**Q1.** (a) A car driver makes an emergency stop.

The chart shows the 'thinking distance' and the 'braking distance' needed to stop the car.



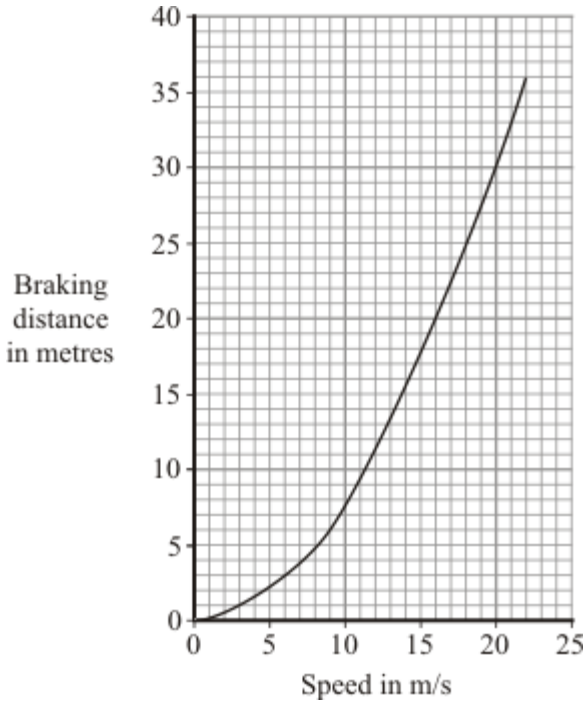

Calculate the total stopping distance of the car.

.....

Stopping distance = ..... m

**(1)**

(b) The graph shows how the braking distance of a car driven on a dry road changes with the car's speed.




The braking distance of the car on an icy road is longer than the braking distance of the car on a dry road.

(i) Draw a new line on the graph to show how the braking distance of the car on an icy road changes with speed.

**(2)**

(ii) Which **two** of the following would also increase the braking distance of the car?

Put a tick (✓) next to each of your answers.

rain on the road ☐

the driver having drunk alcohol ☐

car brakes in bad condition ☐

the driver having taken drugs ☐

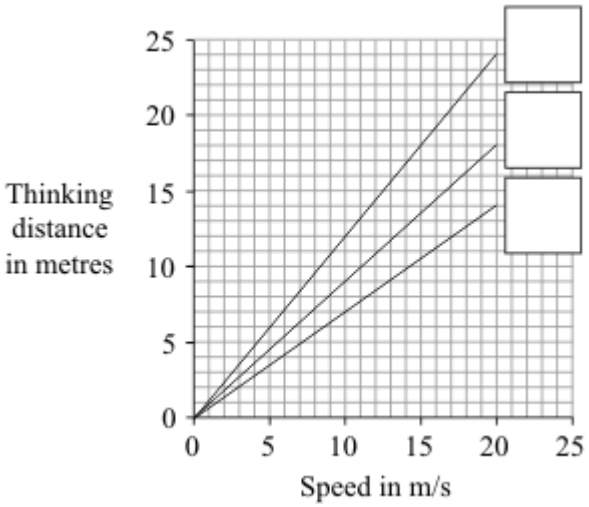
**(2)**

(c) The thinking distance depends on the driver's reaction time.

The table shows the reaction times of three people driving under different conditions.

| Car driver | Condition | Reaction time in seconds |
|---|---|---|
| **A** | Wide awake with no distractions | 0.7 |
| **B** | Using a hands-free mobile phone | 0.9 |
| **C** | Very tired and listening to music | 1.2 |

The graph lines show how the thinking distance for the three drivers, **A**, **B** and **C**, depends on how fast they are driving the car.




(i) Match each graph line to the correct driver by writing **A**, **B** or **C** in the box next to the correct line.

**(2)**

(ii) The information in the table cannot be used to tell if driver **C**'s reaction time is increased by being tired or by listening to music.

Explain why.

.....

.....

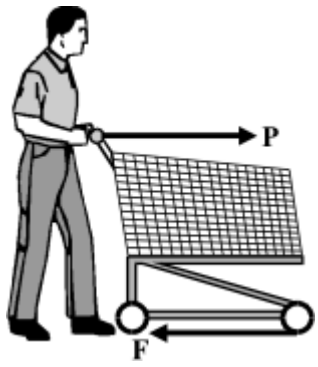
.....

.....

**(2)**

**(Total 9 marks)**

**Q2.** (a) A shopping trolley is being pushed at a constant speed. The arrows represent the horizontal forces on the trolley.

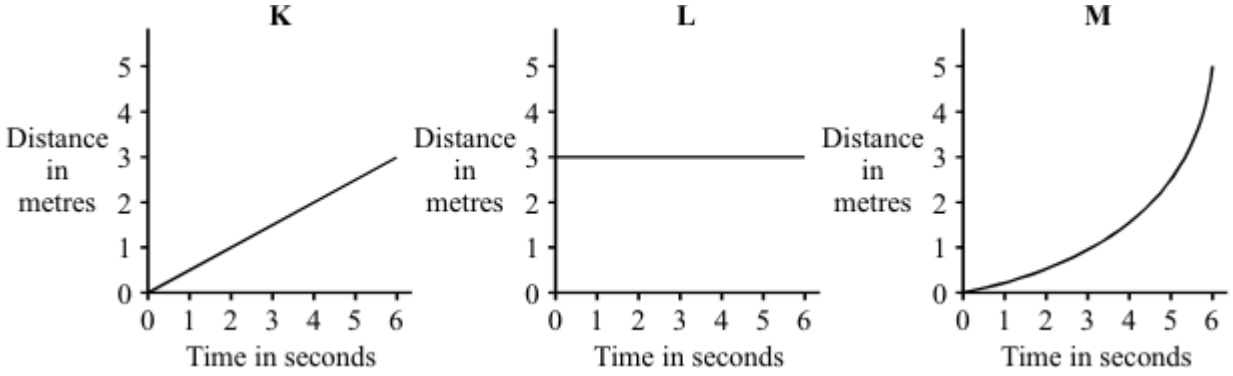



(i) How big is force **P** compared to force **F**?

