



**EXAM PAPERS PRACTICE**

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

2002

**XVIII**

1583

Time allowed  
**42 Minutes**

Score

**/35**

Percentage

**%**

**CHEMISTRY**

**OCR  
AS & A LEVEL**

**Mark Scheme**

**Module 2: Foundations in chemistry**

[www.exampaperspractice.co.uk](http://www.exampaperspractice.co.uk)



## EXAM PAPERS PRACTICE

Question			Expected Answers	Marks	Additional Guidance
1	a	i	(atoms of the) same element <b>OR</b> same atomic no. <b>OR</b> no. of protons  <b>AND</b>  with different numbers of neutrons <b>OR</b> different masses ✓	1	<b>IGNORE</b> 'same number of electrons'  <b>DO NOT ALLOW</b> 'different numbers of electrons'  <b>DO NOT ALLOW</b> 'different relative atomic masses'  <b>DO NOT ALLOW</b> 'elements with different numbers of neutrons' <b>without</b> mention of same protons <b>OR</b> same atomic number
		ii	<b>same</b> (number of) <b>electrons</b> (in the outer shell)  <b>OR</b>  same <b>electron</b> configuration <b>OR</b> structure ✓	1	<b>DO NOT ALLOW</b> different number of protons  <b>IGNORE</b> 'same number of protons'  <b>IGNORE</b> 'they are both carbon' <b>OR</b> 'they are both the same element'
		iii	<b>mass</b> of the isotope compared to 1/12th <b>OR</b> <b>mass</b> of the atom compared to 1/12th ✓  (the mass of a) carbon-12 <b>OR</b> $^{12}\text{C}$ (atom) ✓	2	<b>IGNORE</b> reference to average <b>OR</b> weighted mean (i.e. correct definition of relative atomic mass will score both marks)  <b>ALLOW</b> mass of a <b>mole</b> of the isotope/atom with 1/12th the mass of a <b>mole</b> <b>OR</b> 12 g of ✓ carbon-12 ✓  <b>ALLOW 2 marks for:</b> ' <b>mass</b> of the isotope <b>OR</b> <b>mass</b> of the atom compared to $^{12}\text{C}$ atom given a mass of 12.0' i.e. 'given a mass of 12' communicates the same idea as 1/12th.'



## EXAM PAPERS PRACTICE

Question	Expected Answers	Marks	Additional Guidance
			<p><b>ALLOW 12C OR C12</b></p> <p><b>ALLOW FOR 2 MARKS:</b> <math display="block">\frac{\text{mass of the isotope}}{\text{mass of 1/12th mass of carbon - 12}}</math> i.e. fraction is equivalent to 'compared to'</p> <p><b>ALLOW 1 MARK FOR</b> a mix of mass of atom and mass of mole of atoms, <b>i.e.:</b> 'mass of the isotope/mass of an atom compared with 1/12th the mass of a <b>mole OR 12 g of carbon-12.</b>'</p>
b	<p>giant covalent (lattice) ✓</p> <p>layers ✓</p> <p><b>Each of the three properties below must be linked to explanation</b> <i>good conductor</i> - because it has mobile electrons <b>OR</b> delocalised electrons <b>OR</b> electrons can move ✓</p> <p><i>high melting / boiling point</i> - because strong <b>OR</b> covalent bonds have to be broken ✓</p>	5	<p><b>Use annotations with ticks, crosses etc. for this part.</b></p> <p><b>All five marking points are independent</b></p> <p><b>ALLOW</b> giant atomic <b>OR</b> giant molecular <b>OR</b> macromolecular</p> <p><b>ALLOW</b> planes <b>OR</b> sheets Allow diagram showing at least two layers</p> <p><b>Electron(s) must be spelt correctly ONCE</b></p> <p><b>DO NOT ALLOW</b> 'strong ionic bonds' <b>OR</b> strong metallic bonds.</p>



