



AQA Physics Paper 1

Higher

Separate Science

Predicted Paper 2019

Name

Date

1 hour 45 minutes allowed

Similar to your real exam, each question in this gets harder towards the end, so if you find you can't do the last part of a certain question, move on and try the next question. They all start off easier then get harder.

Grade boundaries

These are VERY rough guesses! Getting an 8 or 9 on here does not guarantee you the same mark in the exam.

- 9 75
- 8 65
- 7 55
- 6 45
- 5 35



Exam Analysis

Question	Marks available	Marks gained	Topic	What do you need to do to improve ...
1	15		Circuits	
2	11		Energy	
3	17		Practical	
4	24		Atomic structure	
5	19		The arrangement of particles	
6	14		Pressure	
Total 100	100			



Equation sheet

These will be given to you in the exam, the rest you have to learn. To help with this I have made you flashcards, you can download these from my website.

Equation	Symbol
$E_e = \frac{1}{2} ke^2$	E_e = elastic potential energy k = spring constant e = extension
$\Delta E = mc\Delta\theta$	ΔE = change in thermal energy m = mass c = specific heat capacity $\Delta\theta$ = temperature change
$E = mL$	E = Energy m = mass L = specific latent heat
$pV = \text{constant}$	p = pressure V = volume



Question 1

A bulb is connected to a battery, a fuse and an ammeter.

a) Draw a series circuit using the components above.

[4 marks]

b) State what an ammeter measures.

[1 mark]

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c) Describe which piece of equipment would be used to measure potential difference?

[1 mark]

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d) The potential difference across the bulb in the circuit is measured at 5V. A second bulb is added to the circuit. Predict the potential difference across the first bulb, after a second bulb has been added.

[2 marks]

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e) A fuse is used in plugs as a safety feature. Explain the way a fuse works. [3 marks]

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f) List two other safety features in plug sockets. [2 marks]

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g) The frequency and voltage of electricity that arrives in our homes via plug sockets is tightly controlled. State the frequency and voltage of mains electricity. [2 marks]

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Question 2

- a) A bouncy ball is dropped from a window. Describe the type of energy the ball has just before it starts to fall.

[1 mark]

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- b) Explain how the energy of the ball changes as the ball is falling through the air.

[4 marks]

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- c) When objects fall, they are falling due to gravity. State the value and units for gravity.

[2 marks]

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- d) The ball has a mass of 0.75kg, and the window is 5m from the ground. Calculate the energy the ball has before it falls. If you have not answered part c use the value of 11 [this is not the correct answer].

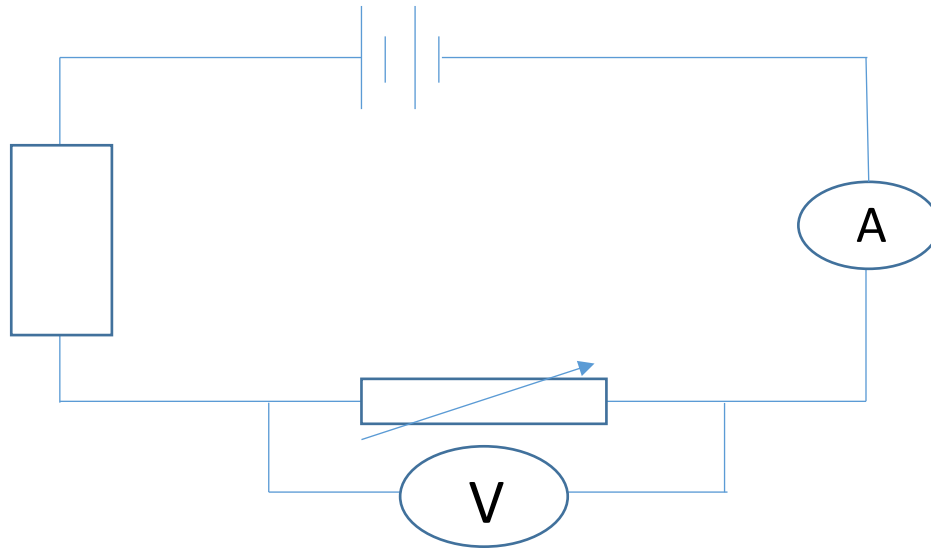
[4 marks]

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Question 3

A group of students wanted to investigate the current-potential difference characteristic of a fixed resistor. They set up the circuit shown below.



