1 Which device is used to measure the time it takes for a 10 cm^3 block of ice to melt in a laboratory at room temperature?

A measuring cylinder

B ruler

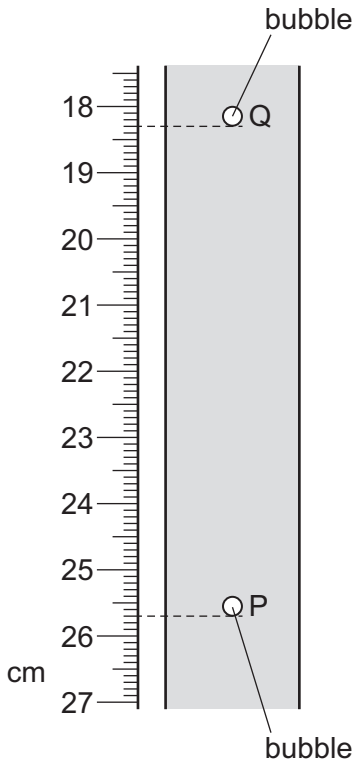
C stopwatch

D thermometer

2 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.

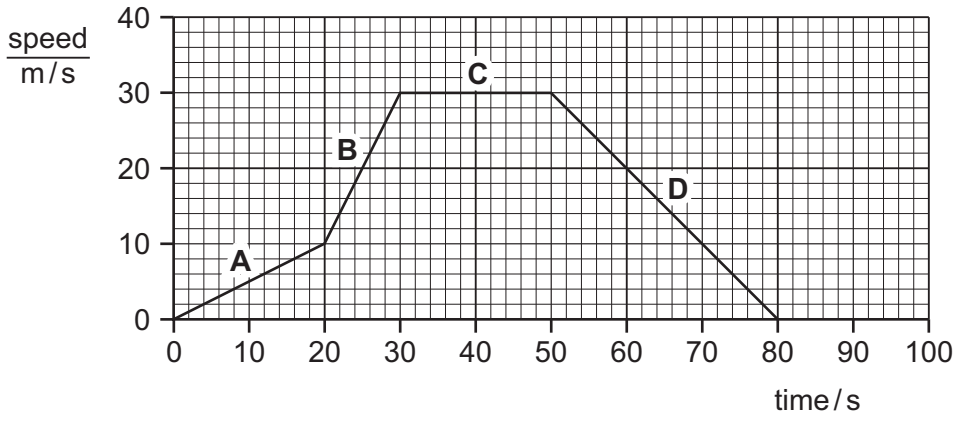


What is the speed of the bubble between P and Q?

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

3 The speed-time graph represents a motorcycle journey.

In which part of the graph is the acceleration equal to zero?



4 Which expression is used to find gravitational field strength *g*?

A mass × density

B mass ÷ weight

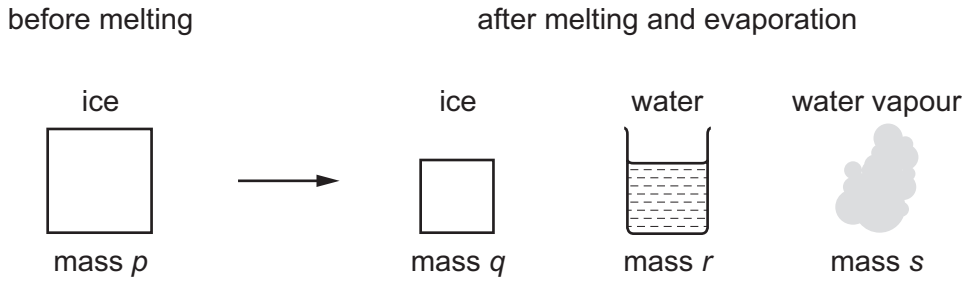
C weight × mass

D weight ÷ mass

5 A block of ice is removed from a freezer. Some of the ice melts to produce water. Some of the water that is produced evaporates.

The original mass of the ice is *p*. The mass of the ice that has not yet melted is *q*. The mass of the water is *r*. The mass of the water vapour is *s*.

The diagram shows these changes.



Which equation gives the relationship between *p*, *q*, *r* and *s*?

