

Centre Number	Candidate Number	Name
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CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICS

0625/02

Paper 2

May/June 2003

1 hour

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s²).

For Examiner's Use

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **16** printed pages.



- 1 A person winds some thread tightly 4 times round the length of a metre rule and cuts the ends off level with the left-hand end of the rule, as shown in Fig. 1.1.

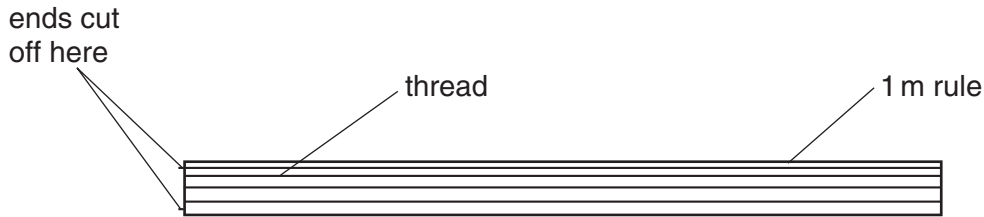


Fig. 1.1

- (a) To the nearest metre, what is the length of the thread?

.....8..... m [1]

- (b) Is the actual length of thread slightly greater or slightly less than your answer to (a)?
Tick one box and give your reason.

slightly greater slightly less

reason ...There is some string around the end of the rule, and the rule...
...has some thickness [1]

- 2 (a) Two horizontal strings are attached to a soft rubber ball, as shown in Fig. 2.1.

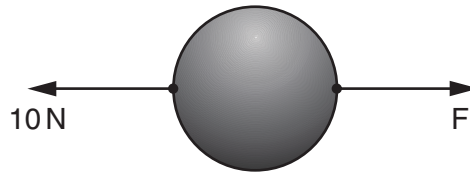


Fig. 2.1

A force of 10 N pulls on one string.

- (i) The ball does not move. What is the value of the force F on the other string?

$F = \dots\dots\dots 10 \dots N$

- (ii) What change to the rubber ball do the two forces cause?

\dots It becomes stretched $\dots\dots\dots$ [2]

- (b) A garden pot containing soil weighs a total of 360 N. The pot rests on three equally-spaced blocks, so that surplus water can drain out of the holes in the base of the pot. The soil is uniformly distributed in the pot. The pot is shown in Fig. 2.2.

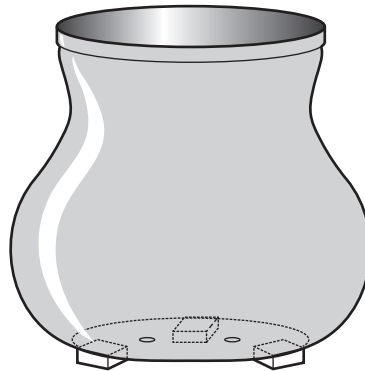


Fig. 2.2

- (i) What is the force exerted by each block on the pot? $\frac{360}{3} \dots\dots\dots 120 \dots N$

- (ii) State the direction of these forces.

\dots Upwards $\dots\dots\dots$

- (iii) The gardener finds that the blocks sink into the ground, but he must have the pot up on blocks to allow the drainage. What can he do to reduce the sinking of the pot?

\dots Use blocks of a larger area $\dots\dots\dots$ [3]

4

- 3 (a) An unopened bottle of olive oil has a mass of 0.97 kg. The empty bottle has a mass of 0.51 kg. Calculate the mass of the olive oil.

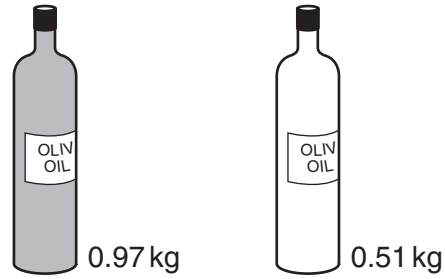


Fig. 3.1

$$0.97 - 0.51$$

mass of olive oil = 0.46 kg [2]

- (b) The olive oil is poured into three 250 cm³ measuring cylinders. The first two cylinders are filled to the 250 cm³ mark. The third is shown in Fig. 3.2.

