Beckfoot

| Subject: Science (Physics) | Topic: Forces- Part 2 | Year Group: 10 |
|---|---|---|

enjoy learn succeed

## Energy equations

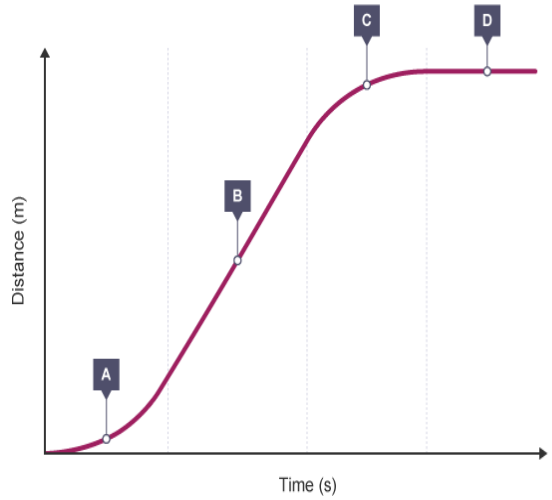
| | | | |
|---|---|---|---|
| 1 | speed | Speed (m/s)= distance (m) ÷ time (s) [V= s÷t] | |
| 2 | Acceleration | **Acceleration (m/s²)= change in velocity (m/s) ÷ time taken (s)** | |
| 3 | **Newton's second law** | **Resultant force(N)= mass (kg) x acceleration (m/s²)** | |
| 4 | HT only Momentum | Momentum( kg m/s)= mass (kg) x Velocity ( m/s) | |
| 5 | Uniform acceleration | $V^2 - U^2 = 2as$<br><br>$V^2 = U^2 + 2as$ | $V = U + at$<br><br>$S = ut + \frac{1}{2}at^2$ |

U= initial velocity V= Final velocity
t=time s= displacement a=acceleration

## Required Practical – Investigating motion

1. How mass affects acceleration
Independent variable- mass
dependent variable acceleration.
Mass and acceleration are inversely proportional.
2. How force affects acceletation.
Independent variable – force
Dependent variable- acceleration
Force and acceleration are directly proportional

## Distance – time graph

| | | | |
|---|---|---|---|
| 1 |  | | |
| 2 | Distance-time graph | Shows how far an object has gone from its starting point at a certain time. | |
| 3 | Area A<br>Area B<br>Area C<br>Area D | Both speed and gradient are increasing- object is speeding up.<br>Both speed and gradient are constant- object move at steady speed.<br>Both speed and gradient are decreasing- object is slowing down<br>Graph line is flat, the object has stopped. | |
| 4 | To calculate the speed from d-t graph | If the graph is a straight line, the speed along the line is equal to the gradient of the line.<br><br>If the graph is a curve, as above, the speed is found by drawing a tangent to the curve and then the gradient of the tangent (HT) | Gradient = vertical ÷ horizontal |

## Key Vocabulary

| | | |
|---|---|---|
| 1 | Force | Make objects move or change shape, measures in Newtons. |
| 2 | Speed | How something covers a set distance, speed is a scalar quantity. |
| 3 | velocity | Speed in a given direction, a vector quantity. |
| 4 | Acceleration | How quickly something speeds up |
| 5 | distance | A scalar quantity that measures how much ground an object covers when moved. |
| 6 | Displacement | Measures how far out of place an object is from A to B |
| 7 | Resultant force | The overall single force. This is zero if objects are stationary or at constant speed. |
| 8 | Terminal velocity | Maximum speed objects reach when falling. When weight = resistive forces |
| 9 | Stopping distance | The amount of time it takes to stop ( thinking distance + braking distance (in m). |
| 10 | Momentum (HT) | A vector quantity that is a property of moving objects. |

Beckfoot | Subject: Science (Physics) | Topic: Forces- Part 2 | Year Group: 10 | enjoy learn succeed

## Newton's Laws

| | | |
|---|---|---|
| 1 | First law | Resultant force is zero if stationary or travelling at constant speed. Objects will travel in a straight line unless a force acts on it ( HT- resisting that change) |
| 2 | Second law | **F= ma- acceleration is proportional to force and inversely proportional to mass** |
| 3 | Third law | **When objects interact their forces are equal and opposite** |

