AQA style exam paper

VideoPlato Academy

Please write clearly in block capitals

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE

PHYSICS

Higher Tier Paper 1

Practice Paper #1 Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- a protractor
- the Physics Equation Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the box at the top of this page.
- Answers **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do no want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

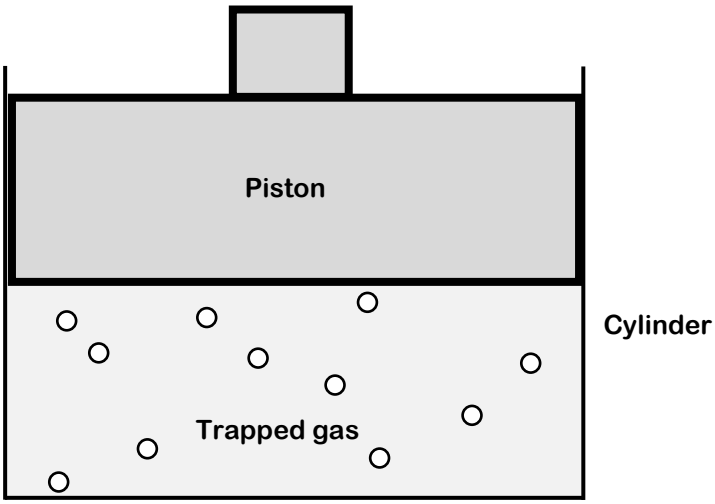
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded for the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

Answer **all** questions in the spaces provided.

0 1 **Figure 1** shows a large piston in a cylinder. The piston can move up and down to change the volume of the trapped gas.

Figure 1



0 1 . 1 Complete the sentence.

Choose the correct answer from the box.

increase	decrease	stay the same

When the volume of a gas increases at constant temperature, the pressure of the gas will _____. **[1 mark]**

0 1 . 2 The gas in the sealed container is compressed, reducing its volume from 2.0 m^3 to 1.5 m^3.

The initial pressure of the gas is 150 kPa.

Calculate the new pressure of the gas, assuming the temperature remains constant.

Show your working. **[3 marks]**

_____

_____

_____

_____

New pressure = _____ kPa

0 1 . 3 Explain why compressing the gas in the cylinder causes the pressure to increase.

[3 marks]

0 1 . 4 Describe the motion of the particles in a gas.

[2 marks]

0 1 . 5 The initial volume of the gas in the cylinder was 325 cm^3. Calculate the mass of the gas if the density was 0.0012g/cm^3.

[2 marks]

11

0 2 A washing machine is shown in **figure 2.** The washing machine has a power rating of 2000W.

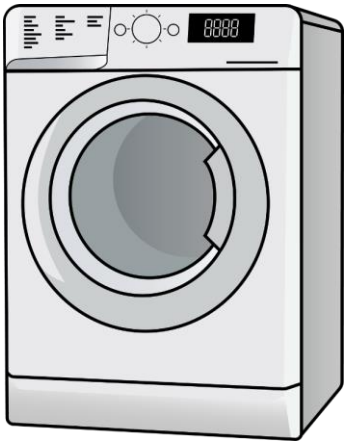
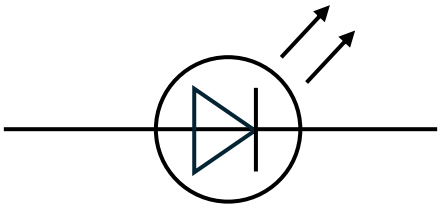


Figure 2

0 2 . 1 When the washing machine is in use, a power indicator light is on.

The component shown below is used in the power indicator light.



Name this component. _____ **[1 mark]**

0 2 . 2 The washing machine runs off a domestic mains electricity supply. What is the voltage supplied?

[1 mark]

UK domestic mains electricity voltage is _____ V

0 2 . 3 The UK mains is supplied as an alternating current. What is meant by the term 'alternating current'?

[1 mark]

_____

_____

0 2 . 4 The fuse needs replacing in the washing machine. Which one of the fuses below should be used as a replacement. Circle the correct fuse.

1 AMP	2 AMP	5 AMP	10 AMP	13 AMP

Explain why this is the best fuse to use.

