AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	the data are not continuous the names are categoric		1 1	AO2
01.2	one in 1990 three in 2017	**or** three times as many in 2017 than in 1990 = 2 marks	1 1	AO2 4.1.3
01.3	total fossil fuels in 1990 = 230 + 20 + 0 = 250 total fossil fuels in 2017 = 20 + 10 + 140 = 170 change = -80 (-70 to -90) (TWh)		1 1 1	AO2 4.1.3
01.4	coal plausible reason: • coal more expensive • less available • too polluting • causes global warming or greenhouse gases	one mark for 'coal', one mark for reason	1 1	AO2 AO3 4.1.3
02.1	the cost of production of solar cells/photovoltaic cells is very high		1	AO1 4.1.3
02.2	the cheapest method is coal which produces the highest mass of CO_2 per unit CO_2 is a greenhouse gas/contributes to climate change/global warming		1 1 1	AO2 AO3 4.1.3
02.3	**two** from: • there are other considerations such as nuclear fuel produces radioactive waste • nuclear accidents cause radioactive material to be released • which could have a significant impact on the environment	one for each correct answer up to a maximum of two points	2	AO3 4.1.3

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02.4	(biomass involves) growing plants plants take in CO_2 from the atmosphere which would lower the concentration of CO_2/reduce the greenhouse effect/effects of climate change/idea of carbon neutral		1 1 1	AO2 AO3 4.1.3
03.1	one point for appropriate x and y-axes one point for three or four points of data plotted correctly two points for all points of data plotted correctly one point for drawing a line of best fit		4	AO2 AO3 4.1.3
03.2	for small wind speeds the output is zero as the wind speed increases, the output power increases for a wind speed over 10 m/s, the power output doesn't change/is constant		1 1 1	AO2 4.1.3
03.3	Advantage: no greenhouse gases produced while it is in use/renewable resources/can be used in remote places Disadvantage: wind speed is variable/wind doesn't always blow/needs a large space/noisy		1 1	AO1 4.1.3
04.1	independent – number of sheets of transparent film dependent – energy per second		1 1	AO2 4.1.3
04.2	**three** from: • the distance of the lamp from the solar cell • the angle of the solar cell • the type/thickness of transparent film • the type/area of the solar cell	one mark for each correct answer up to a maximum of three marks	3	AO3 4.1.3

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Specification reference</th></tr>
<tr><td>04.3</td><td><u>statement one:</u> do not incorporate 2.11 into the calculation of the mean/ change mean to 3.65/repeat test
<u>statement two:</u> add units to columns two/three and change mean to mean energy per second (J/s)
<u>statement three:</u> change all the measurements to the same number of significant figures/three significant figures.</td><td></td><td>1

1

1</td><td>AO3
4.1.3</td></tr>
<tr><td>04.4</td><td>uncertainty = $\frac{\pm(4.31-4.12)}{2}$
= $\frac{\pm 0.2}{2}$
= ± 0.1 (J/s)</td><td></td><td>1

1</td><td>AO2
4.1.3</td></tr>
<tr><td>05.1</td><td>a renewable resource can be replenished as it is used, but a non-renewable resource cannot</td><td></td><td>1</td><td>AO1</td></tr>
<tr><td>05.2</td><td><table><tr><th>Resource</th><th>Used to generate electricity</th><th>Used as a fuel in cars</th><th>Is a renewable resource</th></tr><tr><td>coal</td><td>✓</td><td></td><td></td></tr><tr><td>biomass</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>oil</td><td>✓</td><td>✓</td><td></td></tr><tr><td>wind</td><td>✓</td><td></td><td>✓</td></tr></table></td><td>one mark for each correct column</td><td>3</td><td>AO1
AO2
4.1.3</td></tr>
<tr><td>05.3</td><td>non-renewable resources are very reliable/can produce a steadier supply of electricity</td><td></td><td>1</td><td>AO2
4.1.3</td></tr>
</table>

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06.1	**one** from: • wind • wave • hydroelectric • geothermal • solar • biofuel		1	AO1 4.1.3
06.2	in 1990 the total kWh for these resources was 225 million kWh, out of a total of 250 million kWhs so percentage = $\frac{225 \times 100}{250}$ = 90% in 2015 there were 190 million kWh out of 225 million kWh so percentage = $\frac{190 \times 100}{250}$ = 84.4% the percentage has decreased/so has the overall energy use	accept 230 million kWh giving 92%	1 1 1 1 1	AO2 AO3 4.1.3
06.3	change in energy use in 5 years = 230 million kWh - 250 million kWh = -20 million kWh rate of decrease = $\frac{20000000}{5}$ = 4 million kWh/year current use = 230 million kWh hours. half of this is 115 million kWh, so number of years $\frac{115\,000\,000\ \text{kWh}}{4\ \text{kWh per year}}$ = 28.8 years	accept four with no working for the one calculation mark accept 29 with no working for the one calculation mark	1 1 1 1	AO3 4.1.3