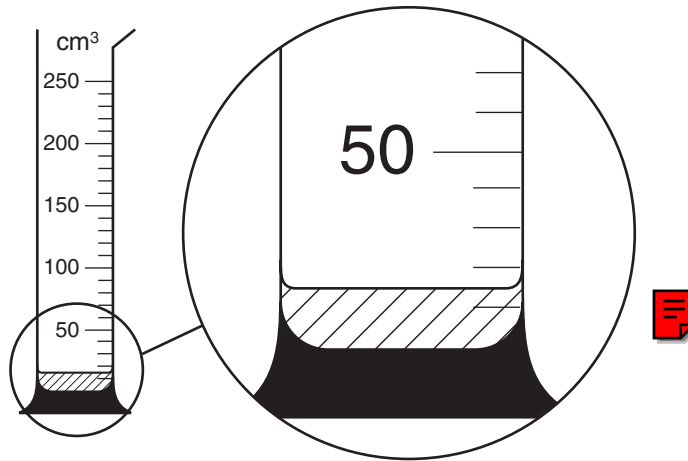


Fig. 3.2

- (i) What is the volume of the olive oil in the third measuring cylinder?

volume = 15 cm³

- (ii) Calculate the volume of the olive oil in the unopened bottle.

$$250 + 250 + 15$$

volume = 515 cm³

- (iii) Calculate the density of the olive oil. Express your answer to 2 significant figures.

$$\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{460}{515} = 0.8932$$

$$= 0.89 \text{ to } 2 \text{ sig figs}$$

density = 0.89g / cm³ [1]

- 4 The air trapped in a cylinder by a piston is kept under pressure by a load, as shown in Fig. 4.1.

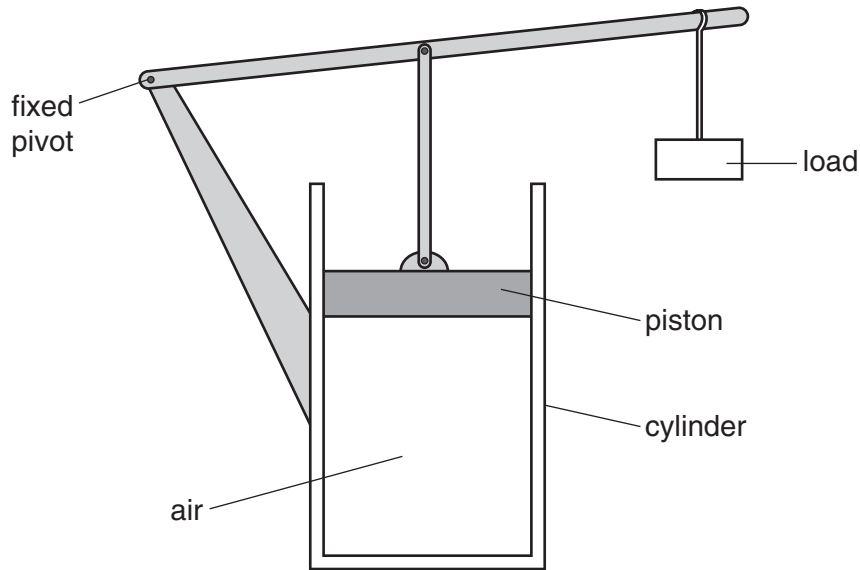


Fig. 4.1

- (a) Describe how the pressure in the cylinder is caused by the air molecules.

The air molecules are moving about at random and hit the walls of the cylinder and the piston

[3]

- (b) The load is increased.

- (i) State what happens to the piston.

It moves down

- (ii) State what happens to the pressure in the cylinder, and give a reason.

what happens ... The pressure rises

reason ... The molecules are in a smaller space and so hit the sides

more often

[3]

- 5 An immersion heater is put into some crushed ice at 0°C . The immersion heater is switched on.

