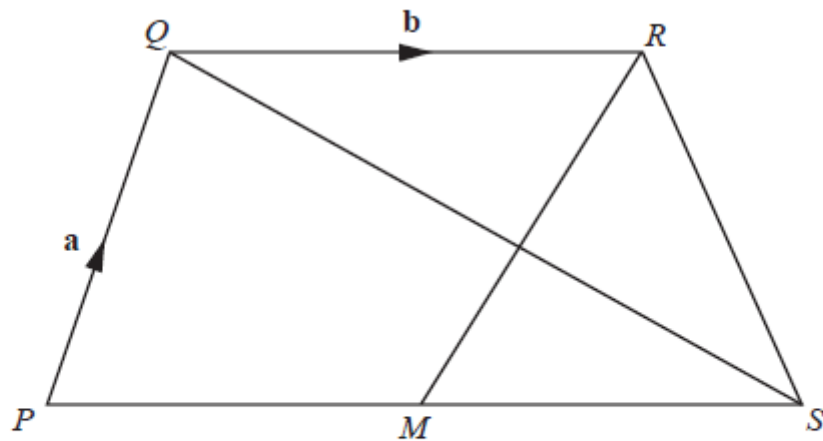


SAMPLE 2

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Mathematics

1.



NOT TO SCALE

$PQRS$ is a quadrilateral and M is the midpoint of PS .

$\vec{PQ} = \mathbf{a}$, $\vec{QR} = \mathbf{b}$ and $\vec{SQ} = \mathbf{a} - 2\mathbf{b}$.

(a) Show that $\vec{PS} = 2\mathbf{b}$.

[1]

(b) Write down the mathematical name for the quadrilateral $PQRM$, giving reasons for your answer.

Answer(b) because

.....

[2]

2.

The table shows some values for $y = x^2 - \frac{1}{2x}$, $x \neq 0$.

x	-2	-1.5	-1	-0.5	-0.25	-0.2		0.2	0.25	0.5	1	1.5	2
y	4.25	2.58			2.06	2.54		-2.46	-1.94			1.92	3.75

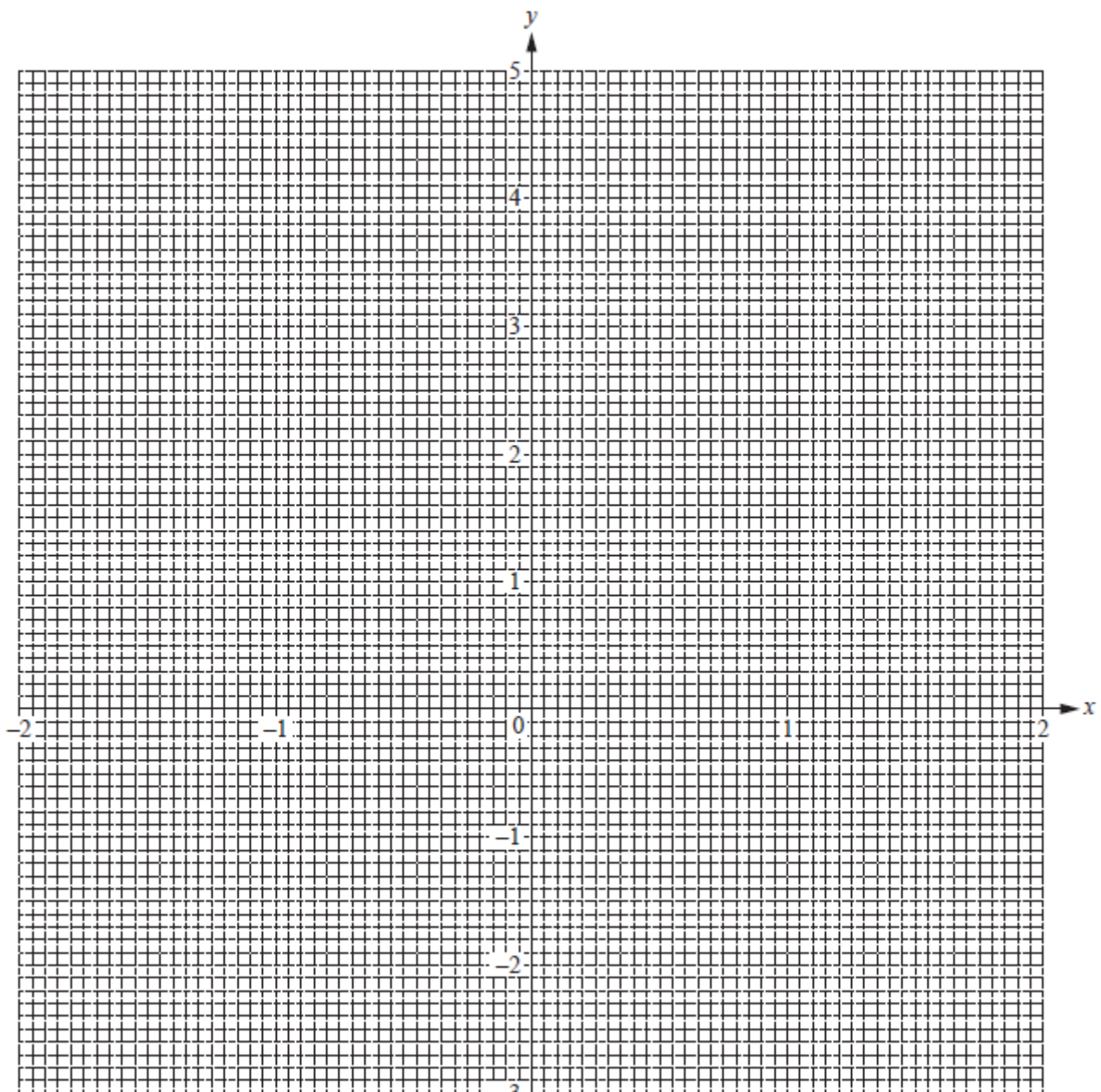
(a) Complete the table of values.