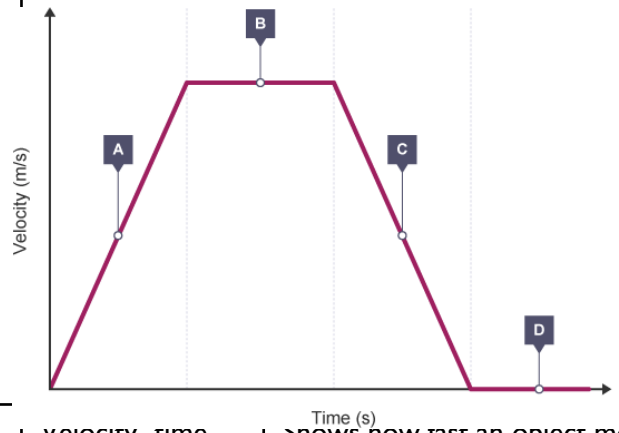
common speeds
Walking- 1.5m/s, running- 3m/s, cycling – 6m/s

**PHYSICS & HT ONLY** Force as rate of change of momentum: Force = change in momentum ÷ time taken for the change

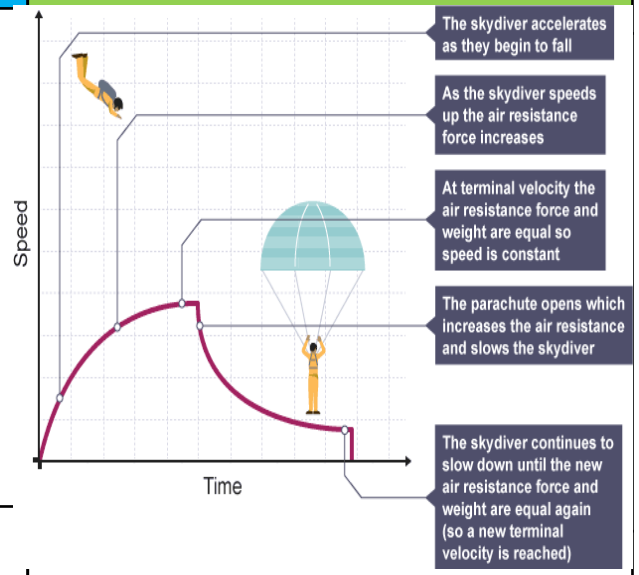
## Forces and Braking

| | | |
|---|---|---|
| 1 | Stopping distance | Stopping distance= thinking distance +braking distance |
| 2 | Thinking distance | The distance a vehicle travels while a driver is reacting. |
| 3 | Reaction time<br><br>Affected by: | The time it takes for a driver to react ( typically 0.2-0.9 sec)<br>Tiredness, drugs, alcohol and distractions. |
| 4 | Braking distance<br><br>Affected by: | The distance a vehicle travels under braking.<br>Weather conditions( rain or ice) and conditions of the brakes or tyres of the vehicle. |
| 5 | Braking force (HT) | When the brakes are pressed, work done by the friction force between the brakes and the wheel reduces the KE of the vehicle and the temperature of the brake increases.. The greater the speed the greater the force needed to stop. Large deceleration may lead to loss of control or overheating of the brakes. |

## Velocity – Time graph

| | | | |
|---|---|---|---|
| 1 |  | | |
| 2 | Velocity- time graph | Shows how fast an object moves. | |
| 3 | Area A<br>Area B<br>Area C<br>Area D | Both acceleration and gradient are positive, the velocity is increasing.<br>Graph is flat- object has constant/steady speed.<br>The gradient and acceleration is negative, the velocity is decreasing.<br>The velocity is stationary, the object is at rest | |
| 4 | Calculating the distance travelled or the displacement from velocity-time graph (HT) | The area under a section of the graph is equal to the distance travelled in that time. | Distance= speed x time |
| | | If the acceleration is constant, the area can be split into a rectangle or a triangle | Area of rectangle= base x height<br><br>Area of triangle= ½ base x height |

## Terminal velocity




Termiinal velocity- When you jump out of a plane you accelerate because the force of the air pushing against you is not as strong as gravity. As you accelerate, the force of the air pushing against you increases. Eventually, the force of air resistance is equal to the force of gravity. You stop accelerating. You have reached terminal velocity. When you pull your parachute, the air resistance becomes the larger force and so you slow down.

## Momentum (HT)

| | |
|---|---|
| 1 | **Momentum** is the product of mass and velocity. |
| 2 | **Conservation of momentum-** states that in a closed system:<br>Total momentum before an event= total momentum after an event.<br>Momentum is conserved in collisions and explosions. |