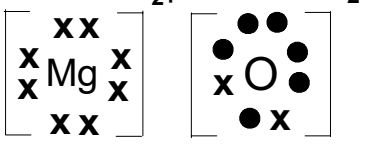
Question	Answer	Marks
1(a)(i)	n /oxygen/fluorine/neon;	1
1(a)(ii)		1
1(a)(iii)		1
1(a)(iv)	ni	1
1(a)(v)		1
1(a)(vi)		1
1(a)(vii)	/fluorine;	1
1(a)(viii)		1
1(b)(i)	$_2O_3$;	1
1(b)(ii)	$_3N$;	1

Question	Answer	Marks
2(a)(i)	<u>number of protons</u> in one atom of an element;	1
2(a)(ii)	**M1** <u>number of protons and neutrons</u> in one atom of an element; **M2** in one atom of an element;	2 1 1
2(b)	A 6 6 6 $^{12}_6C$ B 12 12 12 $^{24}_{12}Mg$; C 8 10; 8; $^{16}_8O^2$ D 11 10 13 $^{24}_{11}Na^+$ 11, 24; Na;+;	6

Question	Answer	Marks
3(a)	the number of e gained or lost = numerical value of oxidation state; any two from: • Na to Al (Si) lose e ; • (Si) P to Cl gain e ; • Si gains and loses e / Ar neither gains nor loses e ;	**1** **2**
3(b)	**M1** positive ions / cations / metallic ions; the (correct) particles named in **M1** are arranged in a lattice / rows / layers; sea of electrons / delocalised electrons;	**3**
3(c)	they have mobile electrons;	**1**
3 (d)	chlori	**1**
3(e)	strong covalent bonds ; in a giant lattice / macromolecule / giant (structure);	**2**

Question	Answer	Marks
3(f)	any two from: • sodium chloride is ionic **and** PCl_3 is covalent; • ionic bonds are strong **and** intermolecular forces are weak; • PCl_3 reacts with water **and** NaCl does not;	**2**
3(g)	MgO will react with / dissolve in / neutralise hydrochloric acid / acid / acid oxide; if amphoteric, MgO will react with or dissolve in or neutralise hydrochloric acid or acid or acid oxide **and** MgO will react with dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide; MgO will not react with or dissolve in or neutralise sodium hydroxide or alkali or base or basic oxide = [2]	**2**
3(h)	 magnesium with 8 or 0 outer shell electrons; oxygen with 8 outer shell electrons and 2 indicated differently from the other 6 and these 2 electrons must match the Mg electrons if these have been shown; correct charges;	**3**

Question	Answer	Marks
4 (a)	sul dioxide / SO_2;	**1**
4(b)	hydr / H_2;	**1**
4(c)	et / C_2H_4;	**1**
4(d)	a / Ar;	**1**
4(e)	car monoxide / CO;	**1**
4(f)	met / CH_4;	**1**

5(a)	M1 add chlori**n**e to (potassium) iodi**d**e solution; M2 red / brown / yellow / orange (solution) is formed; M3 Cl_2 + 2KI → 2KCl + I_2 Cl_2 + 2I → 2Cl + I_2 ;	**3**	Solution must be implied for M1 **A** any soluble iodide solution **A** black (ppt or solid) **A** multiples **I** state symbols but KI(aq) would allow the solution aspect of mark in M1
5(b)	M1 (0.013 moles of I and 0.065 moles of F atoms gives a) ratio 1:5; Formula = IF_5 ;	**2**	Award 2 marks for IF_5 **A** one mark for I_5F (as ratio is inverted) **A** one mark for IFl_5 or I_5Fl

Question	Answer	Marks	Guidance
5(c)(i)	example of a reversible reaction including attempts at removing / adding waters of crystallisation **OR** example of a reaction which under closed conditions would be reversible;	**1**	**A** written description of the reaction e.g. 'Haber process' unless equation is attempted in which case ignore written description **A** word equations / unbalanced equations **A** equations without equilibrium arrows **I** descriptions of physical changes
5(c)(ii)	*Any **two** from:* (a reaction) M1 which can take place in both directions **OR** which can be approached from both directions; M2 in which concentrations / macroscopic properties do not change (with time); M3 the two reaction rates are equal;	**2**	**I** reference to 'closed system' **A** 'a reaction which can go forwards and backwards' for M1 **I** 'a reaction with an equilibrium arrow' or with '⇌' for M1 **R** concentrations (of reactants and products) are the same
5(d)	M1 equilibrium goes to LHS **OR** equilibrium goes to reactants side; M2 because the concentration of chlorine decreases;	**2**	**A** reaction goes to LHS but **R** 'equilibrium goes to LHS and to products side' **A** backward reaction is favoured **I** less yield or less products **A** 'reactant' for 'chlorine' but not reactants **A** to replace missing chlorine

Question	Answer	Marks	Guidance
5(e)	M1 equilibrium goes to RHS **OR** equilibrium goes to products side; M2 exothermic reactions are favoured by low temperatures; M3 the forward reaction is exothermic;	**3**	**A** reaction goes to RHS but **R** 'equilibrium goes to RHS and to reactants side' **A** forward reaction is favoured **I** more yield or more products **A** for M1 and M2 'decreasing temperature makes the equilibrium go to RHS' **A** backward reaction is endothermic

Question	Answer	Marks	Guidance
6(a)	high melting point / mp / mpt **OR** high boiling point / bp / bpt; poor / non conductor (when liquid and / or solid);	**3**	**I** mpt/bpt above room temp
(b)	(good) conductor when <u>solid</u> (and liquid);	**2**	**A** (good) conductor in any state / both states **I** high melting point/boiling point **R** low melting point/boiling point
(c)	melting point / –7 (°C) is below room temperature / 25 (°C) / RTP ora; boiling point / 59 (°C) is above room temperature / 25 (°C) / RTP ora;	**3**	**I** low melting point / boiling point / conductivity 25 (°C) / room temperature / RTP is in between –7 (°C) and 59 (°C) **OR** 25 (°C) / room temperature / RTP is between mpt and bpt would both score the 2 evidence marks
(d)	high melting point / mp / mpt **OR** high boiling point / bp / bpt; **BOTH** poor / non conductor when solid **and** good conductor when liquid **OR** molten / only conduct when liquid;	**3**	**A** melting point **and** boiling point both above room temp / 25 °C / RTP **I** conducts when aqueous or in solution **I** conducts in liquid due to free electrons