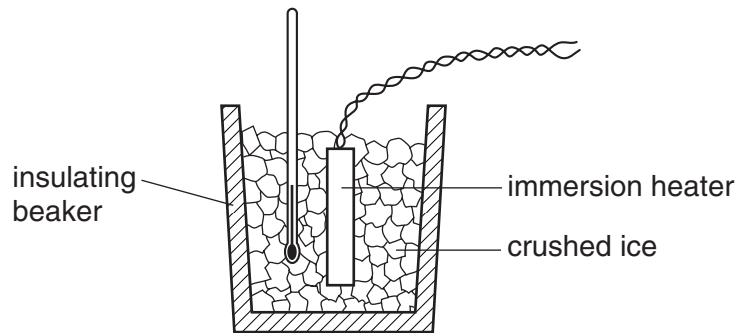


Fig. 5.1

- (a) On Fig. 5.2, sketch the graph of temperature against time, up to the time when all the ice has melted. [3]

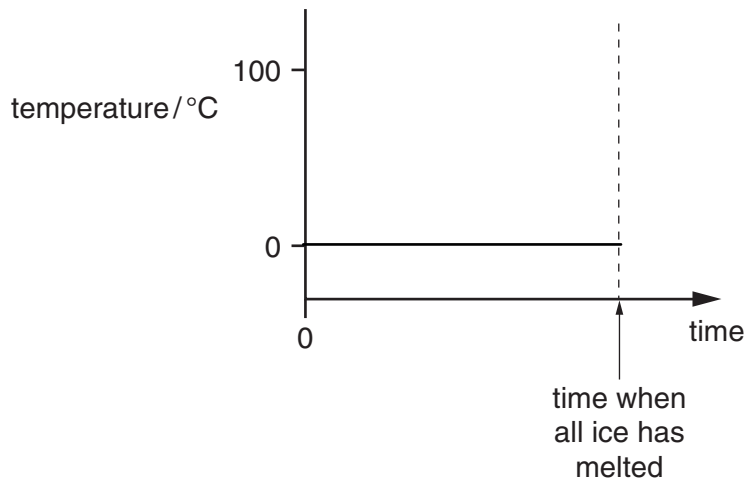


Fig. 5.2

- (b) The heater is left switched on after all the ice has melted, and the temperature rises. After some time, the temperature stops rising, even though the heater is still on.

- (i) Suggest why the temperature stops rising, even though the heater is still on.

The water may have reached its boiling point and started to boil. 

- (ii) State what happens to the energy received by the water whilst this is happening.

The water molecules are given energy to escape. The bonds between the molecules are broken.

[2]

 In this question, drawing should be done carefully.

Fig. 6.1 shows a ray of light striking mirror 1 at point X.

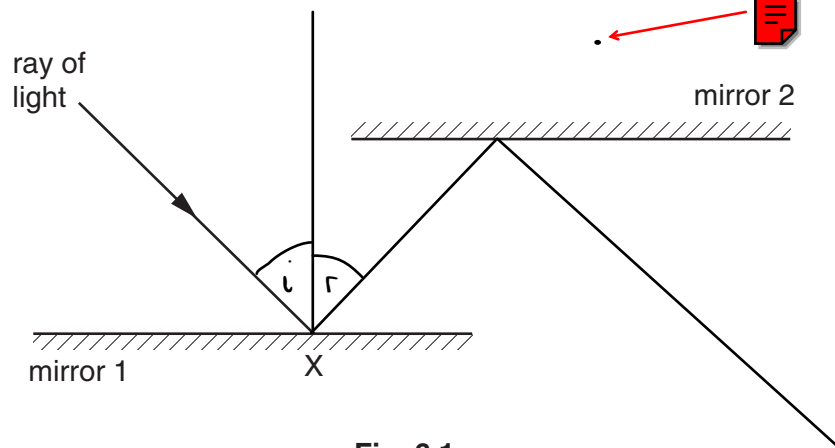


Fig. 6.1

(a) On Fig. 6.1,

- (i) draw the normal at X,
- (ii) draw the ray reflected from mirror 1,
- (iii) mark the angle of incidence using the letter i and the angle of reflection using the letter r .

[3]

(b) Mirror 2 is parallel to mirror 1. The reflected ray from mirror 1 strikes mirror 2.

Compare the direction of the ray reflected from mirror 2 with the incident ray at X. You may do a further construction if you wish. Complete the sentence below.

The reflected ray from mirror 2 is parallel to the ray that strikes mirror 1.

