# T2 Motion and Forces part 2 HIGHER

## Section A

1) Which of these is the most likely human reaction time?

- ☐ **A:** 0.2 s
- ☐ **B:** 1.2 s
- ☐ **C:** 0.2 ms
- ☐ **D:** 2.0 ms

2) Which of these is NOT a method of reducing the forces experienced by passengers in a car crash?

- ☐ **A:** seat belts
- ☐ **B:** crumple zones
- ☐ **C:** rubber tyres
- ☐ **D:** air bags

3) How is stopping distance calculated?

- ☐ **A:** thinking distance - braking distance
- ☐ **B:** thinking distance + braking distance
- ☐ **C:** thinking distance × braking distance
- ☐ **D:** thinking distance ÷ braking distance

4) Which of these could affect thinking distance?

- ☐ **A:** ice on the road
- ☐ **B:** quality of the brakes a vehicle has
- ☐ **C:** mass of the vehicle
- ☐ **D:** alcohol consumption

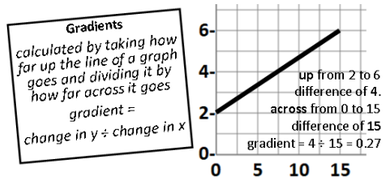
5) What is the name given to any force that causes circular motion?

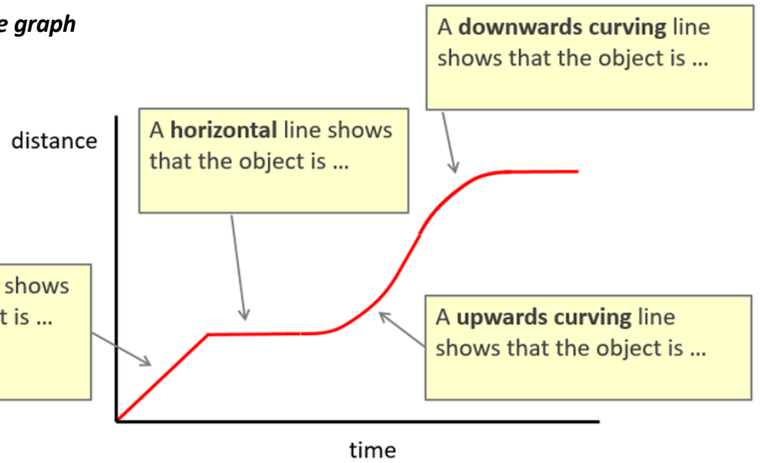
- ☐ **A:** centrifugal force
- ☐ **B:** centripetal force
- ☐ **C:** reaction force
- ☐ **D:** action force

6) Which phrase describes the relationship between kinetic energy and braking distance?

- ☐ **A:** Non-linear
- ☐ **B:** Directly proportional
- ☐ **C:** Inversely proportional

*Complete the labels for the **distance time graph***



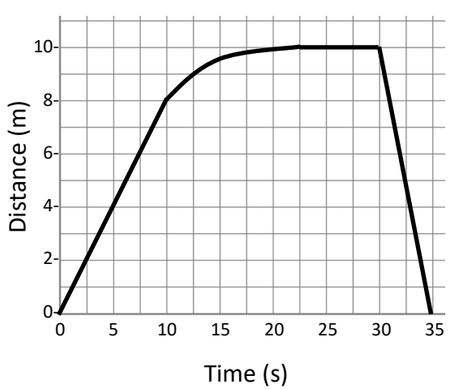

The **gradient** of the line in a distance time graph is equal to the .....

of the object

The motion of the object between 10 s and 20 s is ...

The velocity of the object between 0 s and 10 s is ...

The object is stationary for ..... s




The motion of the object between 30 s and 35 s is ...