[1]

(b) On the grid, draw the graph of $y = x^2 - \frac{1}{2x}$ for $-2 \leq x \leq -0.2$ and $0.2 \leq x \leq 2$.

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[2]

(c) By drawing a suitable line, use your graph to solve the equation $x^2 - \frac{1}{2x} = 2$.

Answer(c) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ or $x = \dots\dots\dots$

[2]

(d) The equation $x^2 - \frac{1}{2x} = k$ has only one solution.

Write down the range of values of k for which this is possible.

[2]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1$.

[2]

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3.

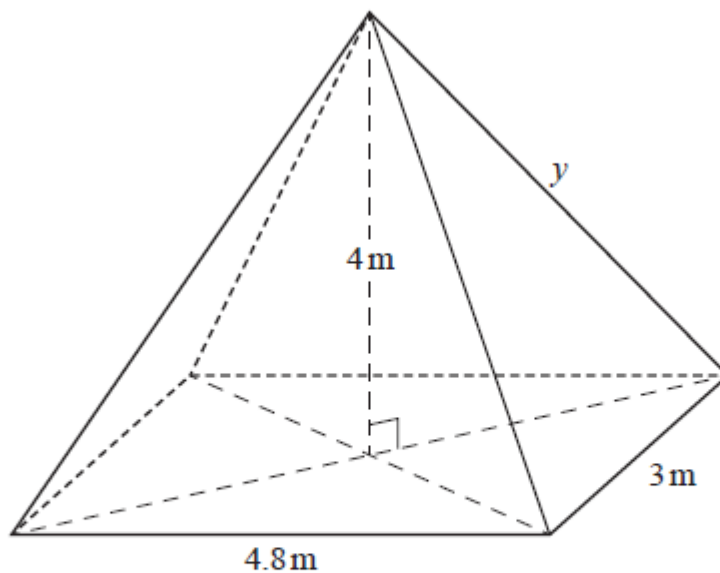
(a) Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.

(i) Calculate the angle of elevation of the top of the tower. [2]

(ii) Andrei walks a distance x metres directly towards the tower.
The angle of elevation of the top of the tower is now 24.8° .

Calculate the value of x . [2]

(b) The diagram shows a pyramid with a horizontal rectangular base.