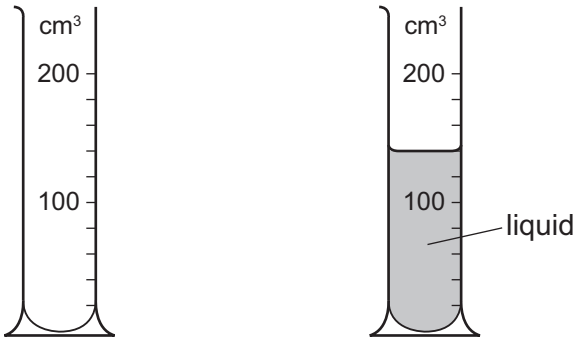
A $p = q + r$

B $p = q + r + s$

C $p = q + r - s$

D $p = q + s$

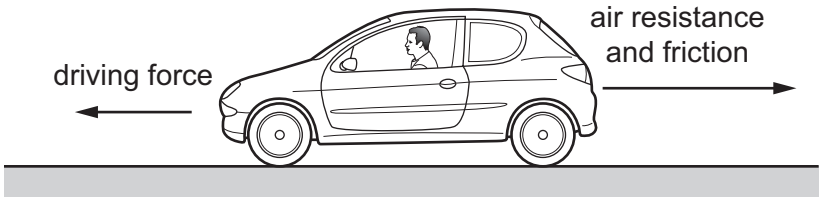
6 The masses of a measuring cylinder before and after pouring some liquid into it are shown in the diagram.



What is the density of the liquid?

A $\frac{100}{120}\,g/cm^3$ **B** $\frac{100}{140}\,g/cm^3$ **C** $\frac{180}{120}\,g/cm^3$ **D** $\frac{180}{140}\,g/cm^3$

7 A car travels forwards along a straight horizontal road. Only the horizontal forces acting on it are shown.



The length of each arrow represents the size of each force.

How do these forces affect the motion of the car?

A The car moves at constant speed.

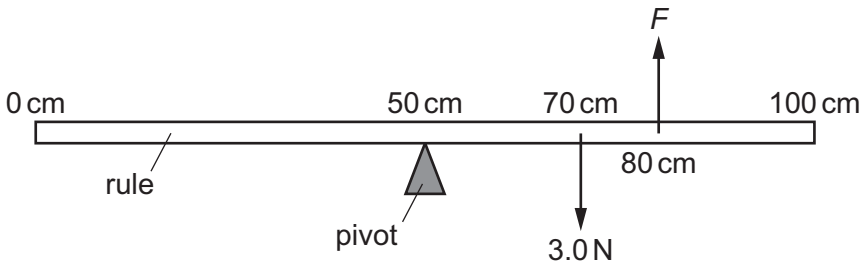
B The car moves backwards.

C The car slows down.

D The car's forward speed increases.

8 The centre of a uniform metre rule rests on a pivot. A load of weight 3.0 N is placed at the 70 cm mark.

A force *F* acts upwards at the 80 cm mark. The rule is in equilibrium.



What is the magnitude of *F*?

A 2.0 N **B** 2.6 N **C** 3.0 N **D** 4.5 N

9 An energy resource is used to generate electrical energy.

Which energy resource uses a transfer of gravitational potential energy to generate this electrical energy?

A geothermal

B hydroelectric

C solar

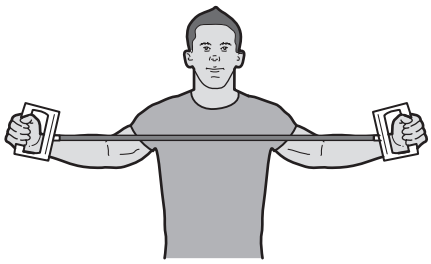
D wind

10 The diagrams show athletes training by stretching springs.

Each spring has the same stiffness.

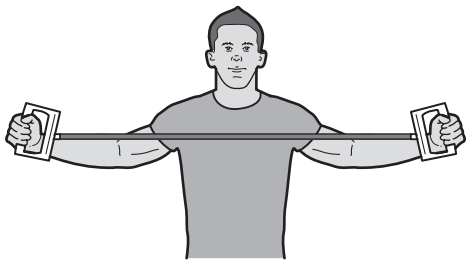
Which athlete does the most work?

