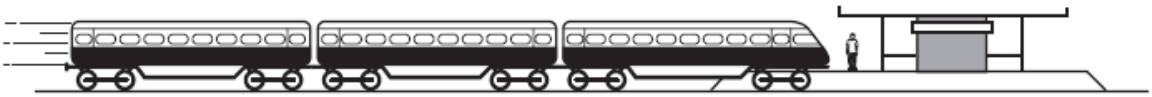
Mixed Exercise 1

1.

A child is standing on the platform of a station, watching the trains.



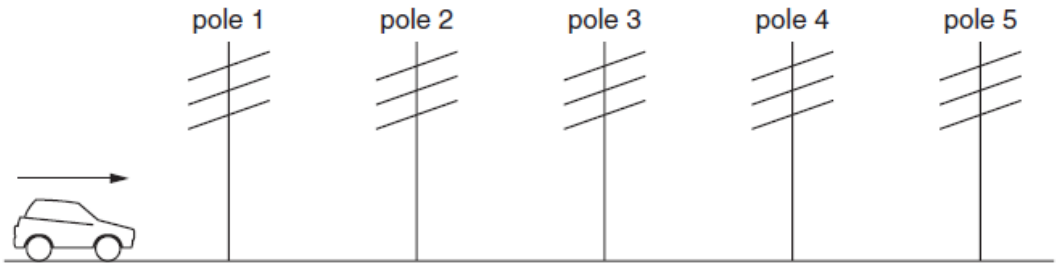
A train travelling at 30 m / s takes 3 s to pass the child.

What is the length of the train?

A 10 m **B** 30 m **C** 90 m **D** 270 m

2.

Five telegraph poles are positioned at equal distances along the side of a road.



A car accelerates until it is level with pole 4. The car then continues along the road at a steady speed. The times taken to travel between one pole and the next are measured.

Which time is the greatest?

The time between

A pole 1 and pole 2.

B pole 2 and pole 3.

C pole 3 and pole 4.

D pole 4 and pole 5.

3. An object moves with a constant acceleration of 4 m/s^2.

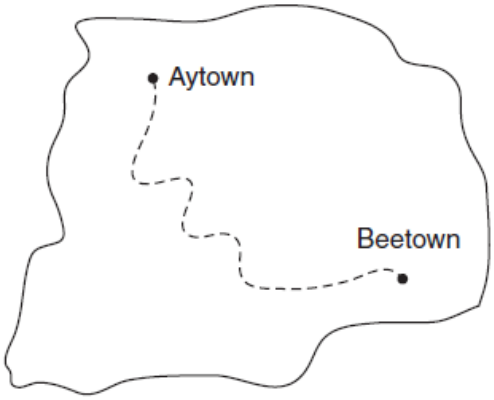
(a) How long does it take for its velocity to increase from 20 m/s to 48 m/s?

After reaching a velocity of 48 m/s, the object starts decelerating with a uniform deceleration of 3 m/s^2.

(b) How long should the object decelerate at this rate, if it is to stop eventually?

4.

A train travels along a track from Aytown to Beetown. The map shows the route.



The distance travelled by the train between the towns is 210 km. It moves at an average speed of 70 km / h.

(a) How long does the train take to travel from Aytown to Beetown?

(b) Circle the correct statement about the magnitude of the average velocity of the train.

(A) The magnitude of the average velocity is less than 70 km/h.

(B) The magnitude of the average velocity is equalt to 70 km/h.

(C) The magnitude of the average velocity is greater than 70 km/h.

5.

Fig. 1.1 shows the speed-time graph for a bus during tests.

At time $t = 0$, the driver starts to brake.

