A Level AQA Chemistry

Chapter 11 – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	Sodium oxide is ionic so strong attraction between oppositely charged ions Sulfur dioxide is molecular covalent so weak attractions/dipole-dipole So less energy is needed to separate the molecules		1 1 1	3.2.4 AO1
01.2	Aluminium oxide has smaller, more highly charged positive ions / greater charge density Oxide ions can get closer So stronger bonds form/more tightly held	Allow Al is a 3^+ Na is a 1^+	1 1 1	3.2.4 AO1
01.3	$Na_2O + H_2O \rightarrow 2\ NaOH$ pH 12–14 Aluminium oxide is insoluble pH 7 $SO_2 + H_2O \rightarrow H_2SO_3$ pH 1–3	Mark pH from equation independently Allow multiples Allow 'Al does not react'	1 1 1 1 1 1	3.2.4 AO1
02.1	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$		1	3.1.1.3 AO1
02.2	$P_4 + 5O_2 \rightarrow P_4O_{10}$	must be P_4 Reject P_2O_5	1	3.2.4 AO1
02.3	$P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$ The pH (of phosphoric acid) is 1–3		1 1	3.2.4 AO1

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02.4	Sample in suitable melting point apparatus (e.g. capillary in oil bath/Thiele tube / melting point apparatus) Heat slowly/gradually/gently (to establish melting point range) Lower melting point / (broad) range of melting point indicates presence of impurities	Do not allow water bath OR melting point agrees with/ close to data book value / melts sharply/over narrow range / melting point exactly 573 K indicates purity	1 1 1	3.2.4 AO3
03.1	$Si + O_2 \rightarrow SiO_2$		1	3.2.4 AO1
03.2	$4Na + O_2 \rightarrow 2Na_2O$		1	3.2.4 AO1
03.3	Silicon (di)oxide has the highest melting point Silicon dioxide has a giant/macromolecular covalent structure Sodium oxide is ionic (crystal) structure More energy needed to break the strong covalent bonds in silicon dioxide		1 1 1 1	3.2.4 AO1
04.1	A and E Both have low melting points OR weak intermolecular forces/van der Waals		1 1 1	3.2.4 AO1
04.2	Add water Test pH/add indicator pH 13–14	Accept flame test Flame colour Yellow flame	1 1 1	3.2.4 AO1

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04.3	B Highest melting point Giant/ macromolecular covalent/strong covalent bonds		1 1 1	3.2.4 AO1
04.4	Add sodium hydroxide solution to both samples Magnesium oxide would not dissolve/ no visible change Aluminium oxide would react Then dissolve	Award only 3 if no mention of reaction	1 1 1 1	3.2.4 AO1
05.1	Ionic lattice / solid / giant ionic Strong forces between ions		1 1	3.2.4 AO1
05.2	Covalent molecules Weak forces of attraction **between** molecules		1 1	3.2.4 AO1
05.3	P_4O_{10} is larger/more electrons Stronger van der Waals forces/dipole-dipole forces of attraction		1 1	3.2.4 AO1
05.4	$Na_2O(s) + H_2O(l) \rightarrow 2Na^+(aq) + 2OH^-(aq)$ pH = 12–14 $P_4O_{10}(s) + 6H_2O(l) \rightarrow 12H^+(aq) + 3PO_4^{3-}(aq)$ pH 0–2	State symbols required	1 1 1 1	3.2.4 AO1
05.5	$6Na_2O + P_4O_{10} \rightarrow 4Na_3PO_4$		1	3.2.4 AO1
06.1	$S(g) \rightarrow S^+(g) + e^-$		1	3.1.1.3 AO1
06.2	Electron is $3p^4$/paired in p orbital Repulsion makes it easier to remove		1 1	3.1.1.3 AO1

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06.3	$S(g) + 1.5O_2(g) \rightarrow SO_3(g)$	Must have state symbols	1	3.1.4.1 AO1
06.4	Both are simple/molecular covalent Sulfur has large rings/S_8/lots of electrons Strong van der Waals Sulfur trioxide is smaller dipole-dipole/intermolecular forces are weaker	If this is contradicted then 0 scored	1 1 1 1 1	3.1.3.7 AO1
06.5	$2(-395) - 2(296) = -198\ kJ\ mol^{-1}$		1 1	3.1.4.3 AO2 MS2.4
06.6	$CaSO_4$ Reduces acid rain		1 1	3.2.4 AO3

Skills boxes Answers:

1. $ab^2 = 1.538 \times 10^4 \times 15.98704^2 = 3\,930\,904.1896\ldots$, which rounds to 3 931 000 or 3.931×10^6 (4 s.f.)
2. $a + b + c = 1.538 \times 10^4 + 15.98704 + 19 = 15\,414.9870\ldots$, which rounds to 15 000 or 1.5×10^4 (2 s.f.)
3. $d \times (b + c) = 3 \times 10^{-6} \times (15.98704 + 19) = 0.000104961\ldots$, which rounds to 0.0001 or 1×10^{-4} (1 s.f.)
4. $\log_{10} b = \log_{10} 15.98704 = 1.203768061578\ldots$, which rounds to 1.203768 (7 s.f.)
5. $10^d = 10^{3 \times 10^{-6}} = 1.0000069077\ldots$, which rounds to 1 (1 s.f.)