A



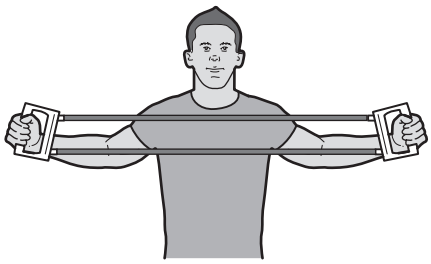
one spring stretched
by 0.60 m

B



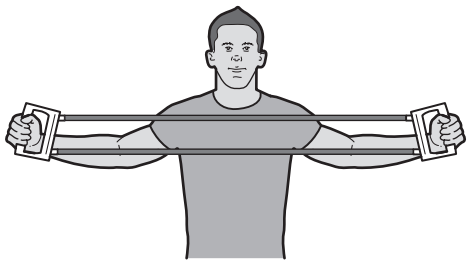
one spring stretched
by 0.80 m

C



two springs stretched
by 0.60 m

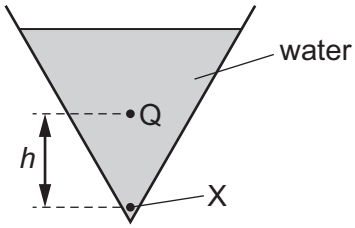
D



two springs stretched
by 0.80 m

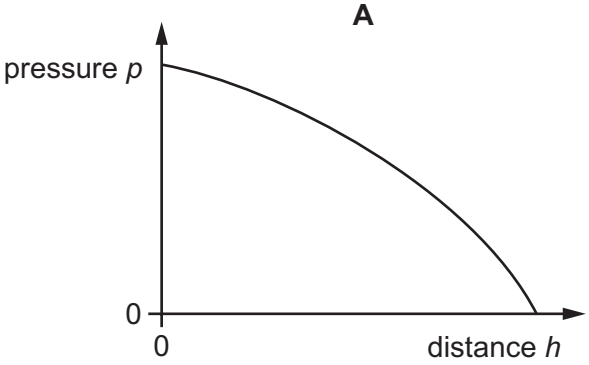
11 The diagram shows a conical vessel full of water.

The pressure at point X due to the water is p. A point Q is a distance h above point X.

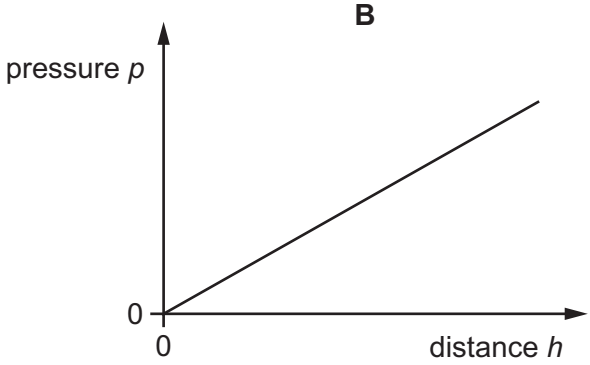


Which graph shows how the pressure due to the water at Q varies with distance h?

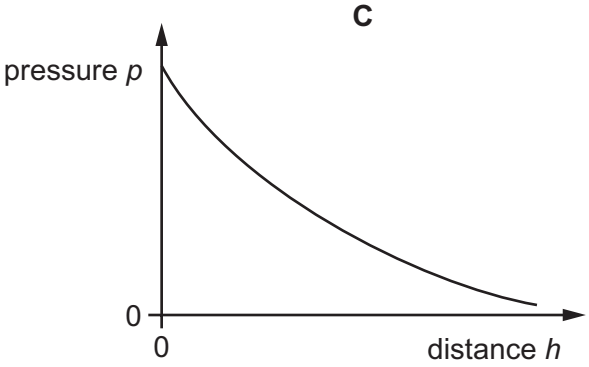
A



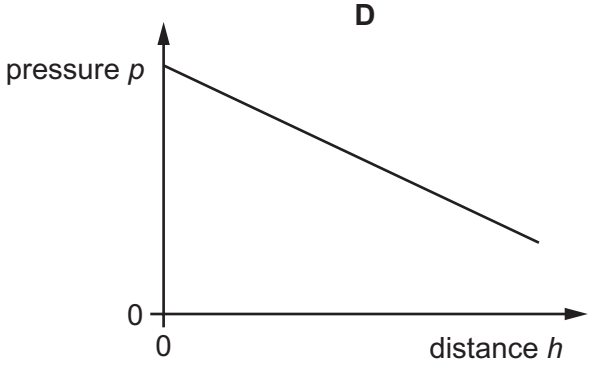
B



C



D



12 What is the most accurate and precise method to measure the thickness of a coin?

A Use a micrometer screw gauge.

