

Question	Answer	Marks	Guidance												
1 a	<table border="1" data-bbox="344 185 1029 448"> <thead> <tr> <th></th> <th>Chlorine atom</th> <th>Oxide ion</th> </tr> </thead> <tbody> <tr> <td>Number of protons</td> <td>17</td> <td>8</td> </tr> <tr> <td>Number of neutrons</td> <td>20</td> <td>8</td> </tr> <tr> <td>Number of electrons</td> <td>17</td> <td>10</td> </tr> </tbody> </table> <p>chlorine - number of protons and number of neutrons correct (1)</p> <p>oxide ion – number of neutrons correct (1)</p> <p>- number of electrons correct (1)</p>		Chlorine atom	Oxide ion	Number of protons	17	8	Number of neutrons	20	8	Number of electrons	17	10	3	
	Chlorine atom	Oxide ion													
Number of protons	17	8													
Number of neutrons	20	8													
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b	<p>J J Thomson - discovered the electron (1)</p> <p>Bohr suggested - that electrons occupy orbits / electrons in shells / electrons in energy levels (1)</p>	2	<p>ignore reference to plum pudding model</p> <p>allow discovered that atoms have electrons</p> <p>not electrons were found in the nucleus / discovered that electrons orbit the nucleus / reference to ions</p> <p>not discovered neutrons or protons</p> <p>negative particles in shells is not sufficient</p> <p>allow reference to orbitals</p> <p>ignore reference to other aspects of atomic structure e.g. protons and neutrons</p>												
Total		5													

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2 a	relative mass of neutron (1) relative charge of electron (1)	2	<table border="1"> <thead> <tr> <th>Particle</th> <th>Relative charge</th> <th>Relative mass</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>+1</td> <td>1</td> </tr> <tr> <td>neutron</td> <td>0</td> <td>1</td> </tr> <tr> <td>electron</td> <td>-1</td> <td>0.0005</td> </tr> </tbody> </table>	Particle	Relative charge	Relative mass	proton	+1	1	neutron	0	1	electron	-1	0.0005
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b i	molecules (1) high (1)	2	<table border="1"> <thead> <tr> <th></th> <th>Sodium chloride</th> <th>Carbon dioxide</th> </tr> </thead> <tbody> <tr> <td>Formula</td> <td>NaCl</td> <td>CO₂</td> </tr> <tr> <td>Type of particles present</td> <td>ions</td> <td>molecules</td> </tr> <tr> <td>Melting point</td> <td>high</td> <td>low</td> </tr> </tbody> </table>		Sodium chloride	Carbon dioxide	Formula	NaCl	CO ₂	Type of particles present	ions	molecules	Melting point	high	low
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ii	weak forces between molecules / weak intermolecular forces (1)	1	<p>allow weak forces between particles, but not weak forces between ions or between atoms</p> <p>allow weak intermolecular bonds / weak bonds between molecules</p> <p>not weak intermolecular forces between atoms / weak covalent bonds</p> <p>weak forces and weak bonds on their own are not sufficient</p>												
	Total	5													

Question	Answer	Marks	Guidance
3 a	<p>Level 3 Deduce the number of protons, neutrons and electrons and the electronic structure for the atom of aluminium AND Identifies both the group and period for aluminium Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>Level 2 Deduce the number of protons, neutrons and electrons in the aluminium atom or the electronic structure and identifies the group or the period of aluminium OR Deduce the number of protons and neutrons in the aluminium atom and the electronic structure of aluminium Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Deduce the number of protons and neutrons OR Deduce the electronic structure for aluminium OR Identifies the group or the period of aluminium Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p>	6	<p>This question is targeted at grades up to A*.</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • number of protons is 13 / bottom number is number of protons • number of neutrons is 14 / difference between mass number and atomic number • number of electrons is 13 / same as number of protons • electronic structure is 2.8.3 – this also shows 13 electrons • Al is in the 3rd period / the number of (occupied) shell electrons is the period number • Al is in Group 3 / the number of electrons in the outer shell is the group number <p>Allow row for period and column for group</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>

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	Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		

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b	Any two from: Fired alpha particles at gold foil (1) Geiger and Marsden's experiment gave unexpected results / some alpha particles rebounded (1) led to theory of nuclear atom / idea of atoms having a nucleus (1)	2	Allow wrong particle rebounded if mentioned already at MP1 Allow reflected rather than rebounded Ignore reference to electrons, protons and shells Atoms have a dense centre is not sufficient
		8	

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4	(a)	${}_{15}^{32}\text{P}$ (1) 18 electrons (1)	2	<table border="1"> <thead> <tr> <th rowspan="2">atom or ion</th> <th colspan="3">number of</th> </tr> <tr> <th>electrons</th> <th></th> <th>protons</th> </tr> </thead> <tbody> <tr> <td>${}^1_1\text{H}$</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>${}^2_1\text{H}$</td> <td>1</td> <td></td> <td>1</td> </tr> <tr> <td>${}_{15}^{31}\text{P}$</td> <td>15</td> <td></td> <td>15</td> </tr> <tr> <td>${}_{15}^{32}\text{P}$</td> <td>15</td> <td></td> <td>15</td> </tr> <tr> <td>${}_{16}^{32}\text{S}^{2-}$</td> <td>18</td> <td>16</td> <td></td> </tr> </tbody> </table> <p>allow ${}^{32}\text{P}$ not ${}_{32}\text{P}$</p>	atom or ion	number of			electrons		protons	${}^1_1\text{H}$	1		1	${}^2_1\text{H}$	1		1	${}_{15}^{31}\text{P}$	15		15	${}_{15}^{32}\text{P}$	15		15	${}_{16}^{32}\text{S}^{2-}$	18	16	
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	(b)	same atomic number and different mass number (1)	1	<p>allow same proton number or number of protons and different number of neutrons or atomic mass allow same element but different mass number / same type of atom and different number of neutrons ignore same number of electrons not different relative atomic mass</p>																											

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	(c)	<p>any two from:</p> <p>so results can be replicated / so work does not need to be duplicated (1)</p> <p>so further evidence can be collected (1)</p> <p>idea of peer review / work can be checked (1)</p> <p>to provide information to other scientists or public or other organisations / AW (1)</p> <p>so he can get recognition for his work (1)</p>	2	<p>allow work can be developed further (1)</p> <p>allow so work can be evaluated (1)</p> <p>allow idea that information can be used by other scientists (1)</p> <p>allow idea of to increase the sum of human knowledge / to educate people (1)</p> <p>allow so other scientists cannot take credit (1)</p>
		Total	5	

Question	Answer	Marks	Guidance
5 a	C_2H_6 / H_6C_2 (1)	1	the numbers must clearly be subscripts not C^2H^6 / C2H6
b	B contains carbon and hydrogen (1) only / AW (1) C contains oxygen / has oxygen in the formula / does not contain only carbon and hydrogen (1)	3	allow (formula) has only (1) H and C (1) the only is not an independent mark and must be linked to the carbon and hydrogen not contains carbon and hydrogen molecules / contains a mixture of carbon and hydrogen not hydro atoms but ignore for the third marking point allow C has three elements / C has three different atoms (1) not C contains oxygen molecules
c	A and F (1)	1	both needed
	Total	5	