AQA Style

GCSE

PHYSICS

F

Foundation Tier Physics Paper 1

Time allowed: 1 hour 45 minutes

Materials

- A ruler
- A pen and pencil
- A calculator
- Physics Equation Sheet

Instructions

- Answer all the questions using a black pen.
- Answer the questions in the space available and cross out any work you do not want to be marked.
- In any calculations make sure you show your working out.
- The marks for each question are shown in brackets.
- The maximum mark for the paper is 100.
- You must make your work as neat as possible and use good English in your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Name _____

Date _____

BEYOND SCIENCE

0 1 Electrical power is transferred from power stations to consumers using the National Grid.

0 1 . 1 Transformers form part of the National Grid.

Which of the parts below is also part of the National Grid?

Tick **one** box.

[1 mark]

power station ☐

cables ☐

pylons ☐

0 1 . 2 A step-up transformer is used close to the power station.

Complete the sentences. Choose answers from the box.

current	energy
resistance	potential difference

[2 marks]

A step-up transformer increases the _____, making the National Grid an efficient way to transfer _____.

0 1 . 3 The mains electricity supply in UK homes uses an alternating current.

What is an alternating current?

Tick **one** box.

[1 mark]

a current that repeatedly changes direction ☐

a current that alternates between components ☐

a current that is always in the same direction ☐

a current that alternates between routes in a parallel circuit ☐

0 1 . 4 What is the potential difference of the domestic electricity supply in the UK?

Tick **one** box.

[1 mark]

1×10^{-1}V ☐

0V ☐

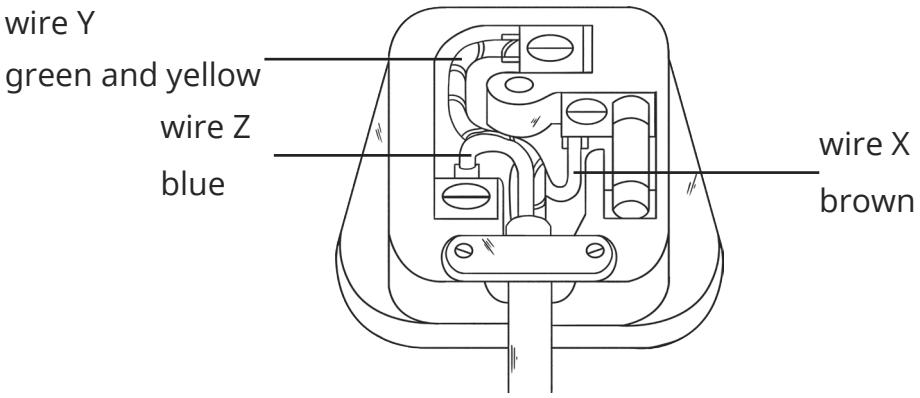
50V ☐

230V ☐

0 1 . 5 **Figure 1** shows the wiring inside a plug. There are three different coloured wires.

Figure 1

[1 mark]



Name wire **Z**.

_____

0 1 . 6 The wires in the plug are made from copper. They are surrounded by a layer of rubber or flexible plastic.

[2 marks]

Explain why.

_____

_____

0 1 . 7 The plug is connected to a games console.

The console is connected to a 110V power supply.

The current in the console is 1.2A

Calculate the power of the console.

Use the equation:

power = potential difference × current

[2 marks]

