1 Which measuring instrument is used to determine the volume of water in a cup?

A clock

B measuring cylinder

C ruler

D thermometer

2 Which property of an object **never** changes when a force acts on the object?

A mass

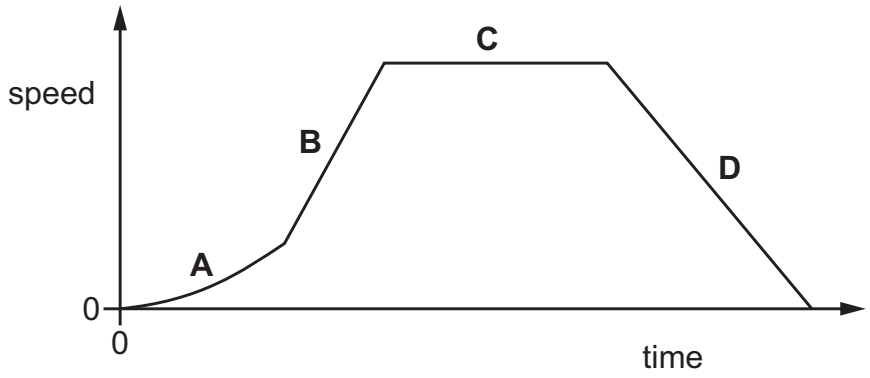
B shape

C size

D speed

3 A car is travelling along a straight horizontal road. The speed–time graph is shown.

In which labelled part of the journey is the resultant force on the car zero?



4 Which list contains only energy stores?

A electrostatic, kinetic, light

B electrostatic, kinetic, nuclear

C electrostatic, light, nuclear

D kinetic, light, nuclear

5 **(a)** State the principle of conservation of energy.

.....

..... [1]

(b) Fig. 4.1 shows a stop-watch that is powered by a battery. The stop-watch measures a time period in minutes and seconds.

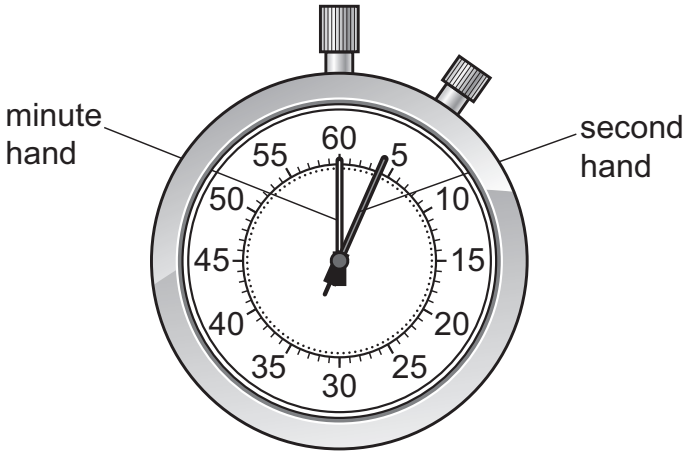


Fig. 4.1

Complete the sentences about energy transfers in the stop-watch that is measuring a time period.

(i) The type of energy stored in the battery is ..... energy. [1]

(ii) The type of energy stored in the stop-watch's second hand is ..... energy. [1]

(iii) The stop-watch has a bell.
When the bell rings, energy is transferred to the surroundings as ..... energy. [1]

[Total: 4]

6 **(a)** A boy weighs 620 N.
Calculate the mass of the boy.

mass of boy = ... kg [3]

(b) Fig. 3.1 shows another boy sitting on a solid block of wood.

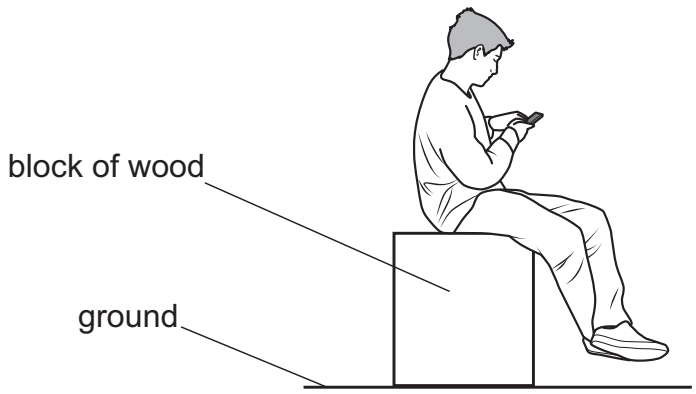


Fig. 3.1

The total weight of the boy and the block is 1200 N.
The area of the block of wood in contact with the ground is 0.16 m^2.

