Name of the Student:_____

Max. **Marks : 22 Marks**   **Time : 22 Minutes**

Q1.

A car driver sees a rabbit on the road.

The driver makes an emergency stop after he sees the rabbit.

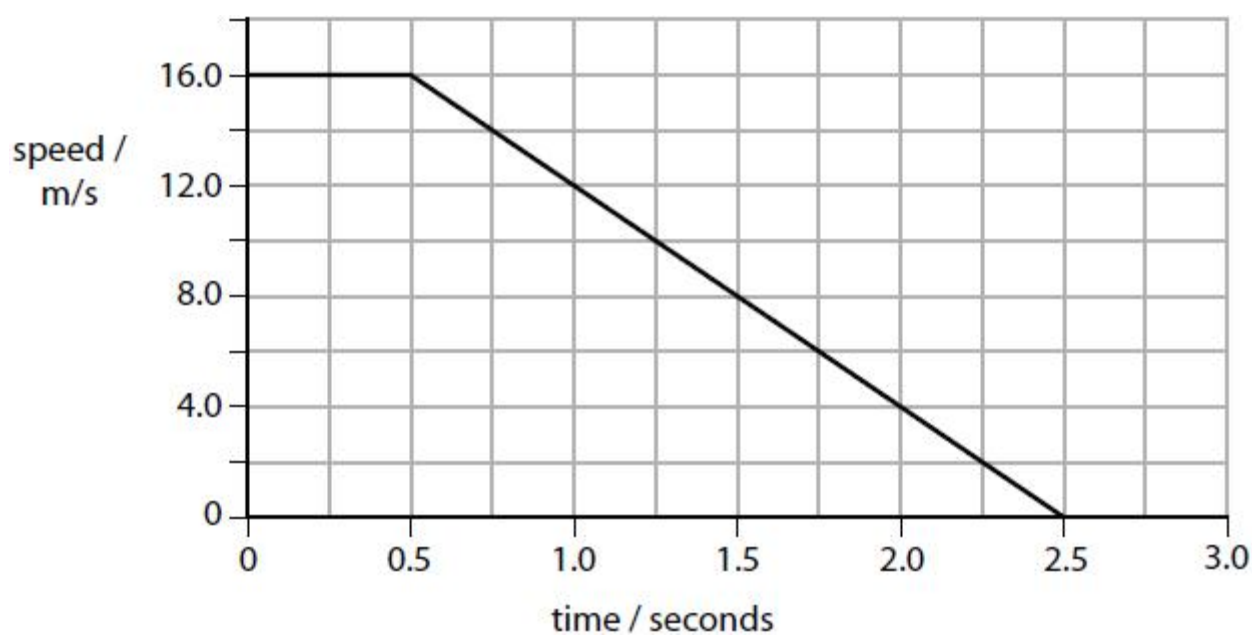Figure 6 shows the speed of the car from the time the driver sees the rabbit until the car stops.

Figure 6

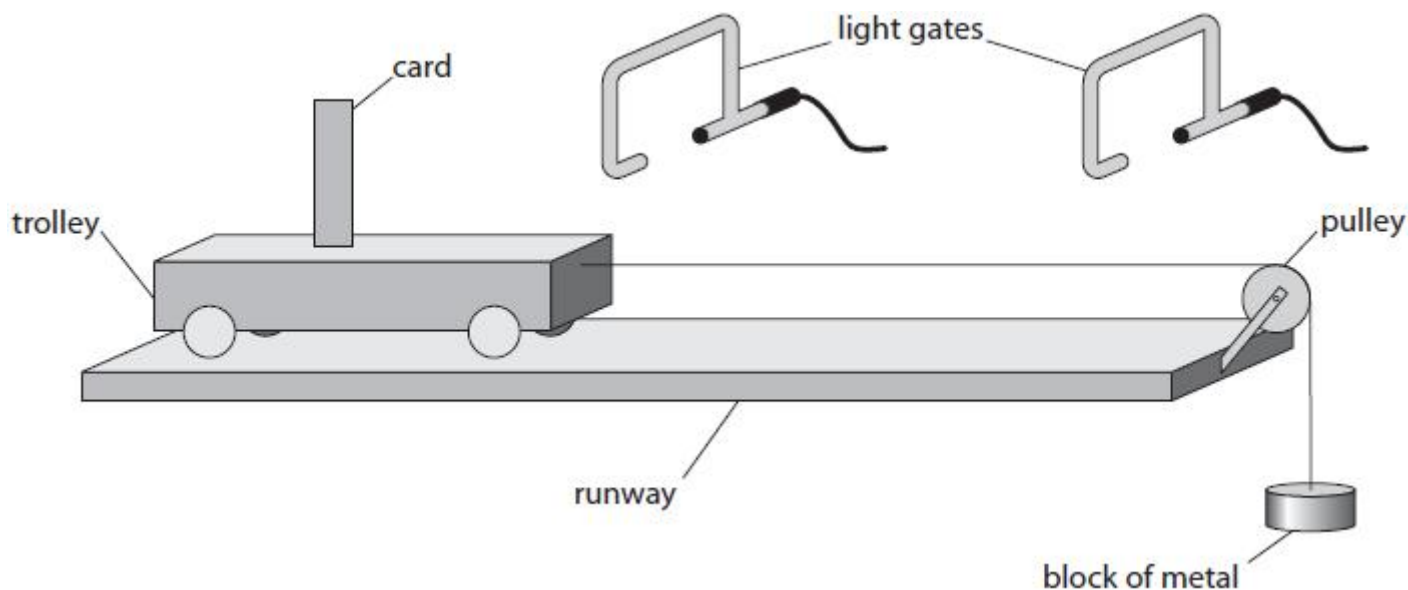Calculate the distance that the car travels in the first 0.5 seconds.