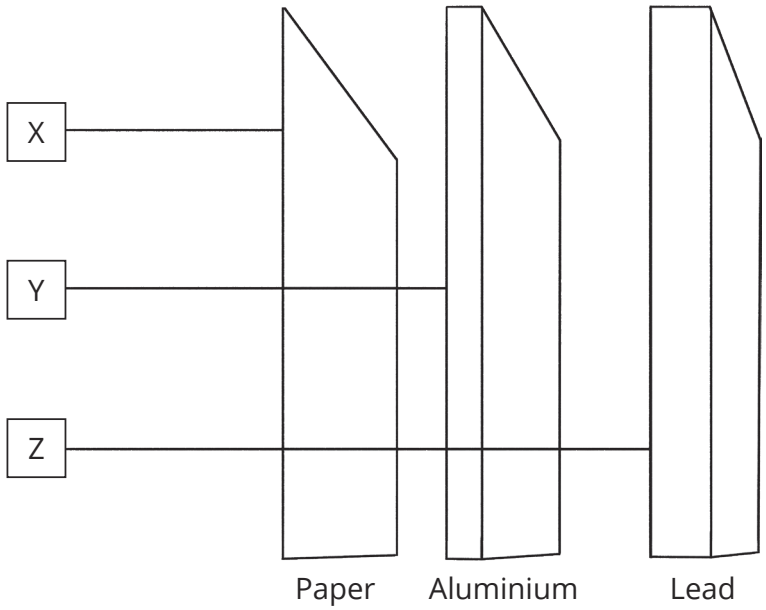
power = _____ W

10

0 2 A teacher demonstrated the penetration of three types of nuclear radiation through different materials.

The demonstration is shown in **Figure 2**.

Figure 2



0 2 . 1 Which letter in **Figure 2** represents beta radiation?

Tick **one** box.

[1 mark]

X ☐

Y ☐

Z ☐

0 2 . 2 Radioactive sources can be dangerous.

Give **one** safety precaution that should be taken when handling radioactive sources.

[1 mark]

_____

_____

0 2 . 3 People that work with radioactive sources monitor their radiation dose using radiation monitoring badges. Even when they are not close to the radioactive sources their badges will measure radiation.

Background radiation is around us all the time.

Give **two** sources of background radiation.

[2 marks]

1. _____

2. _____

0 2 . 4 When uranium decays, it emits a particle with the symbol $^{4}_{2}He$.

Write down the name of this particle.

[1 mark]

_____

0 2 . 5 Uranium decays to form thorium. The decay can be represented by the equation in **Figure 3**.

[1 mark]

Figure 3

$$^{235}_{92}U \longrightarrow {}^{4}_{2}He + {}^{231}_{\square}Th$$

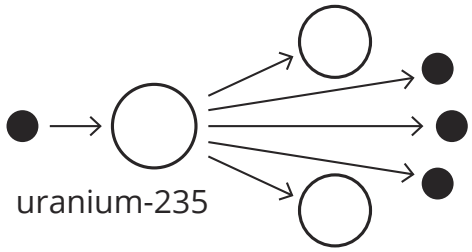
Determine the atomic number of thorium-231.

_____

0 2 . 6 The energy released from the nuclear fission of uranium is used in nuclear power stations to generate electricity.

Figure 4 shows the process of nuclear fission.

Figure 4



The black dots in **Figure 4** represent particle **X**.

What is particle **X**?

Tick **one** box.

[1 mark]

an electron ☐

a neutron ☐

a proton ☐

0 2 . 7 Complete the sentence.

Choose the answer from the box.

chain reaction	fusion reaction
nuclear reaction	spontaneous reaction

[1 mark]

The three black particles released from the uranium atom may go on to cause a _____.

0 2 . 8 The nuclear fission of uranium also releases a gamma wave.

What effect does this have on the mass of the uranium nucleus?

[1 mark]

_____

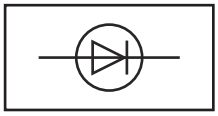
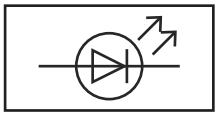
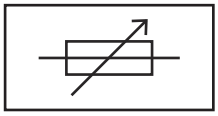
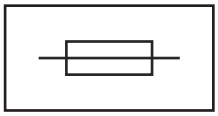
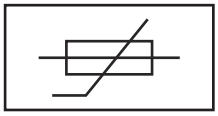
_____

9

0 3 A circuit diagram is a visual display of an electric circuit. Circuit diagrams use standard symbols.

