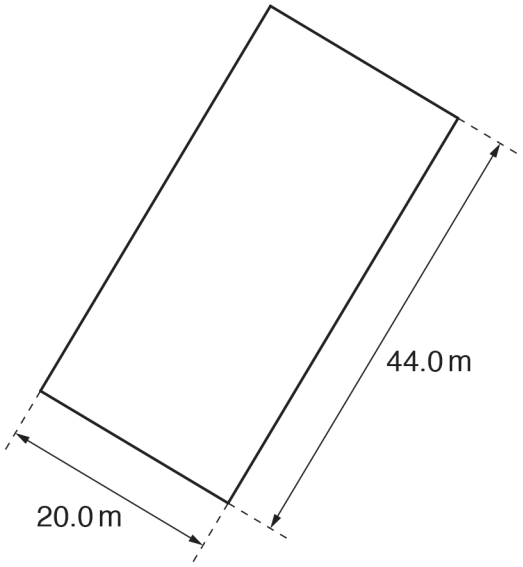
1 The diagram shows the top view of a rectangular paddling pool of constant depth. The pool is filled with sea water.



(a) The volume of the sea water in the pool is 264 m^3.

Calculate the depth of the pool.

depth = ... [3]

(b) The mass of the sea water in the pool is 2.70×10^5 kg.

Calculate the density of the sea water. Give your answer to 3 significant figures.

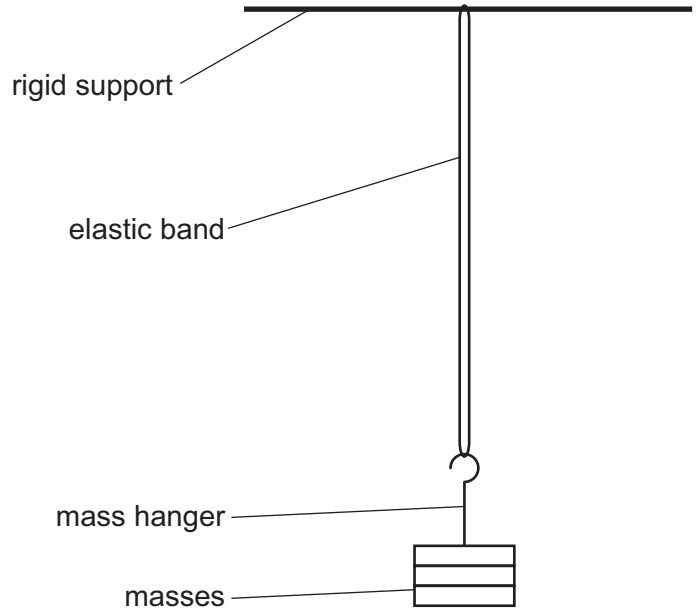
density = ... [2]

(c) Calculate the pressure due to the sea water at the bottom of the pool.

pressure = ... [2]

[Total: 7]

2 The diagram shows some masses on a mass hanger attached to an elastic band. The elastic band is stretched by the masses.



A student pulls the mass hanger down and then releases it. The mass hanger and masses oscillate up and down.

The student uses a stop-watch to time 20 oscillations. The diagram below shows the time reading on the stop-watch after the 20th oscillation.

(a) Determine the time **in seconds** for 20 oscillations from the time shown on the stop-watch.

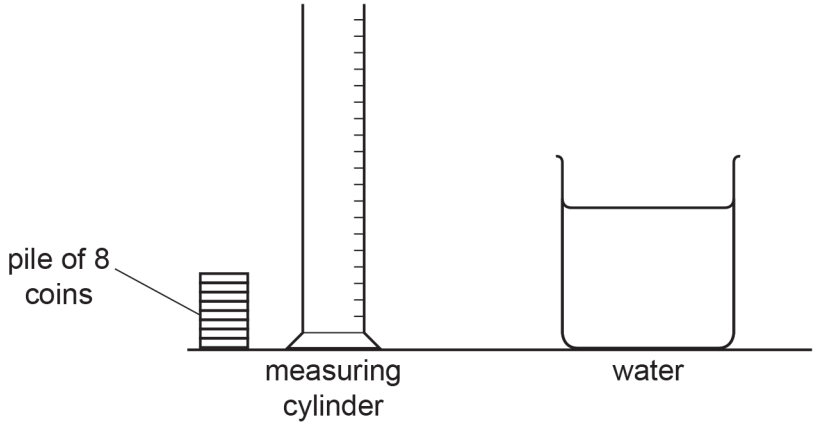
time for 20 oscillations = ... s [1]

(b) Calculate the time in seconds for **one** oscillation.

time for one oscillation = ... s [2]

[Total: 3]

3 The diagram shows a pile of coins, a measuring cylinder and a beaker containing some water.



Describe how the student can measure the volume of **one** of the coins using the set-up shown in the diagram.

.....

.....

.....

..... [4]

[Total: 4]

4 A student is measuring the time period (the time for one complete oscillation) of a pendulum.

The student uses a stopwatch to measure the time taken for 50 periods of a pendulum.
The diagram shows the time taken on the stopwatch.

Calculate the time for one period of the pendulum. Give your answer to 3 significant figures.

time for one period = ... s [3]

[Total: 3]

5 A device has a light-emitting diode (LED) that flashes briefly at regular intervals.

Describe how to determine accurately the average time for each interval, using a stopwatch.

.....

.....

.....

.....

.....

..... [4]

[Total: 4]

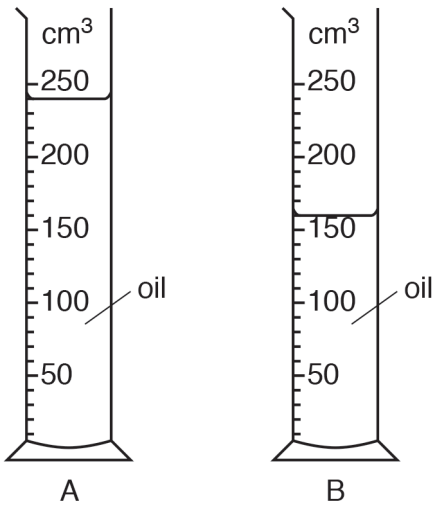
6 A bottle contains some oil.

(a) The mass of the oil and the bottle is 678 g. The mass of the empty bottle is 318 g.

Calculate the mass of the oil.

mass = ... g [1]

(b) Some of the oil from **(a)** is poured into measuring cylinder A. The rest of the oil is poured into measuring cylinder B, as shown in the diagram.



(i) State the volume of oil in measuring cylinder B, as shown in the diagram.

volume = ... cm^3 [1]

(ii) Calculate the total volume of oil.

