1 The melting temperature of sodium is lower than the melting temperature of magnesium. The **best** explanation for this is

☒ **A** sodium atoms are smaller than magnesium atoms.

☒ **B** sodium ions have a larger charge density than magnesium ions.

☒ **C** the repulsion between the ions in sodium is less than in magnesium.

☒ **D** the number of delocalised electrons per atom is fewer in sodium than in magnesium.

(Total for Question = 1 mark)

2 A trend going down Group 1 is that the

☒ **A** first ionization energy of the element decreases.

☒ **B** lattice energy of the chloride becomes more negative.

☒ **C** radius of the atom decreases.

☒ **D** melting temperature of the element increases.

(Total for Question = 1 mark)

3 Which of the following properties **decreases** on descending Group 2 of the Periodic Table?

☒ **A** Solubility of the sulfates.

☒ **B** Solubility of the hydroxides.

☒ **C** Reactivity of the elements.

☒ **D** Ionic character of the oxides.

(Total for Question = 1 mark)

4 Which of the following is the correct equation for the decomposition of the corresponding nitrate?

☒ **A** $4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

☒ **B** $4NaNO_3 \rightarrow 2Na_2O + 4NO_2 + O_2$

☒ **C** $Mg(NO_3)_2 \rightarrow Mg(NO_2)_2 + O_2$

☒ **D** $Ba(NO_3)_2 \rightarrow Ba(NO_2)_2 + O_2$

(Total for Question = 1 mark)

5 When steam is passed over heated magnesium, which of the following occurs?

☒ **A** $Mg + H_2O \rightarrow MgO + H_2$

☒ **B** $Mg + H_2O \rightarrow MgOH + \frac{1}{2}H_2$

☒ **C** $Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$

☒ **D** There is no reaction with the magnesium.

(Total for Question = 1 mark)

6 The first five ionization energies of an element, **X**, are

578, 1817, 2745, 11578 and 14831 kJ mol^{-1}, respectively.

In which group of the Periodic Table is **X** found?

☒ **A** 1

☒ **B** 2

☒ **C** 3

☒ **D** 4

(Total for Question = 1 mark)

7 Going down Group 2 from calcium to barium

☒ **A** the first ionization energy of the element increases.

☒ **B** the strength of the metallic bonding increases.

☒ **C** the polarizing power of the 2+ ion decreases.

☒ **D** the stability of the nitrate to heat decreases.

(Total for Question = 1 mark)

8 A white solid produces oxygen when it is heated, but no other gases. The solid could be

☒ **A** lithium nitrate.

☒ **B** potassium nitrate.

☒ **C** strontium nitrate.

☒ **D** calcium oxide.

(Total for Question = 1 mark)

9 A solid is soluble in water and produces steamy acidic fumes with concentrated sulfuric acid. The solid could be

☒ **A** potassium carbonate.

☒ **B** magnesium sulfate.

☒ **C** silver chloride.

☒ **D** sodium chloride.

(Total for Question = 1 mark)

10 When solid samples of sodium carbonate and magnesium carbonate are strongly heated

☒ **A** both compounds decompose.

☒ **B** sodium carbonate decomposes but magnesium carbonate does not.

☒ **C** magnesium carbonate decomposes but sodium carbonate does not.

☒ **D** neither compound decomposes.

(Total for Question 1 mark)

11 As Group 2 is **descended**

☒ **A** the solubility of hydroxides and of sulfates increases.

☒ **B** the solubility of hydroxides increases and of sulfates decreases.

☒ **C** the solubility of hydroxides decreases and of sulfates increases.

☒ **D** the solubility of hydroxides and of sulfates decreases.

(Total for Question 1 mark)

12 The elements in Group 1 of the Periodic Table have very similar chemical properties. This is because

☒ **A** they have the same number of outer electrons.

☒ **B** they have the same number of filled shells of electrons.

☒ **C** their outer electrons are in the s sub-shell.

☒ **D** their outer electrons have very similar shielding.