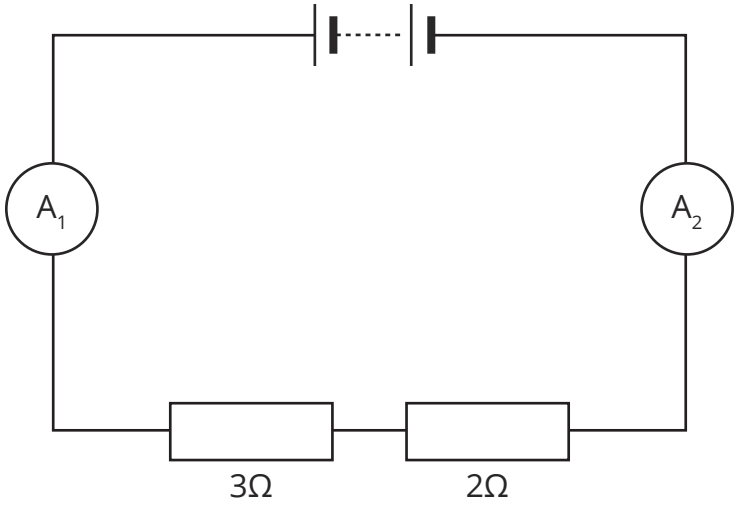
0 3 . 1 Draw **one** line from each component to its circuit symbol.

[3 marks]

Component	Circuit Symbol
diode	
	
fuse	
	
variable resistor	

0 3 . 2 **Figure 5** shows a circuit. The circuit contains two resistors joined in series.

Figure 5



Calculate the total resistance of the two resistors.

[1 mark]

_____

_____

total resistance = _____ Ω

0 3 . 3 The current through ammeter 1 (A_1) is 0.6A.

What is the current through ammeter 2 (A_2)?

Explain your answer.

[2 marks]

current _____ A

explanation _____

_____

_____

0 3 . 4 A voltmeter is used to measure potential difference. Draw a voltmeter on **Figure 5** to show how it should be connected to measure the potential difference across the battery.

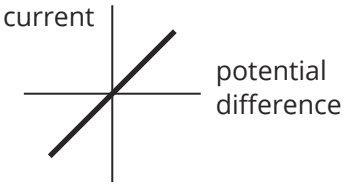
[1 mark]

0 3 . 5 A different circuit contains a lamp. As current flows through the lamp the resistance of the lamp changes.

Which graph represents the resistance of the lamp?

[1 mark]

Tick **one** box.



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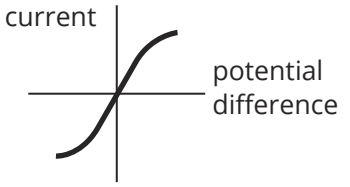

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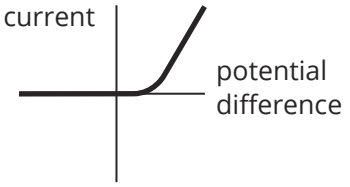


☐

0 3 . 6 A current of 4A flows through the lamp for 120 seconds.

Calculate the charge transferred while the lamp is on.

Use the equation:

charge = current × time

[2 marks]

charge = _____C

10

0 4 Different energy sources are used to generate electricity. Some energy sources are renewable, others are not.

0 4 . 1 What does 'renewable energy source' mean?

[1 mark]

0 4 . 2 Name **one** non-renewable source of energy.

[1 mark]

0 4 . 3 Three examples of energy resources are:

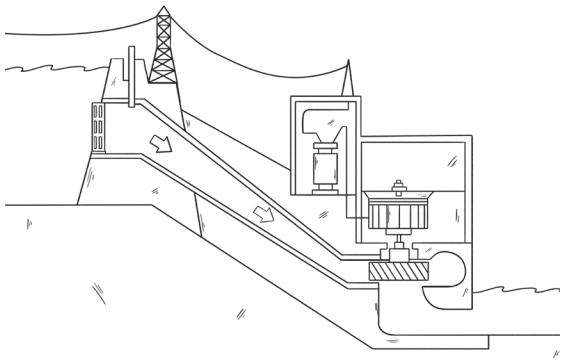
- geothermal
- tides
- wind

Explain which of the energy resources is the least reliable.

[2 marks]

0 4 . 4 **Figure 6** shows an example of a hydroelectric power station. Electricity is generated when the water flows at speed from the reservoir at the top to the reservoir at the bottom. The flowing water turns turbines that are attached to generators and electricity is produced.

Figure 6



Name the type of energy stored in the water when it is contained in the top reservoir.

[1 mark]

0 4 . 5 1000kg of water is released from the reservoir.

It travels down the slope at 20m/s.

Calculate the kinetic energy of the flowing water.

