

Mr Sully Unfolds Physics
mrsullyphysics.com

Predicted Mock Paper 1

Physics · Higher Tier · for the June 2027 exams

Topics 4.1–4.4: Energy · Electricity · Particle model of matter · Atomic structure

Name _____ Class _____ Date _____

Materials

- A ruler, a protractor and a scientific calculator.
- The AQA **Physics Equations Sheet** (insert). Every equation you need is on it.

Instructions

- Use black ink or black ball-point pen. Pencil only for drawing.
- Answer **all** questions in the spaces provided.
- Show all your working: you can get marks for working even if your final answer is wrong.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is **100**.
- You are expected to use a calculator where appropriate.
- You will be assessed on your ability to use good English, organise information clearly and use specialist vocabulary where appropriate.

Time allowed: 1 hour 45 minutes. Aim for about 1 minute per mark.

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

This is not an AQA paper. It was written by Mr Sully to practise for AQA GCSE Physics (8463) Paper 1. The question styles follow the AQA specification; the topic choices are a prediction and are not a guarantee of what will come up.

0 1 This question is about generating electricity and the National Grid.

01.1 Which energy resource is renewable **and** can be used to respond quickly to a sudden increase in demand? **[1 mark]**

Tick (✓) one box.

Coal	☐
Hydro-electricity	☐
Solar	☐
Wind	☐

01.2 Table 1 gives information about two power stations. **[4 marks]**

	Gas-fired power station	**Offshore wind farm**
Maximum power output (MW)	1200	600
Average percentage of the time it produces its maximum output	85%	35%
Carbon dioxide released when generating (g per kWh)	350	0

Compare the reliability and the environmental impact of the two power stations. Use information from Table 1.

01.3 The National Grid transmits electricity at a very high potential difference. **[3 marks]**
Explain why this makes the National Grid an efficient way to transfer energy.

01.4 A transmission cable has a potential difference of 400 kV and carries a current of 1500 A. **[3 marks]**
Calculate the power transmitted. Give your answer in standard form.

Answer = ... **W**

01.5 Name the device used to reduce the potential difference to 230 V before electricity reaches homes. **[1 mark]**

0 2 A student investigated how the thickness of a layer of insulation affects how quickly hot water in a beaker cools down.

02.1 Describe a method the student could use. Include how the student could make the investigation a fair test. **[6 marks]**

02.2 Table 2 shows the results. **[2 marks]**

Number of layers of insulation	0	1	2	3	4
Temperature decrease in 10 minutes (°C)	22	15	11	9	8

Describe the pattern shown by the results.

02.3 The student's thermometer had a resolution of 1 °C. **[1 mark]**
Suggest how the student could measure the temperature with a higher resolution.

0 3 Figure 1 shows a circuit containing a 10 Ω resistor and a thermistor.

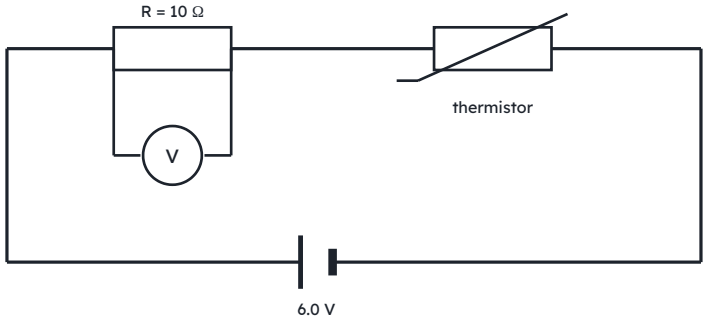


Figure 1

03.1 Why is the current in the resistor the same as the current in the thermistor? **[1 mark]**

03.2 At 20 °C the resistance of the thermistor is 20 Ω. **[3 marks]**
Calculate the current in the circuit.

Answer = ... **A**

03.3 Calculate the reading on the voltmeter. **[2 marks]**

Answer = ... **V**

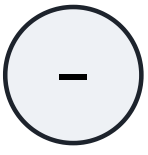
03.4 The temperature of the thermistor increases. **[3 marks]**
Explain what happens to the reading on the voltmeter.

03.5 A second 10 Ω resistor is connected in parallel with the first resistor. **[2 marks]**
Explain what happens to the current from the battery.

0 4 This question is about static electricity. (Physics only)

04.1 A balloon is rubbed on a woollen jumper. The balloon becomes negatively charged. **[2 marks]**
Explain how the balloon becomes negatively charged.

04.2 Draw the electric field pattern around the isolated negatively charged sphere below. **[2 marks]**



04.3 A metal sphere on a stand becomes highly charged. A spark jumps from the sphere to an earthed metal rod held close to it. **[3 marks]**

Explain why the spark happens.

04.4 The spark transfers 0.012 J of energy. The potential difference across the gap is 30 kV. **[3 marks]**

Calculate the charge that flows in the spark.

Answer = ... **C**

0 5 A student heated 0.25 kg of solid wax with a 50 W immersion heater. Figure 2 shows how the temperature of the wax changed.