Your answer should include a calculation. **[4 marks]**

0 2 . 5 The washing machine has a metal case. Why is it important the washing machine is earthed?

[3 marks]

10

0 3 A cricket ball is thrown vertically into the air by a fielder. The cricket ball has mass of 160g.

0 3 . 1 The ball climbs to a maximum height of 12m. It is caught by the person who has thrown it. At what speed is the cricket ball falling when it is caught? Give your answer to 2 significant figures.

Take the gravitational field strength on Earth to be 9.8N/kg and assume that no energy is lost to the surroundings. **[5 marks]**

0 3 . 2 How much work must be done by the catcher to stop the ball falling?

[2 marks]

0 3 . 3 A simple bowling machine uses a spring to launch a cricket ball at a batsman. To launch the ball with a kinetic energy of 72J the spring is stretched by 0.30m. What is the spring constant?

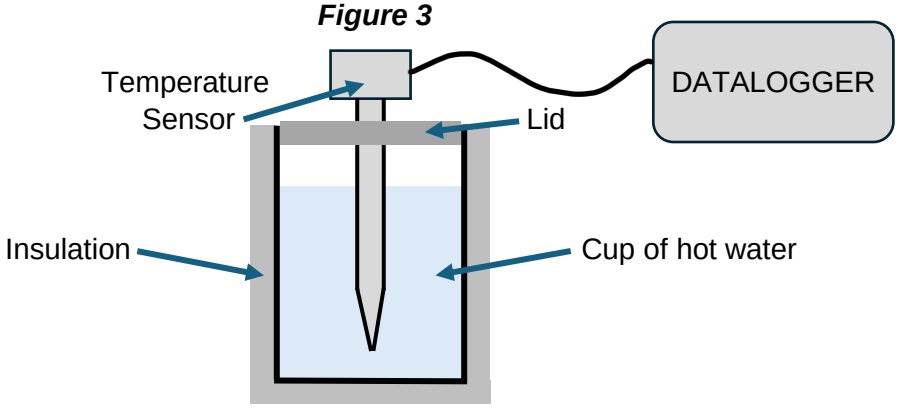
[3 marks]

Spring constant: _____ N/m

10

0 4 A student investigated the insulation properties of different materials with the apparatus shown in **figure 3**.

Figure 3



0 4 . 1 The student used a temperature sensor and datalogger to record their results.

Give one advantage of using the sensor and datalogger rather than using a regular thermometer when recording temperature.

[1 mark]

_____

_____

0 4 . 2 **Figure 4** shows a summary table of results obtained by the student.

Material used as an insulator	Mean temperature after 15 minutes
Control	41°C
Wool	59 °C
Corrugated Cardboard	53 °C
Polystyrene	55 °C
Bubble wrap	47 °C

What type of graph should the student use to plot their results.

Give a reason for your answer. **[2 marks]**

_____

_____

_____

0 4 . 3 Describe a method that the student could have used to obtain these results.

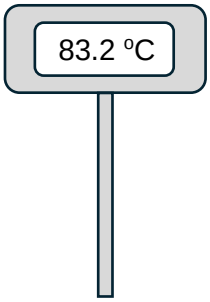
Your answer should include:

- Readings taken
- Any calculations
- Control variables
- A risk assessment

[6 marks]

0 4 . 4 The student could have used a digital thermometer like the one shown in **figure 5**.

Figure 5



What is resolution of this thermometer?

[1 mark]

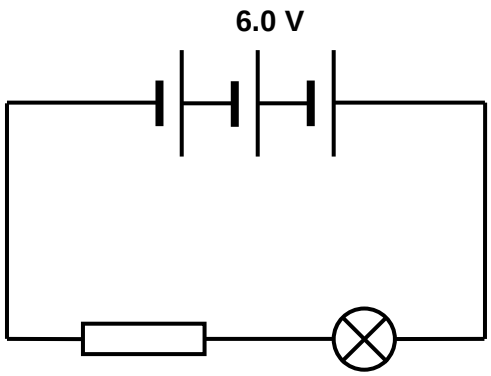
_____

_____

10

0 5 The circuit shown if **figure 6** shows a resistor and a filament lamp connected in series with a 6.0V battery.

Figure 6



0 5 . 1 The lamp is rated at 5.0V. What is the potential difference across the resistor when the lamp is supplied with 2V?