- a) Describe the problem the students have made when setting up their experiment, you should reference variables in your answer.

[4 marks]

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- b) List three control variables in this experiment, and for each explain why the control is needed.

[6 marks]

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- c) The power in the circuit is measured at 15W. If the current is 3A, calculate the potential difference.

[4 marks]

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- d) Sketch the graph of current against potential difference for this fixed resistor.

[3 marks]



Question 4

- a) List the two subatomic particles in the nucleus of an atom. [2 marks]

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- b) The model of the structure of the atom has changed over the years as scientists discover new things. Put these in order, oldest to newest.

Plum pudding Billiard ball Nuclear model

[2 marks]

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- c) Rutherford was the first to suggest the presence of a nucleus inside an atom.

- i. Rutherford used alpha particles in his experiment, describe the characteristics of alpha particles.

[3 marks]

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ii. Describe the experiment that Rutherford carried out and explain his results.

[6 marks]

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d) Alpha particles can be used in everyday life, as can other types of radiation. Describe three examples where radiation can be useful. You should give details about the type of radiation and why it is suitable.

[6 marks]

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e) Radon gas is a naturally occurring gas that emits alpha particles. Build-up of this gas is commonly found in areas with lots of rock.

i. Give the units we measure radiation in?

[1 mark]

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ii. Radon gas accounts for 48% of the background radiation the average person in the UK receives each year. Give three other sources.

[3 marks]

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iii. State the instrument we use to measure radiation?

[1 mark]

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Question 5

- a) A solid block of copper was heated. Describe the arrangement of particles within a solid and how they change upon heating

[4 marks]

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- b) The solid block was heated by connecting it up to a power pack. The power pack became hot as it was used. The heat energy can be called wasted energy; describe what happens to wasted energy.

[2 marks]

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- c) If the power pack was running at 78% efficiency and 87.36W was usefully transferred, calculate the total power in.

[3 marks]

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- d) To reduce energy loss from the block as it was heated, the block was wrapped in an insulating material. Suggest properties that would make a good insulating material.

[2 marks]

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- e) If the solid block had a height of 90cm, a depth of 1.2m and a width of 873mm, calculate the volume of the block in cm^3 .

[2 marks]

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- f) The density of a block can be found by dividing the mass by the volume, what are the units for density?

[1 mark]

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- g) The specific heat capacity of copper is $385.2 \text{ J/Kg } ^\circ\text{C}$. If it took 4.7kJ to increase the temperature of a block of copper from 17.4°C to 47.9°C . Calculate the mass of copper, give your answer to two significant figures.

Use the equation $E = mc\Delta\theta$

[5 marks]

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Question 6

- a) Two students fill a balloon with air. Eve thinks that the pressure inside the balloon will increase if the balloon is squashed. Bram disagrees, he says that pressure will only increase if more air is added to the balloon. Explain who is correct.

[3 marks]

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- b) The relationship between pressure and volume can be described as inversely proportional.

- i. Sketch a graph to show this relationship.

[3 marks]

- ii. Describe how you could calculate the constant for this gas equation from the graph.

[2 marks]

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- c) A new balloon was filled with air at room temperature, this balloon was then placed in a bucket full of liquid nitrogen at -196°C . Suggest what would happen to the appearance of the balloon, explain your answer.

[6 marks]

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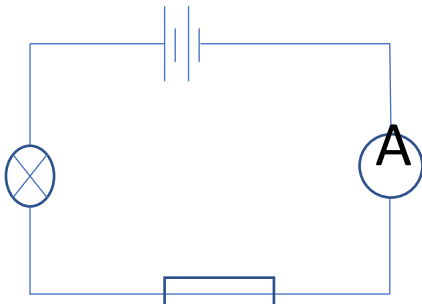
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End of questions

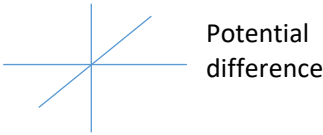
Good luck with your revision!! 😊 YOU'LL ACE THIS!!



