

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Figure 9 shows a small steel ball held at a height, h , above the ground.

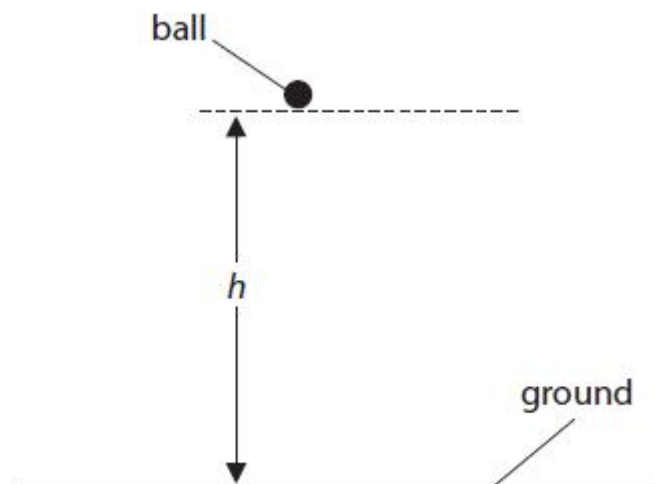


Figure 9

Two students use the arrangement shown in Figure 9.

They use a stopwatch to time the ball falling through the height of 1.4 m.

The students repeat the measurement many times, but their average value for t is different from the calculated value.

(i) Suggest a reason why the students' value for t is different from the calculated value.

(1)

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(ii) Suggest **one** improvement the students could make to their procedure so that their value for t is closer to the calculated value.

(1)

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(Total for question = 2 marks)

Q2.

Figure 3 is a speed limit sign from a European motorway.

The speeds shown are in km/h (kilometres per hour).

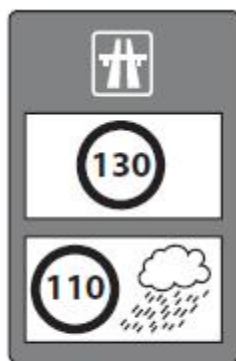


Figure 3

(i) The sign tells drivers to drive at a slower speed in wet weather.

Explain why it is safer for drivers to drive at a slower speed in wet weather.

(2)

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(ii) Show that a speed of 31 m/s is less than a speed of 130 km/h.

(2)

(iii)

The driver's reaction time is the time between the driver seeing an emergency and starting to brake.

A car is travelling at a speed of 31 m/s.

The car travels 46 m between the driver seeing an emergency and starting to brake.

Calculate the driver's reaction time.

Give your answer to 2 significant figures.

(3)

driver's reaction time s

(Total for question = 7 marks)

Q3.

A student investigates the motion of a trolley along a horizontal runway.
Figure 6 shows the apparatus.

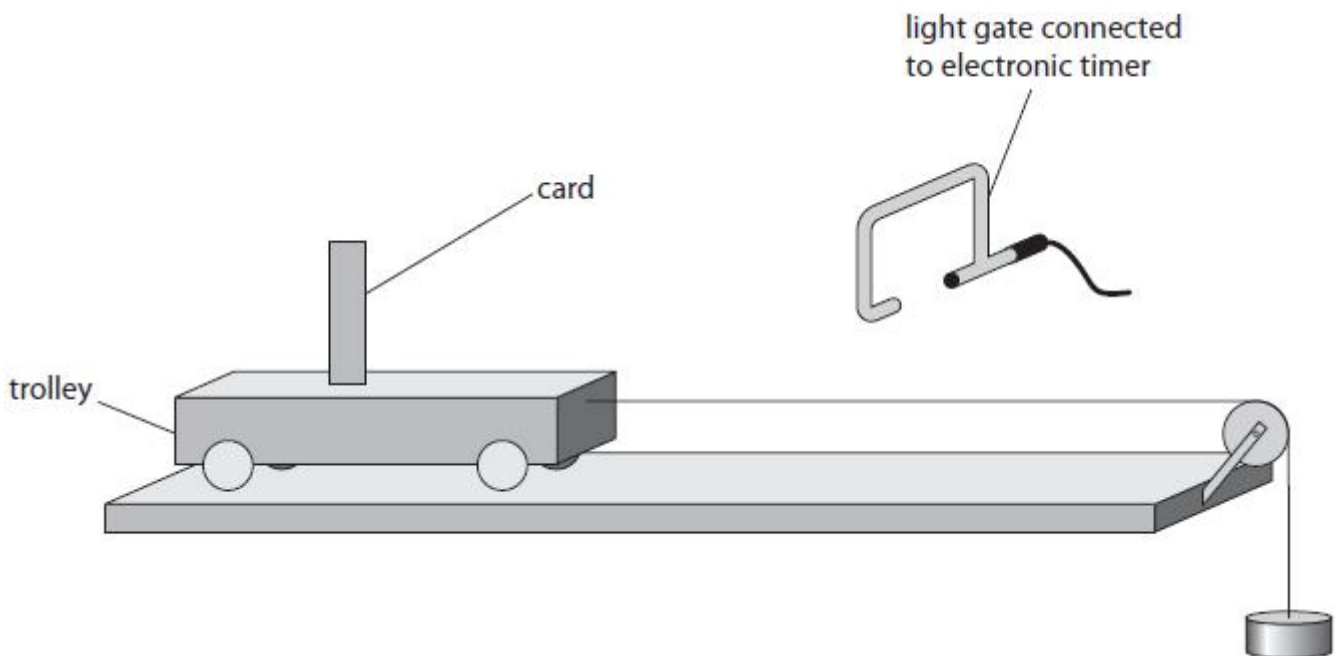


Figure 6

The trolley is attached to a string passing over a pulley.
A 100 g metal disc hangs on the end of the string.
The light gate measures the time it takes for the card to pass through it.
When the trolley is released, it accelerates along the track.

(i) Explain why the trolley accelerates along the track.

(2)

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(ii) The card takes 0.040 s to travel through the light gate.

The student calculates that the average speed of the trolley through the light gate is 1.15 m/s.
Calculate the width of the card.

(2)

width = cm

(iii) The trolley travels 1.2 m along the track from the start before the card reaches the light gate.

Show that acceleration of the trolley along this distance is approximately 0.55 m/s^2 .

(2)

(Total for question = 6 marks)

Q4.

The diagram shows a collision between a proton (p) and a helium nucleus (He).
before collision



after collision



(i) The table gives some information about the collision.

		before collision	after collision
proton	kinetic energy (arbitrary units)	12.5	4.5
helium nucleus	kinetic energy (arbitrary units)	0	8

Use information from the table to show that the collision is elastic.

(2)

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(ii) State the name of one device that can be used to accelerate protons to very high speeds.

(1)

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