NOT TO
SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

(i) y , the length of a sloping edge of the pyramid, [2]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

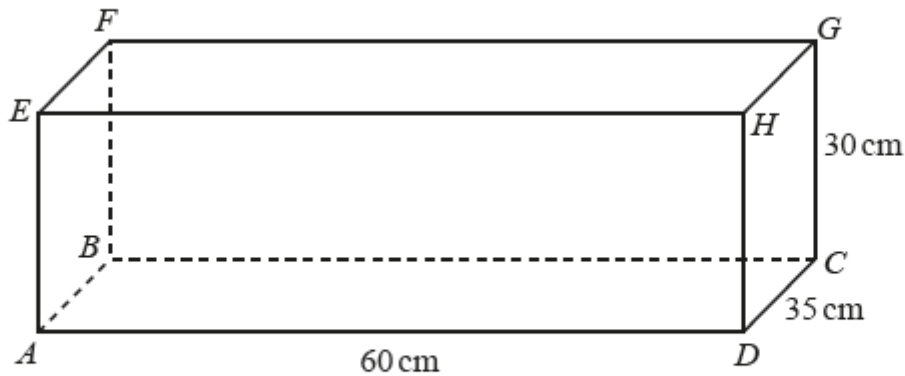
[2]

SAMPLE 2

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4.

The diagram shows a cuboid.



NOT TO
SCALE

$AD = 60 \text{ cm}$, $CD = 35 \text{ cm}$ and $CG = 30 \text{ cm}$.

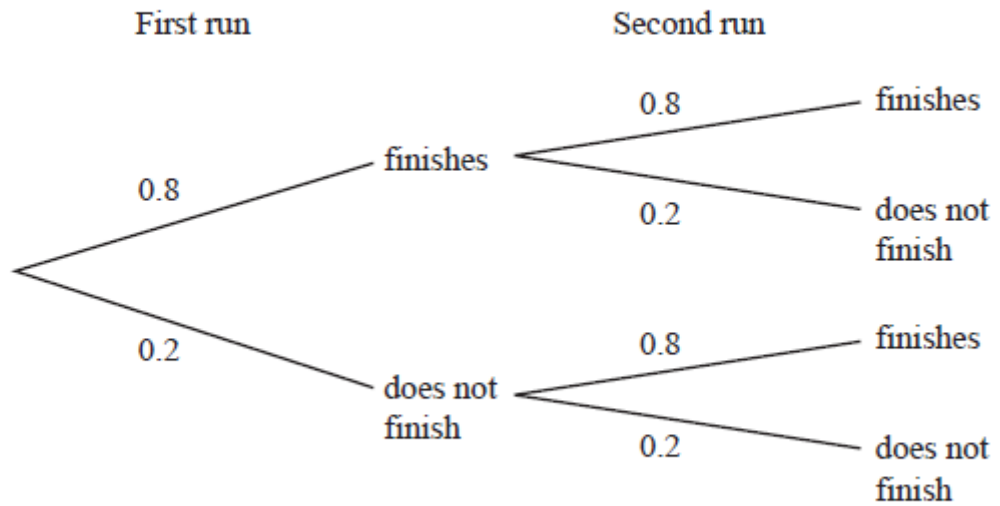
- (a) Write down the number of planes of symmetry of this cuboid. [1]
- (b) (i) Work out the surface area of the cuboid. [2]
- (ii) Write your answer to **part (b)(i)** in square metres. [1]
- (c) Calculate
- (i) the length AG , [2]
- (ii) the angle between AG and the base $ABCD$. [2]
- (d) (i) Show that the volume of the cuboid is $63\,000 \text{ cm}^3$. [1]
- (ii) A cylinder of height 40 cm has the same volume as the cuboid.
Calculate the radius of the cylinder. [2]

SAMPLE 2

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5.

Samira takes part in two charity runs.
The probability that she finishes each run is 0.8 .



Find the probability that Samira finishes at least one run.

[3]

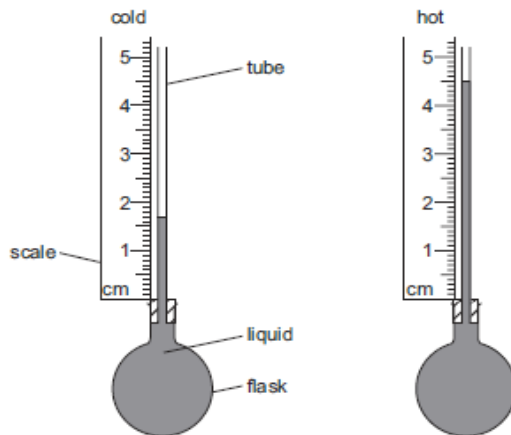
SAMPLE 2

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Physics

- 1 Some liquid is heated in a flask.

The diagrams show the height of the liquid in the tube when the liquid is cold and when it is hot.



