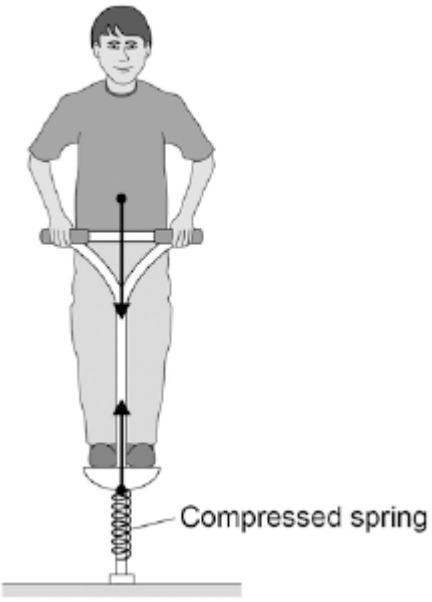
Q1. The figure below shows the forces acting on a child who is balancing on a pogo stick.

The child and pogo stick are not moving.



(a) The downward force of the child on the spring is equal to the upward force of the spring on the child.

This is an example of which one of Newton's Laws of motion?

Tick **one** box.

First Law ☐

Second Law ☐

Third Law ☐

(1)

(b) Complete the sentence.

Use an answer from the box.

elastic potential	**gravitational potential**	**kinetic**

The compressed spring stores ..... energy.

(1)

(c) The child has a weight of 343 N.

Gravitational field strength = 9.8 N / kg

Write down the equation which links gravitational field strength, mass and weight.

.....

(1)

(d) Calculate the mass of the child.

.....

.....

.....

Mass = ... kg

(3)

(e) The weight of the child causes the spring to compress elastically from a length of 30cm to a new length of 23cm.

Write down the equation which links compression, force and spring constant.

.....

(1)

(f) Calculate the spring constant of the spring.

Give your answer in newtons per metre.

.....

.....

.....

Spring constant = ... N / m

(4)
(Total 11 marks)

Q2. (a) A car is being driven along a straight road. The diagrams, **A**, **B** and **C**, show the horizontal forces acting on the moving car at three different points along the road.

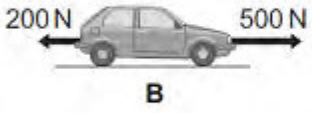
Describe the motion of the car at each of the points, **A**, **B** and **C**.



A

.....

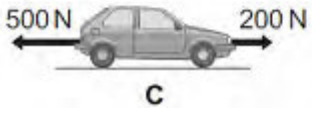
.....



B

.....

.....



C

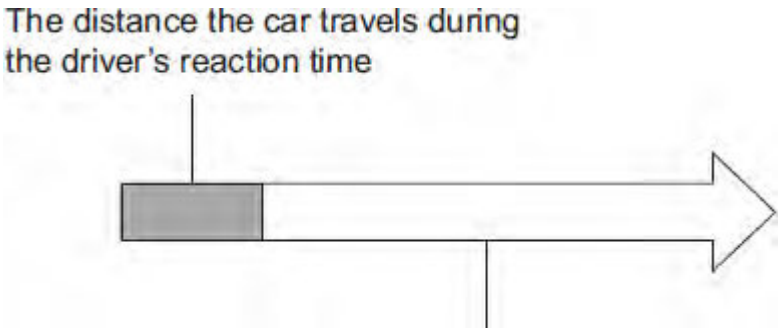
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(3)

(b) The diagram below shows the stopping distance for a family car, in good condition, driven at 22 m/s on a dry road. The stopping distance has two parts.

(i) Complete the diagram below by adding an appropriate label to the second part of the stopping distance.



.....

.....

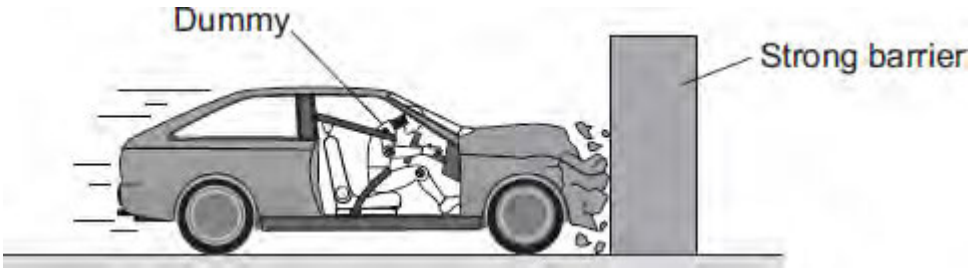
(1)

(ii) State **one** factor that changes both the first part **and** the second part of the stopping distance.

