AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	volume before = 75 cm^3 volume after = 90 cm^3 difference in volume = volume of clay. = 90 cm^3 - 75 cm^3 =15 cm^3	one mark for evidence of using two readings from the measuring cylinders	1 1	AO1 AO2 4.3.1.1
01.2	resolution = $\frac{1}{2}$ smallest division = $\frac{1}{2} \times 5 = 2.5$ cm^3		1 1	AO1 AO2
01.3	digital balance		1	AO2
01.4	density = $\frac{\text{mass}}{\text{volume}}$	allow $\rho = \frac{m}{v}$	1	AO1
01.5	density = $\frac{23.41}{15}$ = 1.56 g/cm^3	accept 1.56 or 1.6 with no working shown for two marks	1 1	AO2 4.3.1.1
01.6	measure the length of each side (in cm)/measure the length, breadth and height cube the answer/multiply the length, breadth and height		1 1	AO1 4.3.1.1
02.1	vibrating potential moving fast kinetic		1 1 1 1	AO1 4.3.2.1

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02.2	the internal energy changes from mainly potential to mainly kinetic/more kinetic	do not accept answers involving solids/liquids/gases	1 1	AO1 4.3.2.1
02.3	the particles in a gas are in random motion		1	AO1 4.3.2.1
03.1	20 °C		1	AO2
03.2	70 °C		1	AO2
03.3	energy transferred = power × time	allow E = P × t	1	AO1 4.3.2.3
03.4	energy = 1000 × 2 × 60 = 120 000 J energy transferred = mass × specific latent heat of vaporisation 120 000 = mass × 365 000 mass = $\frac{120000}{365000}$ = 0.33 kg	allow E = mL	1 1 1 1 1	AO2 4.3.2.3
03.5	an overestimate (the energy transferred to vaporise the water is lower because) some energy is transferred to the thermal energy store of the surroundings.		1 1	AO2 4.3.2.3
03.6	a line that starts at 20 °C steeper than the original line becomes horizontal at 70 °C at about 2 minutes.		1 1 1	AO2

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04.1	energy = power × time	allow E = P × t	1	AP1
04.2	2kW = 2000 W 2 minutes = 120 seconds energy = 2000 × 120 = 240 000 J		1 1 1 1	AO1 AO2 4.1.1.4 4.3.2.3
04.3	change in mass = 1.276 - 1.180 = 0.096 kg energy transferred = specific latent heat × change in mass 240 000 J = specific latent heat of vaporisation × 0.096 kg specific latent heat of vaporisation = $\frac{240000}{0.096}$ = 2 500 000 J/kg = 2500 kJ/kg	allow E = mL	1 1 1 1 1	AO1
04.4	the energy transferred was heating the material of the kettle/air around it as well as vaporising the water a lower mass of water vaporised than should have been the case so the value calculated was bigger than the textbook value		1 1 1	AO2 4.3.2.3
05.1	specific latent heat is the energy required to change the state of 1 kg of a substance specific heat capacity is the energy required to change the temperature of 1 kg of a substance by 1 °C		1 1	AO1 4.3.2.2 4.3.2.3

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05.2	energy to raise temperature = specific heat capacity × mass × change in temperature = 2460 × 0.01 × 50 = 1230 J energy to vaporise = mass × specific latent heat = 0.01 × 838 000 = 8380 J the energy required to vaporise the ethanol is bigger (about seven times bigger) than the energy required to raise the temperature by 50 °C	allow $E = m\,c\,\Delta\theta$ allow 1230 with no substitution for two marks allow $E = mL$ allow 8380 with no substitution for two marks allow any valid comparison e.g., the difference	1 1 1 1 1	AO1 4.3.2.2 4.3.2.3
05.3	the energy required to break the bonds between particles in a liquid is much bigger than the energy required to make particles in a liquid move faster the energy to break bonds is related to the specific latent heat, so the specific latent heat of vaporisation is bigger		1 1	AO1 4.3.2.2 4.3.2.3
06.1	(when the student is in the shower) water evaporates to make water vapour the water vapour condenses when it comes in contact with the colder mirror and energy is transferred to the mirror		1 1	AO1 AO2 4.3.1.2