.....[1]

7 The speed of sound in air is 340 m/s.

- (a) Complete Fig. 7.1 to show how far a sound wave has travelled 2, 3, 4 and 5 seconds after the sound was made. [1]

time elapsed/s	0	1	2	3	4	5
distance travelled/m	0	340	680	1020	1360	1700

Fig. 7.1



- (b) On Fig. 7.2, draw the graph of distance travelled against time for the sound wave. [3]

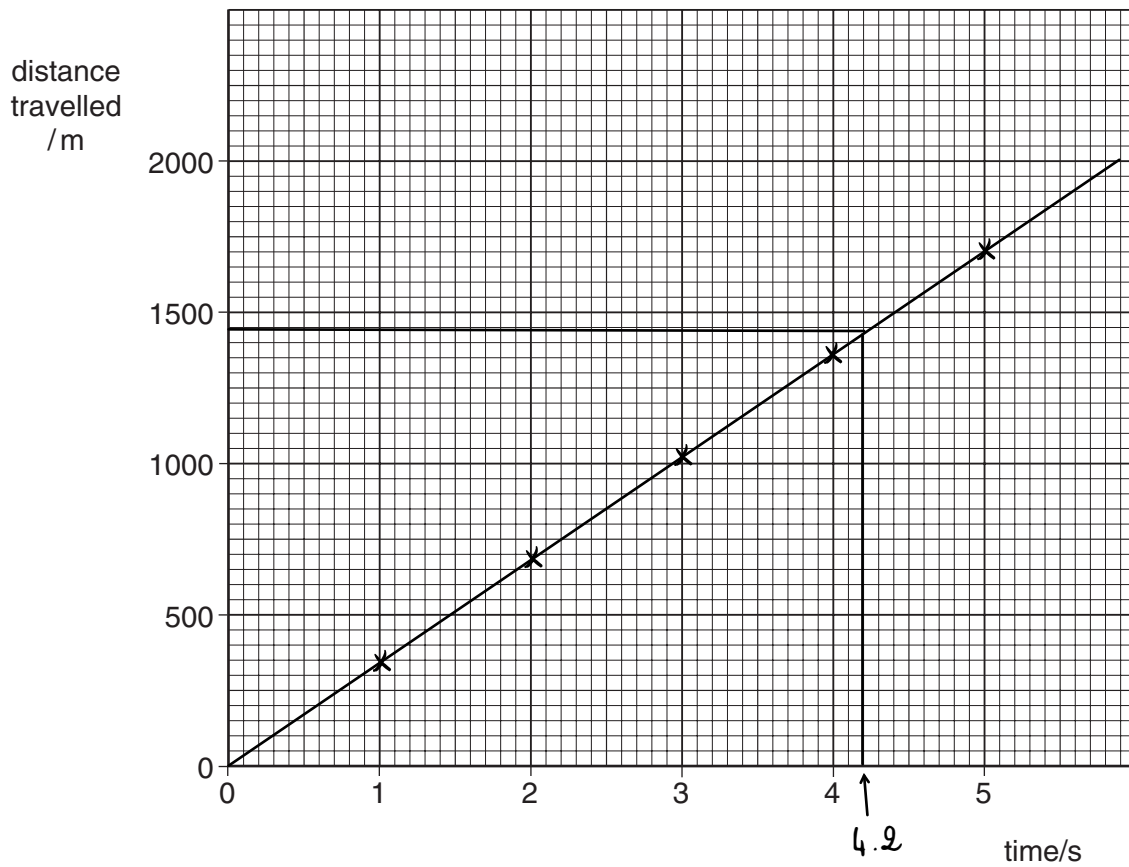



Fig. 7.2

(c) A ship is sinking in the dark as shown in Fig. 7.3.




Fig. 7.3

The sailors on the ship fire a distress flare into the air. It explodes with a bang and a bright flash of light.

-  (i) A lifeboat crew hear the bang and see the flash, but not at the same time. State which reaches the lifeboat first, the bang or the flash, and give a reason.

The flash reaches first. Light travels much faster than sound, at
 3×10^8 m/s rather than 340 m/s

-  (ii) The time interval in (c)(i) is 4.2 s. Use your graph in (b) to find how far away the lifeboat is from the flare. Show clearly on your graph how you got your answer.

distance of lifeboat = 1450 m
 [6]

- 8 (a) In an electronic circuit, what is a capacitor designed to store? charge or energy [1]
- (b) The circuit in Fig. 8.1 contains a large-value resistor and a capacitor.

