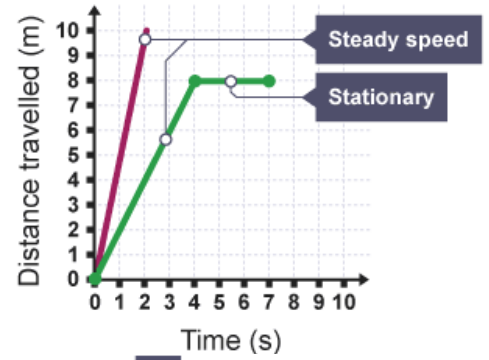


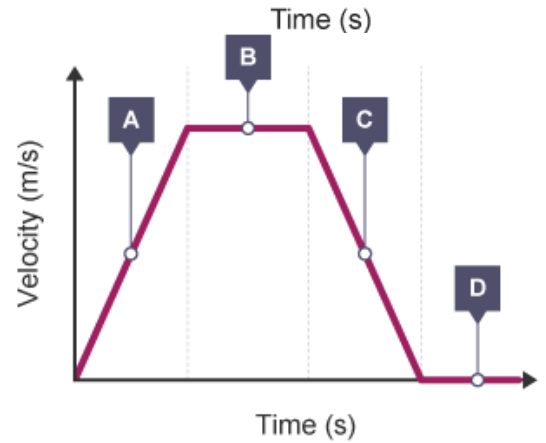
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If an object moves along a straight line, the distance travelled can be represented by a distance-time graph.



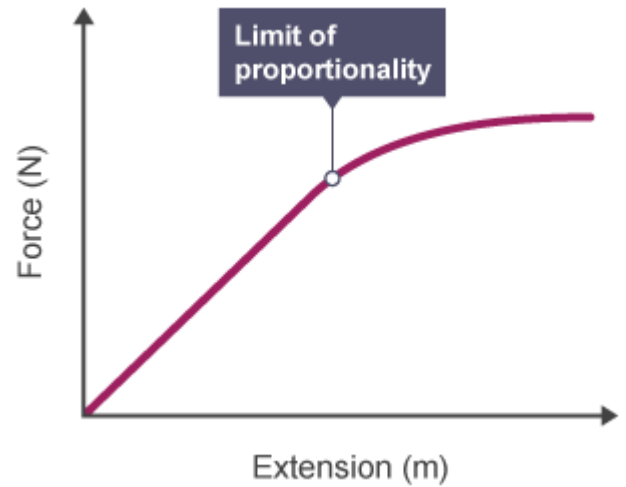
If an object moves along a straight line, its motion can be represented by a velocity-time graph. The gradient of the line is equal to the *acceleration* of the object.

Section of graph	Gradient	Velocity	Acceleration
A	Positive	Increasing	Positive
B	Zero	Constant	Zero
C	Negative	Decreasing	Negative
D ( $v = 0$ )	Zero	Stationary (at rest)	Zero