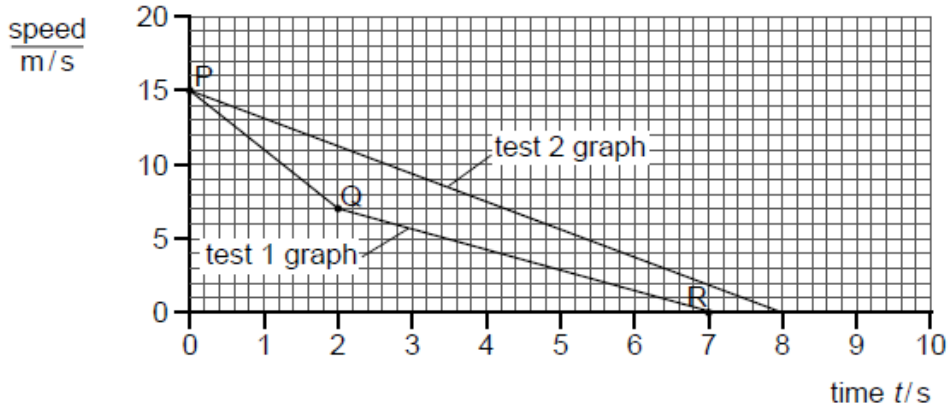


Fig. 1.1

(a) For test 1,

(i) determine how long the bus takes to stop,

.....

(ii) state which part of the graph shows the greatest deceleration,

.....

(iii) use the graph to determine how far the bus travels in the first 2 seconds.

distance = ...

[4]

(b) For test 2, a device was fitted to the bus. The device changed the deceleration.

(i) State two ways in which the deceleration during test 2 is different from that during test 1.

1 .....

2 .....

(ii) Calculate the value of the deceleration in test 2.

deceleration = ...

[4]

(c) Fig. 1.2 shows a sketch graph of the magnitude of the acceleration for the bus when it is travelling around a circular track at constant speed.

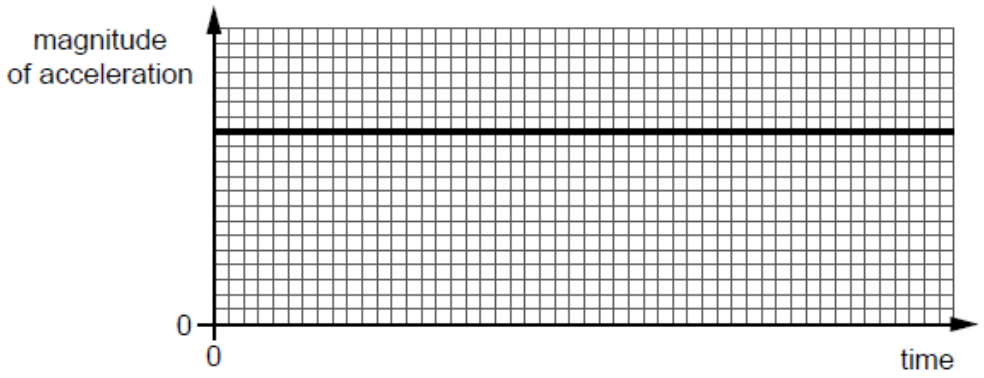


Fig. 1.2

(i) Use the graph to show that there is a force of constant magnitude acting on the bus.

.....

.....

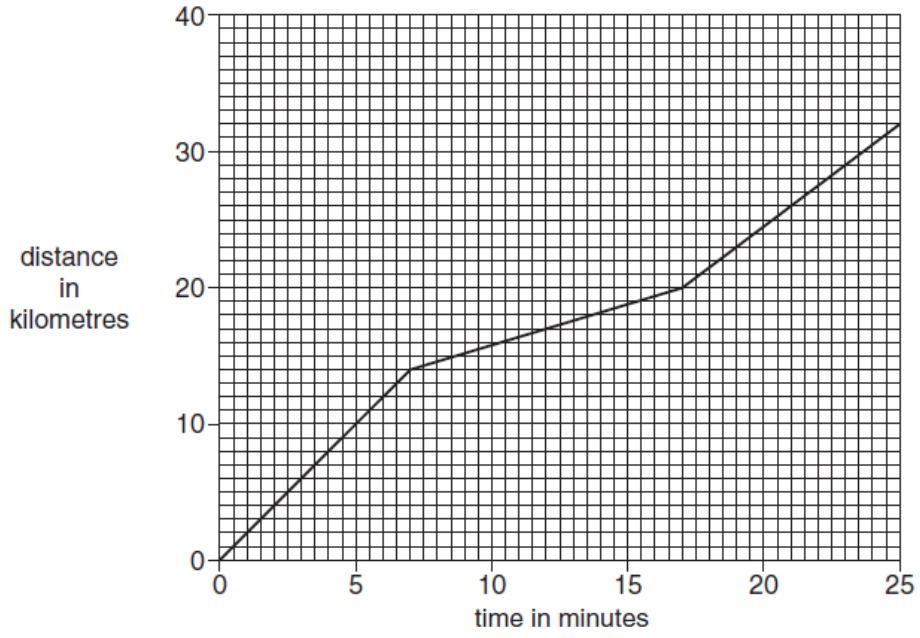
(ii) State the direction of this force.

