

# States of matter

## Mark Scheme

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Chemistry
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Double Award (Paper 1C)
<b>Topic</b>	Principles of Chemistry
<b>Sub-Topic</b>	States of Matter
<b>Booklet</b>	Mark Scheme

**Time Allowed:** 63 minutes

**Score:** /52

**Percentage:** /100

**Grade Boundaries:**

9	8	7	6	5	4	3	2	1
>90%	80%	70%	60%	50%	40%	30%	20%	10%

Question number	Answer	Notes	Marks
1 (a)	<b>B</b> (condensation)		1
(b)	<p><b>M1</b> (the particles/they) lose (kinetic) energy / have less energy</p> <p><b>M2</b> (the particles/they) move closer together / pack more closely</p> <p><b>M3</b> (the particles/they) do not move as freely / move more slowly / move less randomly</p> <p><b>NB M1, M2 and M3</b> can be scored anywhere across the whole answer</p>	<p>ACCEPT lose potential/heat energy</p> <p>ACCEPT not as many gaps / smaller gaps REJECT refs to density</p> <p>ACCEPT molecules for particles</p> <p>REJECT atoms <b>once only.</b></p>	3

Question number	Answer	Notes	Marks												
2 a	<table border="1"> <thead> <tr> <th>Change of state</th> <th>State symbol before change</th> <th>State symbol after change</th> </tr> </thead> <tbody> <tr> <td>Water boils in a kettle</td> <td style="text-align: center;"><b>l</b></td> <td style="text-align: center;"><b>g</b></td> </tr> <tr> <td>Ethene is converted to poly(ethene)</td> <td style="text-align: center;"><b>g</b></td> <td style="text-align: center;"><b>s</b></td> </tr> <tr> <td>Crystals of iodine sublime on heating</td> <td style="text-align: center;"><b>s</b></td> <td style="text-align: center;"><b>g</b></td> </tr> </tbody> </table>	Change of state	State symbol before change	State symbol after change	Water boils in a kettle	<b>l</b>	<b>g</b>	Ethene is converted to poly(ethene)	<b>g</b>	<b>s</b>	Crystals of iodine sublime on heating	<b>s</b>	<b>g</b>	<p>M1 l AND g in first row</p> <p>M2 g AND s in second row</p> <p>M3 s AND g in third row</p> <p>Accept upper case letters, eg S in place of s</p> <p>Accept words, eg liquid in place of l</p> <p>Accept answers in brackets</p>	3
Change of state	State symbol before change	State symbol after change													
Water boils in a kettle	<b>l</b>	<b>g</b>													
Ethene is converted to poly(ethene)	<b>g</b>	<b>s</b>													
Crystals of iodine sublime on heating	<b>s</b>	<b>g</b>													
b	$\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$	<p>Award 1 mark for s and g correct</p> <p>Award 1 mark for other 3 correct</p> <p>Accept upper case</p> <p>Reject words</p>	2												
c	s / solid	Accept upper case S in place of s	1												

Question number	Answer	Notes	Marks
1 a i	six circles separated from each other	Accept minimum of 4 complete circles Ignore size and shape of circles Ignore arrows and other symbols implying movement Ignore a pattern Reject any touching circles Reject circles joined by bonds No penalty for half-circles at edges of square	1
ii	B (They move randomly in the liquid state)		1
ii i	D (melting)		1
b i	B (condensing and evaporating)		1
ii	D (N <sub>2</sub> (l))		1
			<b>Total 5 marks</b>

Question number	Answer	Notes	Marks
1 (a)	Diagram shows four circles well-spaced apart	accept minimum of 3 complete circles ignore size and shape of circles ignore arrows and other symbols implying movement  ignore a pattern reject any touching circles reject circles joined by bonds no penalty for half-circles at edges of square	1
(b)	move freely/randomly	Accept fast OWTTE ignore references to vibrate	1
(c)	<p><b>M1</b> – (average kinetic) energy of the particles increases</p> <p><b>M2</b> – <u>more</u> particles have enough energy to escape / particles can escape <u>more</u> easily            OR  <u>more</u> particles overcome the forces (of attraction) holding them together (in the liquid)            OR            the forces (of attraction) between the particles are overcome <u>more</u> often</p>	accept particles move faster/more rapidly/more quickly allow the energy of the liquid increases  accept particles escape <u>more</u> quickly  accept molecules/atoms for particles for both M1 and M2  allow bonds for force of attraction	2
			<b>Total 4 marks</b>

Question number	Answer	Accept	Reject	Marks
1 (a)	<b>B</b> – (filter) funnel			1
	<b>D</b> – test tube/boiling tube			1
	<b>E</b> - pipette		teat pipette/dropping pipette	1
	<b>F</b> - beaker			1
(b)	<b>M1</b> - A			1
	<b>M2</b> - E			1

(Total marks for Question 1 = 6 marks)

Question number			Answer	Notes	Marks
1	a	i	steam	Accept gas / vapour	1
		ii	ice	Accept solid	1
		iii	ice	Accept solid	1
	b	i	D (melting)		1
		ii	B (condensing)		1
	c		D (solid to gas)		1
	d	i	exothermic		1
		ii	$\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$	Accept multiples and fractions	1

(Total for Question 1 = 8 marks)

Question number	Answer	Accept	Reject	Marks
2 (a)	X boiling Y condensing Z freezing			1 1 1
(b)	C The particles move freely.			1
(c) (i)	thermometer			1
(ii)	it/water boils at 100°C OR it/water boils below the melting point of (solid) Q / 140°C / boils before Q melts <b>IGNORE</b> evaporates	water does not get hotter than 100°C  reverse argument		1
(iii)	to keep the liquid at an even/equal temperature (throughout)  OR to avoid the <u>bottom</u> of the liquid from overheating/the <u>bottom</u> getting hotter than the rest of the liquid/to evenly distribute the heat/to avoid hot spots <b>IGNORE</b> references to increasing movement, etc of particles	OWTTE	words that imply constant temperature, eg steady	1
			<b>Total</b>	<b>7</b>



Question number	Answer	Notes	Marks
2 (a)	(i) element(s)		1
	(ii) compound		1
	(iii) mixture		1
	(iv) element		1
(b)	(i) solid		1
	(ii) gas		1

**Total 6 marks**

Question number	Answer	Notes	Marks
3 (a)	3		1
(b)	ammonia / NH <sub>3</sub> hydrogen chloride / HCl	Do not accept ammonium Do not accept hydrochloric acid Accept in either order. If name and formula given, both must be correct. Ignore state symbols, except HCl (aq)	1 1
(c)	ammonium chloride / NH <sub>4</sub> Cl	Do not accept ammonia chloride. If name and formula given, both must be correct.	1
(d)	cross in box 2 (decomposition) cross in box 4 (neutralisation)		1 1

**Total 6 marks**