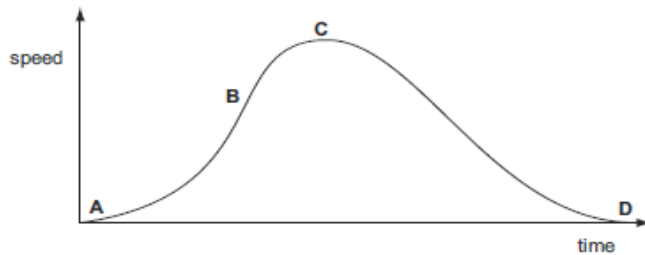
What is the difference in the heights?

- A 1.7 cm B 2.8 cm C 3.2 cm D 4.5 cm

[1]

- 2 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus the greatest?



[1]

- 3 In a race, a car travels 60 times around a 3.6km track. This takes 2.4 hours.

What is the average speed of the car?

- A 1.5 km/h B 90 km/h C 144 km/h D 216 km/h

[1]

SAMPLE 2

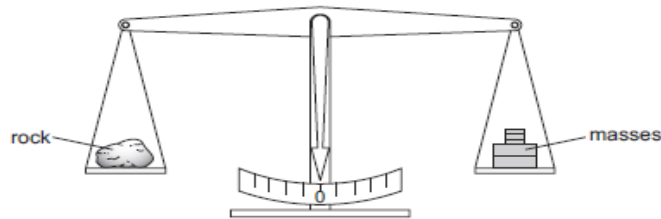
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4 Which quantity is measured in newtons?

- A density
- B energy
- C pressure
- D weight

[1]

5 A geologist places a small rock on the left-hand pan of a balance. The two pans are level as shown when masses with a total weight of 23 N are placed on the right-hand pan. Take the weight of 1.0 kg to be 10 N.

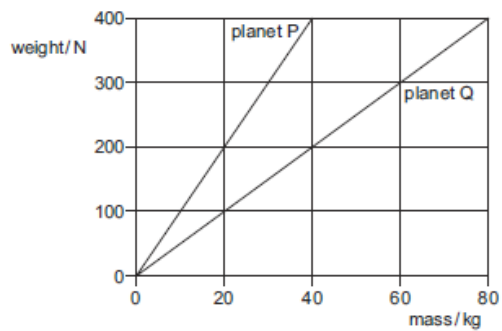


What is the mass of the small rock?

- A 0.023 kg
- B 2.3 kg
- C 23 kg
- D 230 kg

[1]

6 The graph shows how weight varies with mass on planet P and on planet Q.



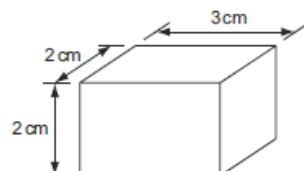
An object weighs 400 N on planet P. The object is taken to planet Q.

Which row is correct?

	mass of object on planet Q / kg	weight of object on planet Q / N
A	40	200
B	40	400
C	80	200
D	80	400

[1]

7 The diagram shows a rectangular block of density 2 g/cm^3 .



What is the mass of the block?

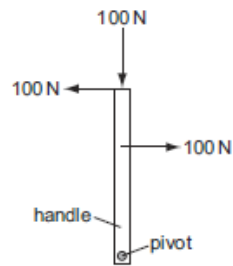
- A 2 g
- B 6 g
- C 14 g
- D 24 g

[1]

SAMPLE 2

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- 8 The diagram shows a handle with three forces, each 100 N, applied to it. The handle is free to move.



What is the effect of the forces on the handle?

- A The handle will move downwards.
B The handle will not move.
C The handle will turn anticlockwise (to the left).
D The handle will turn clockwise (to the right).
- 9 In which pair of energy sources are both sources renewable?
A oil and coal
B oil and tidal
C tidal and geothermal
D tidal and nuclear fission
- 10 Energy is stored in a battery and in a box of matches.
Which type of energy is stored in each of them?

	a battery	a box of matches
A	chemical	chemical
B	chemical	internal (thermal)
C	electrical	chemical
D	electrical	internal (thermal)

- 11 A man lifts 20 bricks, each of weight 6 N.

What other information is needed to calculate the useful work done in lifting the bricks?

