Atomic Structure

Mark Scheme 4

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 4

Time Allowed: **53 minutes**

Score: **/44**

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	i	C (neutrons and protons)		1
		ii	A (6)		1
		iii	D (11)		1
	b		4		1
	c	i	P AND T		1
		ii	S		1
	d		(one) more electron than protons **OR** (one) fewer proton than electrons	Accept more electrons than protons Accept fewer protons than electrons Accept 2 electrons and 1 proton Ignore references to electron gained	1
					Total 7 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>2 a</td><td><table><tr><td>Number of protons</td><td>6</td></tr><tr><td>Number of neutrons</td><td>6</td></tr><tr><td>Number of electrons</td><td>6</td></tr></table></td><td>M1 protons and electrons correct

M2 neutrons correct</td><td>2</td></tr>
<tr><td>b i</td><td>3</td><td></td><td>1</td></tr>
<tr><td>ii</td><td>M1 33

M2 Z is two places/columns/groups/positions after X
OR
Z is in Group 5 and X is in Group 3</td><td>Accept has 2 more protons (than X)

Ignore references to atomic number increasing by 2
Ignore number of protons increases with group number
Ignore references to elements being arranged according to number of protons

31 + 5 – 3 = 33 scores 2 marks</td><td>2</td></tr>
<tr><td>iii</td><td>2.8 / 2,8 / 2 and 8 separated by other mark
eg : or / or) or space</td><td>Do not accept 28 (ie no space)
Accept correct sp notation</td><td>1</td></tr>
</table>

Question number	Answer	Notes	Marks
2 b iv	M1 (similarity) one electron/same number of electrons in outer shell M2 (difference) different number of (electron) shells / T has (one) more (electron) shell / J has (one) less (electron) shell /J has 2 shells and T has 3 /J is 2.1 and T is 2.8.1	Accept rings and energy levels in place of shells in M1 and M2 Accept valence electrons in place of outer shell electrons Accept configuration ends in 1 Accept same outer shell Accept 2 electrons in first/inner shell Accept going down the column there is 1 more shell Ignore T has an extra number Ignore T has 8 more electrons	2
			Total 8 marks

Question number			Answer	Notes	Marks
3	a	i	period	Ignore number of period	1
		ii	Any two of sodium / magnesium / aluminium	Ignore symbols Na, Mg, Al	1
		iii	Ar / argon	If name and symbol both given, then both must be correct	2
			(it does) not easily gain/lose electrons OR has 8 electrons in outer shell	Accept (it has) a full outer shell Ignore 2.8.8 Ignore inert/noble gas Ignore references to Group number Ignore stable M2 DEP on M1	
	b		one electron/same number of electrons AND reference to outer/valence (shell/energy level/orbit)	Reject incorrect number of electrons Ignore similar electronic configurations Ignore actual electronic configurations	1
	c	i	C / carbon		1
		ii	S / sulfur		1
	d		8 for both protons AND electrons 10 neutrons	Accept words Accept words	1 1

(Total for Question 3 = 9 marks)

Question number	Answer	Notes	Marks
4 a	cross in box **D** (neutrons and protons)		1
b	electrons protons AND electrons electrons	 Accept in either order	1 1 1
c	cross in box **A** (2.8)		1
d i	same number of protons different numbers of neutrons	Reference to atoms or elements not essential Do not award M2 if incorrect statement about electrons Max 1 if reference to molecules/compounds/ions	1 1
ii	20.2/A_r closer to 20 (than 22)	OWTTE	1
e i	unreactive	OWTTE Accept does not react	1
ii	(atoms) do not (readily) lose/gain electrons OR contain 8 electrons in outer shell/energy level	Accept outer shell complete Accept orbit Ignore references to Group number Ignore stable	1

(Total for Question 4 = 10 marks)

Question number			Answer	Notes	Marks
5	(a)		does not easily lose / gain electrons	Accept has a complete/full outer shell/octet (of electrons) Accept has 8 electrons in outer shell Ignore references to being stable / inert / a noble gas	1
	(b)		B (2.8.18.8)		1
	(c)	(i)	M1 for idea of electron transfer / loss and gain of electron(s) M2 for direction of transfer M3 for number of electrons transferred	0/3 for electron sharing Ignore covalent eg calcium loses, chlorine gains electrons eg calcium loses 2, (each) chlorine gains 1 Penalise use of chloride in place of chlorine once only All marks may be scored from a correctly labelled diagram	3
		(ii)	Ca^{2+}	Accept Ca^{+2} / Ca^{++} Reject all other ions Penalise incorrect use of lower and upper case letters and position of charge If equation written containing calcium ion formula, the ion must be identified in some way, such as circling or underlining	1
		(iii)	A calcium (and) calcium		1

Question number			Answer	Notes	Marks
5	(d)		M1 (step 1) dip a platinum wire into some concentrated **hydrochloric acid** M2 (step 3) place the wire and sample into **non-luminous** Bunsen flame	Accept complete statements or changes M1 Do not penalise references to dilute instead of concentrated Accept hydrochloric acid / HCl M2 Accept blue flame / roaring flame Ignore references to hot / hotter / hottest flame	2
	(e)		B (lilac)		1
				Total for Question 5	**10**