.....

(1)

(c) The front crumple zone of a car is tested at a road traffic laboratory. This is done by using a remote control device to drive the car into a strong barrier. Electronic sensors are attached to the dummy inside the car.



(i) At the point of collision, the car exerts a force of 5000 N on the barrier.

State the size and direction of the force exerted by the barrier on the car.

.....

.....

(1)

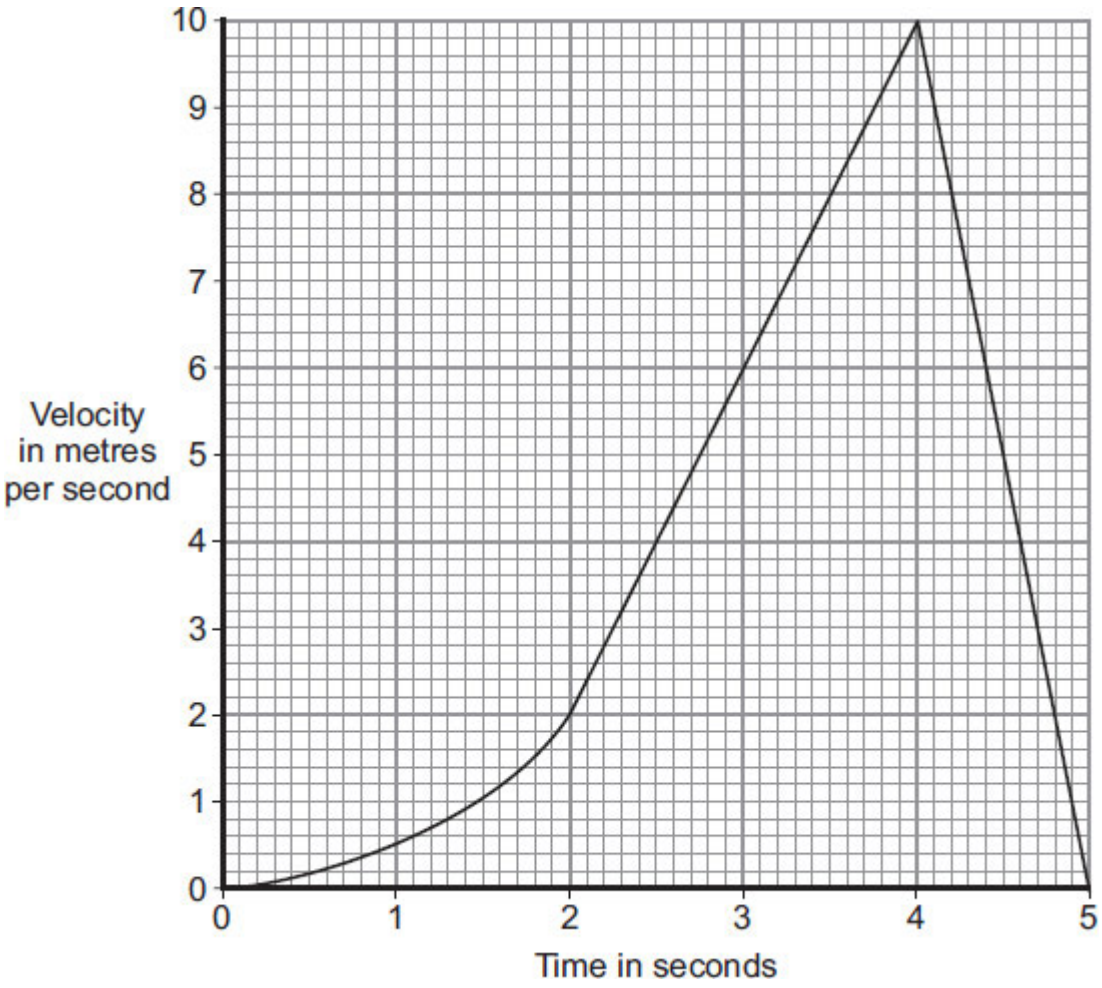
(ii) Suggest why the dummy is fitted with electronic sensors.

.....

.....

(1)

(iii) The graph shows how the velocity of the car changes during the test.



Use the graph to calculate the acceleration of the car just before the collision with the barrier.

Show clearly how you work out your answer, including how you use the graph, and give the unit.

.....

.....

.....

.....

Acceleration = ...

(3)

(Total 10 marks)