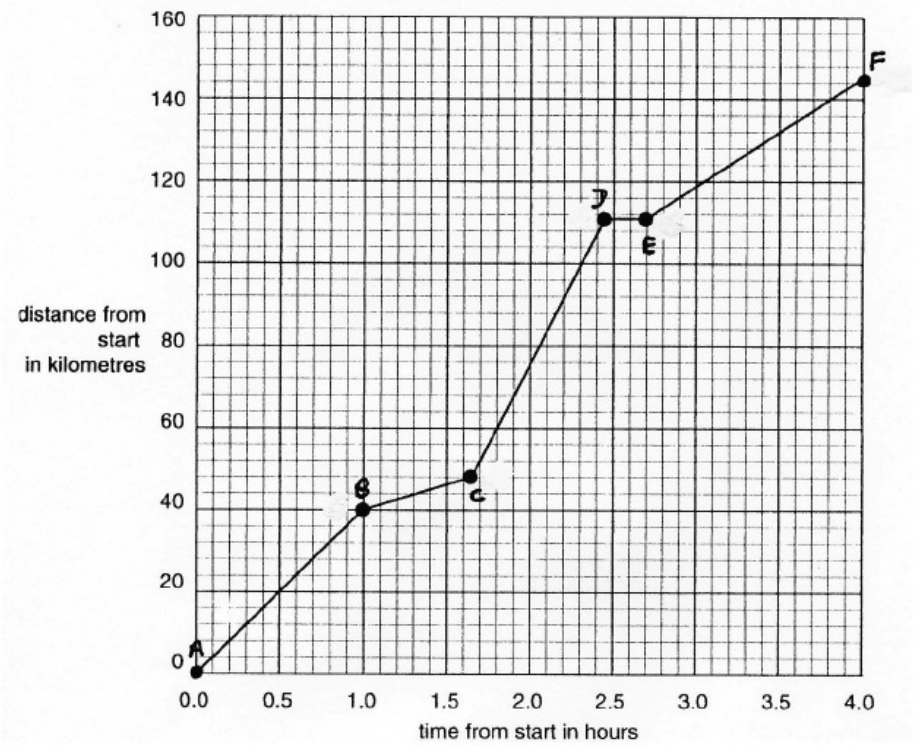
P4 Level Assessed Task 2

8. The graph shows the distance travelled by a cyclist in a race.



(a) During part of the race the cyclist moved at a steady speed and then increased his speed to his fastest during the race.

Which part of the race is described?

Put a (ring) around the correct answer.

A to C **B to D** **B to E** **C to D** **C to F**

[1]

(b) How long did it take the cyclist to travel the first 48 km?

.....[1]

(c) **(i)** What feature of the distance-time graph shows the speed?

.....[1]

(ii) What was the speed of the cyclist between **E** and **F**?

speed = ...km/h [1]

(d) Cycling fans watch a race on television.

They each used a stopwatch to measure the time it took for the cyclist to travel section **B** to **C** of the race.

They recorded the following results.

fan	time in minutes
Erik	38
Lance	57
Nicole	41
Rob	40
Stuart	37

(i) One of the fans made an error in timing. Suggest which fan.

.....[1]

(ii) What name is given to a reading that is wildly out due to a large error?

.....[1]

(iii) What should be done with this timing mistake when calculating the **best** estimate of the time for the cyclist?

Put a tick (✓) in the **correct** box.

Don't use the timing mistake in the calculation.	☐
Change the timing mistake so that it is closer to the others.	☐
Use the timing mistake with the other times in the calculation.	☐
The timing mistake means you can't do the calculation.	☐

[1]

(iv) Which of the following is the **best** estimate of the time for the cyclist?

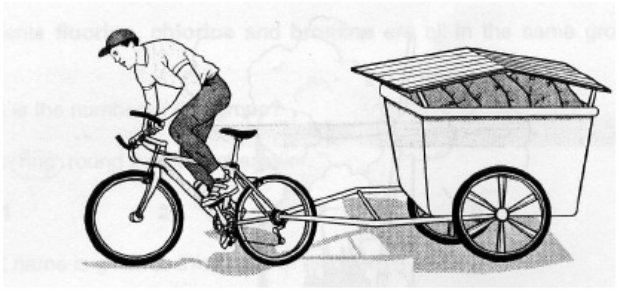
Put a (ring) around your answer.

37 **39** **41** **42.6** **156**

[1]

[Total: 8]

9. In many parts of the world people use a bicycle trailer to transport goods. The trailers are made locally and enable farmers to transport their products to market, children to get to school and water to be carried from the well.