.....

[3]

6.

Ann is driving along the motorway.
The graph shows the journey she takes.



(a) (i) What is Ann's average speed during the whole journey?

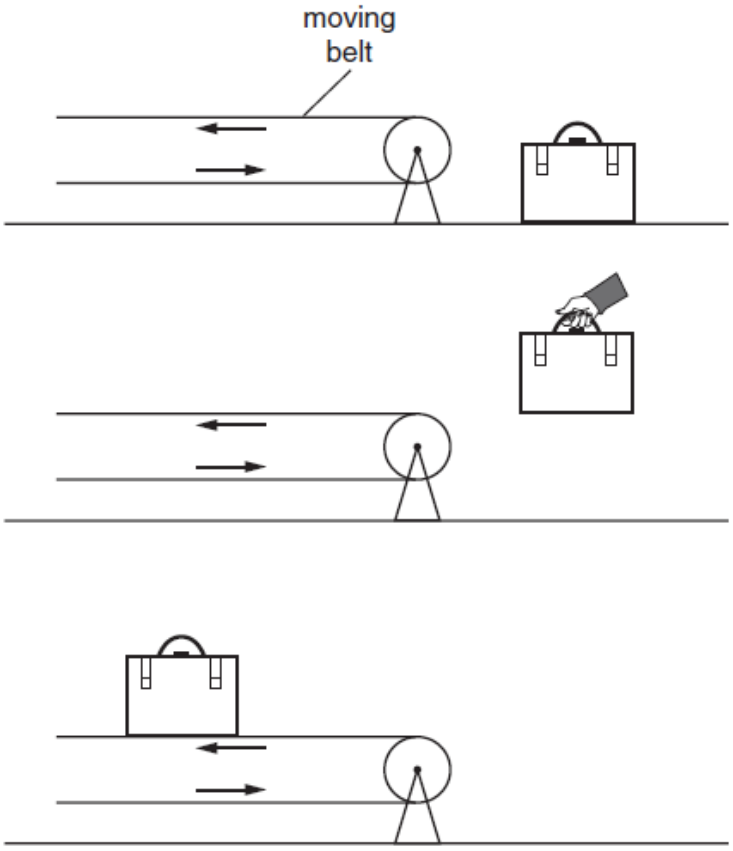
average speed = ... km/min **[1]**

(ii) What is Ann's speed during the **middle part** of her journey?

speed = ... km/min **[1]**

7.

A baggage handler at an airport lifts a suitcase from the ground and places it on a moving belt. The moving belt then transfers the suitcase to the owner.



A suitcase on ground

B suitcase held level with belt

C suitcase moving on belt

Fig. 1.1

(a) (i) How does the total energy of the suitcase in B compare with its energy in A? Tick one box.

The total energy is greater in B than in A. ☐

The total energy is the same in B and in A. ☐

The total energy is less in B than in A. ☐

(ii) Explain your answer.

.....

.....

[2]

(b) (i) How does the total energy of the suitcase in C compare with its energy in B? Tick one box.

The total energy is greater in C than in B. ☐

The total energy is the same in C and B. ☐

The total energy is less in C than in B. ☐

(ii) Explain your answer.