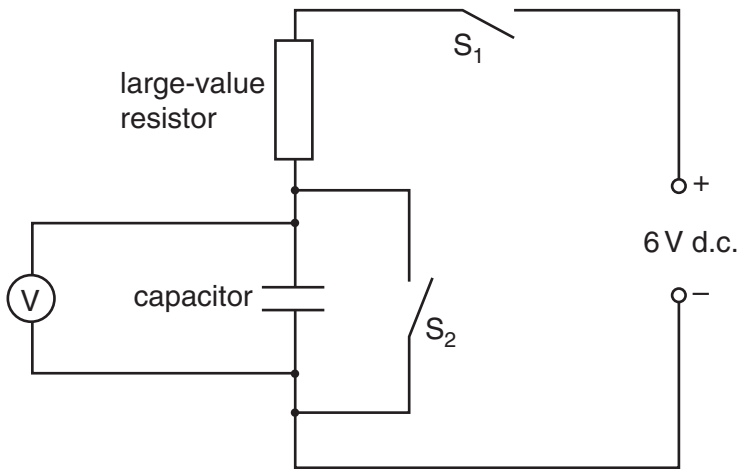


Fig. 8.1

- (i) Switch S_1 is open. Switch S_2 is closed and then opened again.

What reading now shows on the voltmeter? 0 V

- (ii) S_2 is left open and S_1 is closed and left closed.

Describe what happens to the reading on the voltmeter.

The reading on the voltmeter rises from 0 to 6V, taking some time as the capacitor charges up.

- (iii) The circuit in Fig. 8.1 is an example of a simple time-delay circuit.

State one use of a time-delay circuit.

To turn off a cooker automatically after the food has been cooked

[4]

- 9 A length of flexible, slack wire is fixed at A and B so that part of it is held vertically in the field of a horseshoe magnet, as shown in Fig. 9.1.

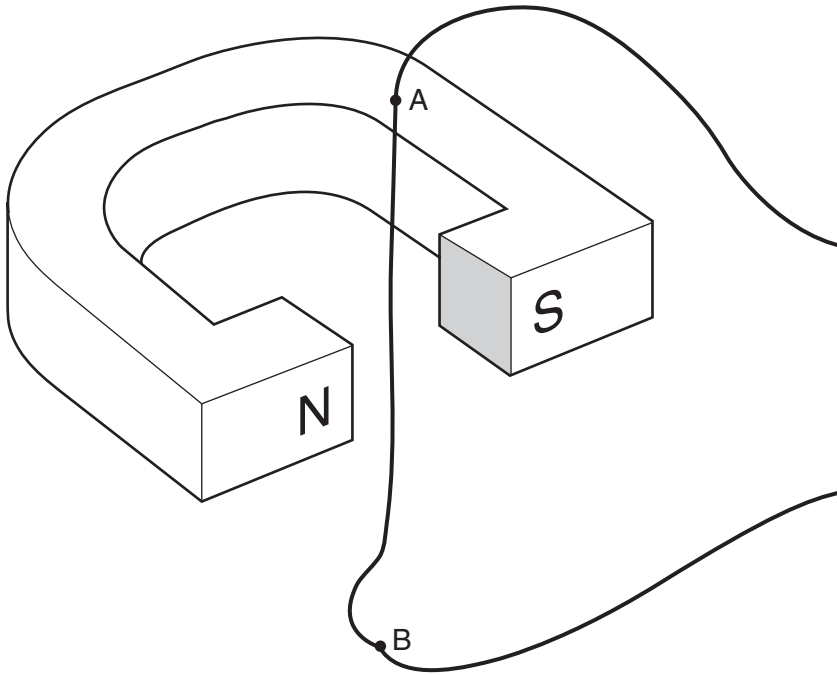


Fig. 9.1

Figs. 9.2 and 9.3 each show the same section through the apparatus. The wire between A and B is not shown.

