

Q1. (2019)

a)

02.3

Substance	Solid	Liquid	Gas
Oxygen		✓	
Nitrogen			✓
Carbon dioxide	✓		

2 correct answers scores 1 mark.
if more than one tick in a row, neither tick can score a mark

2

AO3/2b
6.3.1.1

E

b)

02.4	Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1.1 6.3.1.2	E
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4		
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2		
	No relevant content	0		
	Indicative content cooling <ul style="list-style-type: none"> as the argon cools the particles slow down particles in a liquid move slower than particles in a gas particles in a solid move slower than particles in a liquid as the liquid/solid cools the particles get closer together as the liquid/solid cools the density increases gas to liquid <ul style="list-style-type: none"> particles change from being spread apart to touching each other particles will (collide with other particles more often and) change direction more often liquid to solid <ul style="list-style-type: none"> particles change from a random arrangement to a regular pattern particles change from moving freely to fixed positions particles change from moving freely/randomly to vibrating explanation <ul style="list-style-type: none"> (internal) energy (of the argon) decreases (kinetic) energy (of the particles) decreases with temperature (potential) energy (of the particles) changes with change of state (of the argon) forces between particles in a gas are negligible/zero attractive forces act between atoms when they are close to each other attractive forces between particles are stronger in a solid than in a liquid to access level 3 there must be an explanation of changes to arrangement and movement of particles during either cooling or a change of state			

Q2. (2020)

04.4	energy is dissipated (to the surroundings)	allow energy is transferred/lost to the surroundings	1	AO2 6.1.2.1
	at the same rate that energy is transferred to the water		1	

Q3. (2020)

a)

05.1	they vibrate about fixed positions.		1	AO1 6.3.1.1
------	-------------------------------------	--	---	----------------

b)

05.2	kinetic energy decreases potential energy decreases		1	AO1 6.3.2.1
------	--	--	---	----------------

c)

05.4	a high specific heat capacity		1	AO2 6.3.2.2
	so it can absorb a large amount of energy with only a small temperature change		1	

Q4. (2021)

a)

06.1	the kinetic energy (and the potential energy) of the particles increases	allow the speed of the particles increases	1	AO1 6.3.2.1 6.3.2.3
	so the internal energy increases because it is the sum of kinetic and potential energy (of the particles)		1	

b)

06.3	stays the same		1	AO1 6.3.1.2
------	----------------	--	---	----------------

Q5. (2022)

02.7	the water will recover its original properties if the steam is cooled		1	AO1 6.3.1.2
------	---	--	---	----------------

Q6. (2022)

04.4		particles refers to particles in the steam throughout		AO2 6.3.3.1
	(as the amount of steam increases) the number of particles increases		1	
	and (as the temperature increases) particles move faster	allow (as the temperature increases) the (average) kinetic energy of the particles increases	1	
	particles collide with the wall of the cooker		1	
	these collisions are more frequent	if MP3 is not awarded no subsequent marks may be awarded	1	
	and each collision exerts more force		1	

Q7. (2023)

a)

06.2	(metals) have a high(er) thermal conductivity	allow metals are good/better (thermal) conductors	1	AO1 6.1.2.1
	which allows a greater rate of (thermal) energy transfer	allow (thermal) energy is transferred more quickly	1	

b)

06.3	(a low) specific heat capacity		1	AO1 6.1.1.3 6.3.2.2
------	--------------------------------	--	---	---------------------------

c)

06.5	$1.1 \times 10^3 = \frac{\text{mass}}{1.9 \times 10^{-4}}$		1	AO2 6.1.1.3 6.3.2.2 6.3.1.1
	mass = 0.209 (kg)	allow $m = 1.9 \times 10^{-4} \times 1.1 \times 10^3$	1	
		the equation $\text{density} = \frac{\text{mass}}{\text{volume}}$ must have been used to score subsequent marks		
	$15\,000 = 0.209 \times 4200 \times \Delta\theta$	allow a correct substitution using their calculated value of mass	1	
	$\Delta\theta = \frac{15\,000}{0.209 \times 4200}$	allow a correct re-arrangement using their value of mass and/or an incorrectly / not converted energy value	1	
	$\Delta\theta = 17(.088...)$	allow a correct calculation using their value of mass and / or an incorrectly / not converted energy value	1	
	final temperature (= $76 - 17.088$) = 59 (°C)	allow 58.9... (°C) allow an answer consistent with their value of mass and / or an incorrectly / not converted energy value	1	

Q8. (2024)

06.3	$48 = \frac{\text{mass}}{5.0 \times 10^5}$		1	AO2
	$\text{mass} = 48 \times 5.0 \times 10^5$		1	6.3.1.1 6.3.2.2
	$\text{mass} = 24\,000\,000$		1	6.1.1.3
		the equation $\text{density} = \frac{\text{mass}}{\text{volume}}$ must have been used to score subsequent marks		
	$E = 24\,000\,000 \times 1100 \times 15$	allow a correct substitution using their calculated value for mass	1	
	$E = 396\,000\,000\,000$	allow an answer consistent with their calculated value for mass	1	
	$E = 3.96 \times 10^{11}(\text{J})$	allow a correctly converted answer consistent with their calculated value for energy using the equation $\Delta E = m c \Delta \theta$	1	