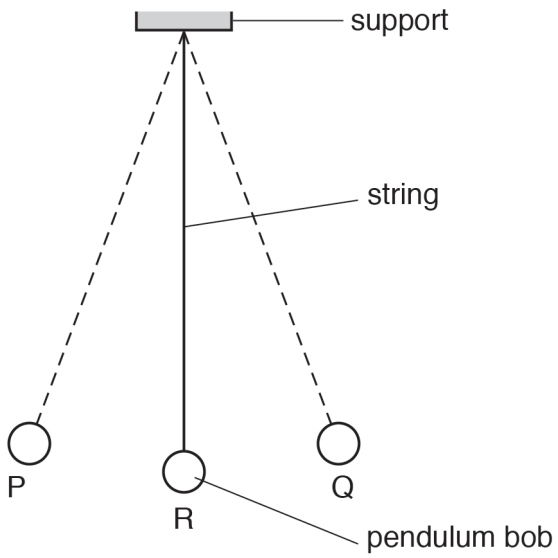
volume = ... cm^3 [1]

(iii) Calculate the density of the oil.

density = ... g/cm^3 [3]

[Total: 6]

7 The diagram shows a simple pendulum swinging backwards and forwards between P and Q. One complete oscillation of the pendulum is when the bob swings from P to Q and then back to P.



A student starts two stopwatches at the same time while the pendulum bob is swinging.

The student stops one stopwatch when the pendulum bob is at P. He stops the other stopwatch when the pendulum bob next is at Q.

The diagram shows the readings on the stopwatches.

reading at P

reading at Q

(a) Use the readings on the two stopwatches to determine the time for one complete oscillation of the pendulum.

time = ... s [2]

(b) The method used by the student does not give an accurate value for one complete oscillation of the pendulum.

Describe how the student could obtain an accurate value for one complete oscillation of the pendulum.

.....

.....

.....

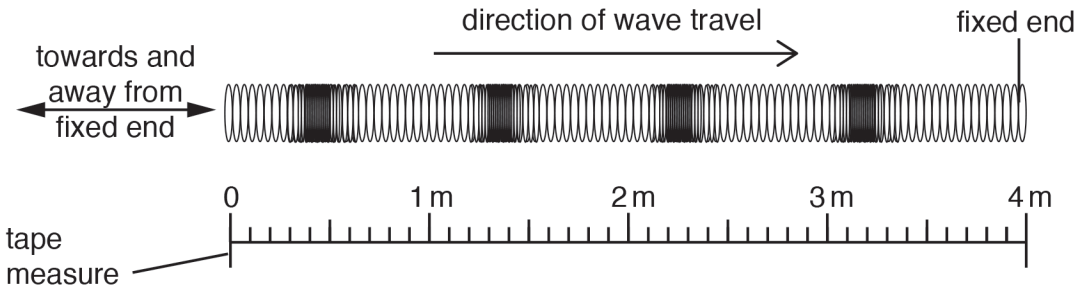
.....

.....

..... [4]

[Total: 6]

8 A long spring is fixed at one end, as shown in the diagram. The spring is moved towards and away from the fixed end, repeatedly. The compressions and rarefactions on the spring at a particular time can be seen.



(a) State the type of wave in the spring.

..... [1]

(b) State one other example of this type of wave.

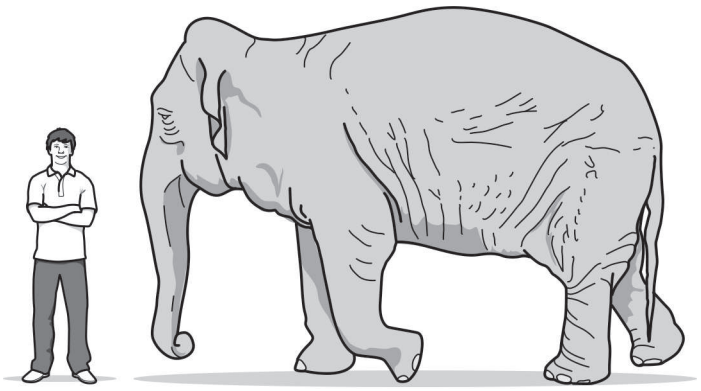
..... [1]

(c) Use the scale in the diagram to determine the wavelength of the wave in the spring.

wavelength = ... cm [1]

[Total: 3]

9 A student is studying elephants.The diagram shows an elephant.



(a) The student measures the elephant and records the values, as shown in the table.

Complete the table by adding a suitable unit for each measurement. Choose the units from those shown in the box.

m^2	kg	cm	mm^2	g	m	cm^2	mg	mm

measurements	value	unit
mass of elephant	4000	
height of elephant	3.0	
average area of an elephant's foot	0.125	

[2]

(b) Using information from the table in **(a)**:

(i) calculate the weight of the elephant

weight = ... N [3]

(ii) calculate the pressure the elephant exerts on the ground when it is standing on four feet. Include a unit.

pressure = ... [4]

[Total: 9]

10 This question is about measuring the speed of sound in air.

A student stands in front of a large wall. She hits a drum and hears an echo. The diagram shows the position of the student and the wall.

(a) **(i)** State the name of a piece of equipment for measuring the distance from the student to the wall.

..... [1]

(ii) Explain how sound forms an echo.

.....

..... [1]

(b) The student hits her drum repeatedly once per second. She walks away from the wall and listens for the echo. When the student is 170 m from the wall she hears the echo from one beat of the drum at the same time as the next beat of the drum.

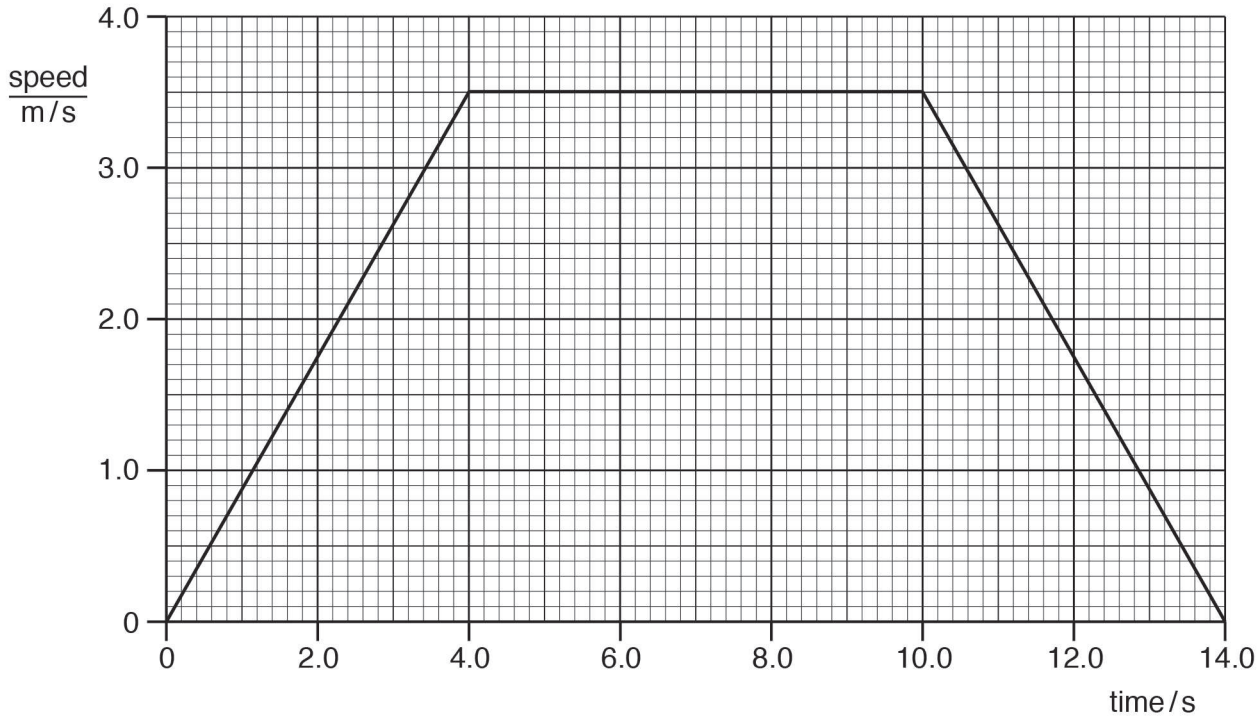
Use this information to determine the speed of sound. State the unit.

speed = ... [4]

[Total: 6]

11 A model train is travelling along part of a model railway track.

The graph is a speed-time graph for this model train as it travels along part of the track.