## EXAM PAPERS PRACTICE

Question			Expected Answers	Marks	Additional Guidance
			intermolecular forces <b>OR</b> weak bonds <b>OR</b> weak forces between the layers <b>OR</b> <i>soft</i> - because layers can slide ✓		
	<b>c</b>	<b>i</b>	0.0268 <b>OR</b> 0.027 <b>OR</b> 0.02675 mol ✓	<b>1</b>	<b>NO OTHER ACCEPTABLE ANSWER</b>
		<b>ii</b>	$1.61 \times 10^{22}$ ✓	<b>1</b>	<b>ALLOW</b> $1.6 \times 10^{22}$ up to calculator value <b>ALLOW</b> <b>ECF</b> answer to <b>(i)</b> $\times 6.02 \times 10^{23}$ <b>ALLOW</b> any value for $N_A$ in the range: $6.0 \times 10^{23} - 6.1 \times 10^{23}$
			<b>Total</b>	<b>11</b>	



EXAM PAPERS PRACTICE

Question			Expected Answers	Marks	Additional Guidance
2	a	i	white precipitate <b>OR</b> white solid ✓	1	<b>DO NOT ALLOW</b> goes white / cloudy / milky / off-white <b>DO NOT ALLOW</b> creamy white precipitate <b>ALLOW</b> milky white precipitate
		ii	$\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \longrightarrow \text{AgCl}(\text{s})$ Balanced equation correct ✓ <b>ALL</b> state symbols correct ✓	2	<b>ALLOW 2 marks</b> $\text{AgNO}_3(\text{aq}) + \text{Cl}^-(\text{aq}) \longrightarrow \text{AgCl}(\text{s}) + \text{NO}_3^-(\text{aq})$ <b>(equation mark and state symbol mark)</b> <b>ALLOW 1 mark for:</b> $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$ <b>(state symbol mark)</b> <b>ALLOW 1 mark for the state symbols for THESE balanced equation ONLY:</b> $\text{Ag}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \longrightarrow \text{AgCl}_2(\text{s})$ $\text{Ag}(\text{aq}) + \text{Cl}(\text{aq}) \longrightarrow \text{AgCl}(\text{s})$
		iii	(precipitate) dissolves <b>OR</b> disappears <b>OR</b> goes colourless <b>OR</b> goes clear ✓	1	<b>ALLOW</b> forms a solution
	b	i	removes or kills bacteria <b>OR</b> kills germs <b>OR</b> kills micro-organisms <b>OR</b> make it safe to drink <b>OR</b> sterilises water ✓	1	<b>ALLOW</b> to make water potable <b>IGNORE</b> virus <b>DO NOT ALLOW</b> 'purifies water' <b>DO NOT ALLOW</b> 'antiseptic'
		ii	it is toxic <b>OR</b> poisonous <b>OR</b> could form chlorinated hydrocarbons ✓	1	<b>ALLOW forms</b> carcinogens <b>OR</b> forms toxins <b>DO NOT ALLOW</b> harmful <b>DO NOT ALLOW</b> 'it causes cancer' (chlorine is not a carcinogen) <b>DO NOT ALLOW</b> 'irritates lungs'
	c	i	$\text{Cl}_2$ is 0 <b>AND</b> HCl is -1 <b>AND</b> HClO is (+)1 ✓	1	<b>ALLOW</b> 1- <b>ALLOW</b> 1+



## EXAM PAPERS PRACTICE

Question		Expected Answers	Marks	Additional Guidance
	ii	It has been both oxidised and reduced <b>OR</b> Its oxidation state has increased and decreased ✓  it has been oxidised (from 0) to +1 <b>AND</b> it has been reduced (from 0) to -1 ✓ (These two points together subsume the first marking point)	2	<b>ALLOW</b> 'chlorine' <b>OR</b> 'it' <b>DO NOT ALLOW</b> chlorIDE  <b>IF CORRECT OXIDATION STATES IN (i), ALLOW 2 marks for:</b> it is oxidised to form HClO it is reduced to form HCl
	iii	$\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaClO} + \text{NaCl} + \text{H}_2\text{O}$ ✓	1	<b>IGNORE</b> state symbols
d	i	$2\text{ClO}_2 \rightarrow \text{Cl}_2 + 2\text{O}_2$ <b>OR</b> $\text{ClO}_2 \rightarrow \frac{1}{2}\text{Cl}_2 + \text{O}_2$ ✓	1	<b>IGNORE</b> state symbols
	ii	divides each % by correct $A_r$ : i. $\frac{1.20}{1.0} : \frac{42.0}{35.5} : \frac{56.8}{16.0}$ <b>OR</b> 1.20, 1.18, 3.55 ✓  $\text{HClO}_3$ ✓	2	<b>ALLOW 1 mark</b> for empirical formula of $\text{HCl}_2\text{O}_6$ (use of atomic numbers) <b>ALLOW 1 mark</b> for empirical formula of $\text{H}_3\text{Cl}_3\text{O}$ (upside-down expression)  <b>ALLOW ECF</b> for use of incorrect $A_r$ values to get empirical formula but only if no over-rounding  <b>ALLOW 2 marks</b> for correct answer of $\text{HClO}_3$
	iii	the oxidation number of chlorine ✓	1	<b>ALLOW</b> 'the oxidation state of chlorine <b>OR</b> oxidation number of chlorine is 5' <b>DO NOT ALLOW</b> 'it' instead of 'chlorine'  <b>DO NOT ALLOW</b> 'the oxidation state <b>OR</b> number of chlorIDE is 5'
		<b>Total</b>	<b>14</b>	