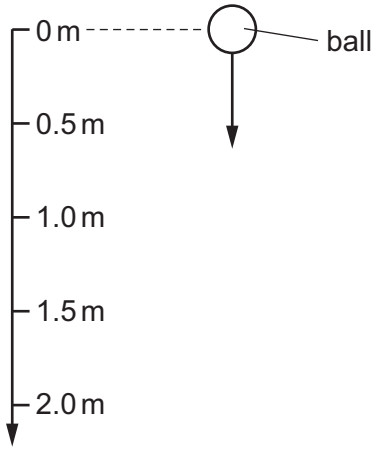
B Use a ruler and look at the scale perpendicularly.

C Use a top pan balance.

D Use the displacement method with water in a measuring cylinder.

13 On Earth, a ball is dropped and falls 2.0 m in a vacuum.

The acceleration of the ball at 1.0 m is $10\,m/s^2$.



What is the acceleration of the ball at 0.5 m?

A $5.0\,m/s^2$ **B** $10\,m/s^2$ **C** $15\,m/s^2$ **D** $20\,m/s^2$

14 A skydiver reaches terminal velocity. Then he opens his parachute.

What happens to the skydiver as the parachute opens?

A There is a decrease in weight.

B There is acceleration upwards.

C There is an increase in speed.

D There is movement upwards.

15 A piece of steel is taken from the Earth to the Moon for an experiment. The gravitational field strength on the Moon is smaller than on the Earth.

Which statement about the piece of steel is correct?

A It has less mass on the Moon than on the Earth.

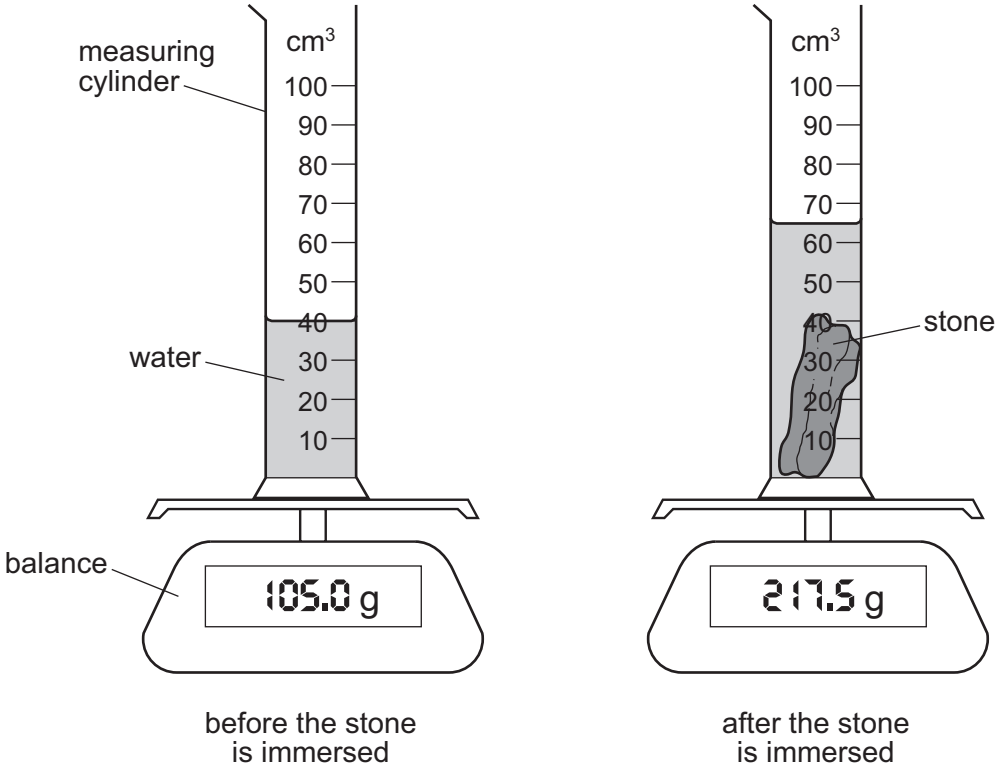
B It has more mass on the Moon than on the Earth.

C It weighs less on the Moon than on the Earth.

D It weighs more on the Moon than on the Earth.