(Total for Question 1 mark)

13 When a solution of barium chloride is added to sulfuric acid, a white precipitate is formed. The ionic equation (including state symbols) for this reaction is

☒ **A** $H^+(aq) + Cl\ (aq) \rightarrow HCl(s)$

☒ **B** $Ba^+(aq) + SO_4\ (aq) \rightarrow BaSO_4(s)$

☒ **C** $Ba^{2+}(aq) + 2SO_4\ (aq) \rightarrow Ba(SO_4)_2(s)$

☒ **D** $Ba^{2+}(aq) + SO_4^{2}\ (aq) \rightarrow BaSO_4(s)$

(Total for Question 1 mark)

14 The correct balanced equation for the reaction between heated magnesium and steam, including state symbols, is

☒ **A** $Mg(s) + H_2O(l) \rightarrow MgO(s) + {}_2(g)$

☒ **B** $Mg(s) + 2H_2O(g) \rightarrow Mg(OH)_2(aq) + H_2(g)$

☒ **C** $Mg(s) + H_2O(g) \rightarrow MgO(s) + {}_2(g)$

☒ **D** $Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2(aq) + H_2(g)$

(Total for Question 1 mark)

15 This question concerns the trends in properties on descending Group 2 of the Periodic Table.

(a) What are the trends in solubility of sulfates and hydroxides down Group 2?

(1)

☒ **A** Sulfates increase, hydroxides decrease.

☒ **B** Sulfates decrease, hydroxides increase.

☒ **C** Sulfates increase, hydroxides increase.

☒ **D** Sulfates decrease, hydroxides decrease.

(b) What are the trends in thermal stability of carbonates and nitrates down Group 2?

(1)

☒ **A** Carbonates increase, nitrates decrease.

☒ **B** Carbonates decrease, nitrates increase.

☒ **C** Carbonates increase, nitrates increase.

☒ **D** Carbonates decrease, nitrates decrease.

(c) What are the trends in first ionization energy and electronegativity of the elements down Group 2?

(1)

☒ **A** Ionization energy increases, electronegativity decreases.

☒ **B** Ionization energy decreases, electronegativity increases.

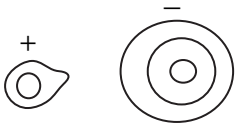
☒ **C** Ionization energy increases, electronegativity increases.

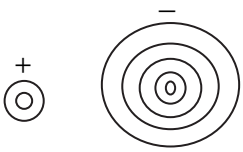
☒ **D** Ionization energy decreases, electronegativity decreases.

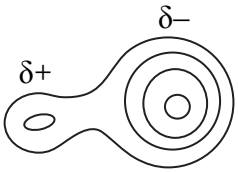
(Total for Question 3 marks)

16 Which of these electron density maps best represents the bonding in the compound lithium iodide, LiI?

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(Total for Question = 1 mark)

17 Which of the following statements is correct?

☒ **A** Barium sulfate is less soluble in water than calcium sulfate.

☒ **B** Barium hydroxide is less soluble in water than calcium hydroxide.

☒ **C** Barium nitrate undergoes thermal decomposition more readily than calcium nitrate.

☒ **D** Barium shows more than one oxidation state in its compounds.

(Total for Question = 1 mark)

18 When excess calcium is added to water, effervescence occurs and

☒ **A** a clear colourless solution is formed.

☒ **B** a cloudy suspension is formed.

☒ **C** an orange-red flame is seen.

☒ **D** a yellow flame is seen.

(Total for Question 1 mark)

19 When samples of magnesium nitrate, $Mg(NO_3)_2$, and calcium nitrate, $Ca(NO_3)_2$, are heated

☒ **A** both compounds decompose to form the corresponding nitrite and oxygen.

☒ **B** both compounds decompose to form the corresponding oxide, nitrogen dioxide and oxygen.

☒ **C** magnesium nitrate decomposes to form magnesium nitrite and oxygen whereas calcium nitrate decomposes to form calcium oxide, nitrogen dioxide and oxygen.