- A the distance he lifts the bricks
B the mass of the bricks
C the time taken to lift the bricks
D the volume of the bricks

[1]

[1]

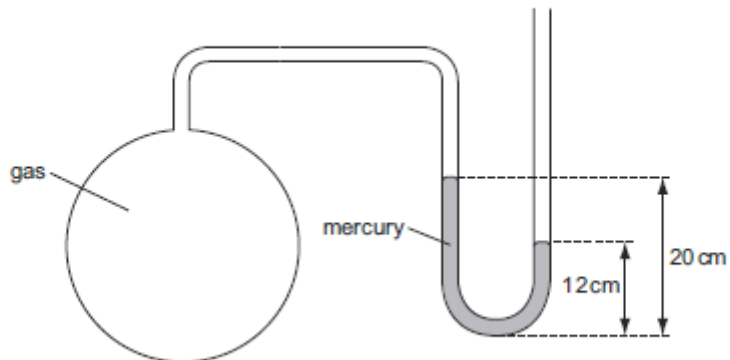
[1]

[1]

SAMPLE 2

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- 12 The diagram shows a mercury manometer used to measure the pressure of gas in a container. Atmospheric pressure is 76 cm of mercury.



What is the pressure of the gas?

- A 56cm of mercury
 - B 68cm of mercury
 - C 84cm of mercury
 - D 96cm of mercury
- 13 Brownian motion is observed when looking at smoke particles in air using a microscope.

What causes the smoke particles to move at random?

- A Smoke particles are hit by air molecules.
- B Smoke particles are moved by convection currents in the air.
- C Smoke particles have different weights and fall at different speeds.
- D Smoke particles hit the walls of the container.

[1]

[1]

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14

During a period of hot weather, the atmospheric pressure on the pond in Fig. 3.1 remains constant. Water evaporates from the pond, so that the depth h decreases.

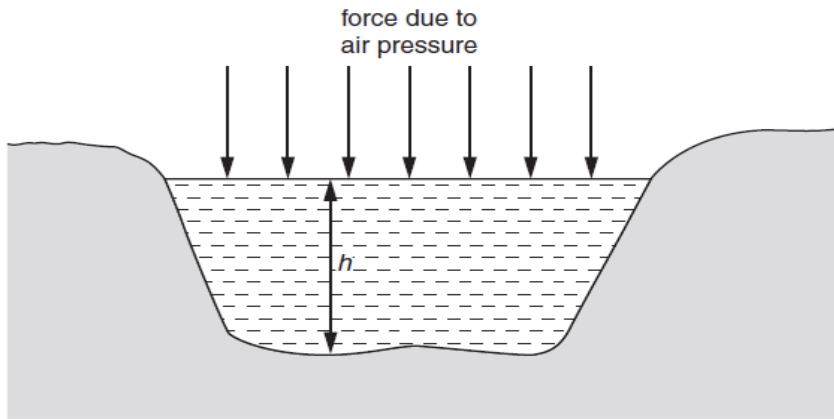


Fig. 3.1

(a) Study the diagram and state, giving your reason, what happens during this hot period to

(i) the force of the air on the surface of the pond,

.....
.....[1]

(ii) the pressure at the bottom of the pond.

.....
.....[1]

(b) On a certain day, the pond is 12 m deep.

(i) Water has a density of 1000 kg/m^3 .

Calculate the pressure at the bottom of the pond due to the water.

pressure due to the water =[2]

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(ii) Atmospheric pressure on that day is 1.0×10^5 Pa.

Calculate the total pressure at the bottom of the pond.

total pressure =[1]

(iii) A bubble of gas is released from the mud at the bottom of the pond. Its initial volume is 0.5 cm^3 .

Ignoring any temperature differences in the water, calculate the volume of the bubble as it reaches the surface.

volume =[2]

(iv) In fact, the temperature of the water is greater at the top than at the bottom of the pond.

Comment on the bubble volume you have calculated in (b)(iii).

.....
.....
.....[1]

15 (a) The speed of light in air is known to be 3.0×10^8 m/s.

Outline how you would use a refraction experiment to deduce the speed of light in glass. You may draw a diagram if it helps to clarify your answer.

.....
.....
.....
.....
.....
.....[4]

(b) A tsunami is a giant water wave. It may be caused by an earthquake below the ocean.

Waves from a certain tsunami have a wavelength of 1.9×10^5 m and a speed of 240 m/s.

(i) Calculate the frequency of the tsunami waves.

frequency =[2]

SAMPLE 2

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16

A simple motor is made in a school laboratory. A coil of wire is mounted on an axle between the poles of a horseshoe magnet, as illustrated in Fig. 9.1.

