chloride of element (iv) can be electrolysed to extract the element, similar to silicon tetrachloride. The chloride of (i) is most likely a simple molecular structure whose melting point is low. (ans)

09-1-M-24

07ZZ09-1-M-24

**B** As the oxide of A is basic, it is most likely ionic. That of B is mainly ionic and partially covalent, and is thus an amphoteric oxide. The oxide of C could be macromolecular or covalent, and thus is acidic. Therefore the order in terms of increasing atomic size: A < B < C.

Across A period, the electronegativity increases. If the elements belonged to period 3, then A could be sodium; B aluminium, and C phosphorous. The ionic radius would be in the order C > B > A. (ans)

09-1-M-25

07ZZ09-1-M-25

**D** Aluminium oxide is amphoteric, i.e. it reacts with both acids and bases. However, aluminium chloride is a Lewis acid. Aluminium chloride dimerises at 180°C to form its readily vapourised dimer, $Al_2Cl_6$. As the bonds between aluminium oxide molecules are mainly ionic, it does not sublime, and it melts at a very high temperature of 2050°C. Aluminium oxide is insoluble in water. (ans)

09-1-M-26

07ZZ09-1-M-26

**B** The boiling points of the elements depend greatly on the structure and bonding in the substance. Element G has a high boiling point which could be due to its giant molecular structure. Thus G is a covalent compound which does not conduct electricity. Element D has a lower boiling point and could have a simple molecular structure. The oxide of D is therefore acidic. Element A and beryllium are in the same period and not group. It is impossible to tell the atomic size from the boiling point as structure and bonding are the factors directly affecting the boiling point of a substance. (ans)

09-1-M-27

07ZZ09-1-M-27

**C** There is a horizontal line in graph 2 which could indicate the electrical conductivity of elements as sodium, magnesium and aluminium are good electrical conductors, unlike silicon and phosphorous which have little or no conductivity. The melting point of the oxides and chlorides depend on the structure and bonding in a substance and is generally high for metal oxides and silicon oxide which has a giant covalent structure. Sodium and magnesium chlorides are ionic and thus have high melting points. Aluminium, silicon and phosphorous chlorides however, have lower melting points as they are covalent compounds with simple molecular structures. (ans)

09-1-M-28

07ZZ09-1-M-28

**A** Sodium chloride is ionic and undergoes hydration to produce a neutral solution. Aluminium, silicon and phosphorous chlorides react with water to form acidic solutions. (ans)

09-1-M-29

07ZZ09-1-M-29

**B** Calcium is in the same group as magnesium and could be expected to react in a similar fashion as magnesium. Calcium oxide would react with water to a small extent but its reactivity increases if cold water is used. An alkaline solution is produced. Group II nitrates can be heated to produce the oxides, nitrogen dioxide gas and oxygen gas. The redox potential becomes more negative down the group indicating that the elements become better reducing agents down the group. Thus calcium oxide cannot be reduced by magnesium which is higher up in the group. (ans)

09-1-M-30

07ZZ09-1-M-30

**C** The electronegativity of elements increases across a period while the atomic radius decreases. As the ionic radius increase down a group, the polarizing power of the cation will decrease. Down a group, the redox potential becomes more negative, thus the reducing power increases. (ans)