AQA GCSE Physics

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	A should be in the uppermost circle V should be in the right hand circle The resistor is between the cell and the voltmeter The variable resistor is the lower-most circuit component	one mark for 'A' in correct place one mark for 'V' in correct place one mark for resistor labelled correctly one mark for variable resistor labelled correctly	1 1 1 1	AO1 4.2.1.1
01.2	the rate of flow of charge/charge flowing per second		1	AO1 4.2.1.2
01.3	resistance = $\frac{\text{potential difference}}{\text{current}}$ **or** potential difference = current x resistance	allow V = IR or R = $\frac{V}{I}$	1	AO1 4.2.1.3
01.4	R = $\frac{6}{0.3}$ = 20 unit = Ω	accept 20 with no working for two calculation marks	1 1 1	AO2 4.2.1.3
02.1	circuits A and C are parallel circuits	no marks if more than one box ticked	1	AO1 4.2.2
02.2	A, C B, D B, D	in all cases, both letters required for the mark letters can be in either order	1 1 1	AO2 4.2.2

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02.3	no the bulbs will be the same brightness because they are in a series circuit		1 1 1	AO2 4.2.2
03	**Level 3:** Correct diagrams with description of measurements (total current and potential difference) to be taken in each circuit. Rearrangement of equation to give an equation for resistance. Correct statement about relative magnitudes of equivalent resistances.		5-6	AO1 4.2.2
	Level 2: Diagrams or description of measurements (total current and potential difference) to be taken in each circuit lacking one or two details Evidence of use of equation involving current, potential difference, and resistance. Correct statement about relative magnitudes of equivalent resistances.		3-4	
	Level 1: One correct diagram. Either potential difference or current measurement mentioned. Little or no evidence of use of equation. Little or no statement about the relative magnitudes of the equivalent resistances.		1-2	
	No relevant comment.		0	

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	Indicative content: • two correct circuits drawn with an ammeter in each circuit in an appropriate place to measure the total current, with or without a voltmeter across the battery • one circuit should be a parallel circuit with a bulb in each circuit, with an ammeter in the circuit closest to the cell • the other circuit should be a single circuit with two bulbs and one ammeter • you need to measure the total current in each circuit, and the potential difference of the supply. • you use the equation potential difference = current × resistance • rearrange to give resistance = $\frac{\text{potential difference}}{\text{current}}$ to calculate the equivalent resistance of each circuit the equivalent resistance of the series circuit is bigger than the equivalent resistance of the parallel circuit			
04.1	as the temperature increases, the resistance decreases		1	AO1 4.2.1.4
04.2	the reading on the voltmeter will not change it is connected directly across the battery/there is only one component (other than the battery)		1 1	AO2 4.2.2

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04.3	the potential differences across resistors in a series circuit are in the same proportion as the size of the resistances there is 8 V out of the total 12 V across the thermistor, which is $\frac{2}{3}$ of the total so the resistance of the thermistor is 2 x 10 = 20 kΩ this happens when the resistance is very cold there is 3 V out of the total 12 V across the thermistor, which is $\frac{1}{4}$ so the resistance of the thermistor is 3.3 kΩ this happens when the resistance is very hot		1 1 1 1 1 1 1	AO2 4.2.2
05.1	potential difference = 6 - 4 = 2 V	accept 2 V with no working for two marks	1 1	AO2 4.2.2
05.2	potential difference = current × resistance **or** V = IR 4 = 0.2 × resistance resistance = $\frac{4}{0.2}$ = 20 Ω	accept 20 with no working shown for three marks	1 1 1	AO1 AO2 4.2.1.2

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05.3	$R = \frac{2}{0.2}$ = 10 Ω **or** total resistance = $\frac{6}{0.2}$ = 30 Ω so resistance of resistor = 30 - 20 = 10 Ω		1 1 **or** 1 1	AO2 4.2.2
05.4	decrease adding a resistor in series increases the total resistance of the circuit so less current will flow		1 1	AO2 4.2.2
06.1	component A		1	AO2 4.2.1.4
06.2	evidence of reading current and potential difference from the graph e.g., current = 0.5 A, potential difference = 5.0 V potential difference = current × resistance resistance = $\frac{\text{potential difference}}{\text{current}}$ = $\frac{5.0\text{V}}{0.5\text{A}}$ = 10 (Ω)	accept any correct pair of readings accept ten with no working shown for three marks	1 1 1	AO1 AO2 4.2.1.2

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06.3	as the potential difference increases the resistance of component A stays the same the ratio of all the potential difference and current readings stays the same = 10 (Ω) as the potential difference increases, the resistance of component B increases the ratio of the potential difference: current readings increases, from $\frac{1.0}{0.2}$ = 5 Ω to $\frac{3.0}{0.4}$ = 7.5 Ω	do not accept any answer involving gradients of the lines	1 1 1 1	AO2 4.2.1.4
06.4	at 3.0 V, total current = 0.3 A + 0.4 A = 0.7 A		1 1	AO2 4.2.2
06.5	resistance = $\frac{V}{I}$ = $\frac{3}{0.7}$ =4.3 (Ω) [= 4.286(Ω)]	accept 4.3 with no working shown for two marks	1 1	
07.1	negative		1	AO2 4.2.5.2
07.2	an arrow in a direction away from the sphere		1	AO2 4.2.5.2
07.3	(the force) decreases/gets smaller		1	AO2 4.2.5.1