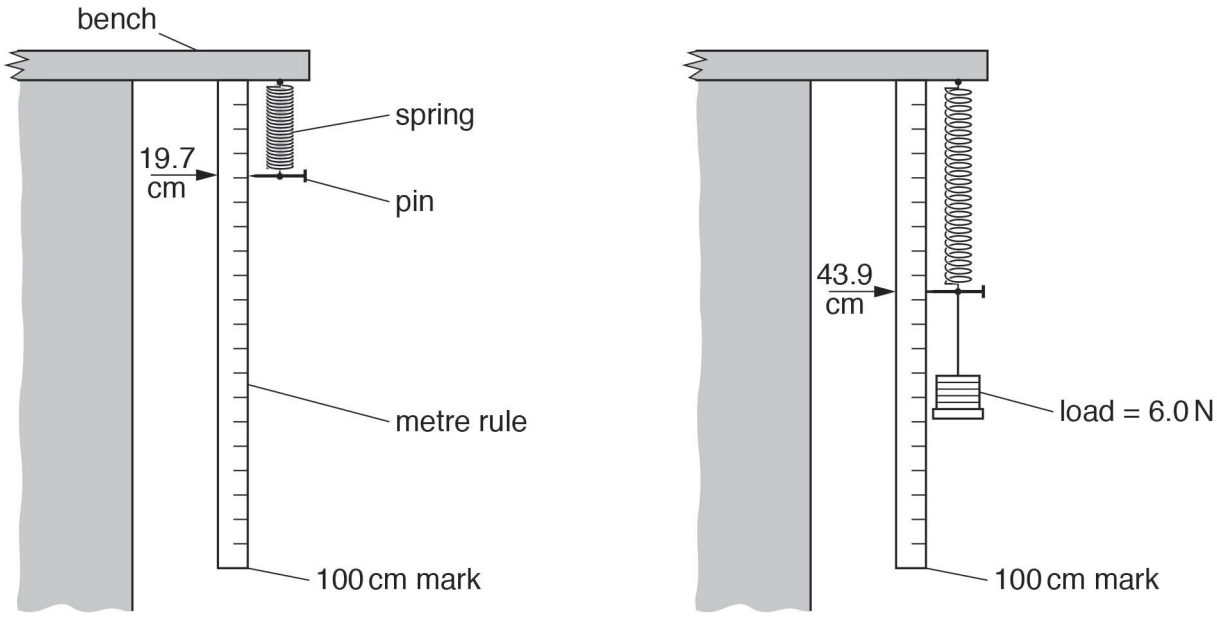


Determine the total distance travelled by the train on this part of the track.

distance = ... m [4]

[Total: 4]

12 A spring is suspended from the edge of a bench, as shown in diagram **A**.



A **B**

With no load on the spring, the pin points to 19.7 cm on the metre rule, as shown in diagram **A**. When a load of 6.0 N is attached to the spring, the pin points to 43.9 cm, as shown in diagram **B**.

(a) Calculate the extension of this spring for a load of 6.0 N.

extension = ... cm [1]

(b) Describe how a student could use the equipment in diagram **A** to obtain accurate readings for a load-extension graph for this spring.

.....

.....

.....

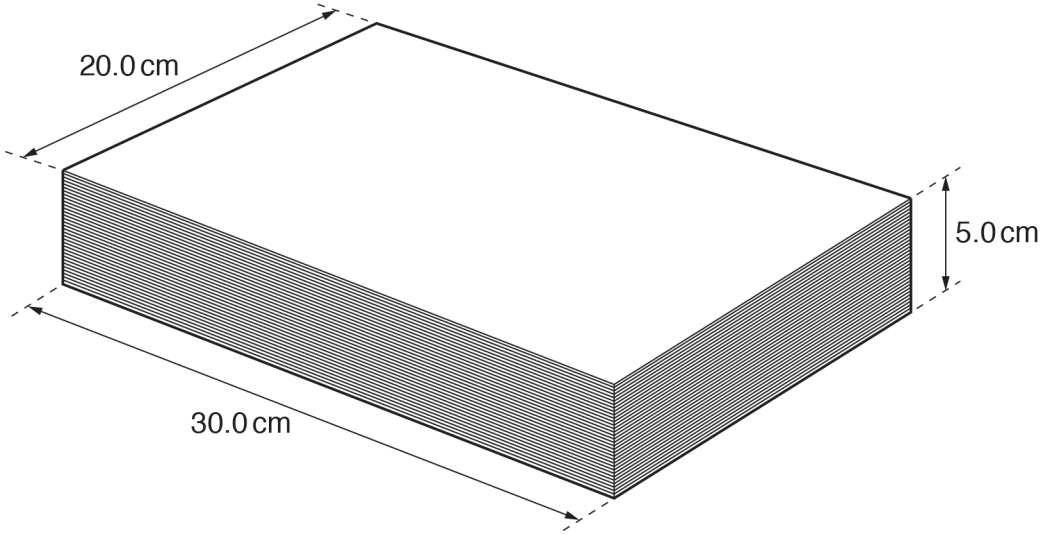
.....

..... [2]

[Total: 3]

13 A student has a pile of A4 paper for his computer printer.

The diagram shows the dimensions of the pile of paper.



(a) Show that the pile of paper has a volume of 3000 cm^3. Use the information shown in the diagram.

[1]

(b) The mass of the paper in the pile is 2400 g.

Calculate the density of the paper.

density = ...g / cm^3 [3]

[Total: 4]

14 A pendulum is swinging. Five students each measure the time it takes to swing through ten complete swings.

Three students measure the time as 17.2 s. Another student measures it as 16.9 s, and the fifth student measures it as 17.0 s.

What is the average period of the pendulum?

A 1.69 s **B** 1.70 s **C** 1.71 s **D** 1.72 s

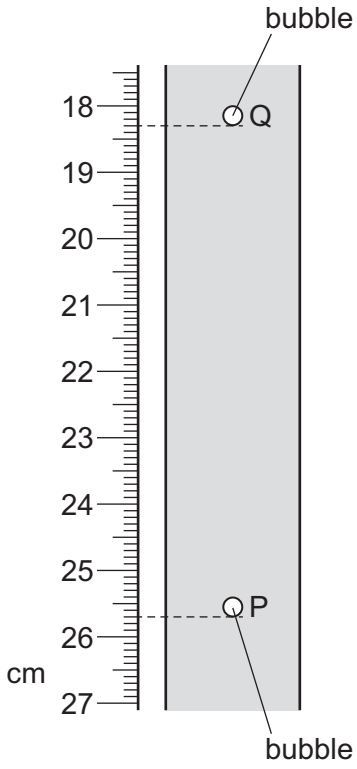
[1]

[Total: 1]

15 A student determines the average speed of a bubble rising through a liquid at constant speed.

When the student starts the stopwatch the bubble is at position P.