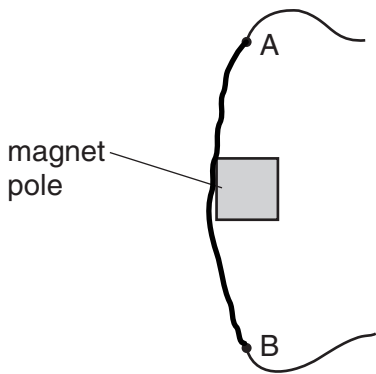


Fig. 9.2

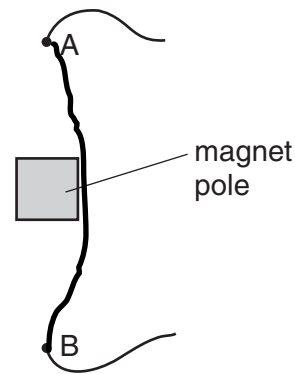


Fig. 9.3

- (a) (i) On Fig. 9.2, draw what the wire might look like when a large current passes through it. [2]
- (ii) Explain why the wire looks like this.
 There is a force on a current in the wire when it is placed in a
 magnetic field. [3]
- (b) On Fig. 9.3, draw what the wire might look like if the current in (a) is reversed. [1]

10 Fig. 10.1 shows a simplified diagram of the front of a cathode-ray oscilloscope (c.r.o.).

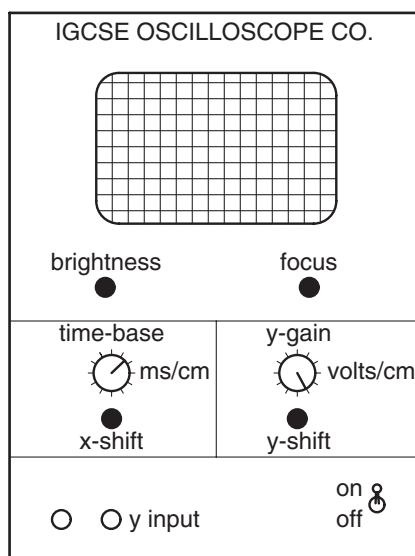


Fig. 10.1

(a) When the oscilloscope is switched on, a bright spot is seen at the centre of the screen.

(i) Describe what causes this bright spot.

Electrons hit the screen and fluorescence (light emitted) occurs. 

.....
.....
.....[3]


(ii) The spot is rather blurred. Which control should be adjusted to make it sharper?

The focus control.....[1]

(iii) Which control would be switched on to turn the spot into a horizontal line?

The time-base.....[1]

(iv) Describe what happens inside the oscilloscope to turn the spot into a horizontal line.

The electrons are deflected horizontally by the x plates as they travel to the screen. When they reach one side they fly back quickly to the left and then start again. 

.....[3]

(b) You have an alternating p.d. whose waveform you wish to display on the screen.

(i) Where would you connect this alternating p.d. to the oscilloscope?

To the y-input

(ii) Fig. 10.2 shows what the trace on the screen might look like.

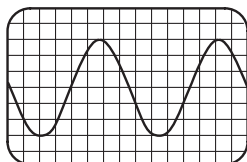


Fig. 10.2

1. What change would you see on the screen if you adjusted the x-shift control?

The trace moves sideways (horizontally or left/right)

2. What change would you see on the screen if you adjusted the y-shift control?

The trace moves vertically (up/down) as a whole, but does not change its shape or look, in both cases. [3]

- 11 (a) Fig. 11.1 shows a circuit containing a lamp and a variable resistor.

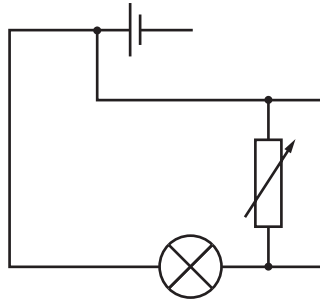
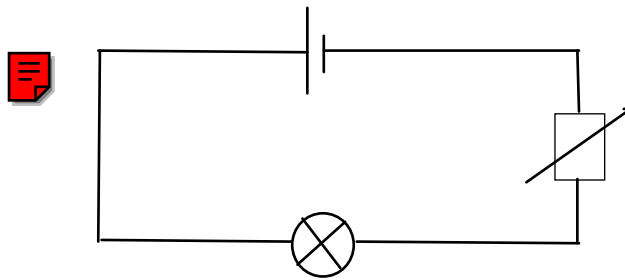


Fig. 11.1

The circuit does not work. The lamp does not light and altering the setting on the variable resistor makes no difference.