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07.4	charge = current × time **or** Q = It 4×10^{-6} = current × 0.2 current = $\frac{4 \times 10^{-6}}{0.2}$ = 2×10^{-5} A	student must show working for full marks	1 1 1 1	AO1 AO2 4.2.1.2
08.1	electron(s)		1	AO1 4.2.5.1
08.2	negatively charged particles (electrons) are transferred from the jumper to the balloon which leave a (net) negative charge on the balloon		1 1	AO2 4.2.5.1
08.3	yes because opposite charges attract and an attractive force keeps the balloon on the wall **or** no the wall is neutral but when the balloon is close to the wall it repels the electrons which leaves a net positive charge on the surface	all marks for this question are awarded for explanations, rather than for the 'yes'/'no' answer	1 1 **or** 1 1	AO2 4.2.5.2
08.4	the balloons will repel they have the same charge on them/both are negatively charged like/similar charges repel		1 1 1	AO1 AO2 4.2.5.2

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09.1	charge = current × time **or** Q = It $0.6 = 15\times10^{-3} \times$ time time = $\frac{0.6}{15\times10^{-3}}$ = 40 s	accept 40 with no working shown for three marks accept 0.04 (not converting from mA) for one mark	1 1 1	AO1 AO2 4.2.1.2
09.2	graph should show a smooth curve with resistance increasing sharply initially before beginning to gradually plateau	One mark for a graph labelled mass on x-axis, resistance on y-axis one mark for a curved shape with decreasing gradient	2	AO3 4.2.1.2
09.3	as the mass of salt increases the current increases the potential difference is constant (6 V) $R = \frac{V}{I}$, so the resistance will decrease (as mass increases) the current increases at a decreasing rate, so the resistance will decrease at a decreasing rate from 25 g to 30 g the resistance decreases from 400 Ω to 240 Ω from 75 g to 80 g the resistance decreases from 150 Ω to 146 Ω		1 1 1 1 1 1	AO2 AO3 4.2.1.2

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10.1	graph should show that resistance initially drops sharply, but begins to gradually plateau as light intensity increases the curve should be a smooth arch showing a negative correlation	one mark for plotting light intensity on x-axis and resistance on y-axis one mark for correct units one mark for correct shape of graph	3	AO2 4.2.1.4
10.2	sensible suggestion e.g., street lights, security lights		1	AO2 4.2.1.4
10.3	description of how it is used appropriate circuit diagram explanation of why it is needed **for example:** turning the lights on in a house when it gets dark outside connect up the light dependent resistor in a circuit with an LDR, a resistor and a battery circuit diagram with labelled components use the output potential difference across the LDR or the resistor to switch on the lights as the light level changes, the changing resistance produces a changing potential difference which can be used to turn on the lights when the potential difference reaches a certain level		2 1 2	AO2

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11.1	points should be plotted at the following co-ordinates: (5, 1.5), (10, 3.8), (15, 4.6), (20, 5.9), (25, 7.8) line of best fit should be straight	three or four points plotted correctly for one mark all points plotted correctly for two marks one mark for appropriate scales on correctly labelled axes one mark for plotting an appropriate line of best fit	4	AO2 4.2.1.3
11.2	independent variable = length dependent variable = resistance control variable = type of metal/diameter of wire/temperature of wire		1 1 1	AO3 4.2.1.3
11.3	6.8 (Ω)	accept values between 6.5 and 7.3 (Ω)	1	AO2 4.2.1.3
11.4	take repeat measurements **and** calculate/plot the average/mean of repeat measurements		1	AO3 4.2.1.3
11.5	both students A and B are correct the line is straight (so is linear) and foes through (0,0) (so it is directly proportional)		1 1 1	AO3 4.2.1.3

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12.1	energy in the kinetic energy store is transferred to a gravitational potential energy store as the ball moves upwards. as the ball moves through the air some energy is transferred to the thermal energy store of the surroundings as the ball moves down energy is transferred from a gravitational potential energy store to a kinetic energy store some of this energy is transferred to the thermal energy store of the hand		1 1 1 1	AO2 4.1.1.1
12.2	gravitational potential energy = mass × gravity × (change in) height	allow gpe = mgh	1	AO1 4.1.1.2
12.3	0.4 = 0.1 × 9.8 × change in height change in height = $\frac{0.4}{0.98}$ = 0.41 m	accept 0.4 with no working shown for three marks	1 1 1	AO2 4.1.1.2
13.1	efficiency = $\frac{\text{useful energy transferred}}{\text{total energy transferred}} \times 100$ = $\frac{4000 \times 1000 \times 100}{10000 \times 1000} \times 100$ = 40 %	accept 40% with no working shown for three marks accept 0.4 for 1 mark	1 1 1	AO1 AO2 4.1.2.2

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13.2	efficiency of vehicle B is 2 × 40% = 80% **or** 0.8 $0.8 = \frac{6000 \times 1000}{\text{total energy transferred}}$ total energy transferred = $\frac{6000 \times 1000}{0.8}$ = 7 500 000 J = 7500 kJ	accept 7500000 J with no working for three marks	1 1 1	AO2 4.1.2.2
13.3	power = $\frac{\text{useful energy transferred}}{\text{time taken}}$ $= \frac{6000 \times 1000}{2 \times 3600}$ = 833 W = 830 W to two significant figures	accept 833 with no working shown for two marks	1 1 1 1	AO1 AO2 4.1.1.4
14.1	A – the graph for a resistor with a small resistance B – the graph for a resistor with a large resistance C – the graph for a filament lamp	one mark for two lines correct two marks for all lines correct	2	AO1 4.2.1.4
14.2	while potential difference is negative, current should be 0 once potential difference becomes positive, current should increase sharply	one mark for current with positive potential difference one mark for approximately zero current with negative potential difference	2	AO1 4.2.1.4

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14.3	none of them will light up light emitting diode X is in the reverse direction/cannot allow current from positive to negative terminals of the battery.		1 1	AO2 4.2.1.4