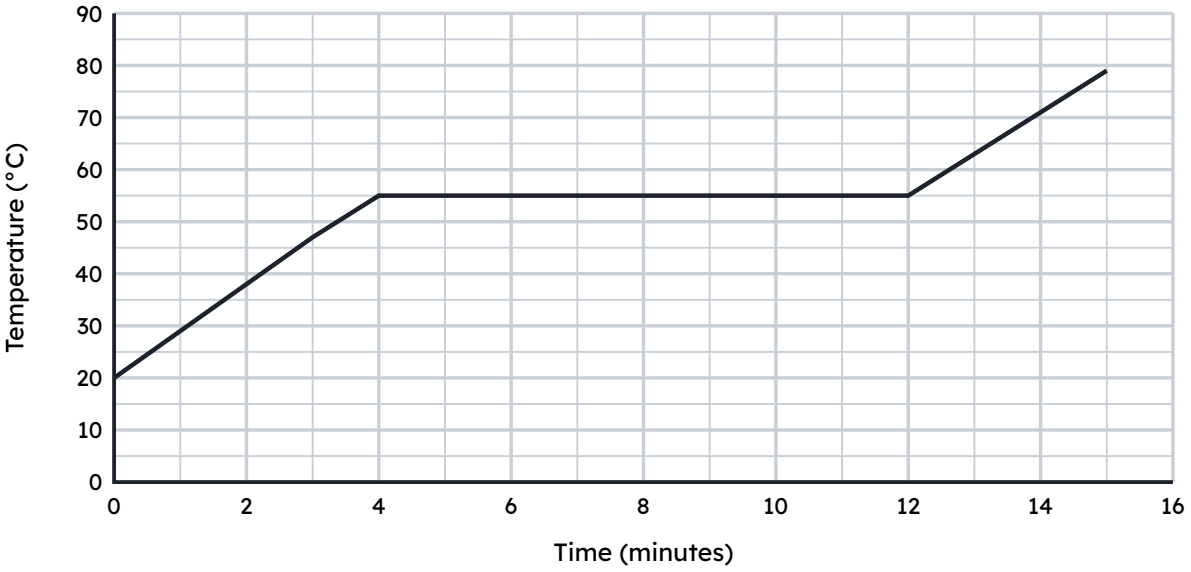


Figure 2

05.1 **[1 mark]**

Give the melting point of the wax.

Answer = ... **°C**

05.2 Describe what happens to the internal energy of the wax between 4 minutes and 12 minutes. **[3 marks]**

Explain your answer in terms of the particles.

05.3 Calculate the specific latent heat of fusion of the wax. **[4 marks]**
Use data from Figure 2.

Answer = ... **J/kg**

05.4 The student's value is higher than the true value. **[1 mark]**
Suggest why.

05.5 The liquid wax cools from 70 °C to 55 °C. **[2 marks]**
The specific heat capacity of liquid wax is 2200 J/kg °C.
Calculate the energy transferred from the wax.

Answer = ... **J**

0 6 This question is about atoms and radioactive decay.

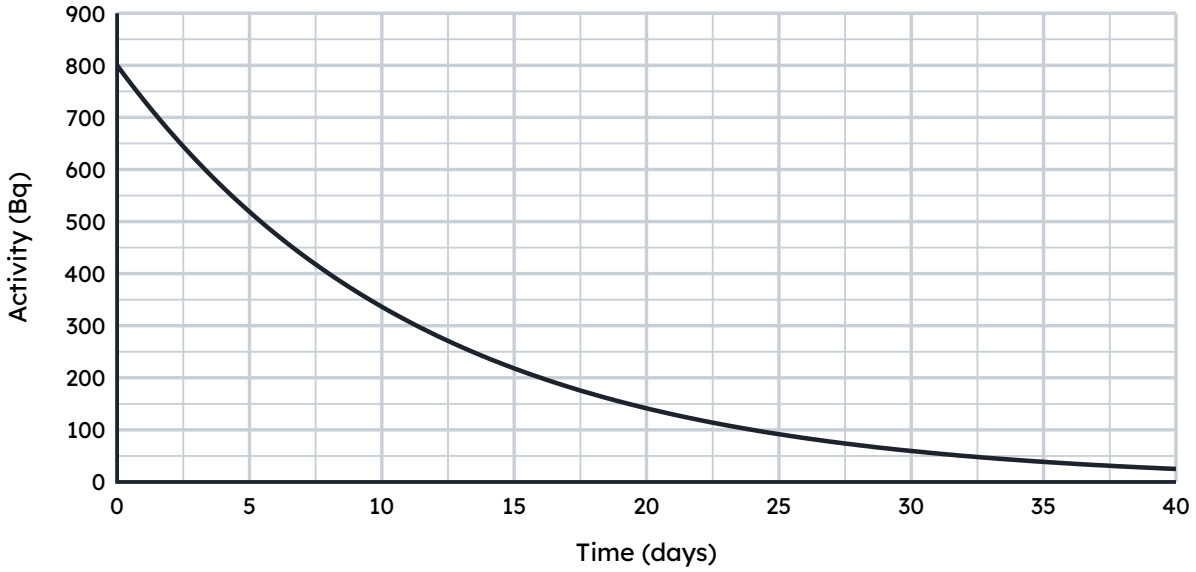
06.1 Describe what happens to an electron in an atom when the atom absorbs electromagnetic radiation. **[2 marks]**

06.2 Complete Table 3. **[2 marks]**

Isotope	Number of protons	Number of neutrons
$^{127}_{53}I$		
$^{131}_{53}I$		

06.3 Strontium-90 ($^{90}_{38}Sr$) decays by beta emission to yttrium (Y). **[2 marks]**
Complete the nuclear equation.

$^{90}_{38}Sr \rightarrow$ ..... Y + ...