(3)

distance = ... m

(Total for question = 3 marks)

Q2.

A student investigates the motion of a trolley along a horizontal runway using the apparatus in Figure 2.

Figure 2

A trolley is attached to a string passing over a pulley.

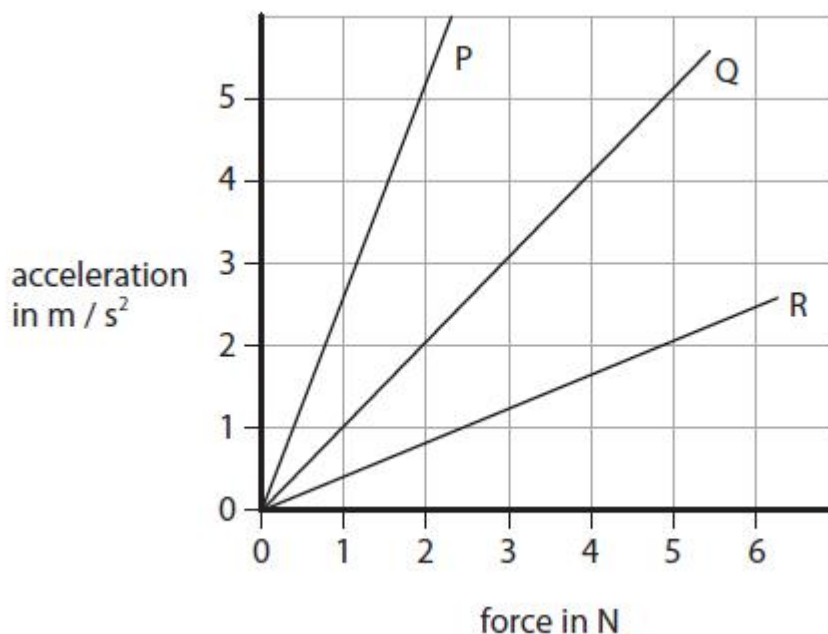A block of metal hangs on the end of the string.

Each light gate measures the time it takes for the card to pass through the gate.

When the trolley is released, it moves along the track.

A computer measures the time it takes for the card to pass between each light gate.

Figure 3 shows a graph of acceleration against force for three trollies of different mass that are pulled along the runway.

The graphs for the trollies are labelled P, Q and R.

Figure 3

Use the information from the graph.

(i) Calculate the mass of trolley Q

(2)

mass of trolley Q = ... kg

(ii) Describe how the graph shows that trolley R has the greatest mass.

(2)

....

....

....

....

