

Atomic Structure

Mark Scheme 5

Level	IGCSE(9-1)
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2C)
Topic	Principles of Chemistry
Sub-Topic	Atomic Structure
Booklet	Mark Scheme 5

Time Allowed: 41 minutes

Score: /34

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				Accept	Reject	Marks
1 (a)	Element	Arrangement of electrons in atom	Arrangement of electrons in ion	Charge on ion	K ⁽¹⁾⁺ / K ⁺¹ S ²⁻ / S ⁻²		3
			2.8.8	(1)+/+1			
			2.8.8	2-/-2			
<p>M1 – <u>both</u> arrangements correct</p> <p>M2 – charge on potassium ion</p> <p>M3 – charge on sulfide ion</p>					positive for potassium and negative for sulfide for 1 mark		
(b) (i)	<u>ions</u> move/travel (to the electrodes)				<u>ions</u> are free to move / <u>ions</u> are mobile	electrons free to move	1
	(ii)	<p>M1 (electrostatic) forces (of attraction) between (oppositely charged) <u>ions</u></p> <p>M2 are (relatively) strong</p> <p>M3 large amount of energy required to overcome the forces / separate the ions from the lattice</p> <p>M2 dep on mention of forces (of attraction) or bonds</p> <p>Mention of covalent bonds or intermolecular forces no M1</p>				<p><u>ionic bonding</u> / <u>ionic bonds</u></p> <p>break the bonds</p>	

Total 7 marks

Question number			Answer	Notes	Marks
2	a		cross in box C (neutrons and protons)		1
	b	i	6		1
		ii	14		1
	c		cross in box B (the numbers of electrons and protons are equal)		1
	d	M1	same number of protons / (they both have) 6 protons	Ignore references to electrons	1
		M2	different numbers of neutrons / more neutrons	If number of extra neutrons specified, it must be 2 Reject different numbers of electrons	1
				Ignore references to atomic number and mass number	
	e		cross in box B (2.4)		1
TOTAL					7

Question number	Expected Answer	Accept	Reject	Marks												
3 (a)	<table border="1"> <thead> <tr> <th></th> <th>Proton</th> <th>Neutron</th> <th>Electron</th> </tr> </thead> <tbody> <tr> <td>relative mass</td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>relative charge</td> <td></td> <td>0</td> <td>-</td> </tr> </tbody> </table> <p>1 mark for each correct answer</p>		Proton	Neutron	Electron	relative mass	1			relative charge		0	-	+1	- 1 / one Zero minus one /negative	4
	Proton	Neutron	Electron													
relative mass	1															
relative charge		0	-													
(b) (i)	Protons <u>AND</u> electrons = 1 neutrons = 2	one two		1 1												
(ii)	<u>atoms</u> of the same element with different masses Ignore references to electrons	atoms with same atomic number / number of protons / proton number with different mass numbers / different numbers of neutrons / different neutron numbers	molecules / compounds for first mark only different relative atomic masses for second mark only	1 1												

Question number	Expected Answer	Accept	Reject	Marks
3(c)	$((79 \times 50.7) + (81 \times 49.3))/100$ <p>OR</p> $(79 \times 0.50.7) + (81 \times 0.493)$ <p>= 79.99 Allow 1 mark for a single transcription error (e.g. 43.9 instead of 49.3) Ignore units such as grams</p>	Correct answer on its own scores 2		1 1
			Total	10

Question number	Answer	Notes	Marks
4 a	A (the crystal dissolves)		1
b	A (it is all blue)		1
c i	4		1
ii	21		1

Question number	Answer	Notes	Marks									
5 a	<table border="1"> <thead> <tr> <th>Halogen</th> <th>Colour</th> <th>Physical state</th> </tr> </thead> <tbody> <tr> <td>bromine</td> <td></td> <td>liquid</td> </tr> <tr> <td>iodine</td> <td>black</td> <td></td> </tr> </tbody> </table>	Halogen	Colour	Physical state	bromine		liquid	iodine	black		<p>M1 (bromine) liquid / (l)</p> <p>M2 (iodine) black allow (dark) grey</p>	2
Halogen	Colour	Physical state										
bromine		liquid										
iodine	black											
b	<pre> •• xx •• : Br x P x Br : •• xx •• : Br : •• </pre>	<p>M1 three bonding pairs of electrons correct</p> <p>M2 rest of electrons correct</p> <p>Accept any combination of dots and crosses Ignore circles</p>	2									
c	$\text{PBr}_3 + 3\text{H}_2\text{O} \rightarrow 3\text{HBr} + \text{H}_3\text{PO}_3$	<p>M1 all formulae correct</p> <p>M2 balanced M2 DEP on M1</p>	2									

Total 6 marks