16 A measuring cylinder containing only water is placed on an electronic balance. A small, irregularly shaped stone is now completely immersed in the water.

The diagrams show the equipment before and after the stone is immersed.



What is the density of the material of the stone?

A $1.7\,g/cm^3$ **B** $3.3\,g/cm^3$ **C** $4.5\,g/cm^3$ **D** $8.7\,g/cm^3$

17 A boat is travelling at a steady speed in a straight line across the surface of a lake.

Which statement about the boat is correct?

A The resultant force on the boat is in the direction of motion.

B The resultant force on the boat is in the opposite direction to its motion.

C The resultant force on the boat is vertically downwards.

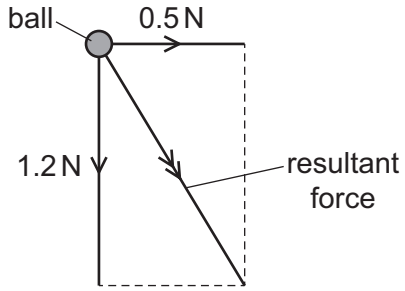
D The resultant force on the boat is zero.

18 A ball of weight 1.2 N drops through the air at terminal velocity.

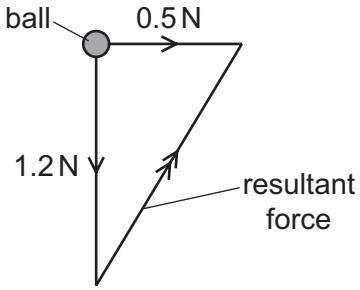
A sudden gust of wind exerts a horizontal force of 0.5 N on the ball from the left.

Which diagram shows the resultant force on the ball while the wind is blowing?

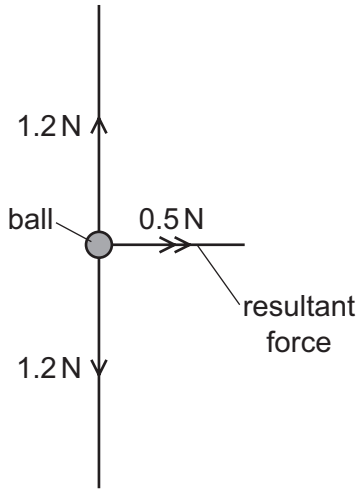
A



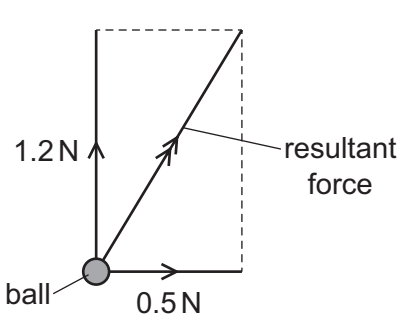
B



C

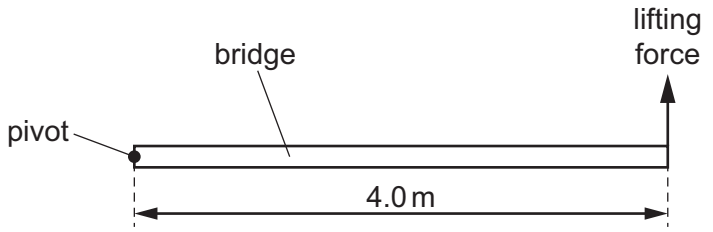


D



19 The diagram shows a uniform bridge, 4.0 m long and weighing 10 000 N.

The bridge is pivoted at one end. A force at the other end gradually increases until the bridge begins to lift.



What is the lifting force as the bridge starts to move upwards?

A 2500 N **B** 5000 N **C** 10 000 N **D** 20 000 N

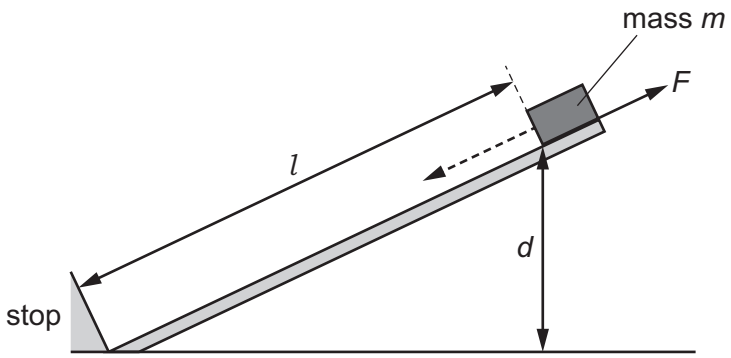
20 A bullet of mass 0.10 kg travels horizontally at a speed of 600 m / s. It strikes a stationary wooden block of mass 1.90 kg resting on a frictionless, horizontal surface.