Use the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

[2 marks]

kinetic energy = _____ J

0 4 . 6 Complete the sentence. Choose the answer from the box.

electricity	movement	sound

[1 mark]

As the water flows through the power station, some energy is wasted as

_____.

0 4 . 7 Give **one** advantage and **one** disadvantage of hydroelectric energy.

[2 marks]

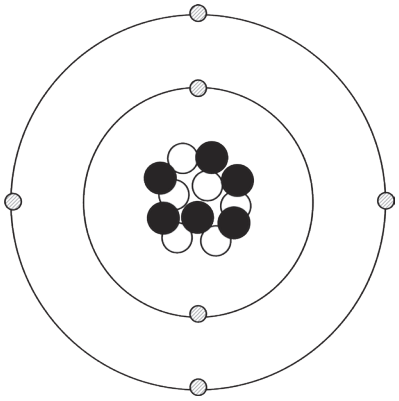
advantage: _____

disadvantage: _____

10

0 5 Atoms contain three different types of subatomic particles: protons, neutrons and electrons. **Figure 7** shows a diagram of an atom.

Figure 7



0 5 . 1 Name the **two** types of subatomic particles found in the nucleus of an atom.

[1 mark]

1. _____

2. _____

0 5 . 2 Explain why an atom has no overall charge.

You should refer to the subatomic particles in your explanation.

[2 marks]

_____

_____

_____

0 5 . 3 Carbon-12 and carbon-14 are isotopes of carbon. **Figure 8** shows a representation of each isotope.

Figure 8

$^{12}_{6}C$ $^{14}_{6}C$

What are isotopes?

[2 marks]

_____

_____

0 5 . 4 Radioactive substances give out radiation from their nucleus. The half-life of carbon-14 is 5730 years.

What does 'half-life' mean?

[1 mark]

0 5 . 5 Radiation can be measured by a Geiger-Müller tube and counter.

Table 1 shows the count-rate for a radioactive source over 8 hours.

Table 1

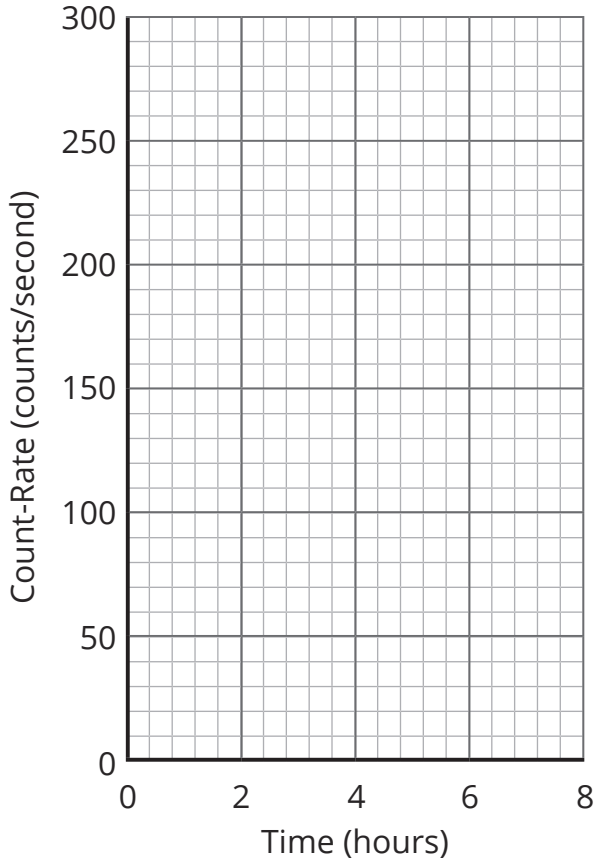
Time (hours)	Count Rate (counts/second)
0	280
2	190
4	140
6	100
8	70

Complete **Figure 9** using the results in **Table 1**.

Draw a line of best fit.

[3 marks]

Figure 9



0 5 . 6 Use your completed graph to determine the half-life of the radioactive isotope.

Show clearly on **Figure 9** how you obtain your answer.

[2 marks]

_____

_____

_____

half-life = _____ hours

11

Turn over for the next question

0 6 An electric kettle is used to boil water.

0 6 . 1 Complete the sentences. Choose answers from the box.

thermal	sound	gravitational potential
electrical	magnetic	

[3 marks]

The kettle transfers _____ energy into useful _____ energy. Some of the energy is wasted as _____.