After 2.0 s the bubble is at position Q.



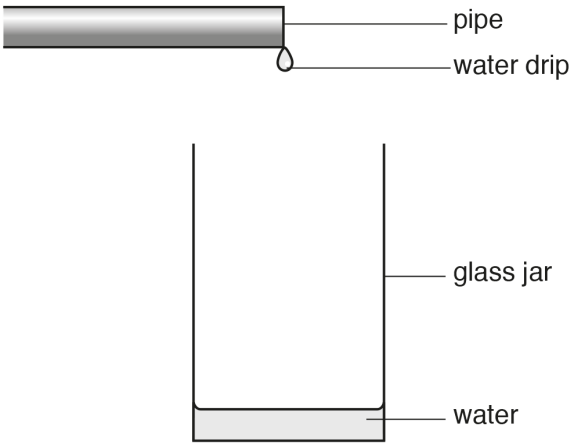
What is the speed of the bubble between P and Q?

A 3.2 cm / s **B** 3.7 cm / s **C** 6.4 cm / s **D** 7.4 cm / s

[1]

[Total: 1]

16 A pipe drips water into an empty glass jar. A student takes measurements to find how fast the water is rising up the jar. The diagram shows the arrangement.



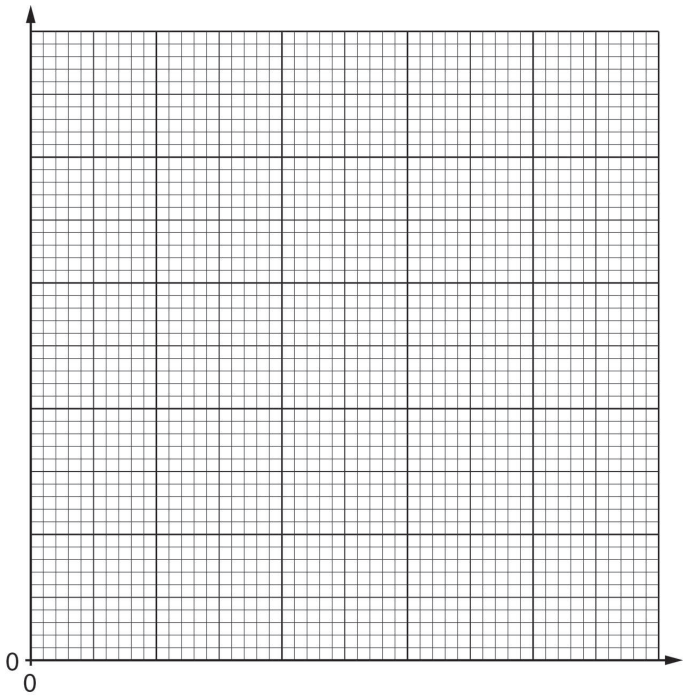
(a) The student measures the depth of the water every minute.

State the **two** pieces of equipment that she uses.

1. .....

2. ..... [2]

(b) The student records her observations in a table. She then plots a graph using the axes shown.



(i) On the grid, label both axes with title and unit. [2]

(ii) The water rises up the jar at a constant rate.

Draw a line on the grid to show the student's graph. Start the line from the time when the jar is empty. [2]

(c) A puddle of water forms on the ground. The average depth of the water is 2.5 mm.

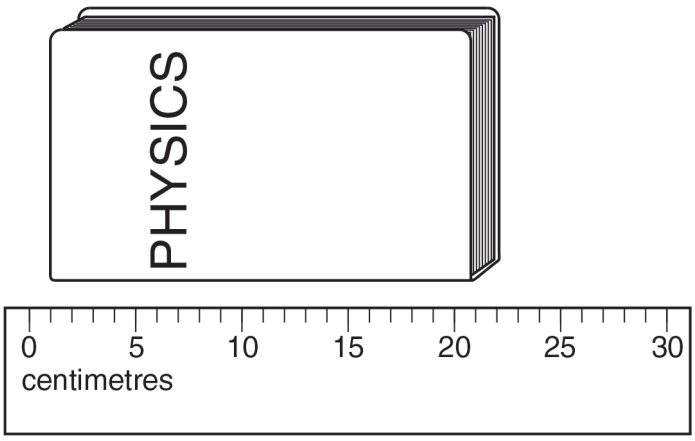
Determine the average depth of the water in m.

depth = ... m [2]

[Total: 8]

17 A student measures a book.

(a) He measures the length of the book, as shown in the diagram.



The student records his measurements.

length of book = 19.9 cm

His measurement is not accurate.

Describe **two** ways that the student can improve the accuracy of his measurement.

1. .....

.....

2. .....

..... [2]

(b) The book contains 200 thin sheets of paper.
The student wants to find the average (mean) thickness of a sheet of paper in the book.

Describe how he can determine such a small distance using only a ruler.

.....

.....

.....

.....

..... [3]

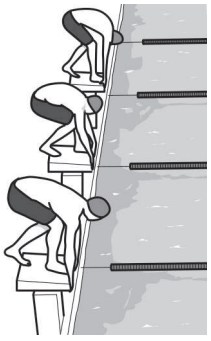
(c) The book has a mass of 400 g.

Calculate the weight of the book. Include the unit.

weight = ... [4]

[Total: 9]

18 The diagram shows students about to start a 50.0 m swimming race.



(a) The length of the pool is 50.0 m.

Name a suitable piece of equipment that could be used to measure the length of the pool.

..... [1]

(b) The race starts and the students swim to the end of the 50.0 m pool.

The diagram shows the times recorded on the stop watches for the winner and the swimmer in second place.

(i) Determine the time taken by the winner to swim 50.0 m. Use information from the diagram.

winner's time = ... s [1]

(ii) Calculate the average speed of the winner.

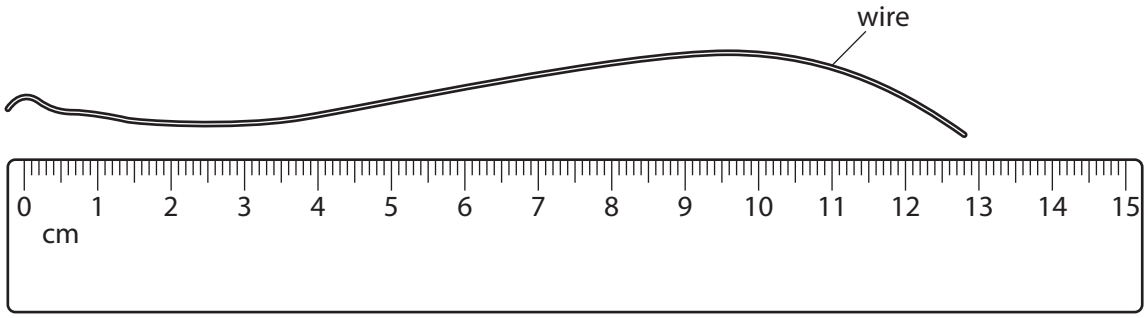
average speed = ... m/s [2]

(iii) Calculate the time difference between the winner and the swimmer in second place.

time difference = ... s [1]

[Total: 5]

19 A student uses a rule to measure a thin piece of wire as shown in the figure.



The student records the length of the wire as 12.8 cm.

