Science: Forces part 2

1. Vector and Scalar quantities

Scalar quantity	Value that only has magnitude, but no direction
Vector quantity	Value that has both magnitude and direction

Scalar	**Vector**
Time	Force
Distance	Velocity
Speed	Displacement
Mass	Acceleration
Temperature	Momentum

2. Equations

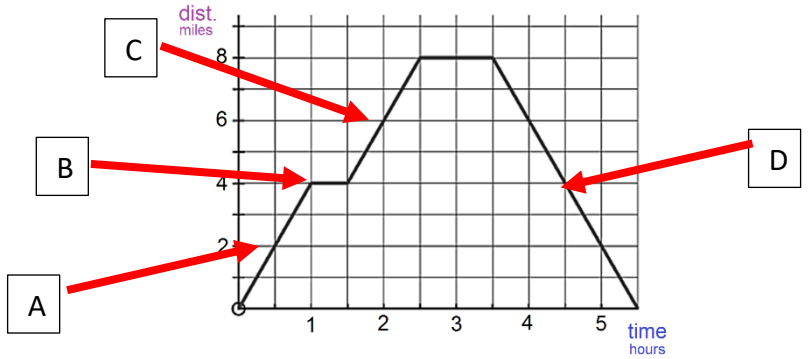
Velocity	Velocity (m/s) = distance (m) ÷ time (s)
Acceleration	Acceleration (m/s^2) = change in velocity (m/s) ÷ time (s)
Work done	Work done (J) = Force (N) x distance (m)
Stopping distance	Stopping distance = thinking distance + breaking distance
Momentum	Momentum (kg m/s) = mass (kg) x velocity (m/s)

3. Newton's 3 Laws

1	If the resultant force on a stationary object is zero, the object will remain stationary or travel at a constant speed
2	The acceleration of an object is proportional to the resultant force exerted and inversely proportional to the mass of the object (F=ma)
3	For every action, there is an equal and opposite reaction

4. Distance-time graphs

A	Travelling at a constant speed from the origin
B	Stationary as the line is flat
C	Traveling at the fastest speed as the line has a steeper gradient
D	Returning to the start



The velocity is calculated by calculating the gradient of the line

The total distance travelled is calculated by adding together the distances travelled in each component of the graph

5. Terminal Velocity

Maximum velocity reached when the weight and drag are balanced

Mass does not affect the terminal velocity of an object

Surface area affects the terminal velocity of an object. Increasing the surface area, decreases the terminal velocity of an object e.g. when a skydiver opens their parachute

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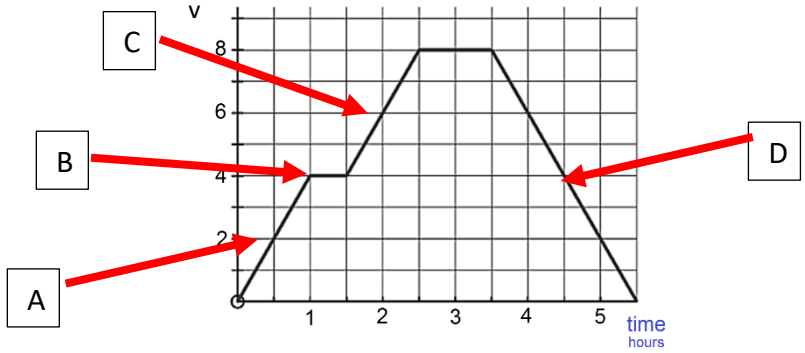
6. Velocity-time graphs

A	Accelerating
B	Travelling at a constant speed
C	Accelerating fastest
D	decelerating



The acceleration is calculated by calculating the gradient of the line

The total distance travelled is calculated by calculating the area under the graph

7. Stopping distances

Thinking distance	**Distance** travelled whilst thinking about pressing the brake pedal
Breaking distance	**Distance** travelled whilst the foot is on the brake pedal
Stopping distance	Total distance travelled whilst thinking about braking and physically braking

Factors affecting thinking distance	**Factors affecting braking distance**
Tiredness	Speed
Visibility	Road surface conditions
Alcohol or drugs	Condition of the tyres
Distractions	Condition of the brakes
Speed	
Reaction times	

8. Momentum (HT ONLY)

Conservation of momentum	Momentum **before** = momentum **after**

Momentum (kg m/s) = mass (kg) x velocity (m/s)