The bullet stays in the block.

What is the speed of the bullet and the block immediately after the impact?

A 30 m / s **B** 32 m / s **C** 60 m / s **D** 134 m / s

A box of mass *m* slides down a slope of length *l* and vertical height *d* against a frictional force *F*.

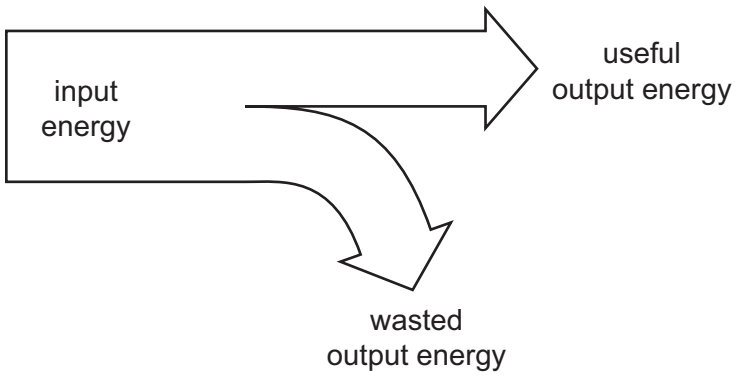


As the box slides down the slope, it loses gravitational potential energy and it does work against the friction.

Which row gives the loss in gravitational potential energy and the work done against friction?

	loss in gravitational potential energy	work done against friction
A	*mgd*	*Fl*
B	*mgd*	*Fd*
C	*mgl*	*Fl*
D	*mgl*	*Fd*

22 The diagram represents the energy transfers for a device.



The device is 50% efficient.

Which equation is correct?

A input energy = useful output energy ÷ 2

B useful output energy = wasted output energy ÷ 2

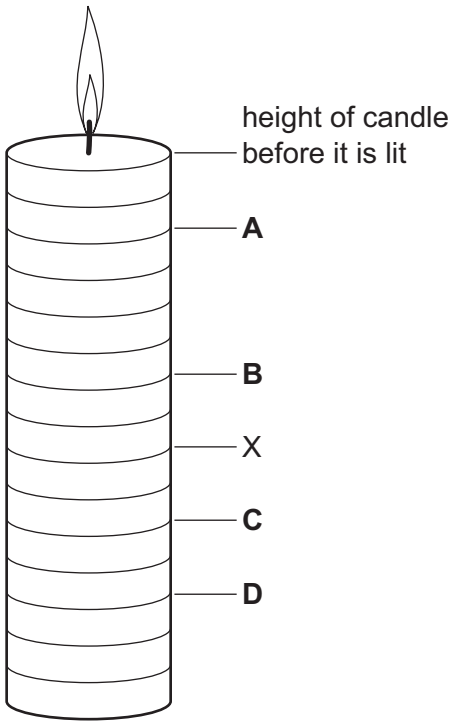
C wasted output energy = useful output energy

D wasted output energy = useful output energy ÷ 2

23 A candle burns evenly. It is used as a timer.

The candle is lit and burns down to point X in 2 hours.

To which labelled point does the candle burn down after a further 30 minutes?



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

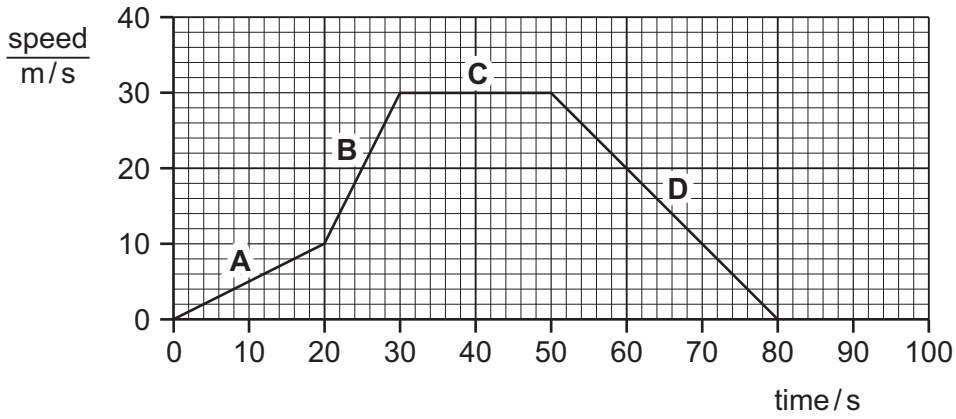
Three students measure the time as 17.2 s. Another student measures it as 16.9 s, and the fifth student measures it as 17.0 s.

