

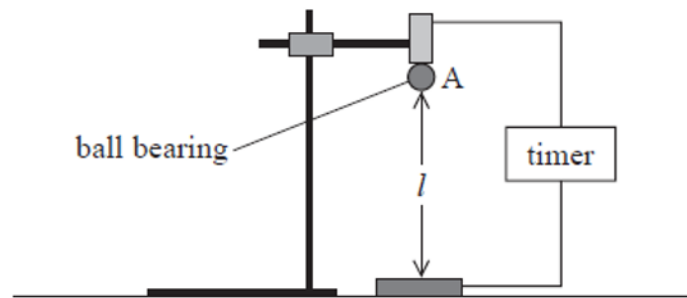


Questions

Q1.

A student carried out an experiment to measure the acceleration of free-fall g .

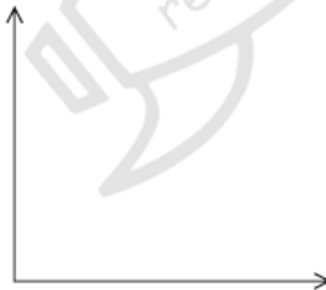
A ball bearing was released from position A. The time t for the ball bearing to fall a distance l was measured. This was repeated for decreasing values of l .



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Explain how the measurements obtained can be used to determine a value for g in m s^{-2} . Your answer should include a sketch on the axes below of the graph that the student would expect to obtain.

(5)



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(Total for question = 5 marks)

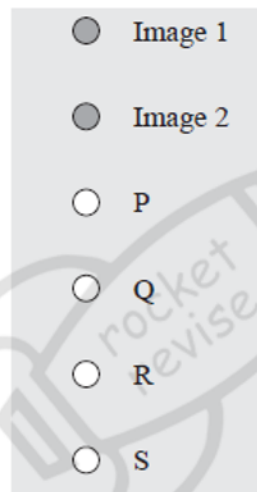
Q2.

A student used a falling sphere to determine the acceleration of free fall.

A camera produced images of the sphere at constant time intervals as it fell.

The positions of the sphere in the first two images are shown. Image 1 shows the sphere's position at the instant it was released.

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Which of the positions P, Q, R or S will the sphere be at in Image 3?

(1)

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** R
- ☒ **D** S

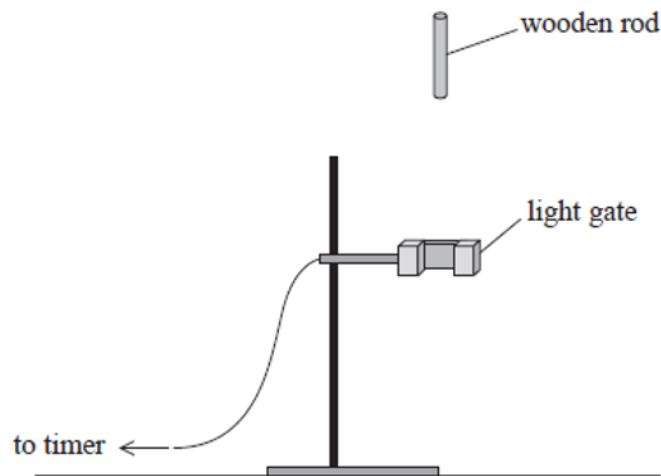
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(Total for question = 1 mark)

Q3.

A student carries out an experiment to determine a value for g , the acceleration of free fall. A short wooden rod is released above a light gate. A timer connected to the light gate is used to measure the time taken for the wooden rod to pass through the light gate.

The experimental arrangement is shown.



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The student uses the equation $v^2 = u^2 + 2as$, where $u = 0$, and a graphical method to determine a value for g .

(a) State the additional measurements the student should take.

(2)

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(b) Describe how the velocity v of the wooden rod as it passes through the light gate can be determined accurately.

(2)

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(c) Describe how the student can determine a value for g using a graphical method.

(3)

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(Total for question = 7 marks)

Q4.

Answer the question with a cross in the box you think is correct ☐ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐ .

A student used a falling sphere to determine the acceleration of free-fall g . The sphere was released from rest.

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Which two quantities would require the fewest measurements to be taken in order to determine g ?

- ☐ **A** displacement and initial velocity
- ☐ **B** displacement and time
- ☐ **C** final velocity and displacement
- ☐ **D** final velocity and time



(Total for question = 1 mark)

Q5.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

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A student determined the acceleration of free fall g .

She measured the time t for a ball bearing to fall from rest through a distance s .
She repeated this for a range of values of s .

Which row of the table shows the graph that would give a gradient equivalent to g ?

	y -axis	x -axis
☐ A	s	$2t^2$
☐ B	$2s$	t^2
☐ C	s	$2t$
☐ D	$2s$	t

(Total for question = 1 mark)

Q6.

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A student measures the time t taken for a ball bearing to fall different measured distances s from rest. The student uses his measurements to plot a graph with a gradient equal to the acceleration due to gravity g .

Which row of the table shows a graph with a gradient equal to g ?



	<i>y</i> -axis	<i>x</i> -axis
☐ A	s	t^2
☐ B	$2s$	t^2
☐ C	t^2	s
☐ D	t^2	$2s$

(Total for question = 1 mark)

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Q7.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

A ball bearing falls vertically from rest through a distance of 50 cm in a time of 0.32 s.

Which expression gives the acceleration of the ball bearing in m s^{-2} ?

- ☐ A $1 \div 0.32^2$
- ☐ B $0.5 \div 0.32$
- ☐ C $100 \div 0.32^2$
- ☐ D $50 \div 0.32$

(Total for question = 1 mark)

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Q8.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

A student measures the time taken for a steel ball bearing to fall a measured distance in air. The student uses these measurements to determine the acceleration due to gravity.



Which of the following conditions is needed to determine an accurate value for the acceleration due to gravity?

- ☐ **A** The air flow around the ball bearing should be laminar.
- ☐ **B** The time taken to achieve terminal velocity should be short.
- ☐ **C** The ball bearing should begin to fall before the timer is started.
- ☐ **D** Air resistance and upthrust should both be negligible.

(Total for question = 1 mark)

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Q9.

Answer the question with a cross in the box you think is correct (☒). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

A student determined a value for g by dropping a metal sphere from rest. The student measured the distance fallen and the time taken for the sphere to fall.

The student obtained a value for g of 11.2 m s^{-2} .

Which of the following could explain the difference between the student's value and the accepted value?

- ☐ **A** The air resistance was not negligible.
- ☐ **B** The student's measured distance was greater than the actual distance.
- ☐ **C** The sphere did not fall vertically.
- ☐ **D** The student's measured time was greater than the actual time taken.

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(Total for question = 1 mark)