P4- Knowledge Organiser – Motion

Key Terms

Terminal velocity	When the weight of a falling object is balanced by resistive forces.
Inertia	Inactivity. Objects remain in their existing state of motion – at rest or moving with a constant speed in a straight line – unless acted on by an unbalanced force.
Thinking distance	The distance a car travels while the driver reacts.
Braking distance	The distance a car travels while the car is stopped by the brakes.
Stopping distance	The sum of the thinking distance and braking distance
Closed system	A system with no external forces on it.

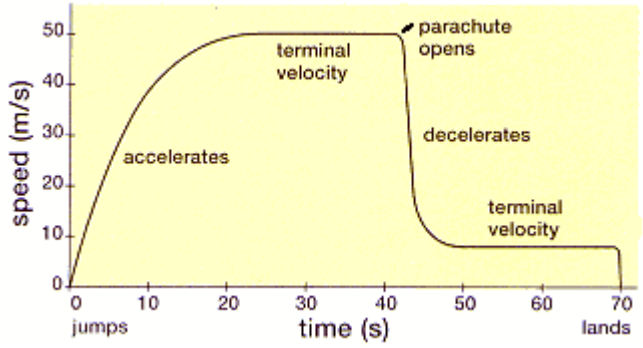
s = d ÷ t speed = distance ÷ time.

a = (v-u) ÷ t acceleration = change in velocity ÷ time.

F = m x a Force = mass x acceleration.

p = m x v momentum = mass x velocity.

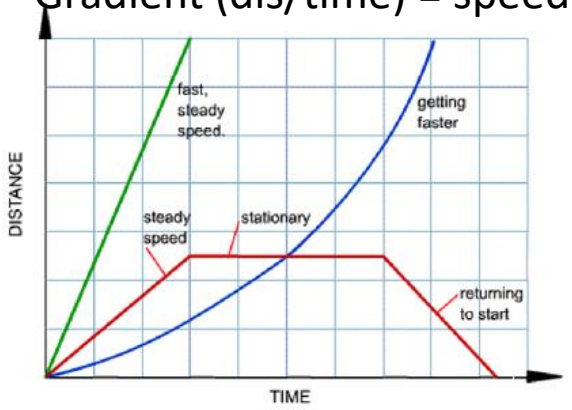
(mv - mu) = F x t change in momentum = Force x time.



Diagrams

Distance-time graphs

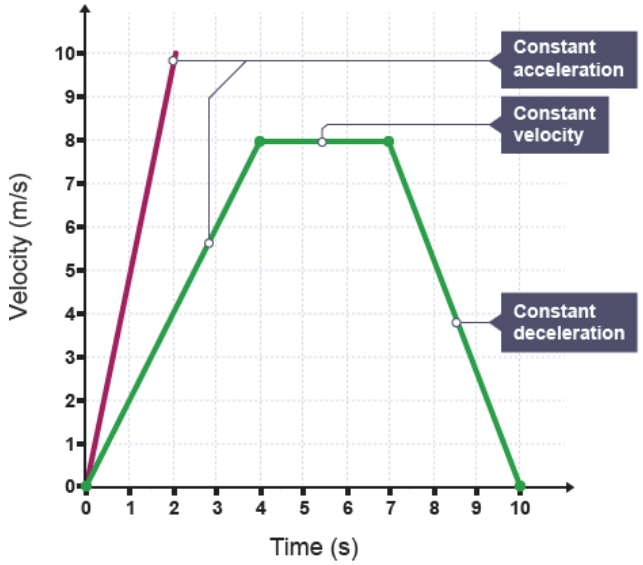
Gradient (dis/time) = speed



Velocity-time graphs

Gradient (velocity/time) = acceleration

Area under graph = distance travelled



P4- Knowledge Organiser – Forces

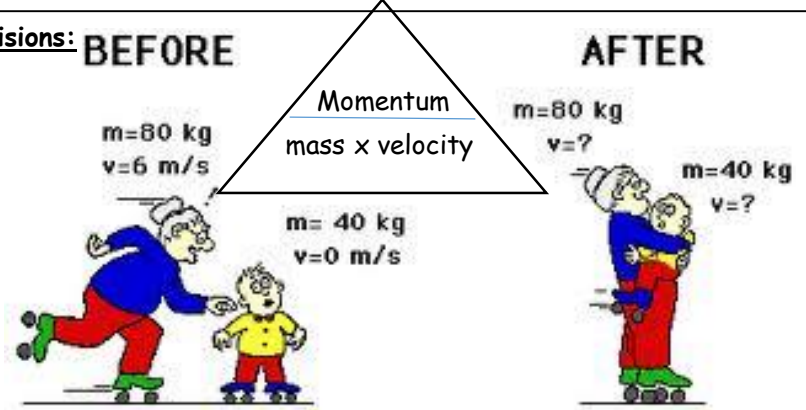
Reaction Force: This is the equal and opposite force when two objects are touching

Newtons 2nd law of Motion: an object with **unbalanced** forces acting on it will **accelerate** in the direction of the resultant force

Gravity: the attractive force which acts between any two masses. On earth gravity or Gravitational field strength 10 N/kg and acceleration due to gravity 10 m/s² always have the same value.

