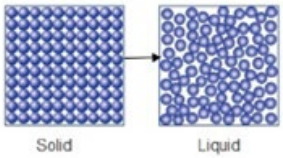
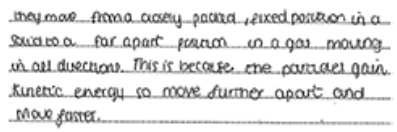
Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1		i	Solid particles in an ordered, close-packed manner ✓ Liquid particles in a more random order, with majority of particles touching each other ✓ e.g.,  	2 (2 x AO 1.1)	**Note: the particles do not need to fill the boxes** **Examiner's Comments** The solid diagram was generally drawn well but candidates were often unable to represent the differences between particles in a solid and a liquid in a convincing way. Many of the liquid diagrams represented particles in a more random order but often the particles were not touching.
		ii	Boiling describes a gas turning into a liquid. ☐ Freezing is a chemical change. ☐ Melting is a physical change. ☑ ✓ The amount of energy needed to melt a substance depends on the strength of the forces between particles. ☑ ✓ The arrangement of particles becomes more random during condensing. ☐	2 (2 x AO 1.1)	**Examiner's Comments** Most candidates correctly ticked the third and fourth boxes.
		iii	**Any two from:** It does not take into account forces (of attraction) between particles ✓ It shows all particles as spheres ✓ It shows all particles as inelastic ✓ It doesn't take into account the size of particles (relative to the space between particles) ✓	2 (2 x AO 1.1)	**ALLOW** atoms / molecules / ions for particles throughout **ALLOW** idea that the forces are not shown **IGNORE** references to bonds between particles **ALLOW** idea that particles are not always spheres **ALLOW** idea that particles aren't all the same size **Examiner's Comments** Many good responses to this question were seen from higher attaining

					candidates who were able to write about the limitations of the particle model, usually with regards to the shape and size of the particles. Very few referred to particles being inelastic. Common incorrect answers included the model not showing space between particles or movement of particles. **Misconception** A common misconception was reference to bonds between particles rather than the fact that the model does not take into account the forces of attraction between the particles.
			Total	**6**	
2		i	**Any three from:** Particles move faster in gas / move slower in solid ✓ Particles have more energy in gas / less energy in solid ✓ Particles are further apart in gas / closer together in solid ✓ Particles are arranged more randomly in gas / arranged regularly in solid ✓ Forces between particles are weaker in gas / stronger in solid ✓	3 (3 × AO 1.1)	**Answers must be comparative** **ALLOW** atoms / molecules for particles **ALLOW** idea of particles (vibrating) in a fixed position for regular arrangement in a solid **Examiner's Comments** Many candidates, even higher attaining candidates, did not gain marks on this question usually because they did not give direct comparisons, choosing instead to make general statements, e.g. stating that particles are arranged regularly in a solid but then not stating their arrangement in a gas. Less successful responses saw candidates write about bulk properties of solids and gases such as referring to gas particles being able to take the shape of the container. Exemplar 1

					 This exemplar illustrates a clear response to this question in which the candidate has described what happens to the movement and arrangement of the particles when a solid changes to a gas. The answer is comparative, as required by the question.
		ii	**Temperature and pressure:** 1.0 MPa and a temperature value between −55 and −41 °C✓ **Reason:** Idea that the temperature selected is between the melting and boiling point (so will be a liquid) / Idea that lower than −56°C CO_2 is a solid and above −40°C CO_2 is a gas ✓ 1.0 MPa has a melting and boiling point (whereas 0.1 MPa does not) / 1.0 MPa does not have a sublimation point ✓	3 (3 × AO 3.2b)	MP dependent on correct temperature **ALLOW ORA** for 0.1MPa **ALLOW** idea that 1.0 MPa is the pressure when CO_2 can be a liquid (between −55 and −41 °C) **Examiner's Comments** Most candidates correctly selected a temperature and pressure at which carbon dioxide is a liquid, although a common misconception was that carbon dioxide is a liquid at its melting point of -56°C. Fewer candidates scored the marks for the explanation with many attempting to wrap up the other 2 marks in a single sentence, hence not answering either condition in the detail required. Very few scored the mark for explanation of their choice of pressure.
			Total	**6**	
3			B ✓	1(AO1.1)	
			Total	**1**	