☒ **D** magnesium nitrate decomposes to form magnesium oxide, nitrogen dioxide and oxygen whereas calcium nitrate decomposes to form calcium nitrite and oxygen.

(Total for Question 1 mark)

20 The equation for the reaction between limewater and hydrochloric acid, including state symbols, is

☒ **A** $CaOH(s) + HCl(aq) \rightarrow CaCl(aq) + H_2O(l)$

☒ **B** $Ca(OH)_2(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(aq)$

☒ **C** $CaOH(aq) + HCl(aq) \rightarrow CaCl(aq) + H_2O(aq)$

☒ **D** $Ca(OH)_2(aq) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(l)$

(Total for Question 1 mark)

21 Element **R** is in Group 1 of the Periodic Table and element **T** is in Group 6. **R** and **T** are not the symbols for the elements.

(a) The compound of **R** and **T** will have the formula

(1)

☒ **A** RT

☒ **B** RT_6

☒ **C** RT_2

☒ **D** R_2T

(b) The compound of **R** and **T** will have bonding which is predominantly

(1)

☒ **A** ionic.

☒ **B** covalent.

☒ **C** dative covalent.

☒ **D** metallic.

(c) In terms of its electrical conductivity, the compound of **R** and **T** will

(1)

☒ **A** conduct when solid and liquid.

☒ **B** conduct when solid but not when liquid.

☒ **C** conduct when liquid but not when solid.

☒ **D** not conduct when solid or liquid.

(Total for Question 3 marks)

22 The equation for the reaction between limewater and hydrochloric acid, including state symbols, is

☒ **A** $CaOH(s) + HCl(aq) \rightarrow CaCl(aq) + H_2O(l)$

☒ **B** $Ca(OH)_2(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(aq)$

☒ **C** $CaOH(aq) + HCl(aq) \rightarrow CaCl(aq) + H_2O(aq)$

☒ **D** $Ca(OH)_2(aq) + 2HCl(aq) \rightarrow CaCl_2(aq) + 2H_2O(l)$

(Total for Question 1 mark)

23 As you go down Group 2 of the Periodic Table, which of the following decreases?

☒ **A** The reactivity of the elements.

☒ **B** The solubility of the hydroxides of the elements.

☒ **C** The solubility of the sulfates of the elements.

☒ **D** The thermal stability of the carbonates of the elements.

(Total for Question 1 mark)

24 Which of the following equations represents the change when concentrated sulfuric acid is added to solid potassium chloride at room temperature?

☒ **A** $8KCl + 5H_2SO_4 \rightarrow 4K_2SO_4 + H_2S + 4Cl_2 + 4H_2O$

☒ **B** $2KCl + 3H_2SO_4 \rightarrow 2KHSO_4 + SO_2 + Cl_2 + 2H_2O$

☒ **C** $6KCl + 4H_2SO_4 \rightarrow 3K_2SO_4 + S + 3Cl_2 + 4H_2O$

☒ **D** $KCl + H_2SO_4 \rightarrow KHSO_4 + HCl$

(Total for Question 1 mark)

25 Going down Group 1 from lithium to rubidium

☒ **A** the radius of the atom decreases.

☒ **B** the radius of the ion decreases.

☒ **C** the first ionization energy decreases.

☒ **D** the polarizing power of the ion increases.

(Total for Question = 1 mark)

26 Which of the following could **not** be an element in Group 2?

☒ **A** An element with an oxide which forms a solution of pH 10.

☒ **B** An element with an insoluble sulfate.

☒ **C** An element with a chloride which is liquid at room temperature.

☒ **D** An element with a carbonate which decomposes on heating.

(Total for Question = 1 mark)

27 Which of the following trends occurs going down the elements in Group 2?

☒ **A** The solubility of the hydroxides increases.

☒ **B** The first ionization energy increases.

☒ **C** The solubility of the sulfates increases.

☒ **D** The stability of the carbonates to heat decreases.

(Total for Question = 1 mark)