....
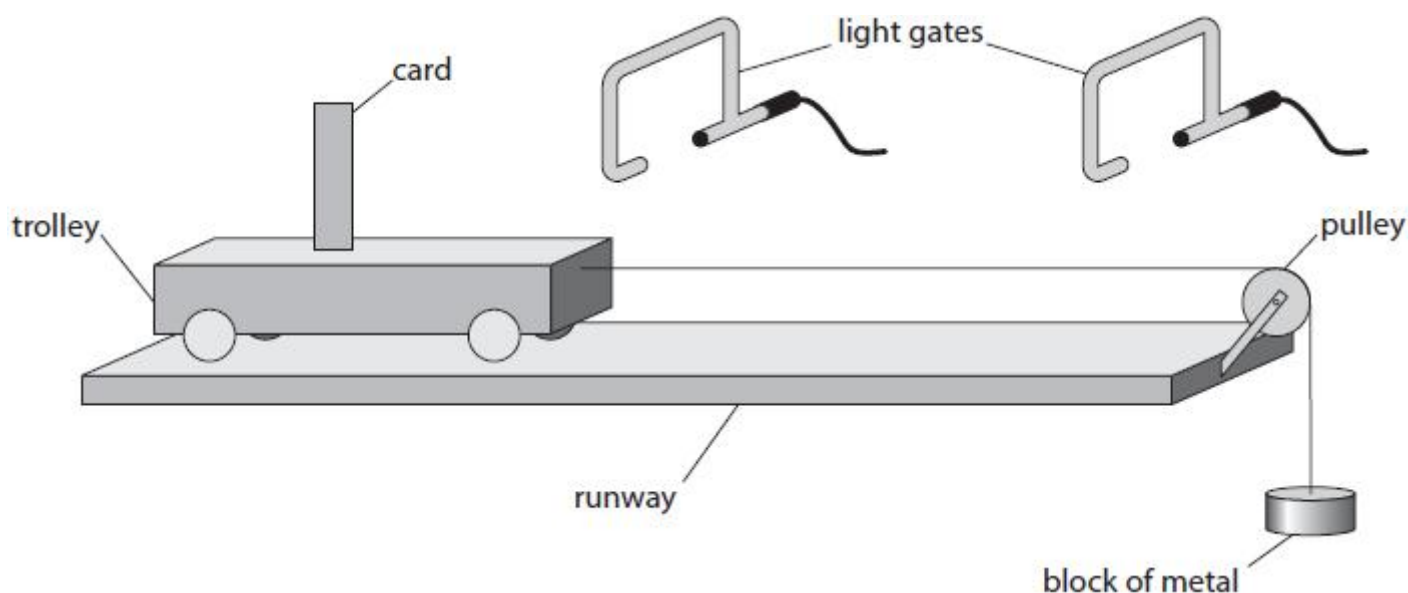
(Total for question = 4 marks)

Q3.

A student investigates the motion of a trolley along a horizontal runway using the apparatus in Figure 2.

Figure 2

A trolley is attached to a string passing over a pulley.

A block of metal hangs on the end of the string.

Each light gate measures the time it takes for the card to pass through the gate.

When the trolley is released, it moves along the track.

A computer measures the time it takes for the card to pass between each light gate.

(i)   The card took 0.080 s to pass through the first light gate.

The width of the card is 5 cm.
Calculate the average speed, in m/s, of the trolley through the first light gate.

(2)

average speed = ... m/s

Another trolley passes through the first light gate at a velocity of 0.72 m/s.

This trolley passes through the second light gate at a velocity of 1.1 m/s.

The time it takes for the card on the trolley to travel between the two light gates is 0.53 s.

(ii) State the equation relating acceleration, change in velocity and time.

(1)

(iii) Calculate the acceleration of the trolley between the two light gates.

(2)

acceleration = ... m/s^2

(Total for question = 5 marks)

Q4.

A car is travelling down a slope at 2.0 m/s.

The car accelerates for 4.0 s.

The speed of the car increases to 12 m/s.

Calculate the acceleration of the car.

Use the equation

$$a = \frac{(v - u)}{t}$$

(2)

acceleration of the car = ... m/s^2

(Total for question = 2 marks)

Q5.

Another cyclist travels 1200 m in a time of 80 s.

Calculate the average speed of the cyclist.

Use the equation

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

(2)

average speed = ... m / s

(Total for question = 2 marks)

Q6.

A car travels along a straight road.

The car accelerates at 3 m / s^2 for a time of 7 s.

Calculate the change in velocity of the car.

Use the equation

change in velocity = acceleration × time taken

(2)

change in velocity = ... m / s

(Total for question = 2 marks)

Q7.

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/s^2.

Calculate the distance, x, travelled by the aircraft while it is accelerating.

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

(2)

x = ... m

(Total for question = 2 marks)

Q8.

A different car has a mass of 1200 kg.

Calculate the force needed to give this car an acceleration of 2.4 m / s^2.

(2)

Use the equation

$$F = m \times a$$

force = ... N

(Total for question = 2 marks)