06.4 **[2 marks]**

Figure 3

Figure 3 shows how the activity of a sample of a radioactive isotope changes with time.
Determine the half-life of the isotope. Show on Figure 3 how you got your answer.

Answer = ... **days**

06.5 Calculate the fraction of the original unstable nuclei that remain after 40 days. (Higher) **[2 marks]**

Answer = ...

0 7 Radioactive isotopes are used in hospitals, and nuclear fission is used in power stations. (Physics only)

07.1 A doctor needs a radioactive tracer that is injected into a patient and detected outside the body. **[3 marks]**
Table 4 gives information about three isotopes.

Isotope	Radiation emitted	Half-life
A	alpha	6 hours
B	gamma	6 hours
C	gamma	30 years

Which isotope is the most suitable? Explain your answer.

07.2 Give **two** ways a hospital worker can reduce their exposure to radiation from a source. **[2 marks]**

07.3 Describe how a chain reaction happens in a nuclear reactor. **[3 marks]**

07.4 Explain why the reactor contains control rods. **[2 marks]**

0 8 This question is about mains electricity.

08.1 What is the frequency of the UK mains electricity supply? **[1 mark]**

Tick (✓) one box.

0 Hz	
50 Hz	
230 Hz	
230 V	

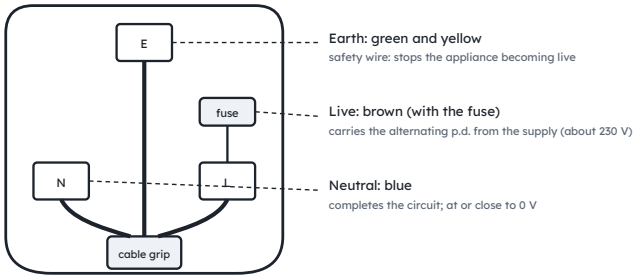


Figure 4

08.2 An electric heater has a metal case. A fault connects the live wire to the metal case.
Explain why this fault could be dangerous if the heater is not earthed. **[3 marks]**

08.3 An electric shower has a power of 9.2 kW. It is connected to the 230 V mains supply.
Calculate the current in the shower. **[3 marks]**

Answer = ... **A**

08.4 The shower is connected using thicker cables than a lamp. **[2 marks]**
Explain why.

0 9 A toy launcher uses a compressed spring to fire a small ball straight upwards.
Spring constant of the spring = 400 N/m · compression of the spring = 0.050 m · mass of the ball = 0.020 kg · gravitational field strength = 9.8 N/kg

09.1 Calculate the maximum height the ball could reach. **[5 marks]**
Assume all the elastic potential energy is transferred to the gravitational potential energy store of the ball.

Answer = ... **m**

09.2 The ball actually reaches a height of 1.8 m. **[3 marks]**
Calculate the efficiency of the energy transfer.

Answer = ...

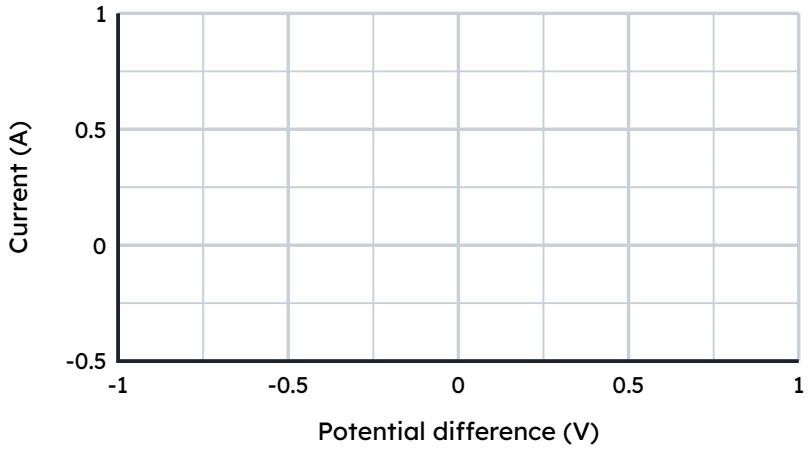
09.3 Explain what has happened to the rest of the energy. **[2 marks]**

1 0 A student wants to find the I–V characteristic of a diode.

10.1 Describe a method the student could use to obtain the results needed to plot the I–V characteristic of the diode. **[6 marks]**

You may include a circuit diagram in your answer.

10.2 Sketch the I–V characteristic of a diode on the axes below. **[2 marks]**



END OF QUESTIONS