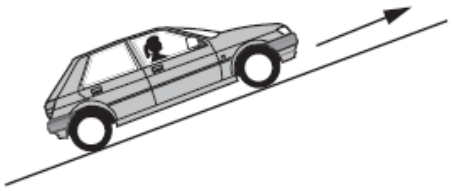
.....

.....

[2]

8.

A car accelerates along a road as it rises uphill.



Which energy changes are taking place?

	energy of motion (kinetic energy)	energy of position (gravitational potential energy)
A	decreasing	decreasing
B	decreasing	increasing
C	increasing	decreasing
D	increasing	increasing

9.

In a car engine, energy stored in the fuel is converted into thermal energy (heat energy) and energy of motion (kinetic energy).

In which form is the energy stored in the fuel?

A chemical

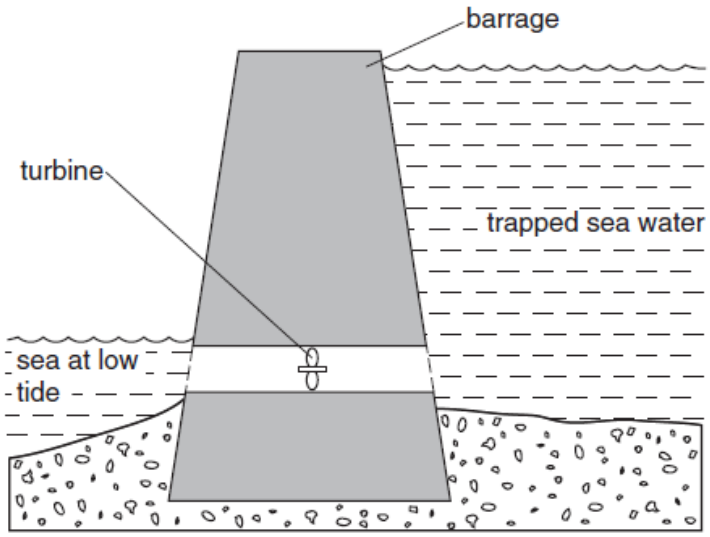
B geothermal

C hydroelectric

D nuclear

10.

A tidal power station is made by building a barrage across the mouth of a river. At high tide the sea water is trapped behind the barrage.



At low tide the water is allowed to flow back into the sea through a turbine.

What is the useful energy change in a tidal power station?

A electrical energy $\longrightarrow$ energy of position (potential)

B electrical energy $\longrightarrow$ energy of motion (kinetic)

C energy of motion (kinetic) $\longrightarrow$ energy of position (potential)

D energy of position (potential) $\longrightarrow$ electrical energy

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11.

A student wrote the following report about an experiment to measure the speed of sound in air.

> My friend and I went into a field a long way from any buildings and measured the distance across the field. My friend stood at one side of the field and I stood at the other. My friend banged two pieces of wood together, and as I saw him do this, I started a stopwatch. I stopped the stopwatch when I heard the sound. We obtained the following readings.
>
> distance across field = 238 m
> time for sound to cross field = 0.7 s

(a) Why was it necessary to be a long way from any buildings?

.....[1]

(b) Why was it necessary to use such a large distance?

.....[1]

(c) Suggest what the students could have used to measure the distance across the field.

.....[1]

(d) Why was there a delay between the student seeing the pieces of wood come together and hearing the bang?

.....

.....[2]

(e) Use the readings to calculate the speed of sound.

speed of sound = ... [4]

(f) Suggest why it might have been a good idea for the students to repeat the experiment after they had exchanged positions.

.....

.....[1]

12.

(a) Here are three quantities that are associated with waves in the electromagnetic spectrum.

speed, wavelength, frequency

(i) Which of these is the same in a vacuum for both X-rays and radio waves?

.....

(ii) Which of these determines the colour of a ray of light?

.....

(iii) Which of these is the distance between two successive wavecrests?

.....

[3]

(b) Which region of the electromagnetic spectrum has the shortest wavelength?

..... [1]