Calculate the pressure exerted on the ground.

pressure = ... N/m^2 [3]

[Total: 6]

7 A student uses a stop-watch to measure the time for one complete oscillation of a pendulum.

Fig. 2.1 shows his measurement.



Fig. 2.1

(a) State the time taken for **one** complete oscillation. Use the information in Fig. 2.1.

time for one complete oscillation = ... s [1]

(b) Another student uses a different pendulum and measures the time for 15 complete oscillations. The time for 15 complete oscillations is 11.7 s.

Calculate the average time for **one** complete oscillation.

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

(c) Fig. 2.2 represents a pendulum. P and Q are the extreme positions of the pendulum bob. R is the position of the bob when the string is vertical.

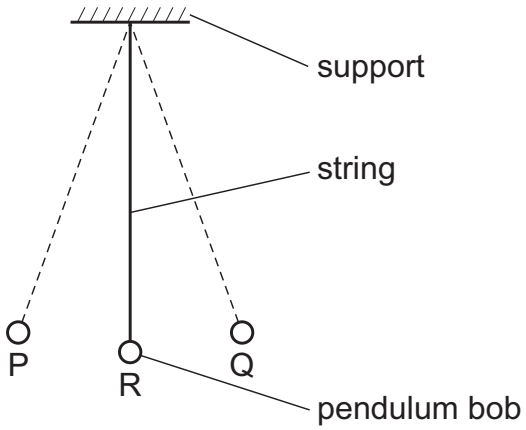


Fig. 2.2

A student holds the pendulum bob at P and then releases it.

Describe the movement of the pendulum bob during **one** complete oscillation of the pendulum. You may draw on Fig. 2.2 as part of your answer.

.....

.....

.....

..... [2]

[Total: 5]

8 **(a)** A scientist determines the density of a sample of sea water.

Describe an experiment to determine the density of the sea water. You may draw a diagram as part of your answer.

Include any equations in your answer.

.....

.....

.....

.....

..... [4]

(b) Table 3.1 shows the density of four materials.

Table 3.1

material	density / g/cm^3
plastic	0.905
wood	0.720
sea water	1.03
baby oil	0.815

Predict whether solid objects made from plastic or wood float in sea water or baby oil.

Use the data in Table 3.1.

Complete Table 3.2 by writing **Yes** or **No** in each space.

Table 3.2

liquid	does a plastic object float?	does a wooden object float?
sea water		
baby oil		

[2]

[Total: 6]