0 6 . 2 What happens to the wasted energy?

[1 mark]

_____

_____

0 6 . 3 Write down the equation that links efficiency, total energy input and useful energy output.

[1 mark]

_____

_____

0 6 . 4 The kettle is supplied with 200J of energy every second. It transfers 66J as useful energy.

Calculate the efficiency of the kettle.

[2 marks]

_____

_____

_____

efficiency = _____

7

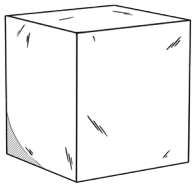
DO NOT WRITE ON THIS PAGE.

ANSWER IN THE SPACES PROVIDED.

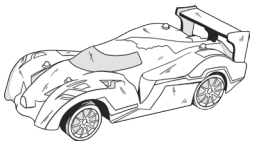
0 7 A group of students wanted to find out the density of the objects shown in **Figure 10**.

Figure 10

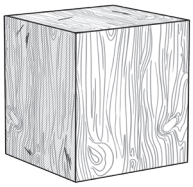
key



regular aluminium block



toy car



regular wooden block

0 7 . 1 Which unit is used to measure density?

[1 mark]

Tick **one** box.

m/cm^2 ☐

N/kg ☐

kg/m^3 ☐

m/s^2 ☐

0 7 . 2 Describe a method that could be used to calculate the density of the objects in **Figure 10**.

You should include:

- the equipment required;
- what would be measured;
- any calculations needed.

[6 marks]

0 7 . 3 Explain how the density of water changes when it is heated.

[3 marks]

10

0 8 A chef wants to melt 0.5kg of chocolate.

0 8 . 1 The chef heats the chocolate over a pan of boiling water. The temperature of the chocolate increases by 9°C.

9450J of energy is transferred to the chocolate.

Calculate the specific heat capacity of the chocolate.

Use the correct equation from the Physics Equation Sheet.

[3 marks]

specific heat capacity = _____ J/kg °C

0 8 . 2 When the chocolate reaches 30°C, it starts to melt.

The energy required for all of the chocolate to melt can be calculated using the equation:

thermal energy for a change of state = mass × specific latent heat

What is the difference between specific heat capacity and specific latent heat?

[2 marks]

0 8 . 3 Describe what happens to the temperature of the chocolate as it melts.

[1 mark]

0 8 . 4 Explain what will happen to the mass of the chocolate when it has all melted.

[2 marks]

0 8 . 5 Melting is an example of a physical change.

Explain why melting is a physical change rather than a chemical change.

[1 mark]

9

Turn over for the next question

0 9 **Figure 11** shows a person's hair becoming electrostatically charged when taking off a hat.

Figure 11

0 9 . 1 Explain what causes the person's hair to become charged.

[2 marks]

0 9 . 2 Explain why the person's hair stands on end.

[2 marks]

0 9 . 3 A group of scientists investigated whether the type of material a hat is made from affects the build-up of charge.

Table 2 shows the results of the investigation.

Table 2

Material	Charge (millicoulombs)		
	Repeat 1	Repeat 2	Mean
nylon	3.1	3.4	3.3
cotton	1.5	1.5	1.5
wool	2.4	2.6	2.5

Which material created the strongest electric field around the person's head?

[1 mark]

0 9 . 4 Suggest how the scientists could reduce the effect of random errors in the investigation.

[2 marks]

0 9 . 5 A different group of scientists repeated the experiment using the same method and got similar results.

Complete the sentence. Choose the answer from the box.

accurate	precise	repeatable	reproducible	valid

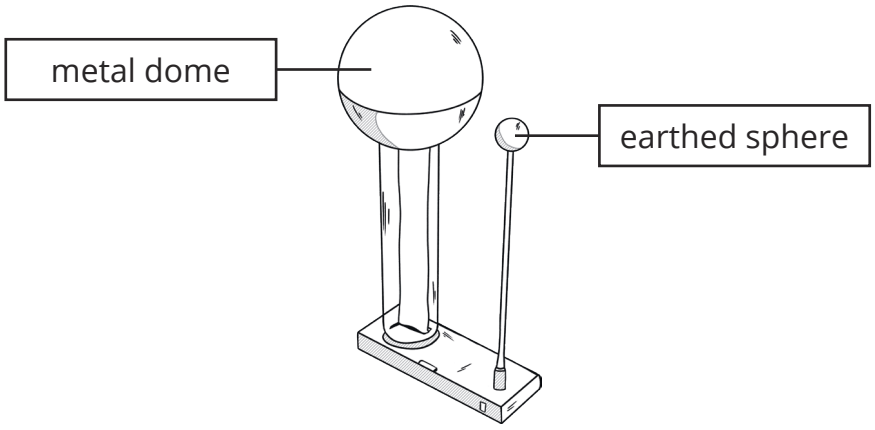
[1 mark]

The measurements were _____.