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06.4	sensible suggestions: the energy use might halve in this time because people use more energy efficient devices/want to save money the energy use might not halve in this time because this is an estimate based on past data/you cannot be sure that the downward trend will continue / world population is increasing		1 1	AO3 4.1.3
07.1	annual energy required by the village = $7000 \times 10^6 \times 60$ min $\times 60$ sec $= 2.52 \times 10^{13}$ J (2.5×10^{13} to two significant figures)		1 1	AO2 4.1.3
07.2	energy generated by one turbine per year = 33 000 W × 60 sec × 60 min × 24 h × 365 days $= 1.04 \times 10^{12}$ J so you would need $\frac{2.52 \times 10^{13}}{1.04 \times 10^{12}} = (24.2)$ 25 wind turbines	correct answer is rounded up	1 1 1 1	AO2 4.1.3
07.3	25 × 1 million = £25 million 7000 MWh = 7 000 000 kWh total cost = 7 000 000 × £0.50 = £3.5 million biofuel is cheaper		1 1 1 1	AO2 AO3 4.1.3
07.4	**Level 3:** Both resources evaluated, with at least one advantage **and** disadvantage of both given.		5-6	AO3 4.1.3
	Level 2: Both resources evaluated, but an advantage or disadvantage missing for one resource.		3-4	
	Level 1: Only one resource evaluated, or only advantages **or** disadvantages given.		1-2	

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	no relevant content.		0	
	Indicative content: • both resources are renewable • biofuels are reliable • biofuels could be carbon neutral / carbon dioxide released by burning fuel (theoretically should) equal the carbon dioxide absorbed from the atmosphere by the living matter • however, carbon dioxide also produced during the process to make and transport biofuels • biofuel would contribute to climate change by producing CO_2. • wind turbines can be noisy • wind turbines are not reliable, as only produce electricity when it is windy • wind power does not contribute to climate change			
08.1	**two** from: • oil • coal • gas	one mark for each correct answer up to a maximum of two marks	2	AO1 4.1.3
08.2	suitable resource e.g., hydroelectric, tidal power correct description e.g., water in a lake moves down a hill/mountain through a generator that produces electricity	one mark for the name of the resource two marks for the description	1 1 1	AO1 AO2 4.1.3

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08.3	two comments e.g., tides happen regularly/twice a day water can be released from a lake on demand **or** the height of tides varies rainfall to fill the lake is variable	one mark for each correct comment	2	AO3 4.1.3
08.4	carbon dioxide is a greenhouse gas it contributes to climate change		1 1	AO1 4.1.3
08.5	suitable comment e.g., power station affects habitats of wildlife		1	AO2 4.1.3
09.1	gravitational potential energy = mass × gravitational field strength × height	accept gpe = mgh	1	AO1 4.1.12
09.2	60 × 9.8 × 10 = 5880 J		1 1	AO2 4.1.1.2
09.3	extension = 10 - 3.2 = 6.8 $5880 = 0.5 \times k \times 6.8^2$ spring constant = $\frac{5880}{0.5 \times 6.8^2}$ = 254.33 = 254 N/m		1 1 1 1 1	AO1 AO2 4.1.1.2
10.1	mass, speed	both needed for the mark	1	AO1 4.1.1.2

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10.2	**Level 3**: Clear and coherent description of energy stores and transfers involved in both situations. Difference clearly stated with reason.		5-6	AO3 4.1.1.1
	Level 2: Beginning or end stores described, and transfers involved in both situations. Difference stated but no reason given.		3-4	
	Level 1: One or more relevant stores stated, with no description of transfer mechanism, or difference.		1-2	
	No relevant content.		0	
	Indicative content: • for the accelerating car: ○ more energy in the chemical store (petrol) at the beginning ○ as it accelerates there is an increasing amount transferred to the kinetic energy store and to the thermal energy store of the car and the surroundings • for the car on the motorway: ○ more energy in the chemical store (petrol) at the beginning ○ this is transferred to the kinetic energy store ○ to keep it at a constant level, energy is passed on to the thermal energy store of the car and the surroundings • in both cases, energy is transferred by mechanical working/force of the engine, and by friction.			
10.3	oil provides lubrication so less energy is transferred to the thermal energy store of the surroundings/less energy is dissipated		1 1	AO2 4.1.2.1