(a) A cyclist can pull a 150 kg load at about 5 m/s on level ground.

Pulling the same load up a slight gradient at 5 m/s, requires about three times as much effort as on level ground.

Why does the cyclist need to put in more effort to pull the load up a hill than to pull it along a level road?

Put a tick (✓) in one or more correct boxes.

There is more gravity.	☐
The cyclist goes slower.	☐
Work must be done to overcome gravity.	☐
The cyclist gains heat energy and becomes hot.	☐
More kinetic energy is produced.	☐

[1]

(b) **(i)** Write down the equation needed to calculate the movement energy of the load.

.....[1]

(ii) Put a tick (✓) next to the correct calculation of the movement energy of the 150 kg load when it is moving at 5 m/s.

energy = 0.5 x 5 x1 50^2 ☐

energy = 5 x 150 x 0.5 ^{2} ☐

energy = 0.5 x 150 x 5^2 ☐

energy = 150 x 52 ☐

energy = 0.5 x 150 x 5 ☐

[1]

(iii) What is the movement energy of the load in joules?

energy .....J [1]

(c) The cyclist pulls the trailer along a horizontal straight road. The cyclist exerts a force of 20 N to keep moving at a steady speed.

(i) How do the counter forces, friction and air resistance compare to the driving force of 20N?

Put a (ring) around the correct answer.

0 N **less than 20 N** **equal to 20 N** **greater than 20 N**

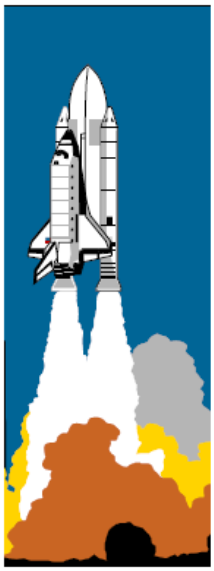
[1]

(ii) What happens to the momentum of the trailer when the driver is exerting the force of 20 N?

.....[1]

[Total: 6]

4 This question is about a space shuttle taking off.



(a) Complete the sentences.
Choose words from this list.

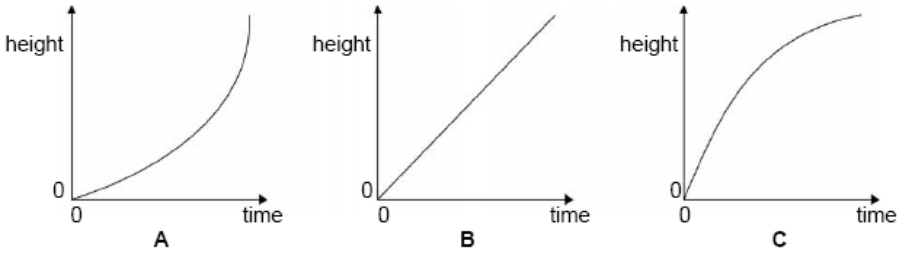
constant
downwards
energy
upwards
weight

The direction of the exhaust gas momentum is ..... .

So the force it exerts on the shuttle is ..... .

The shuttle speeds up when this force is greater than its ..... .
[3]

(b) Here are three height-time graphs.



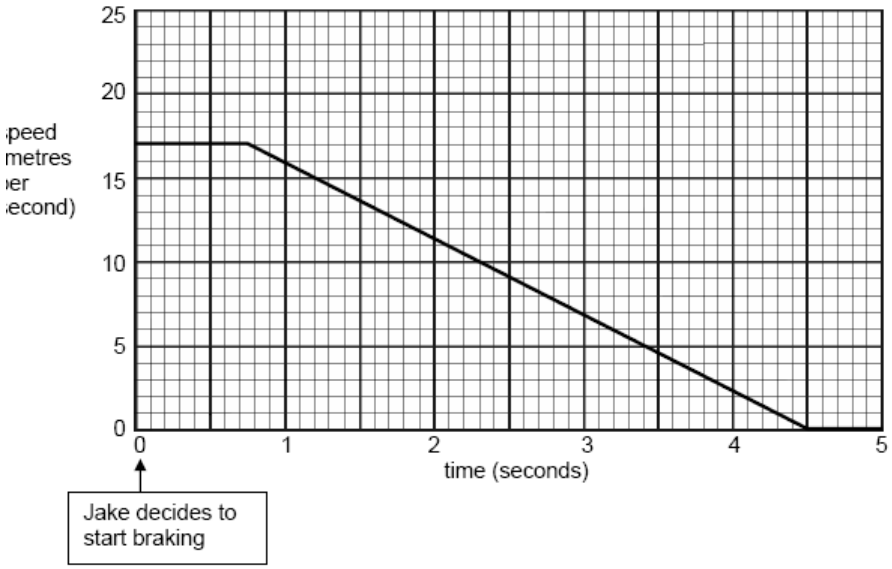
Which **one** shows the shuttle getting faster?

