Year 9 Autumn Term – P1 – Motion (Physics)

Section A: Key Vocabulary	
Keyword	**Definition**
acceleration	A measure of how quickly the velocity of something is changing
distance/time graph	A graph of the distance travelled against time for a moving object. The gradient of a line on a distance/time graph gives the speed.
displacement	The distance travelled in a particular direction.
distance	How far something has travelled.
gradient	The steepness of a line on a graph in numbers. Calculated by taking the vertical distance between two points and dividing by the horizontal distance between the same two points.
magnitude	The size of something.
momentum	A measure of motion, mass multiplied by velocity.
scalar quantity	A quantity that has a magnitude (size) but not a direction.
speed	A measure of the distance an object travels in a given time.
vector quantity	A quantity that has both a size and a direction.
velocity	The speed of an object in a particular direction.
velocity/time graph	A graph of velocity against time. The gradient of a line on the graph gives the acceleration and the area under the graph gives the distance travelled.

Scalar and Vectors Quantities

Scalar: quantities with a magnitude but no direction.

E.g.: Mass, distance, speed, energy, time.

Vector: quantities with a magnitude and direction.

E.g.: Force, displacement, velocity, acceleration

Maths skills in Science

Acceleration equation

Acceleration is calculated using the following equation:

$$\text{acceleration (m/s}^2\text{)} = \frac{\text{change in velocity (m/s)}}{\text{time taken (s)}}$$

This can also be written as:

$$a = \frac{v - u}{t}$$

Worked example W1

An airliner's velocity changes from 0 m/s to 60 m/s in 20 seconds. What is its acceleration?

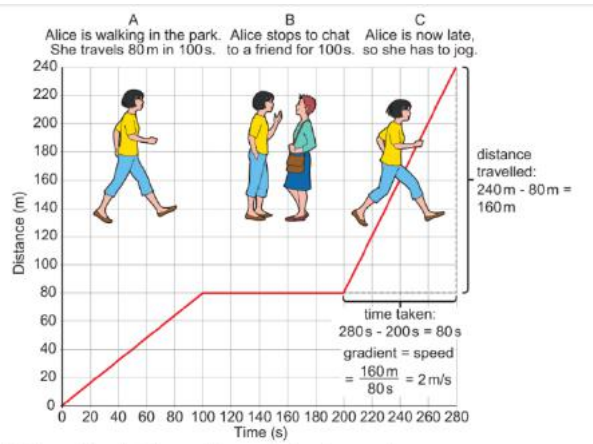
$$a = \frac{v - u}{t}$$
$$= \frac{60\text{ m/s} - 0\text{ m/s}}{20\text{ s}}$$
$$= 3\text{ m/s}^2$$

Force Diagrams

Forces are often shown on diagrams using arrows, with the directions of the arrow representing the direction of the force and the size of the arrow representing the sie of the force.

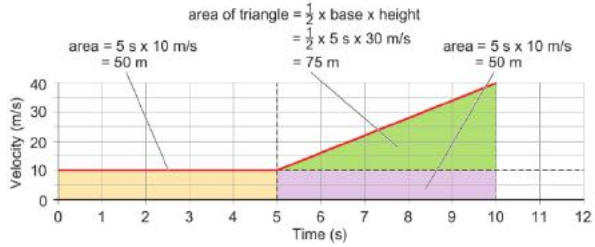
Section C: Graph skills

Distance/Time Graphs



D The gradient of a distance/time graph gives the speed.

Velocity/Time Graphs



Calculating speed from a graph

Worked example W2

In graph D, what is Alice's speed for part C of her walk?

$$\text{gradient} = \frac{\text{vertical difference between two points on a graph}}{\text{horizontal difference between the same two points}}$$
$$= \frac{240\text{ m} - 80\text{ m}}{280\text{ s} - 200\text{ s}}$$

Make sure you take the starting value away from the end value each time.

$$\text{speed} = \frac{160\text{ m}}{80\text{ s}}$$
$$\text{speed} = 2\text{ m/s}$$