State two errors in the student's measurement of the length of wire.

1. .....

.....

2. .....

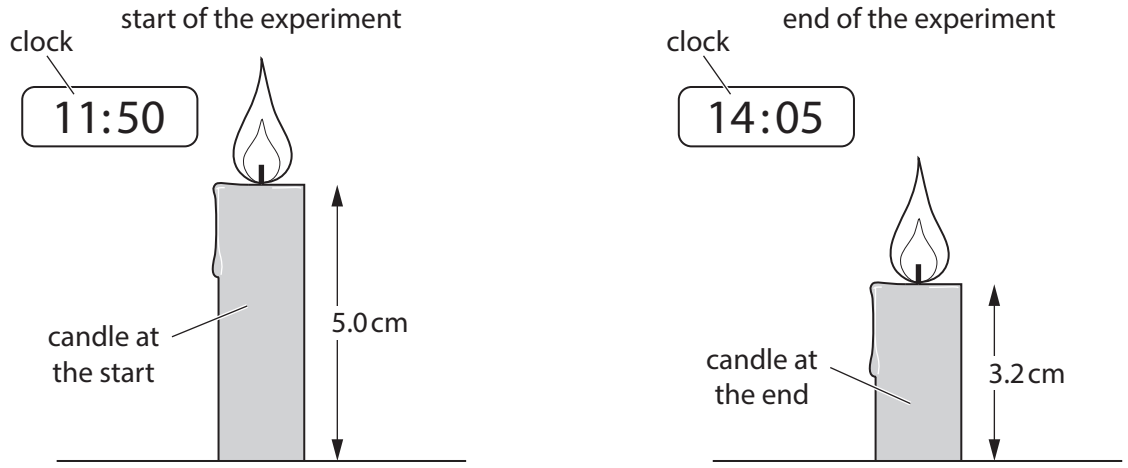
..... [2]

[Total: 2]

20 In the past, burning candles were used as timers.

A boy carries out an experiment to make his own timer using a burning candle.

The figure (not to scale) shows the length of the candle, and the clock he used, at the start of the experiment and at the end of the experiment.



The candle has a cross-sectional area of 1.6 cm^2.

Calculate the volume of candle at the start of the experiment.

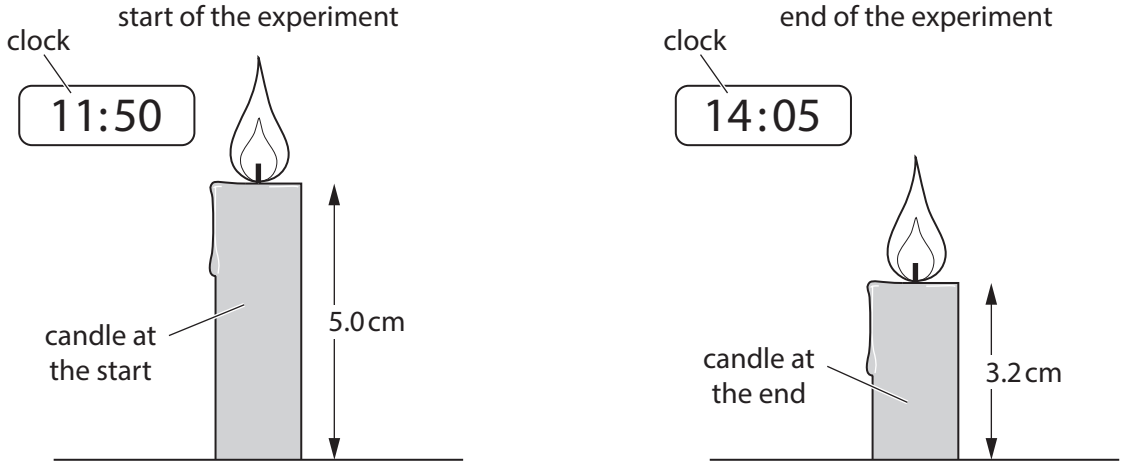
volume = ... cm^3 [2]

[Total: 2]

21 In the past, burning candles were used as timers.

A boy carries out an experiment to make his own timer using a burning candle.

The figure (not to scale) shows the length of the candle, and the clock he used, at the start of the experiment and at the end of the experiment.



(a) Use the figure to complete the table.

time at start of the experiment	
time at end of the experiment	
time for which the candle was burning	..... hours .....minutes = ... hours

[2]

(b) The difference in the length of the candle from the start to the end of the experiment was 1.8 cm.

Calculate the rate, in cm / hour, at which the candle burns.

rate = ... cm / hour [2]

(c) The boy estimates that he would need a candle about 24 cm long, of the same material and diameter, to make a candle timer that would last at least one day.

State whether the boy's estimate is correct. Give a reason for your answer.

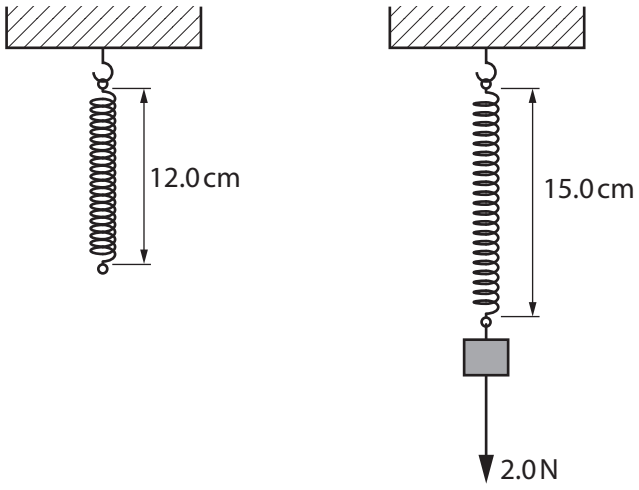
.....

.....

..... [2]

[Total: 6]

22 A student hangs a spring vertically from a hook, as shown in the figure.



Describe how the length of the spring can be measured accurately, after it has been hung from the hook.

.....

.....

.....