Resultant Force is the overall force acting on an object. It is the single force which has the same effect as all the other forces acting on it

Collisions:



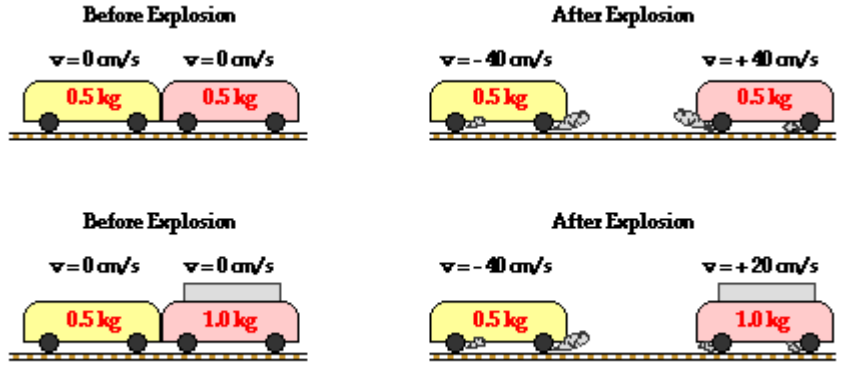
Total momentum before = (80 x 6) + (40 x 0) = 480

Total momentum after = (80+40) x v

So 480 = 120 x v

Answer: v = 4m/s

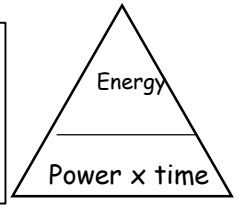
Explosions:

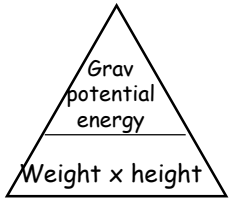


Stopping distance
Total stopping distance = Thinking distance + Braking distance

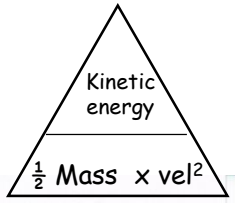
Momentum: is property of moving objects which is calculated
momentum = mass x velocity.
The unit of momentum is kgm/s

Conservation of Momentum: the total momentum before a collision or explosion is the same as the total momentum after a collision or explosion. So long as no other forces are acting.
mass A x velocity A = Mass B x velocity B





Kinetic Energy: The energy of movement. More energy if more mass and going faster. Measured in Joules (J)
Ek = ½ mass x velocity² .

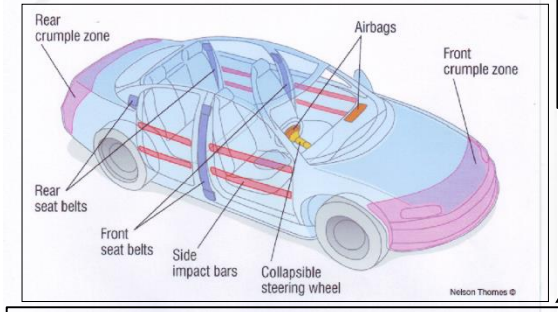


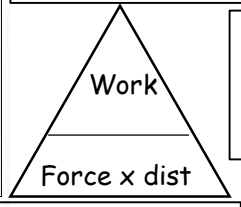
Gravitational Potential energy: When energy is transferred to an object and it gains height, we say we have done work against gravity. It has gained gravitational potential energy. Measured in Joules (J).
Work = force x distance moved in the direction of the force
Ep = weight x height

Energy Conservation Falling Object changes gravitational potential energy into Kinetic Energy. loss in Ep = the gain in Ek

big thinking distance	Big braking distance
Faster speed	Faster speed
Drugs/alcohol	Poor tyres/brakes
Older /tired	Wet/ icy road

Car safety: The force on a passenger will be large if there is a large change in momentum in a short time. The key to safety is to extend the time of impact to reduce the force. This is done by: seat belts stretch a little, crumple zones at the front and rear, air bags to cushion the impact.





Power: is the rate of transfer of energy. Measured in Watts (W)

Braking a car: The kinetic energy, Ek is transferred to the brakes, we say the brakes have done work
Ek = ½ mass x velocity² = braking force x stopping distance

Work done: When energy is transferred we say we have done work. Work is measured in Joules (J)
Work = force x distance moved in the direction of the force

Mass is the amount of matter a body is made from it is measured in Kilograms (Kg)

Weight is the force of gravity pulling a mass down it is measured in Newtons (N)

Terminal Velocity: This is the constant speed reached when drag = weight. If you change your shape when falling you can change your terminal velocity. (open a parachute)

Newtons 1st law of Motion: an object with **balanced** forces acting on it will stay still if already still. But if it is moving will stay moving at a **constant speed** in a straight line