newton's second law: "The acceleration of an object is directly proportional to the resultant force, in the same direction as the force, and inversely proportional to the mass of the object."

Newton's third law

'Every action has an equal and opposite reaction'.