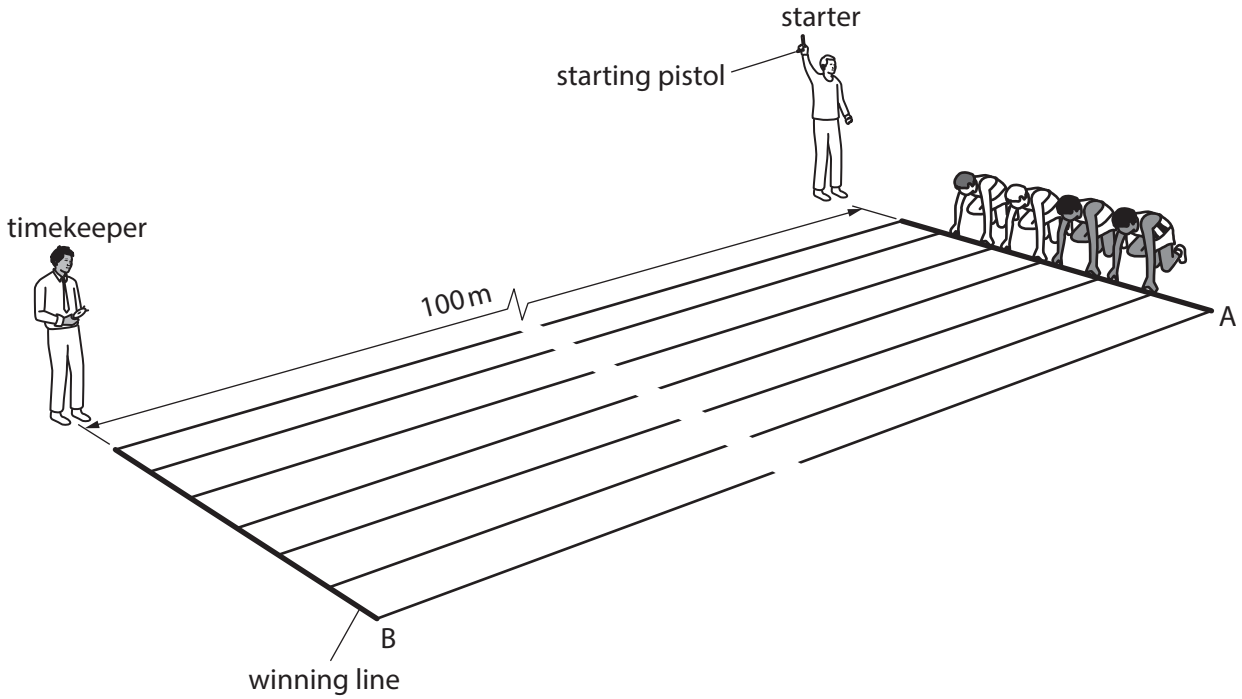
.....

.....

..... [3]

[Total: 3]

23 Four school athletes are about to run a 100 m race, as shown in the figure below.



The runners start at A, when the starter fires the starting pistol, and they finish at B.

The timing instrument is known to work correctly.

What might cause the timekeeper to introduce an inaccuracy into the timing of the race?

..... [1]

[Total: 1]

24 A student has been told to find the density of some liquid paraffin by measuring its mass and its volume.

(a) Which piece of laboratory equipment should she use to measure the volume of the liquid paraffin?

..... [1]

(b) Which piece of laboratory equipment should she use to find the mass of the liquid paraffin?

..... [1]

(c) Describe the procedure she would follow in order to find the mass.

.....

.....

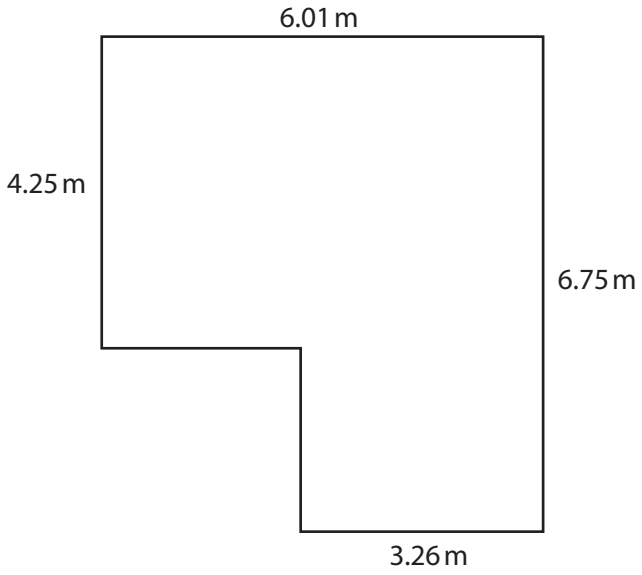
.....

.....

..... [3]

[Total: 5]

25 A surveyor measures the dimensions of a room of constant height. The figure is a top view of the room and shows the measurements taken.



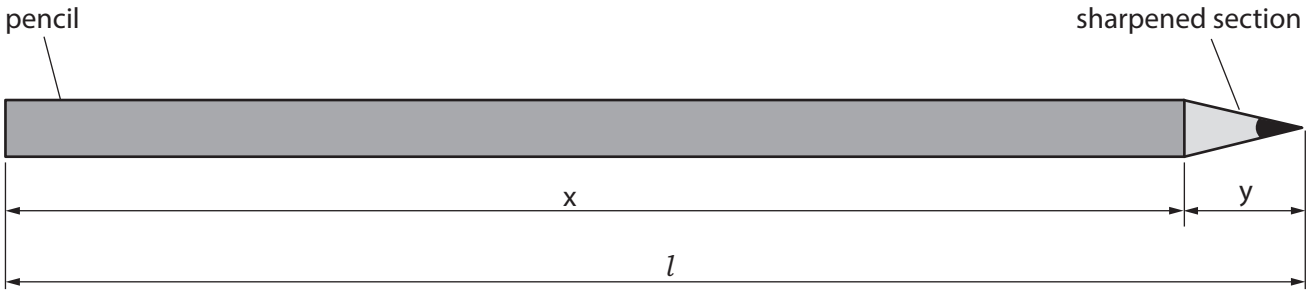
State an instrument that would be suitable to take these measurements.

..... [1]

[Total: 1]

26 An IGCSE student is taking measurements of a pencil.

The figure shows the pencil, drawn full size.



(a) Describe how you would use a length of string and a rule to determine the circumference *c* of the unsharpened section of the pencil.

.....

.....

.....

.....

..... [2]

(b) The student's value for the circumference is $c = 2.4$ cm.

Suggest a source of inaccuracy in determining the circumference of the pencil.

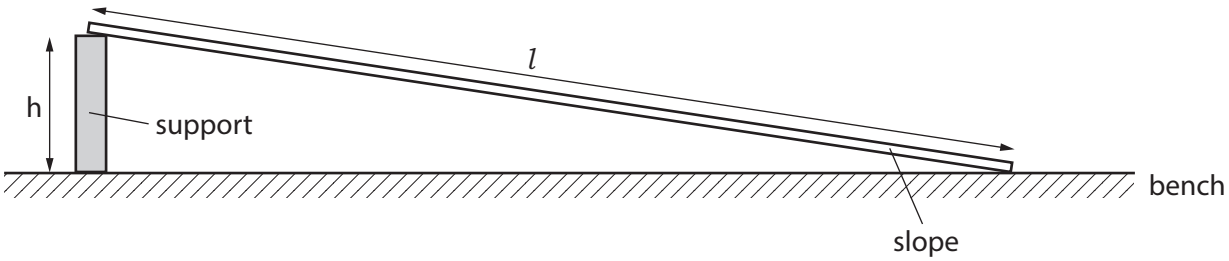
.....

..... [1]

[Total: 3]

27 An IGCSE student is investigating the average speed of a toy car travelling down a slope.

She releases the toy car on the slope. She uses a stopwatch to measure the time taken for the car to travel down part of the slope. The figure shows the slope.



The student tries to determine the time that the toy car takes to travel a distance down the slope.