.....

**(1)**

(ii) Which **one** of the distance-time graphs, **K**, **L** or **M**, shows the motion of the trolley? Draw a circle around your answer.




**(1)**

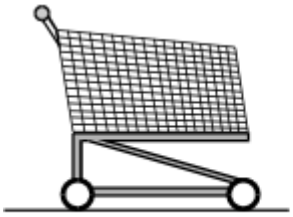
(b) Complete the sentence by crossing out the **two** words in the box that are wrong.

Acceleration is the rate of change of

| |
|---|
| energy. |
| speed. |
| velocity. |

**(1)**

(c) Three trolleys, **A**, **B** and **C**, are pushed using the same size force. The force causes each trolley to accelerate.



**A**



**B**



**C**

Which trolley will have the smallest acceleration?

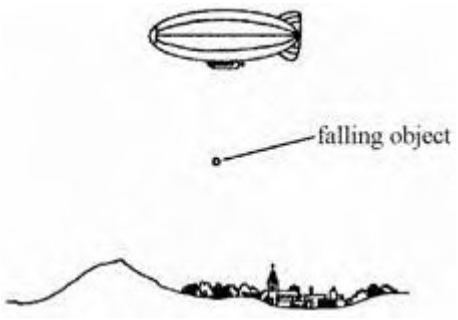
.....

Give a reason for your answer.

.....

**(2)**
**(Total 5 marks)**

**Q3.** A small object falls out of a balloon.




Choose words from the list to complete the sentences below.

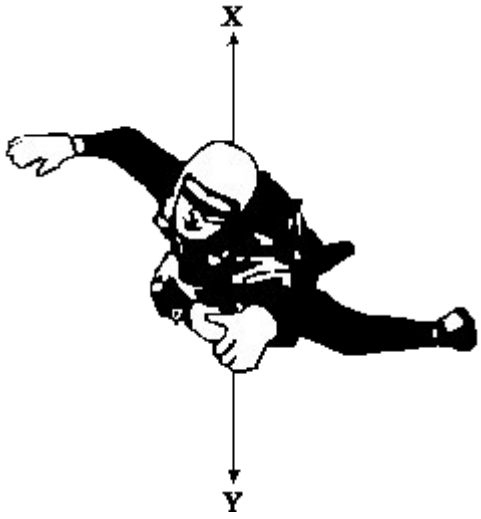
**friction** **gravity** **air pressure**

**accelerates** **falls at a steady speed** **slows down**

- The weight of an object is the force of ..... which acts on it.
- When you drop something, first of all it ..... .
- The faster it falls, the bigger the force of ..... which acts on it.
- Eventually the object ..... .

**(Total 4 marks)**

**Q4.** The diagram shows a sky-diver in free fall. Two forces, **X** and **Y**, act on the sky-diver.




(a) Complete these sentences by crossing out the **two** lines in each box that are wrong.

(i) Force **X** is caused by

| |
|---|
| friction |
| gravity |
| weight |

. **(1)**

(ii) Force **Y** is caused by

| |
|---|
| air resistance |
| friction |
| gravity |

. **(1)**

(b) The size of force **X** changes as the sky-diver falls. Describe the motion of the sky-diver when:

(i) force **X** is smaller than force **Y**,

.....

.....

**(2)**

(ii) force **X** is equal to force **Y**.

.....

.....

**(1)**
**(Total 5 marks)**

**Q5.** (a) Two skydivers jump from a plane. Each holds a different position in the air.



**A**



**B**

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Complete the following sentence.

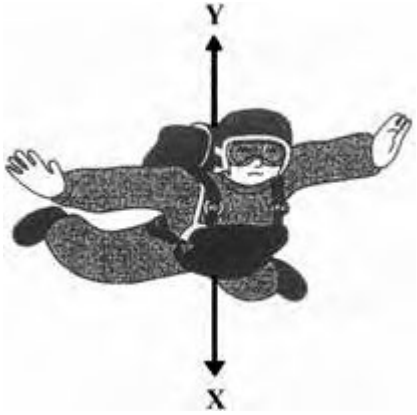
Skydiver ..... will fall faster because.....

.....

.....

**(2)**

The diagram shows the direction of the forces acting on one of the skydivers.




*Adapted from Progress with Physics by Nick England, reproduced by permission of Hodder Arnold*

(b) In the following sentences, cross out in each box the **two** lines that are wrong.

(i) Force **X** is caused by

| |
|---|
| air resistance<br>friction<br>gravity |

**(1)**

(ii) Force **Y** is caused by

| |
|---|
| air resistance<br>gravity<br>weight |

**(1)**

(iii) When force **X** is bigger than force **Y**, the speed of the skydiver will

| |
|---|
| go up<br>stay the same<br>go down |

**(1)**

(iv) After the parachute opens, force **X**

| |
|---|
| goes up<br>stays the same<br>goes down |

**(1)**

(c) How does the area of an opened parachute affect the size of force **Y**?

.....

.....

**(1)**

**(Total 7 marks)**