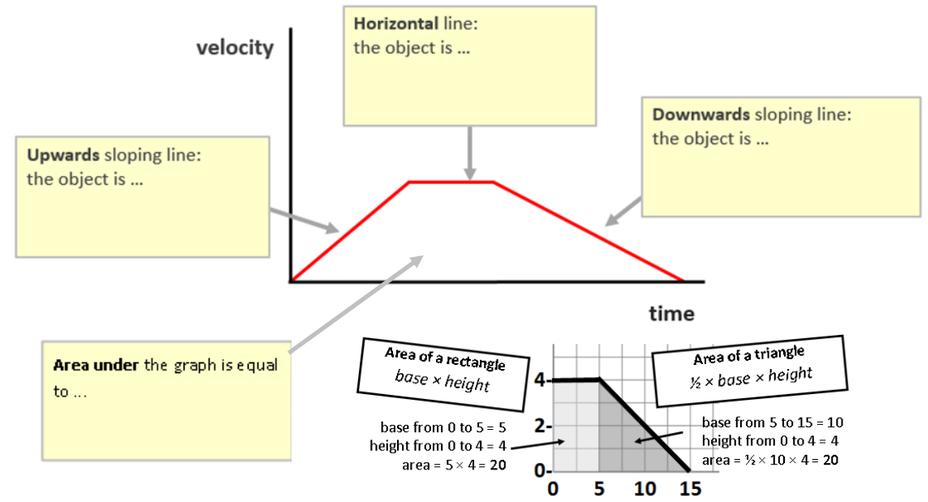
The velocity of the object between 30 s and 35 s is ...

## Section B

*Complete the labels for the **velocity time graph***

The **gradient** of the line in a velocity time graph is equal to the .....

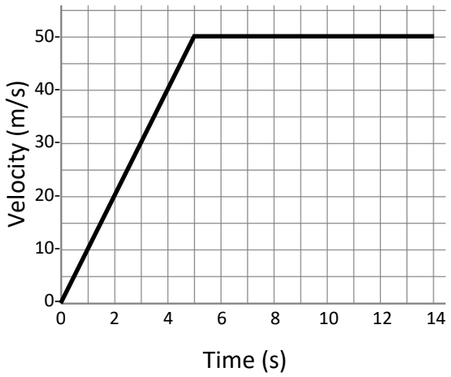
of the object




The motion of the object between 5 s and 10 s is ...

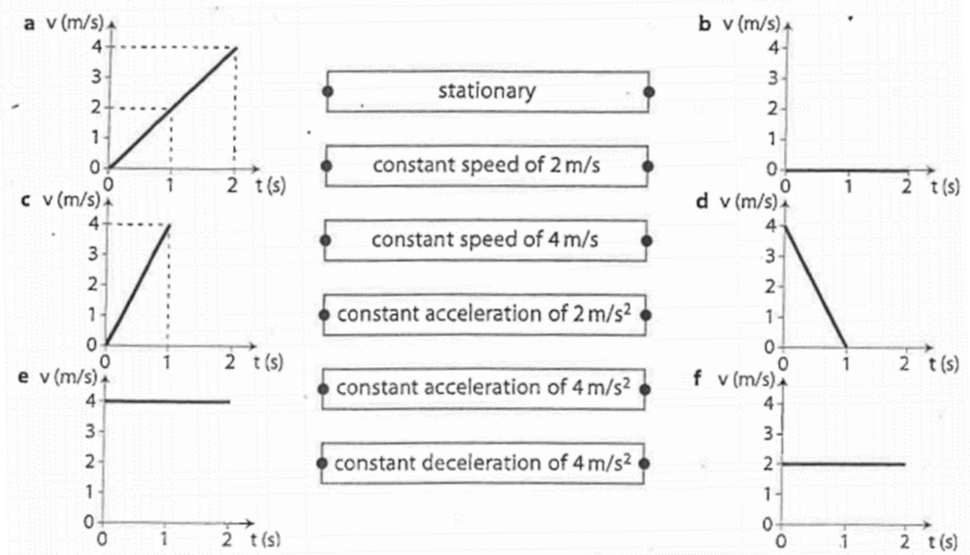
The acceleration of the object between 0 s and 4 s is ...

The object is accelerating for ..... s




The total distance the object covers is ...

Draw lines to match the graphs to the correct statements about the motion shown on the graph.