Make three suggestions about what she could do to ensure that the distance travelled and the time taken by the toy car are measured as reliably as possible.

1. .....

.....

2. .....

.....

3. .....

..... [3]

[Total: 3]

28 Some students collect some drops of water from a leaking tap.

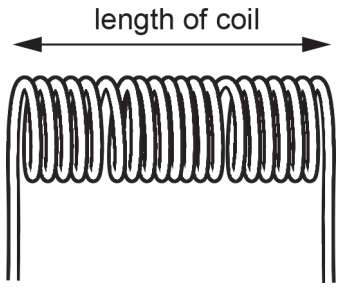
The students measure the volume of the water they collect.

State the term for the equipment that is suitable for measuring the volume accurately.

..... [1]

[Total: 1]

29 The diagram shows a coil of wire.



(not to scale)

A student measures the length of the coil using a ruler. His measurement is 3.8 cm.

There are 20 turns of wire in the coil. The student uses his measurement to calculate the average thickness of the wire.

(a) Show that the average thickness of the wire is about 0.2 cm.

average thickness of wire = ... cm [2]

(b) The student's measurement of 3.8 cm is inaccurate.

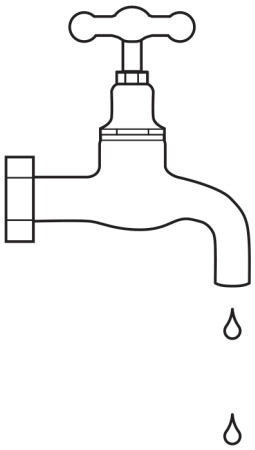
Suggest **one** reason why the measurement is inaccurate.

.....

..... [1]

[Total: 3]

30 Some students observe drops of water falling from a tap that leaks, as shown in the diagram.



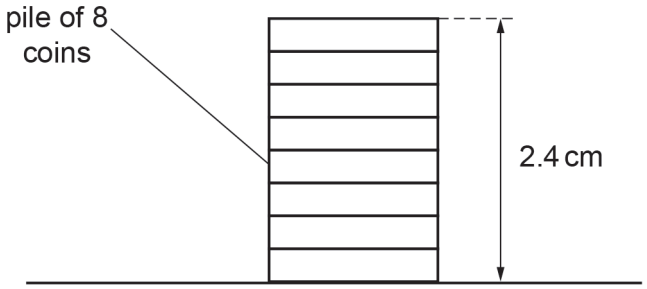
The students measure the time for 50 drops to fall from the tap. The time for 50 drops to fall is 20 s.

Calculate the average time between two drops falling.

average time = ... s [2]

[Total: 2]

31 A student places 8 similar coins in a pile, as shown in the diagram.



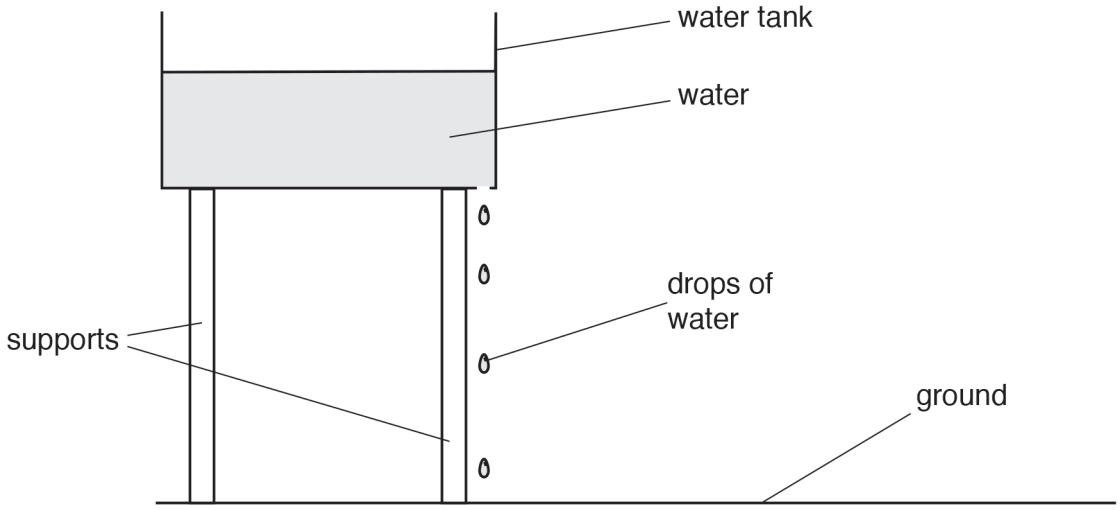
The height of the pile of coins is 2.4 cm.

Calculate the average thickness of one coin.

average thickness = ... cm [2]

[Total: 2]

32 The diagram shows a water tank that is leaking. Drops of water fall from the tank at a constant rate.



(NOT to scale)

A student uses a stopwatch to determine the time between two drops hitting the ground.

He sets the stopwatch to zero. He starts the stopwatch when the first drop hits the ground.

He stops the stopwatch after a further 30 drops have hit the ground.

The reading on the stopwatch is recorded and shown in the diagram.

(a) State the time taken for 30 drops to hit the ground.

time = ... s [1]

(b) Calculate the average time between two drops hitting the ground.

time = ... s [2]

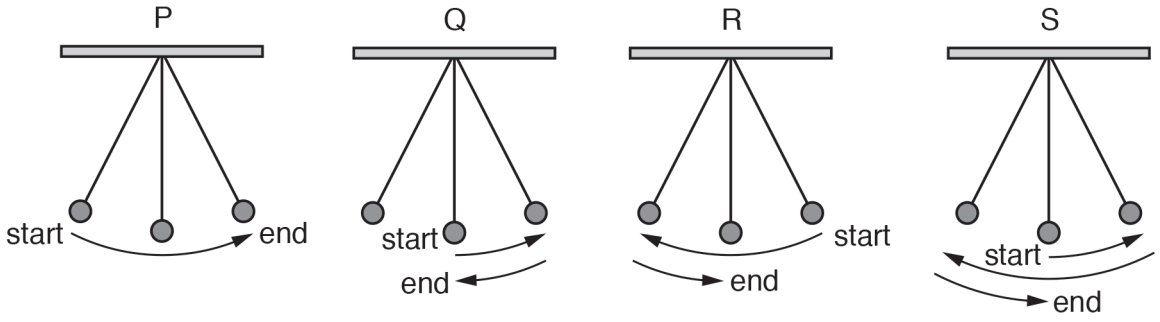
(c) Explain why the student measures the time for 30 drops to hit the ground instead of measuring the time for one drop to hit the ground.

.....

..... [1]

[Total: 4]

33 Four students P, Q, R and S each attempt to measure the time period (the time for one complete oscillation) of a pendulum. The arrows in the diagram show the movements of the pendulum that each student times.



State the student who has chosen the correct movement for one period of a pendulum.