9 Fig. 1.1 shows the speed–time graph for a car travelling along a flat straight road.

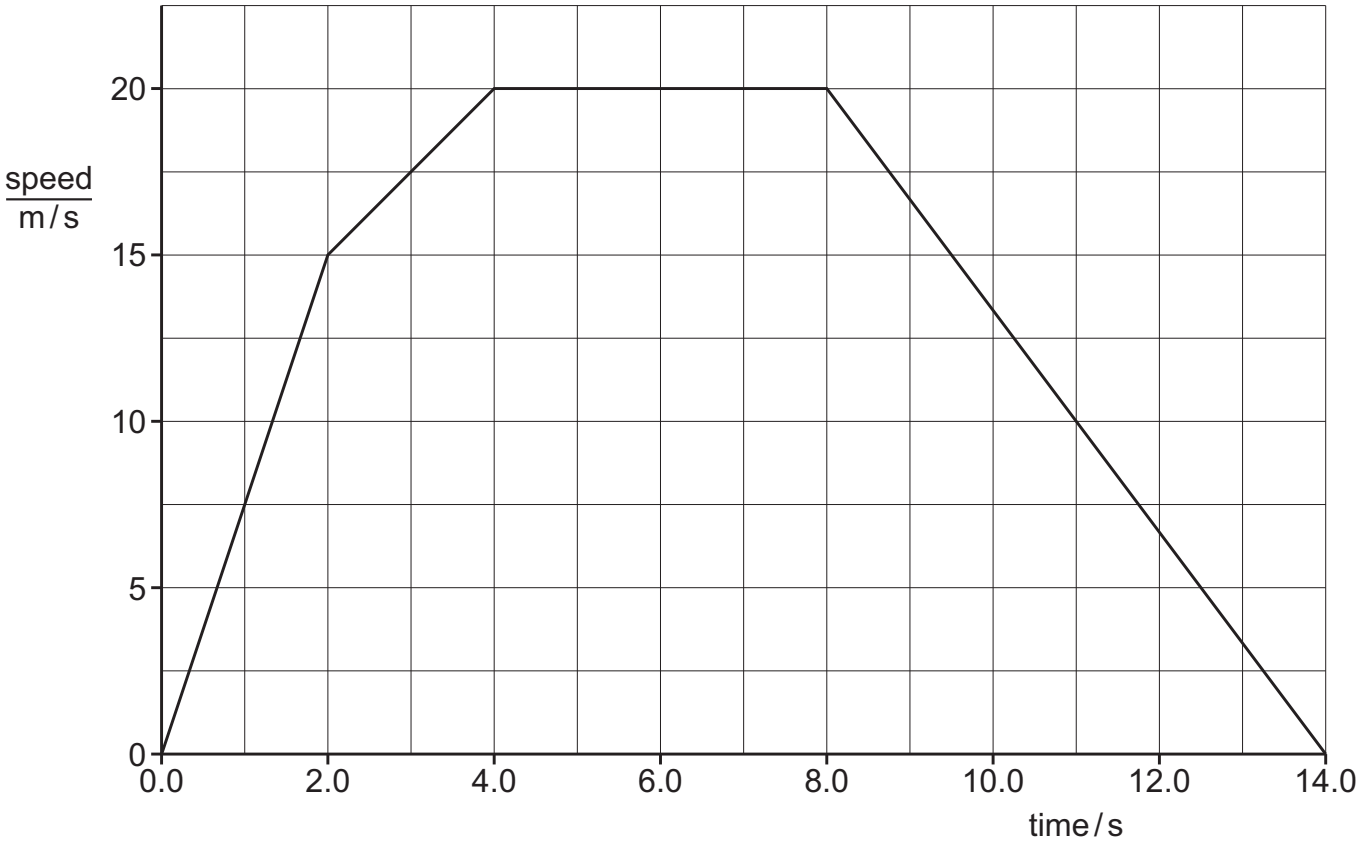


Fig. 1.1

(a) Describe the motion of the car between time = 0 and time = 2.0 s.

..... [1]

(b) State the value of the acceleration of the car between time = 4.0 s and time = 8.0 s.

..... [1]

(c) Calculate the distance travelled by the car between time = 8.0 s and time = 14.0 s.

distance travelled = ... m [3]

[Total: 5]

10 A load is suspended from a thread. The vertical force on the thread due to the load is 0.75 N.

(a) Calculate the mass of the load.

mass = ... [2]

(b) Fig. 1.1 shows the load suspended from the thread.

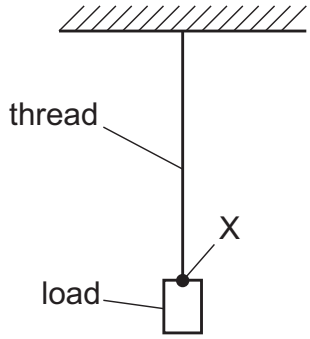


Fig. 1.1

A wire is attached to the load at point X and pulled horizontally to the right.

The tension in the horizontal wire is 1.2 N.

By drawing a scale diagram or by calculation, determine:

- the magnitude of the resultant of the force at X due to the load and due to the tension in the wire
- the direction of the resultant relative to the vertical direction.

Show your working.

magnitude of resultant force = ... N

direction of resultant relative to vertical = ... °

(c) Forces may produce changes in the size and the shape of an object.

State **two** other changes that forces may produce.

1 .....

2 .....

[2]

[Total: 8]

11 A cricket ball is travelling at a speed of 25 m / s horizontally through the air. The mass of the ball is 0.14 kg.

A player catches the ball and the ball comes to rest.

(a) Calculate the change in momentum of the ball during the catch.

change in momentum = ... [2]

(b) The player's hands are in contact with the moving ball for 9.7 ms.

Calculate the horizontal force exerted by her hands to bring the ball to rest.

force = ... [3]

[Total: 5]

12 (a) (i) State the difference between a scalar quantity and a vector quantity.

.....

..... [1]

(ii) In the list below, draw a line under each of the quantities that is a scalar quantity.

acceleration mass momentum electric field strength

energy temperature

[2]

(b) A tennis player throws a tennis ball into the air. The mass of the tennis ball is 5.8×10^{-2} kg. The tennis ball leaves the tennis player's hand and reaches a maximum height of 5.0 m above the point of release.

(i) Show that the initial velocity of the tennis ball is 9.9 m / s upwards.

[3]

(ii) Calculate the momentum of the tennis ball as it leaves the tennis player's hand.

momentum = ... [2]

[Total: 8]