What is the average period of the pendulum?

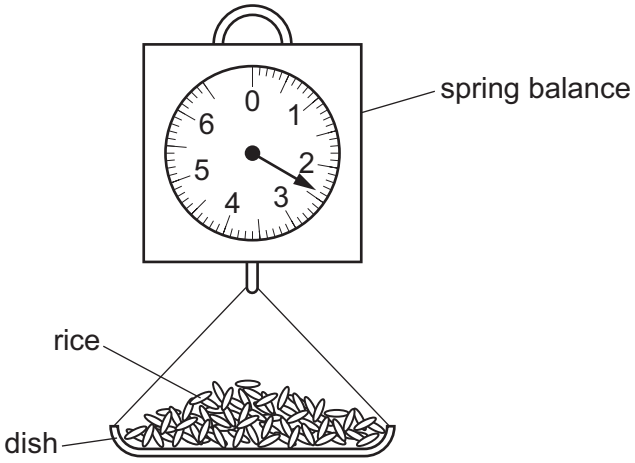
A 1.69 s **B** 1.70 s **C** 1.71 s **D** 1.72 s

25 The speed-time graph represents a motorcycle journey.

In which part of the graph is the acceleration equal to zero?



26 A shopkeeper pours rice into a dish that hangs from a spring balance. He records the reading.



A customer buys some pasta. The shopkeeper notices that the reading on the spring balance, with just pasta in the dish, is the same as it was with just rice in the dish.

Which quantity **must** be the same for the rice and for the pasta?

A density

B temperature

C volume

D weight

[Turn over

27 Four identical steel blocks weigh 120 N in total.

The gravitational field strength *g* is 10 N / kg.

What is the mass of one steel block?

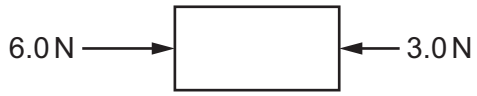
A 3.0 kg **B** 12 kg **C** 30 kg **D** 48 kg

28 A steel ball bearing has a mass of 24 g and a density of 8.0 g / cm^3. It is lowered into a measuring cylinder containing 12 cm^3 of water.

What is the new water level in the cylinder?

A 3.0 cm^3 **B** 4.0 cm^3 **C** 15 cm^3 **D** 16 cm^3

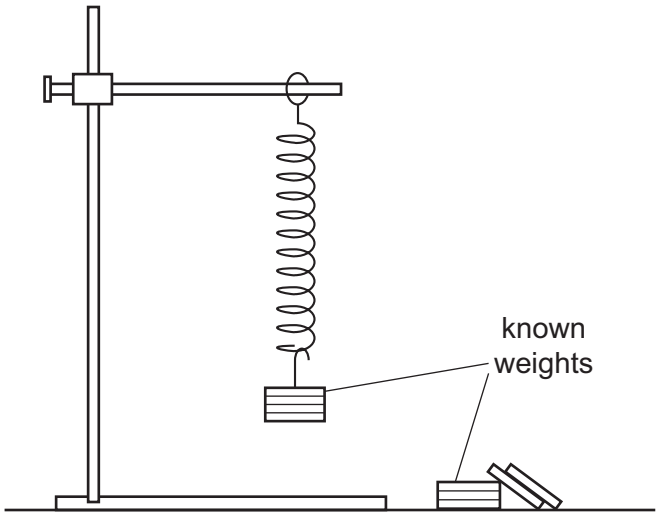
29 The diagram shows an object being acted upon by two forces.



What is the size of the resultant force on the object?

A 2.0 N **B** 3.0 N **C** 9.0 N **D** 18 N

30 A student is asked to investigate the extension of a spring using the apparatus shown in the diagram.



Which other piece of equipment is needed?

A measuring cylinder

B metre rule

C stopwatch

D protractor