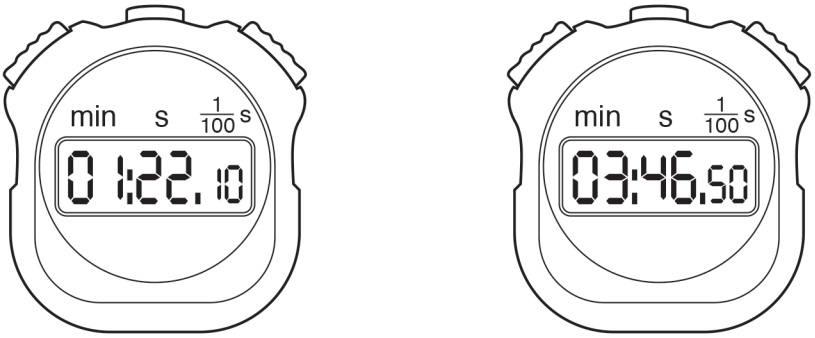
student .....

[1]

[Total: 1]

34 A student uses a stopwatch in a timing experiment.

The diagram shows the stopwatch readings.

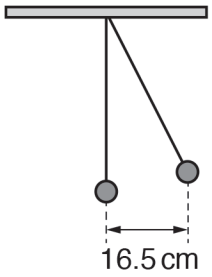


Calculate the time interval between the two readings.

time interval = ... s [2]

[Total: 2]

35 A student measures the displacement of a pendulum bob from its rest position. The displacement is 16.5 cm, as shown in the diagram.

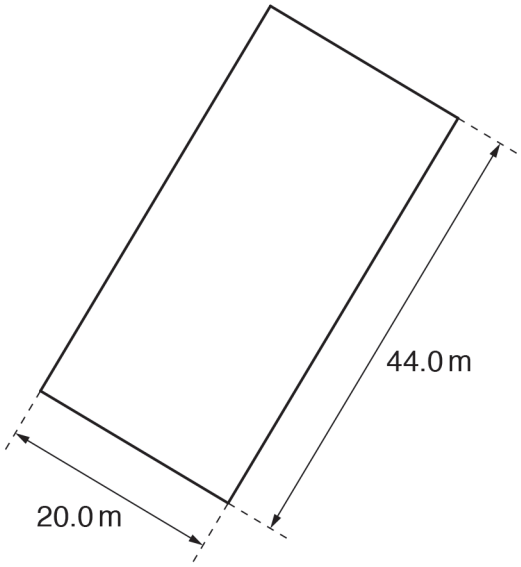


State the displacement in millimetres.

displacement = ... mm [1]

[Total: 1]

36 The diagram shows the top view of a rectangular paddling pool of constant depth. The pool is filled with sea water.

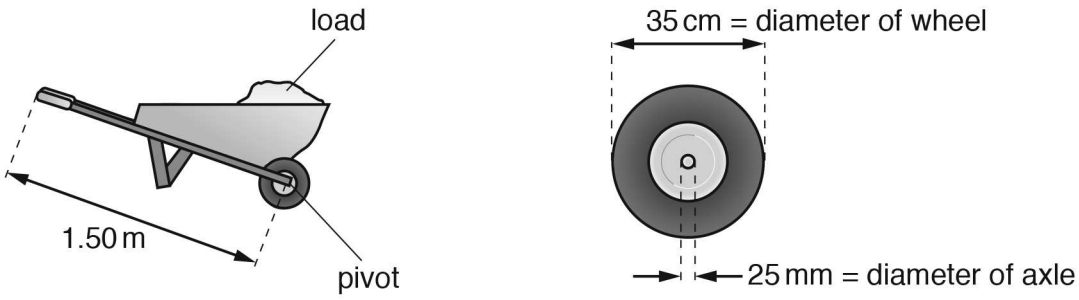


State a suitable instrument for measuring the dimensions given in the diagram.

..... [1]

[Total: 1]

37 The diagrams show a wheelbarrow and the dimensions of its wheel.



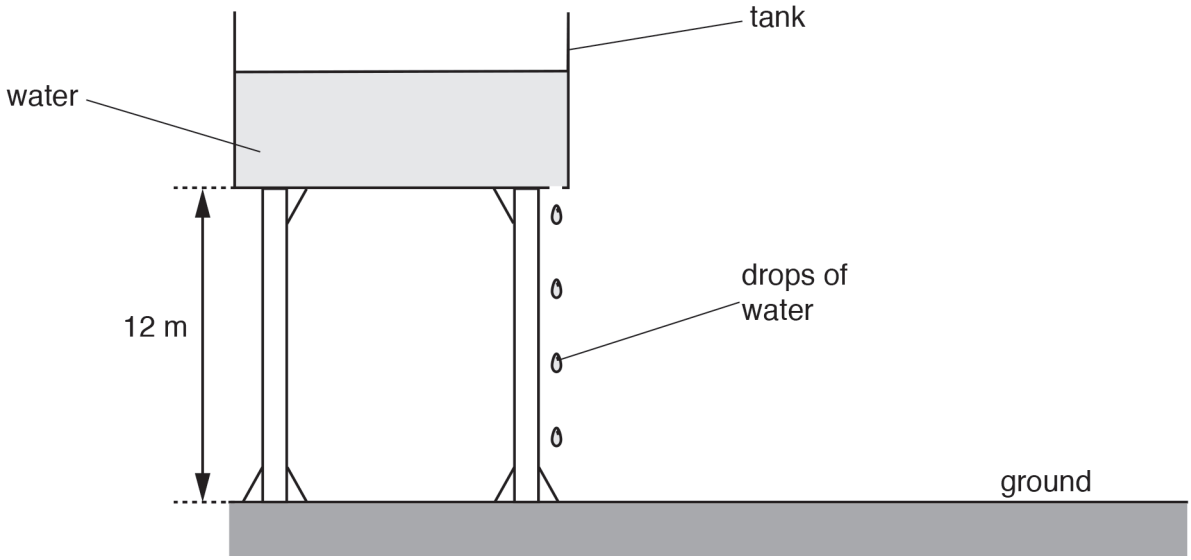
Complete the table to show the diameter of the wheel and axle in metres.

	measurement	measurement in metres
diameter of wheel	35 cm	
diameter of axle	25 mm	

[2]

[Total: 2]

38 The diagram shows a large tank containing water. The tank leaks. Drops of water fall from the tank. The drops hit the ground at a regular rate.



(a) A student measures the time interval between two drops of water hitting the ground. She uses a stopwatch and repeats the procedure three times. The diagram shows each stopwatch reading.

time = ... s time = ... s time = ... s

On the line below each stopwatch, state the time readings shown, in seconds. [1]

(b) Calculate the average time interval between two drops of water hitting the ground.

average time = ... s [2]

[Total: 3]

39 A model train moves along a track passing through two model stations. Students analyse the motion of the train. They start a digital timer as the train starts to move. They record the time that it enters Station A and the time it enters Station B.

The diagram shows the time on entering Station A and the time on entering Station B.

time entering Station A

time entering Station B

Calculate the time taken from the train entering Station A to the train entering Station B.
State your answer in seconds.

time taken = ... s [1]

[Total: 1]

40 A student watches a car race around a track. He uses a stopwatch to measure the time for the car to make one lap of the track.

The student forgets to reset the stopwatch at the start of the race. The diagram shows the time on the stopwatch at the start and the time after going around the track once.

time at start

time after going around the track once

Calculate the time the car takes to go around the track once, in seconds.

time = ... s [2]

[Total: 2]