[1 mark]

0 5 . 2 The resistor has a resistance of 20Ω. What is the current flowing through the resistor?

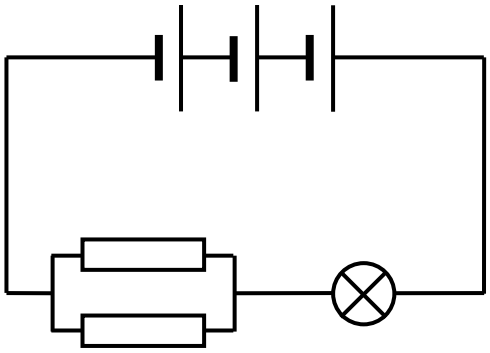
Give the correct unit for your answer.

[3 marks]

Current = _____ unit _____

0 5 . 3 A second resistor is now placed in parallel with the first resistor as shown in **figure 7**.

Figure 7



Explain how this change will affect the light emitted by the lamp?

[3 marks]

0 5 . 4 How much charge is used for the 6V battery to supply 180J of energy to the circuit?

[2 marks]

Charge = _____ C

0 5 . 5 The 2 resistors are now replaced with a single variable resistor.

Draw the symbol for a variable resistor in the box below.

[1 mark]

0 5 . 6 A student then used an ammeter and a voltmeter to obtain the following results.

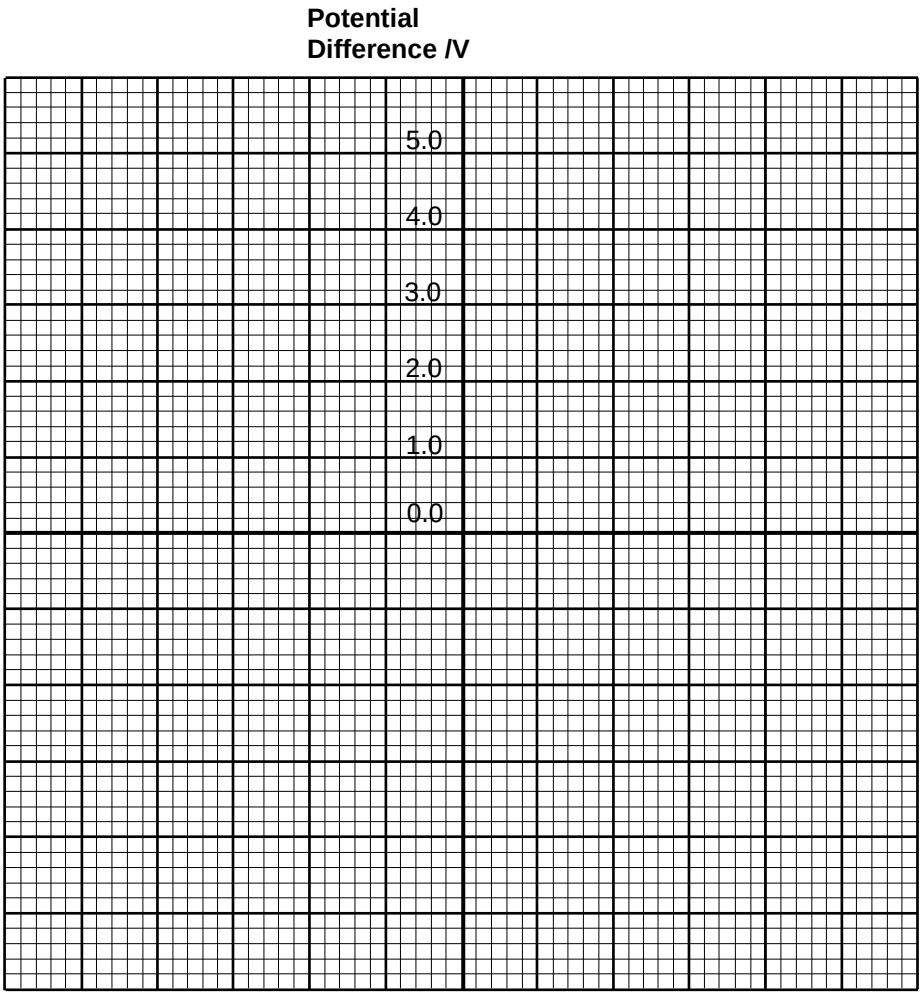
Potential difference across the filament lamp /V	Current through the filament lamp /A
1.0	0.10
2.2	0.24
2.8	0.32
3.6	0.48
4.2	0.64
5.0	1.00

The results can be used to plot a graph of potential difference against current for the filament lamp.

