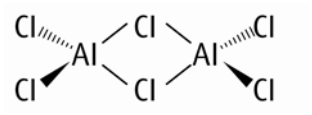
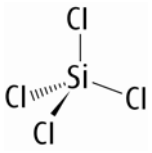
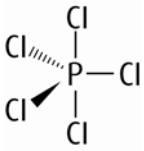
Marking scheme for AHL Worksheet – Chapter 4

1 **a**  [1]

b  [1]

c  [1]

d  [1]

2 **a** $SiCl_4(l) + 4H_2O(l) \rightarrow Si(OH)_4(s) + 4H^+(aq) + 4Cl^-(aq)$ [1]

acidic [1]

$PCl_5(l) + 4H_2O(l) \rightarrow H_3PO_4(aq) + 5H^+(aq) + 5Cl^-(aq)$ [1]

acidic [1]

3 **a** $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$ [1]

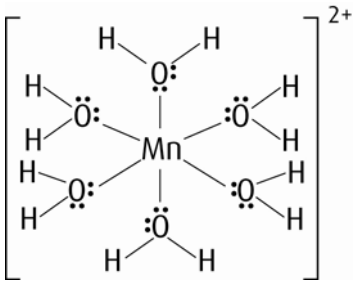
b $1s^2 2s^2 2p^6 3s^2 3p^6$ [1]

c $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2$ [1]

d $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ [1]

e $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$ [1]

4 They do not have a partially filled d subshell in any of their stable oxidation states (except 0). [1]

5  [1]

Ligand: molecule/negative ion with a lone pair of electrons [1]

that forms a dative covalent bond/co-ordinate link to a transition metal ion. [1]

6 **a** +2 [1]

b +4 [1]

c +3 [1]

d 0 [1]

e +7 [1]

f +2 [1]

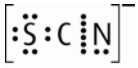
7 Ni^{2+} has a partially filled d subshell. [1]

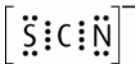
In the complex ion the d orbitals are split into two groups [1]

energy corresponding to a photon of light in the visible part of the spectrum is absorbed [1]

to promote an electron from the lower set of d orbitals to the upper set [1]

the complementary colour is transmitted/reflected. [1]

8 **a**  [1]

 [1]

b **i** There are lone pairs on the N and S [1]

therefore it can form dative covalent bonds to a transition metal ion from N or S. [1]

ii +3 [1]

c **i** $[Fe(H_2O)_6]^{3+} + SCN^- \rightarrow [Fe(H_2O)_5(SCN)]^{2+} + H_2O$ [1]

ii The solution of Fe^{2+} was oxidised by the air so that some Fe^{3+} is now present. [1]