Question 9 continues on the next page.

0 9 . 6 **Figure 12** shows a Van de Graaff generator that is used to investigate static electricity.

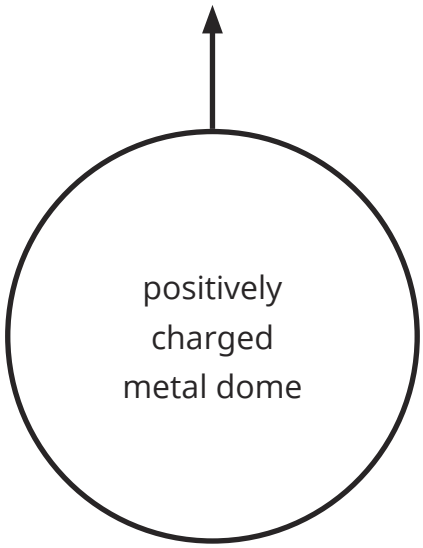
Figure 12



The dome of the Van de Graaff generator is represented by the circle in **Figure 13**.

The dome is positively charged. The arrow shows part of the electric field around the dome.

Figure 13



Draw **three** more arrows on **Figure 13** to complete the electric field pattern.

[1 mark]

0 9 . 7 The longer the Van de Graaff generator is kept on, the more charge is stored on the dome.

When the earthed sphere is moved into the electric field around the dome, a spark jumps between the two.

Explain why.

[2 marks]