Complete the graph.

- Use a suitable scale for the x-axis
- Plot the results
- Draw a line of best fit

[4 marks]



0 5 . 7 The lamp runs at 4.0V for 6 minutes. Use the graph to determine how much electric charge would be supplied by the current in that time?

Assume that the current remains constant.

[3 marks]

Charge = _____ C

0 5 . 8 The polarity of the battery is now reversed. On the graph, sketch the line that you would expect to be produced if the readings of potential difference and current were recorded again.

[1 mark]

18

0 6 Ernest Rutherford devised an investigation to provide experimental evidence for the Plum Pudding model of the atom. It involved passing alpha particles through a thin gold leaf.

Rutherford's students, Marsden and Geiger, spent months gathering results. A simple version of the apparatus is shown in **figure 8**.

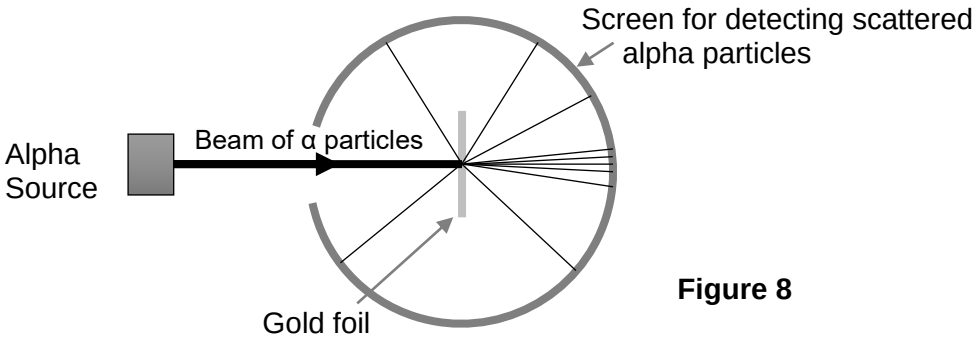


Figure 8

The results of this experiment suggested that the Plum Pudding model was incorrect.

0 6 . 1 When the alpha particles arrived at the thin gold lead, most of them went straight through. Some alpha particles were deflected by small angles. A very small number of alpha particles were deflected by angles larger than 90^{o}.

Explain how these results provided evidence for the nuclear model of the atom.

[5 marks]

0 6 . 2 Gold has one stable isotope, ^{197}Au. It has many unstable radioisotopes. One of the most stable radioisotopes is ^{195} Au.

Compare the structure of ^{197}Au with ^{195} Au.

[2 marks]

0 6 . 3 People who work with alpha emitters need to take precautions. Why is alpha radiation dangerous?

[2 marks]

0 6 . 4 The misuse of radioactive material can cause irradiation and contamination.

Explain the difference between irradiation and contamination.

[2 marks]

11

0 7 A saucepan of water is left on a cooker hob. It initially contains 0.76kg of water at 18°C. How long will it take for the water to boil (at 100°C) and then vaporise completely.

- The specific heat capacity of water is 4200 J/kg°C
- The specific latent heat of vaporisation of water at 100°C is 2,260,000 J/kg
- Assume the hob supplies energy at a steady rate of 450 W

[6 marks]

6

0 8 Uranium 238 can be found naturally in the soil and in rocks. It can decay to become a radium isotope.

Radium can undergo alpha decay to form radon gas which is released from the ground. It can then accumulate in houses and other buildings.

0 8 . 1 Complete the nuclear equation below to show the decay of radium into radon by alpha decay.

[2 marks]

$$^{226}_{88}\text{Ra} \rightarrow \text{.....Rn} + \text{.....He}$$

0 8 . 2 The radon gas produced has a half-life of 4 days. A gas sample is taken from a home and stored for 12 days.

What percentage of the argon taken from the home would remain in the sample after 12 days?