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06.2	for converting all kJ to J, cm to m the mass of water that condenses = $\frac{\text{energy}}{\text{specific latent heat of vaporisation}}$ $= \frac{730000}{2265000}$ = 0.322 kg mass = density × volume volume of water = $\frac{0.322}{1\times10^{-8}}$ = 0.000 322 volume = area x thickness thickness of water = $\frac{0.000322}{0.6\times0.6}$ = 8.95×10^{-4} m		1 1 1 1 1 1	AO1 AO2 4.3.1.1 4.3.2.3
07.1	the particles in a solid are arranges in a regular pattern/array the particles in a gas are moving in all/random direction the particles in a solid are vibrating about a fixed position the particles in a gas are moving quickly		1 1 1 1	AO2
07.2	the particles collide with the walls of the container each particle exerts a force on the wall pressure is force per unit area the total force of all the collisions of the particles per unit area is the pressure		1 1 1 1	AO3

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07.3	pressure on y-axis, temperature on x-axis straight line with positive gradient that intercepts y-axis above zero (does not need to be extrapolated)		1 1 1	AO1 AO2 4.1.2.1
08.1	the steam is at a high temperature (and in the gas state) steam transfers latent heat energy to the milk (steam cools/changes to a liquid state and the temperature of the milk rises)		1 1	AO1 AO2 4.3.2.2 4.3.2.3
08.2	convert 242 g to 0.242 kg, and 3.93 kJ/kg ^{o}C to 3930 J/kg ^{o}C temperature difference = 70 - 20 = 50^{o}C energy required = mass × specific heat capacity × change in temperature = 0.242 × 3930 × 50 = 47 553 J ($\approx$ 48 000 J so about 48 kJ)	allow $E = m c \Delta\theta$	1 1 1 1	AO1 AO2 4.3.2.2 4.3.2.3
08.3	convert 2260 kJ/kg to 2260 000 J/kg energy = mass × specific latent heat of vaporisation 47 553 = mass × 2 260 000 mass = $\frac{47553}{2260000}$ = 0.02 kg	allow $E = mL$	1 1 1 1	AO2 4.3.2.3
08.4	assume that all of the energy transferred to the milk to heat it comes from the change of state of the steam		1	AO2 4.3.2.3

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09.1	B D the temperature isn't changing/doesn't change even though the substance is being heated		1 1 1 1	AO1 4.3.1.2
09.2	solid it changes state twice/goes from solid to liquid, then liquid to gas		1 1	AO1 4.3.1.2
09.3	A		1	AO1 4.3.1.2
09.4	C E		1 1	AO1 4.3.1.2
10.1	volume = 5^3 = 125 cm^3		1 1	AO1 4.3.1.2
10.2	density = $\frac{\text{mass}}{\text{volume}}$ $1.5 = \frac{\text{mass}}{125}$ mass = 1.5 x 125cm^3 = 187.5g		1 1 1 1	AO1 AO2 4.3.1.1
10.3	sublimation		1	AO1 4.3.1.2
10.4	if the process is reversed, the material recovers its original properties		1	AO1 4.3.1.2

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10.5	the internal energy of the gas is bigger than the internal energy of the solid the particles have more kinetic energy/are moving faster		1 1	AO2 4.3.2.1
11.1	one mark for correct symbol one mark for correct label		2	AO1 4.2.1.1
11.2	(when they put the test tube into iced water) the temperature of the water decreases the resistance of the thermistor increases the potential difference across the thermistor increases V_{out} decreases because the total potential difference across the thermistor and the resistor = 12 V at all times		1 1 1 1 1	AO1 AO2 4.2.1.4
11.3	find the potential difference across the resistor by measuring V_{out} find potential difference across thermistor by subtracting V_{out} from 12 V use $\frac{\text{potential difference across the resistor}}{\text{potential difference across the thermistor}} = \frac{\text{resistance of resistor}}{\text{resistance of thermistor}}$ to find the resistance of the thermistor use a graph/table of the resistance of the thermistor at different temperatures to work out the temperature of the water.		1 1 1 1	AO1 AO2 4.2.2
11.4	sensible suggestions e.g., the human body continually generates thermal energy, but the water in the test tube does not.		1	AO3