_____

_____

_____

_____

11

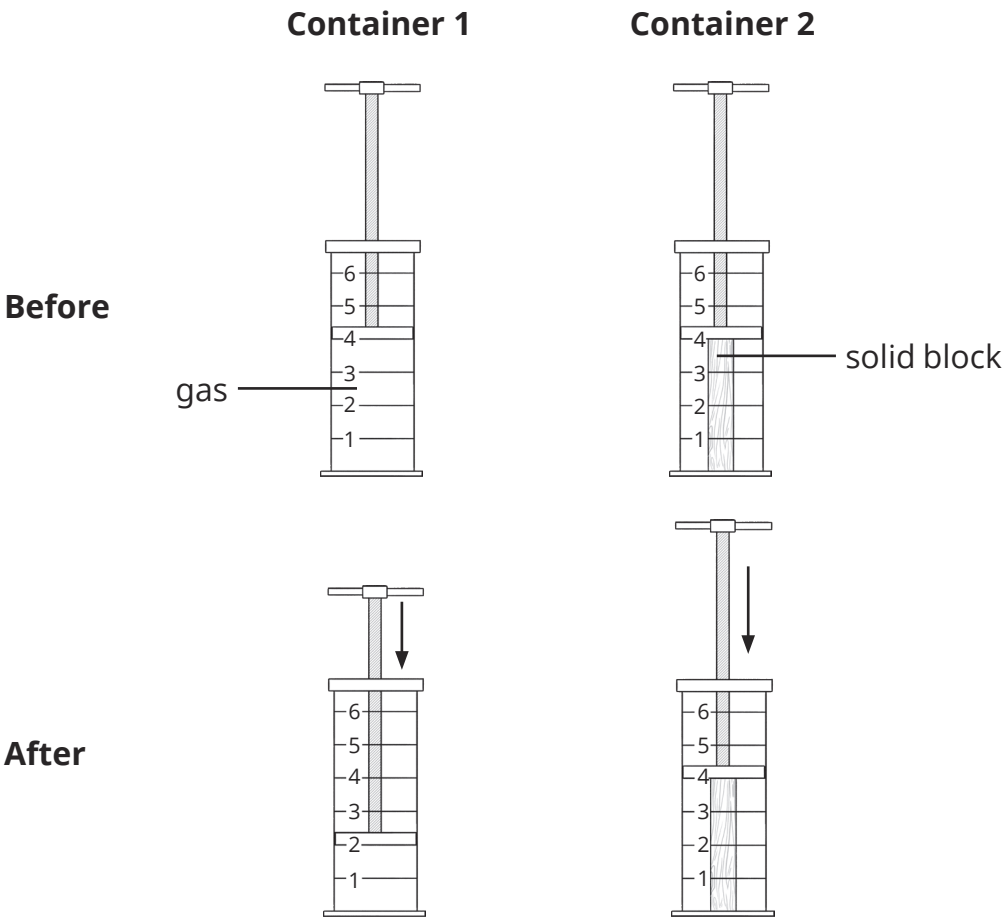
Turn over for the next question

1 0 A group of students are investigating the properties of solids and gases.

The students use two containers with lids that can be used as plungers. They fill the first container with gas and place a solid block into the second container.

Figure 14 shows the appearance of the two containers before and after pushing the plunger.

Figure 14



The students make two observations.

Observation 1: The gas fills the space in the container but the solid block does not.

Observation 2: The gas can be compressed (squashed) but the solid cannot.

1 0 . 1 Explain the students' observations.

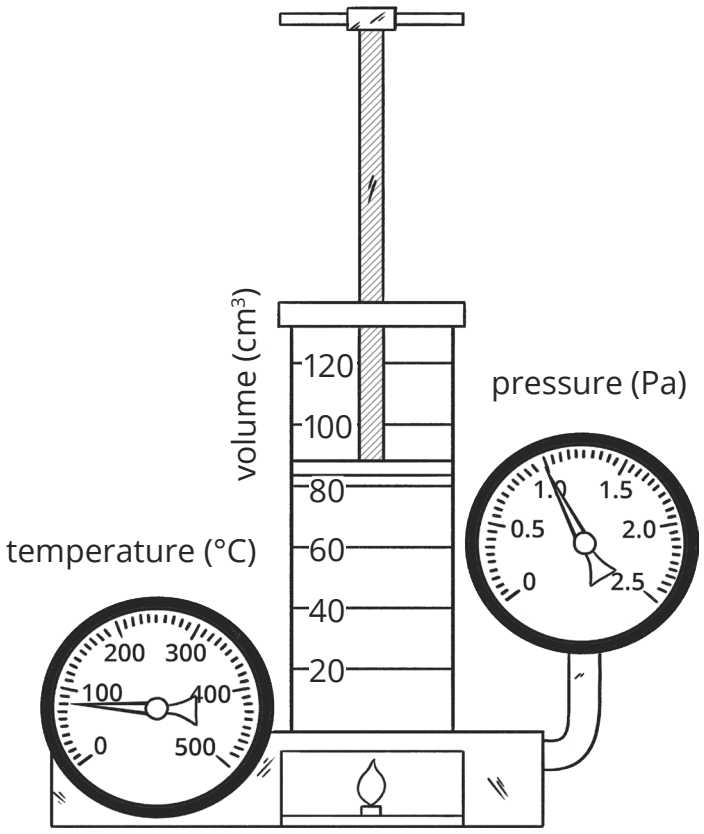
You should include your knowledge of:

- the spacing between particles;
- the movement of individual particles.

[6 marks]

1 0 . 2 **Figure 15** shows the container being used to measure the temperature and pressure of a gas.

Figure 15



Use information from **Figure 15** to determine the temperature of the gas.

[1 mark]

temperature = _____ °C

1 0 . 3 The lid of the container is secured so that the volume is kept constant.

The students increase the temperature of the gas.

Explain how increasing the temperature would change the pressure exerted by the gas.

[3 marks]

_____

_____

_____

_____

_____

_____

1 0 . 4 In a second investigation, the temperature of the gas is kept constant.

When the volume of the gas is 80cm^3, the pressure exerted by the gas is 1.2Pa.

The volume of the gas increases from 80cm^3 to 120cm^3.

Calculate the pressure of the gas when the volume is 120cm^3.

Use the correct equation from the Physics Equation Sheet.

[3 marks]

pressure = _____ Pa

13

END OF QUESTIONS