[2 marks]

0 8 . 3 Uranium 235 is a fissionable isotope and is commonly used in nuclear reactors.

Describe the process of induced fission.

[3 marks]

0 8 . 4 Many modern nuclear power stations have a pressurised water reactor (PWR).

Describe the function of the water in the reactor.

[2 marks]

0 8 . 5 The table below shows how the UK's electricity was generated in 2024.

Gas	26.3%
Wind	30%
Nuclear	14%
Biomass	6.8%
Coal	0.6%
Solar	5%
Imports	14.1%
Hydro	2%
Storage	1.2%

Source: National Energy System Operator (NESO)

What percentage of electricity produced in 2024 came from fossil fuels?

[1 mark]

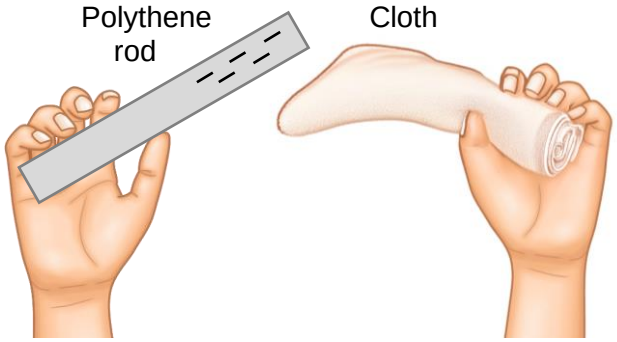
0 8 . 6 Wind and solar combined produced 35% of the electricity. Nuclear only produced 14%.

Compare the advantages and disadvantages of nuclear power stations to wind and solar.

[4 marks]

14

0 9 Jessica rubs a polythene rod with a soft cloth. The surface of the rod becomes negatively charged.



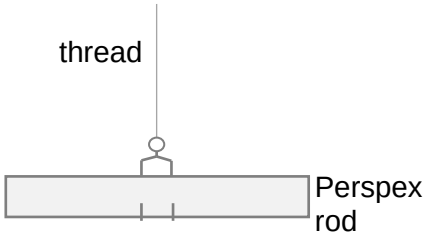
0 9 . 1 Explain how the rod becomes negatively charged.

In your answer you should describe any change in charge of the cloth.

[3 marks]

0 9 . 2 A Perspex rod is rubbed with a similar cloth. The surface of the Perspex rod becomes positively charged. It is then suspended by a hanger on a thread as shown in **figure 9**.

Figure 9



Describe what happens when the negatively charged polythene rod is brought close to the Perspex rod.

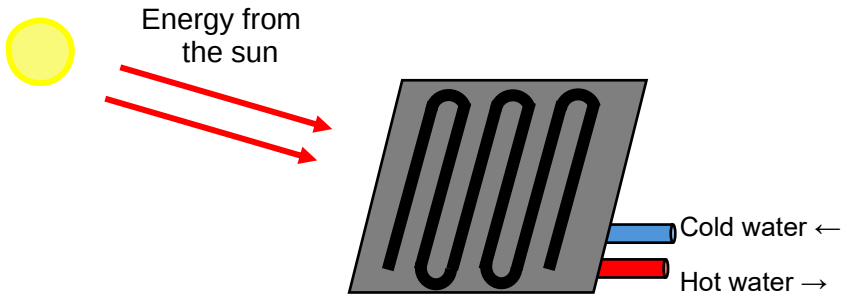
[1 mark]

0 9 . 3 Jessica now rubs a metal ruler with a similar cloth. Why does the ruler not become charged on its surface?

[1 mark]

5

1 0 A house is fitted with solar panels for heating water. The energy required to heat the water comes from the Sun.



1 0 . 1 The sun emits energy due to nuclear fusion in its core. Explain what is meant by nuclear fusion, and why the mass of the particles after the fusion process may be less than before nuclear fusion.

[2 marks]

1 0 . 2 The maximum output power of the solar panels is 3000 W. The maximum efficiency of the panels is 30%.

What is the minimum solar power input needed for the solar panels to produce their maximum output?

[2 marks]

Minimum input power = _____ W

1 0 . 3 How does the thermal energy store of the water change in the solar panel.

[1 mark]

5

END OF EXAM

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