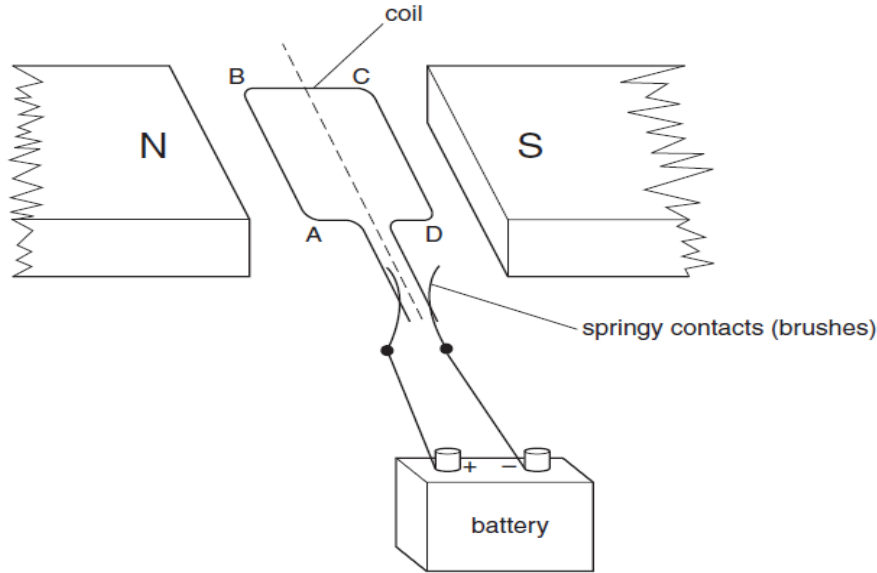


Fig. 9.1

(a) At the instant illustrated in Fig. 9.1, the coil ABCD is horizontal and the battery is connected as shown.

(i) For this position, state the direction of the force on AB and the direction of the motion of AB.

force on AB
 direction of motion of AB[1]

(ii) Explain why BC does not contribute to the turning force on the coil.

.....
[1]

(b) At the instant when the coil is vertical, the springy contacts do not, in fact, make contact with the ends of the coil.

Describe and explain what happens to the coil.

.....

[2]

(c) The motor in Fig. 9.1 does not rotate very quickly. The designer of a commercial motor is required to produce a faster-rotating motor.

Suggest **one** change that could be made to increase the speed of the motor.

.....

[2]

SAMPLE 2

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III YEAR

Information Technology

1. Explain what is meant by computer hardware and computer software, giving an example of each.

Hardware
.....
.....
Software
.....
.....
.....[4]

2. Complete each sentence using a word from the list below.

- (a) The type of processing used for updating bank accounts at ATMs is called.....[1]
- (b) The type of access used on a magnetic tape is called [1]
- (c) The type of software used to create printed magazines is called[1]

- batch sensor spreadsheet**
- online direct random**
- serial DTP**

3. Describe **two** recent developments in ICT which have improved the quality and speed of communication using the internet.

1
.....
2.....
.....[2]

4. An office has a microprocessor controlled central heating system.

(a) Name and describe, in detail, the use of **two** input devices in such a system.

Name 1
.....
Use 1
.....
Name 2
.....
Use 2
.....[4]

(b) Describe how the microprocessor would keep the temperature of the office at a constant 19°C.

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

5. A headteacher keeps all details of students in a database.

Describe what is meant by the following terms, using examples of student data.

Field
.....
.....

SAMPLE 2

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.....
File
.....
.....
.....
Record
.....
.....
.....[3]

6. An airline keeps a database of all the flights it operates. A short extract is shown below.

Flightnumber	DepartureAirport_Code	Number_of_passengers	Destination_Airport_code	Ticket_prices
EK236	JNB	135	LHR	\$1200
EK080	DXB	256	DEL	\$500
EK029	LHR	375	DXB	\$650

Explain fully, what is meant by the following validation checks using the extract above.
Range check
.....
.....
.....
Format check
.....
.....
.....
Length check
.....
.....
.....[6]

7. Biometric methods are increasingly being used to authorise user access to computer systems.

(a) Explain, giving examples, why biometric methods are considered to be a more secure method of authorising access to a network than using id and passwords.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[5]

(b) Give **three** disadvantages of using biometric methods compared to user id and passwords.

1
.....
2
.....
3
.....[3]