Marking scheme for Core Worksheet – Chapter 4

1

H 1																	He 2
Li 3	Be 4											B 5	C 6	N 7	O 8	F 9	Ne 10
Na 11	Mg 12											Al 13	Si 14	P 15	S 16	Cl 17	Ar 18
K 19	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Co 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	As 33	Se 34	Br 35	Kr 36
Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54
Cs 55	Ba 56	La 57	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	Pt 78	Au 79	Hg 80	Tl 81	Pb 82	Bi 83	Po 84	At 85	Rn 86

a all correct for 2 marks, fewer than 4 correct for 0 marks [2]

b all correct for 2 marks, lose 1 mark for each mistake [2]

c group [1]

same number of electrons in outer shell/same outer shell electronic configuration [1]

similar chemical properties [1]

d Hydrogen, like Li, Na, K, has one electron in its outer shell. [1]

Hydrogen is a non-metal and forms mostly covalent compounds but Li, Na, K are metals that form ionic compounds. [1]

e 48 [1]

2 **a** potassium atom is bigger [1]

more shells of electrons [1]

outer electrons further from nucleus in K [1]

less strongly held by nucleus [1]

b Electronegativity increases across a period [1]

fluorine has the most protons in period 2 (except Ne, which does not form compounds).[1]

Electronegativity decreases down a group [1]

fluorine is the smallest element in group 7 and so has the greatest attraction for bonding electrons. [1]

c Sodium and chlorine are in the same period and have same number of shells of electrons [1]

but chlorine has more protons [1]

shielding is approximately the same []1

so outer electrons pulled in more strongly in chlorine. [1]

d Cl^- has three full shells of electrons but Na^+ only has two [1]

so there is more electron–electron repulsion in Cl^-. [1]

3 **a** K^+ Ar Cl^- [1]

they all have the same number of electrons, therefore the amount of electron–electron repulsion is approximately the same [1]

K^+ has a higher nuclear charge than Ar, and Ar has a higher nuclear charge than Cl^- [1]

the electrons are pulled in more strongly by the nucleus of K^+ [1]

b Al^{3+} Mg^{2+} Na^+ [1]

they all have the same number of electrons, therefore the amount of electron–electron repulsion is approximately the same [1]

Al^{3+} has a higher nuclear charge than Mg^{2+}, and Mg^{2+} has a higher nuclear charge than Na^+ [1]

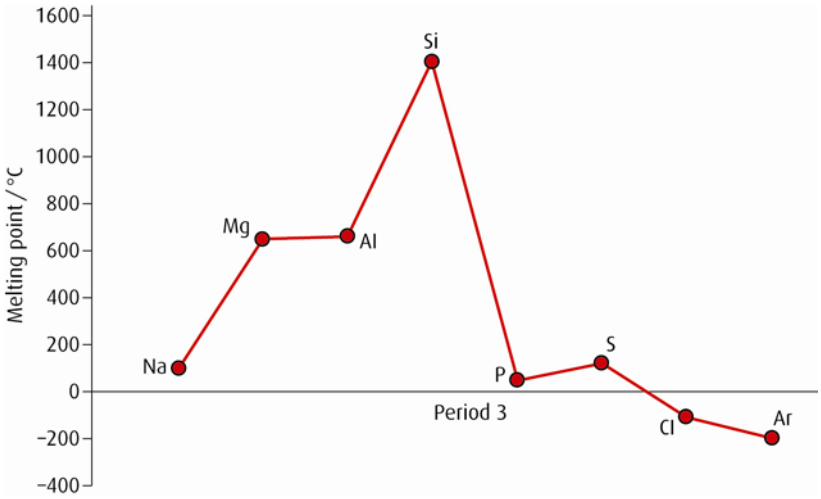
the electrons are pulled in more strongly by the nucleus of Al^{3+} [1]

c Cl Cl^- I^- [1]

Cl is smaller than Cl^- as there is less electron–electron repulsion for the same nuclear charge [1]

I^- has two more shells of electrons than Cl^- [1]

4 **a**



2 marks for all points plotted correctly, lose 1 mark for each mistake [2]

b Na–Al all have metallic bonding [1]

increase in melting point as charge on the ion increases ($Na^+ \rightarrow Mg^{2+} \rightarrow Al^{3+}$) [1]

the size of the ion decreases and there are more electrons in the sea of electrons from Na to Al [1]

Si has a giant covalent structure [1]

strong covalent bonds must be broken when it is melted [1]

P, S and Cl are covalent molecular while Ar is atomic [1]

P_4 molecules have a lower M_r than S_8 molecules, therefore weaker van der Waals' forces [1]

Cl_2 has a lower M_r than S_8 and Ar has a lower relative atomic mass than Cl_2 [1]

van der Waals' forces decrease in strength from S to Cl to Ar [1]

5 **a** $2Na + 2H_2O \rightarrow 2NaOH + H_2$ [1]

b $Cl_2(aq) + 2KBr(aq) \rightarrow Br_2(aq) + 2KCl(aq)$ [1]

6 **a** **i** SO_2 [1]

ii P_4O_{10} [1]

iii Cl_2O [1]

b **i** phosphorus(III) oxide [1]

ii sulfur(VI) oxide [1]

iii chlorine(VII) oxide [1]

c **i** giant [1]

ii molecular [1]

iii molecular [1]

iv giant [1]

v molecular [1]

d **i** yes [1]

ii no [1]

iii no [1]

iv yes [1]

7 **a** $Na_2O(s) + H_2O(l) \rightarrow 2NaOH(aq)$ [1]

b $MgO(s) + H_2O(l) \rightarrow Mg(OH)_2(aq)$ [1]

c $P_4O_{10}(s) + 6H_2O(l) \rightarrow 4H_3PO_4(aq)$ [1]

d $SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$ [1]

8 Sodium oxide reacts with acids to form salts. [1]

$Na_2O + 2HCl \rightarrow 2NaCl + H_2O$ (or reaction with any other acid) [1]