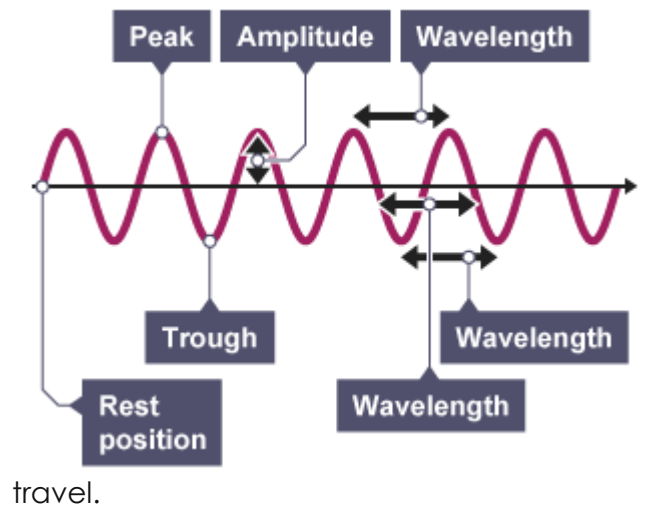
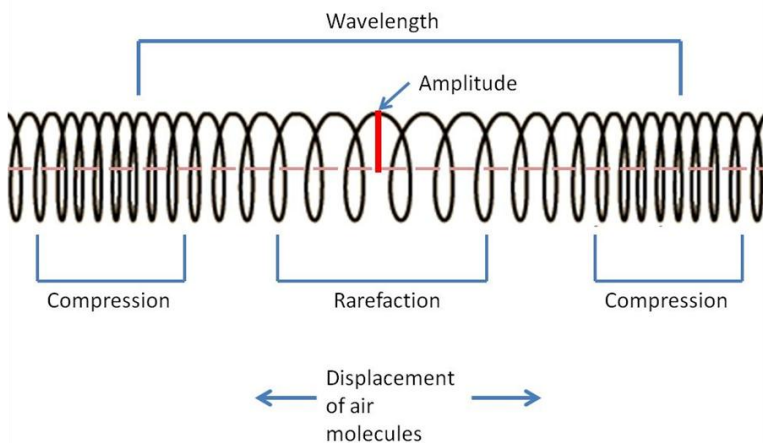
*Contact forces* are forces that act between two objects that are physically touching each other. These forces are: Friction, Air Resistance, Reaction Force and Tension Force

**Spring constant** is a measure of the stiffness of a spring up to its limit of proportionality. The *limit of proportionality* refers to the point beyond which Hooke's law is no longer true when stretching a material. Non-linear extension and *inelastic* deformation can be seen above the limit of proportionality. The limit of proportionality is also described as the 'elastic limit'.



The direction of these oscillations is the difference between longitudinal or transverse waves. In *longitudinal waves*, the vibrations are parallel to the direction of wave travel. In *transverse waves*, the vibrations are at right angles to the direction of wave

## Longitudinal Wave



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*magnetic waves* are transverse waves. Their vibrations or are changes in electrical and magnetic fields at right angles to the direction of wave travel.

All electromagnetic waves:

- transfer energy as *radiation* from the source of the waves to an absorber
- can travel through a *vacuum* such as in space
- travel at the same speed through a vacuum or the air

## Ionising radiation

Ultraviolet waves, X-rays and gamma rays are types of *ionising radiation*. They can add or remove electrons from molecules, producing electrically charged ions. Ionisation can have hazardous effects on the body:

- ultraviolet waves can cause skin to age prematurely and increase the risk of skin cancer
- x-rays and gamma rays can cause the mutation of genes, which can lead to cancer

To investigate the effect of varying the force on the acceleration of an object.

*Method*

1. Position an air track on a bench with a bench pulley at one end and two light gates above the track. Cut an interrupt card to a known length (such as 10 cm) and attach it to an air track glider.
2. Connect the glider to a hanging mass by a string the length of the air track passing over the bench pulley. Make sure the air track is level and that the card will pass through both gates before the mass strikes the floor.
3. Set the data logging software to calculate acceleration.
4. Add  $5 \times 20 \text{ g}$  slotted masses (0.98 N of force) to the end of the string.
5. Release the glider, then record the weight and acceleration.
6. Repeat steps 4 and 5 two more times, and calculate a mean value for the acceleration.
7. Repeat steps 4 to 6, removing one of the slotted masses each time (giving forces of 0.78 N, 0.59 N, 0.39 N and 0.20 N).

Thinking distance is the distance a vehicle travels in the time it takes for the driver to apply the brakes after realising they need to stop

Braking distance is the distance a vehicle travels in the time after the driver has applied the brake

A driver's reaction time can be affected by: *tiredness, drugs, alcohol, distractions*

There are three stages as an object falls through a fluid: at the start, the object accelerates downwards due to the force of gravity as the object's speed increases, frictional forces such as *air resistance* or *drag* increase at terminal velocity, the weight of the object due to gravity is balanced by the frictional forces, and the resultant force is zero