In the space below, re-draw the diagram, showing a circuit in which the variable resistor may be used to change the brightness of the lamp. [2]



- (b) Fig. 11.2 shows two resistors and an ammeter connected in series to a 6 V d.c. supply. The resistance of the ammeter is so small that it can be ignored.

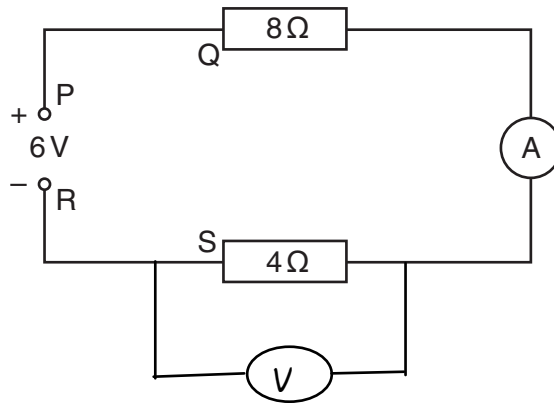




Fig. 11.2


-  (i) Calculate the combined resistance of the 8 Ω and 4 Ω resistors in series.

$$R_{\text{Total}} = R_1 + R_2 = 8 + 4$$

combined resistance = 12 Ω [2]

-  (ii) 1. Calculate the current supplied by the 6 V d.c. supply.


$$R = \frac{V}{I} \text{ so } I = \frac{V}{R} = \frac{6}{12} = 0.5\text{A}$$

current = 0.50 A 

2. State the value of the current

in section PQ of the circuit 0.5 A

recorded by the ammeter 0.5 A

in section SR of the circuit 0.5 A 

[5]

- (iii) On Fig. 11.2, show a voltmeter connected to measure the potential difference across the 4 Ω resistor. [1]

- 12 A rock climber climbs up a rock face, as shown in Fig. 12.1.

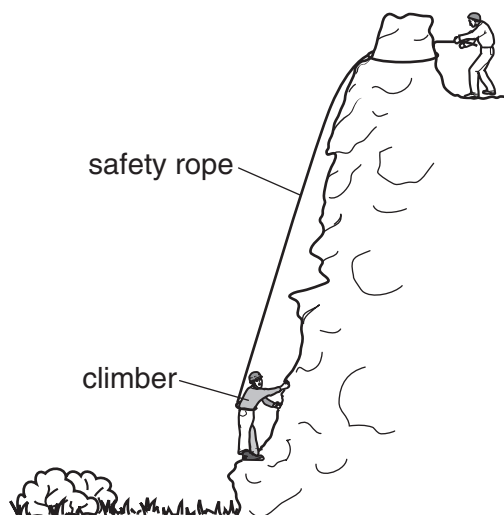



Fig. 12.1

- (a) To climb the rock face, the climber must do work.
Which force must the climber work against as he climbs? Tick one box.
- | | | |
|----------------------------|-------------------------------------|-----|
| air resistance | <input type="checkbox"/> | |
| friction on the rock | <input type="checkbox"/> | |
| his weight | <input checked="" type="checkbox"/> | |
| tension in the safety rope | <input type="checkbox"/> | [1] |
- (b) What other quantity, as well as the force ticked in (a), must be known in order to find the work done by the climber?
- the distance he has climbed [1]
- (c) One climber weighs 1000 N and another weighs 800 N. They both take the same time to climb the cliff.
- (i) Which one has done the most work? the 1000N climber
- (ii) Which one has the greater power rating? the 1000N climber [2]
- (d) When the first climber reaches the top, he has more gravitational potential energy than he had at the bottom.
- (i) What form of energy, stored in his body, was used to give him this extra gravitational potential energy? chemical energy
- (ii) Where did he get this energy from? the food that he eats
- (iii) Other than increasing gravitational potential energy on the way up, how else was energy in his body used? State one way. 
- He loses energy as heat and also uses energy to work his lungs
and heart.

[3]