answer ..... [1]

[Total: 4]

5 Jake tests the brakes of his car on a long stretch of straight, flat road.

The graph shows how his velocity changes with time as Jake slows down the car.



(a) The graph starts at the moment that Jake decides to stop the car.

(i) Here are some statements about the motion of the car shown in the graph.

Put a tick (✓) in the box if it is true.
Put a cross (**x**) in the box if it is false.

the brakes apply a force on the car throughout	
the kinetic energy lost by the car is transferred by heating	
work is done by the car brakes to slow the car down	
the velocity of the car decreases steadily throughout	

[2]

(ii) For how long were the brakes **applied**? Choose from the list.

0.75 s

3.75 s

4.50 s

5.00 s

answer ..... s [1]

(iii) The car has a mass of 800 kg.

How much momentum does the car lose as it stops?

momentum lost = ... kg m / s [1]

(b) Jake does the test again going up a hill.
He finds that, for the same initial velocity, the car stops in less time.

Which statement is the **best** explanation for this?

A Gravity pulls the car onto the road, giving the tyres a better grip.

B The kinetic energy of the car decreases as it does work against gravity.

C The car does not need to lose as much momentum when going up the hill.

answer ..... [1]

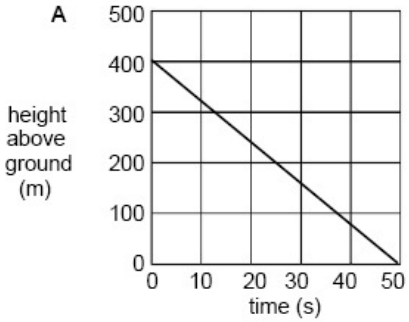
[Total: 5]

6 Sammi enjoys making parachute jumps.

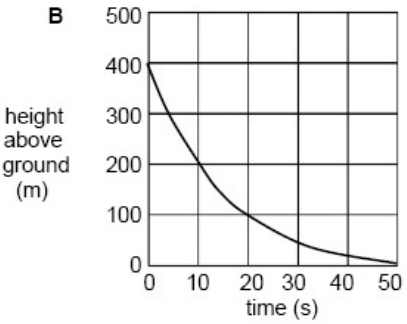
(a) When the parachute is open, Sammi has a constant velocity of 8 m/s in a downwards direction.

(i) Choose the **one** graph, **A**, **B**, **C** or **D**, which correctly shows her motion.

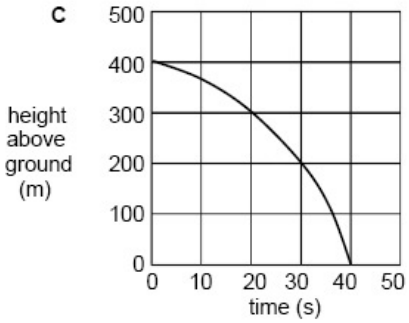
A



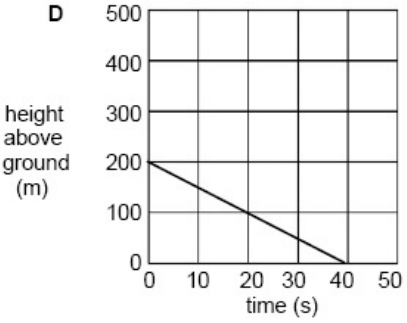
B



C



D



answer ..... [2]

(ii) Sammi has a mass of 60 kg. What is her kinetic energy as she falls at 8 m/s?

Put a (ring) around the correct answer.

240 J **480 J** **1920 J** **38 400 J**

[1]

(b) Sammi and her parachute have a total weight of 800 N.

Calculate the change of gravitational potential energy (GPE) when she drops through a height of 300 m.

change of GPE = ... J [1]

(c) A loss of gravitational potential energy usually results in a gain of kinetic energy. This does not happen when Sammi falls by parachute.

Who has the **best** explanation for this?

answer ..... [1]

[Total: 5]