Question			Answer	Marks	Guidance
3	(a)	(i)	<p><i>Nuclear charge mark</i> (Across the period) number of protons increases <b>OR</b> greater nuclear charge ✓</p> <p><b>Quality of written communication</b> – nuclear <b>OR</b> proton(s) <b>OR</b> nucleus spelled correctly <b>ONCE</b> for the first marking point</p> <p><i>Distance / shielding mark</i> (Outermost) electrons are in the same shell <b>OR</b> (Outermost) electrons experience the same shielding <b>OR</b> Atomic radius decreases ✓</p> <p><i>Nuclear attraction (to electron) mark</i> Greater nuclear attraction (on outermost electrons) <b>OR</b> (outer) electrons are attracted more strongly (to the nucleus) ✓</p>	3	<p><b>FULL ANNOTATIONS WITH TICKS, CROSSES, CON, etc MUST BE USED</b></p> <p>Comparison should be used for each mark</p> <p><b>IGNORE</b> atomic number increases, but <b>ALLOW</b> proton number increases <b>IGNORE</b> nucleus gets bigger <b>IGNORE</b> 'effective nuclear charge increases' <b>DO NOT ALLOW</b> 'charge' increases without reference to nuclear</p> <p><b>ALLOW</b> shielding is similar BUT <b>IGNORE</b> 'there is shielding' <b>DO NOT ALLOW</b> sub-shells <b>OR</b> orbitals</p> <p><b>ALLOW</b> greater nuclear pull for greater nuclear attraction <b>DO NOT ALLOW</b> use of greater nuclear charge for greater nuclear attraction for third mark</p>
		(ii)	(Diamond and graphite form) <b>gaseous atoms</b> (of carbon when they are ionised) ✓	1	<b>ALLOW</b> the <b>atoms</b> are in the <b>gaseous</b> state



Question		Answer			Marks	Guidance
	(b)		<b>Lithium</b>	<b>Carbon (diamond)</b>	<b>Fluorine</b>	<p><b>ALLOW</b> shared pair of electrons for covalent (bond)</p> <p><b>ALLOW</b> vdw for van der Waals'</p> <p><b>ALLOW</b> temporary–induced or instantaneous–induced for van der Waals'</p> <p><b>ALLOW</b> Positive ions for Li<sup>+</sup> ions</p> <p><b>IGNORE</b> 'Lithium ions' but <b>ALLOW</b> 'Positive lithium ions'</p> <p><b>DO NOT ALLOW</b> Li<sup>2+</sup></p> <p><b>IGNORE</b> C and <b>IGNORE</b> F<sub>2</sub></p> <p><b>IGNORE</b> diagrams but <b>ALLOW</b> names of particles if seen as a label on a diagram</p> <p><b>DO NOT ALLOW</b> implication that covalent bonds are broken in fluorine for the <i>particles</i> mark of fluorine as this implies the particles are atoms</p>
		<b>Structure</b>	Giant	Giant ✓	Simple	
		<b>Force or bond overcome on melting</b>	Metallic bond	Covalent (bond) ✓	van der Waals' (forces) <b>OR</b> induced dipoles ✓	
		<b>Particles between which the force or bond is acting</b>	Li <sup>+</sup> ions and (delocalised) electrons ✓	Atoms ✓	Molecules ✓	
<b>Total</b>					<b>10</b>	