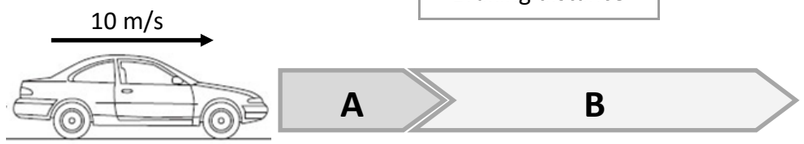

combined sciences text book pages 286-314

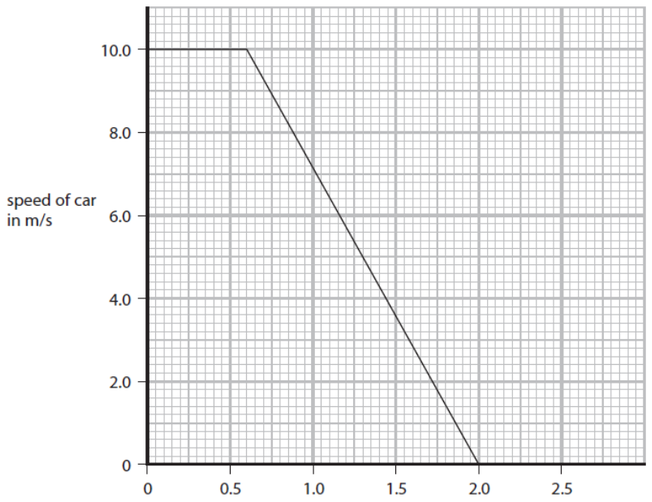
Link to BBC Bitesize

## Section C

The diagram below shows a car travelling at 10 m/s just before the driver spots a hazard in the road ahead and then applies the brakes.
Match the distances A and B to what they represent.

| | |
|---|---|
| Stopping distance | A |
| Thinking distance | B |
| Braking distance | A + B |




What was the driver's reaction time?

..... s

Use the graph to calculate the thinking distance

..... m

Use the graph to calculate the braking distance

..... m

The stopping distance for the car would be smaller if the car

- ☐ A had more passengers
- ☐ B had worn tyres
- ☐ C needed new brakes
- ☐ D was travelling more slowly

Describe the energy transfer that takes place when brake pads in the car press against the wheels of the car.

→

Draw an arrow on the diagram to show the direction of the force that keeps the satellite moving in a circular path. →

The force that keeps an object moving in a circular path is known as the

- ☐ A balancing force
- ☐ B centripetal force
- ☐ C reaction force
- ☐ D resistance force

The satellite in the diagram is moving at constant speed.
Explain why it is *not* moving with constant velocity.

## Section D

| | |
|---|---|
| (final velocity)$^2$ – (initial velocity)$^2$ = 2 × acceleration × distance | $v^2 - u^2 = 2 \times a \times x$ |

The ball bearing is now dropped through air.
The initial velocity of the ball bearing is zero.
The acceleration of the ball bearing is 10 m/s$^2$.
The ball bearing falls 1.5 m.
(a) Calculate the velocity of the ball bearing when it has fallen 1.5 m.

velocity of ball bearing = ..... m/s

An aircraft waits at the start of a runway.
The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s.
The acceleration of the aircraft is 4 m/s2.
Calculate the distance, x, travelled by the aircraft while it is accelerating.

x = ..... m

| | | |
|---|---|---|
| A car begins at a speed of 3 m/s and accelerates at 2 m/s$^2$ over a distance of 30 m, calculate the final speed of the car. | If a car travels 60 m between the driver spotting a hazard and coming to rest and the thinking distance was 15 m, what was the braking distance? | A child travels down a slide, at the top the child is initially at rest, at the bottom the child is travelling at a speed of 7 m/s, the child's acceleration is 4 m/s$^2$, how long is the slide? |
| At 31 m/s a car's brakes can bring it to a stop within 75 m. If the driver of the car travels 96 m after spotting a hazard but before coming to rest, what was the thinking distance? | A cyclist rides in a 0.4 km downhill race. He passes the start line at a speed of 2 m/s accelerates constantly at 0.2 m/s$^2$ during the race. What speed does he possess when he crosses the finish line? | A motorbike reaches a speed of 20 m/s over 60 m, whilst accelerating at a constant 2.5 m/s$^2$, determine the bike's initial speed. |

| Answers | | | | | | |
|---|---|---|---|---|---|---|
| | 6.1 | 21 | 11.4 | 10 | 12.8 | 45 |