Answers

Question Number	Answer	Guidance
1a		
1b	Current	
1c	Voltmeter	
1d	$5/2 = 2.5V$	One mark for answer One mark for units
1e	<ul style="list-style-type: none">-if current gets too high wire in fuse will get too hot-this will cause the wire to break-stopping the flow of current and turning off the circuit	One mark for each bullet point
1f	<ul style="list-style-type: none">-plastic casing on plug-plastic wrapping of wires-earth wire	Any two from the list
1g	50Hz 230V	One for each, units must be included
2a	Gravitational potential energy	
2b	<ul style="list-style-type: none">-Decrease in...-Gravitational potential energy-Changes into / increase in-Kinetic energy	One mark for each bullet point
2c	9.8 N/kg	One mark for value One mark for units
2d	$E_p = mgh$ $= 0.75 \times 5 \times 9.8$ $= 36.75$ J	One mark for each line If different value for c given and used in calculation allow to gain full marks if method is correct. If 10 used as value, answer must be 37.5J



3a	<ul style="list-style-type: none"> -Potential difference is currently being measured across the variable resistor -the variable resistor is the independent variable -the voltmeter needs to measure potential difference across the fixed resistor -the fixed resistor is the dependant variable. 	One mark for each bullet point
3b	<ul style="list-style-type: none"> -the resistance of the fixed resistor – this will directly change the potential difference being measured -the temperature – temperature has an effect on resistance or high temperature will increase resistance in wires and resistors -The battery – will affect current flowing in circuit <p>For 6 pages of questions on this practical see my Required Practicals Exam Practice Workbook</p>	Any three from list with linked explanation, full mark cannot be gained simplify from listing variables
3c	$P = IV \text{ or } V = P/I$ $= 15/3$ $= 5$ V	One mark for each line
3d	<p style="text-align: center;">current</p> 	One mark for line One mark for each correctly labelled axis
4a	Proton Neutron	
4b	Billiard ball Plum pudding Nuclear model	One mark for getting two in the correct order Two marks for all correct
4ci	Positive charge OR +2 charge Made up from 2 protons and 2 neutrons Mass of 4 Helium nuclei No electrons	Any three from list



4cii	<ul style="list-style-type: none"> -very thin layer of gold foil -alpha particles fired at the gold foil -expected results was that the alpha particles would all be deflected back -due to the expected even distribution of positive charge throughout the atom -actual result was that most went through the gold foil -some alpha particles were partially deflected -a limited number were fully deflected -hypothesis was there was a confined region of positive charge in the atom – the nucleus 	<p>1-2 marks This answer will have some valid points but will lack structure and not be complete</p> <p>3-4 marks The majority of the points are valid and correct but the answer is lacking scientific clarity</p> <p>5-6 marks This is a fluid answer, all points mentioned are correct and relevant, and the SPG is almost flawless</p>
4d	<ul style="list-style-type: none"> -Alpha particles in smoke alarms; long half-life; easily stopped. -beta radiation in medical tracers; short half-life can penetrate skin. -beta particles in industrial monitoring; long half-life can be easily stopped. -gamma radiation in medial treatments; long half-life can kill cells 	Any three from list, all relevant details must be given to gain the two marks. 6 marks cannot be gain just from a list of uses
4ei	Becquerels OR Bq	
4eii	Space Medical treatment Flying Nuclear weapons fall out	Three form list
4eiii	Geiger-Muller counter (tube)	
5a	<ul style="list-style-type: none"> -particles close together -vibrate around a fixed position -as the heat up vibrations increase -transfer from thermal to kinetic energy 	One mark for each line
5b	<ul style="list-style-type: none"> -dissipates -into the surrounding 	One mark for each line
5c	Total power in = useful power/ efficiency = 87.36/0.78 =112W	One mark for each line
5d	<ul style="list-style-type: none"> -traps air -reduces energy loss by convection -reduces energy loss by conduction -reduces energy loss by radiation <p>For 6 pages of questions on this practical see my Required Practicals Exam Practice Workbook</p>	Marks form list up to 2
5e	$90 \times 120 \times 87.3$ $=953316\text{cm}^3$	One mark for each line



5f	Kg/m^3	
5g	$m = E/c\Delta\theta$ $= 4700/(385.2 \times 30.5)$ 0.40 kg	One mark for each line
6a	Eve is correct $pV = \text{constant}$ decreasing the volume will lead to an increase in pressure	One mark for each line
6bi	-Line sloping downwards from top left to bottom right -Pressure on y axis, labelled with Pa as units -Volume on x-axis, labelled with m^3 as units	One mark for each bullet point No marks can be gained for label without units
6bii	-inverse.. -...of gradient	One mark for each bullet point
6c	-size decrease -air is cooled -particles move around less -space between the particles decrease -gas take up less volume -air turns to liquid	One mark for each bullet point