

Groups 1 & 2

Question Paper

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|-------------------|--|
| Level | A Level |
| Subject | Chemistry |
| Exam Board | Edexcel |
| Topic | Inorganic Chemistry & The Periodic Table |
| Sub Topic | Groups 1 & 2 |
| Booklet | Question Paper |
| Paper Type | Multiple Choice |

Time Allowed: 37 minutes

Score: /30

Percentage: /100

Grade Boundaries:

| A* | A | B | C | D | E | U |
|------|-------|-----|-------|-------|-----|------|
| >85% | 77.5% | 70% | 62.5% | 57.5% | 45% | <45% |

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 $4\text{LiNO}_3 \rightarrow 2\text{Li}_2\text{O} + 4\text{NO}_2 + \text{O}_2$
- B $4\text{NaNO}_3 \rightarrow 2\text{Na}_2\text{O} + 4\text{NO}_2 + \text{O}_2$
- C $\text{Mg}(\text{NO}_3)_2 \rightarrow \text{Mg}(\text{NO}_2)_2 + \text{O}_2$
- D $\text{Ba}(\text{NO}_3)_2 \rightarrow \text{Ba}(\text{NO}_2)_2 + \text{O}_2$

(Total for Question = 1 mark)

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

- A $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$
- B $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgOH} + \frac{1}{2}\text{H}_2$
- C $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2$
- 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 $\text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{HCl}(\text{s})$
- B $\text{Ba}^+(\text{aq}) + \text{SO}_4^-(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
- C $\text{Ba}^{2+}(\text{aq}) + 2\text{SO}_4^-(\text{aq}) \rightarrow \text{Ba}(\text{SO}_4)_2(\text{s})$
- D $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$

(Total for Question = 1 mark)

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

- A $\text{Mg}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{MgO}(\text{s}) + \text{H}_2(\text{g})$
- B $\text{Mg}(\text{s}) + 2\text{H}_2\text{O}(\text{g}) \rightarrow \text{Mg}(\text{OH})_2(\text{aq}) + \text{H}_2(\text{g})$
- C $\text{Mg}(\text{s}) + \text{H}_2\text{O}(\text{g}) \rightarrow \text{MgO}(\text{s}) + \text{H}_2(\text{g})$
- D $\text{Mg}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{Mg}(\text{OH})_2(\text{aq}) + \text{H}_2(\text{g})$

(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.

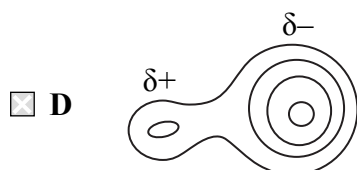
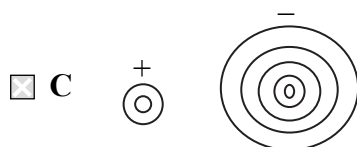
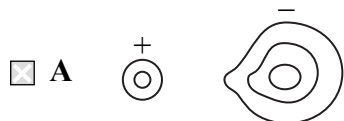
B Ionization energy decreases, electronegativity increases.

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?



(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, $\text{Mg}(\text{NO}_3)_2$, and calcium nitrate, $\text{Ca}(\text{NO}_3)_2$, 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 $\text{CaOH}(\text{s}) + \text{HCl}(\text{aq}) \rightarrow \text{CaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- B $\text{Ca}(\text{OH})_2(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{aq})$
- C $\text{CaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{CaCl}(\text{aq}) + \text{H}_2\text{O}(\text{aq})$
- D $\text{Ca}(\text{OH})_2(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

(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 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)

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

- A $8\text{KCl} + 5\text{H}_2\text{SO}_4 \rightarrow 4\text{K}_2\text{SO}_4 + \text{H}_2\text{S} + 4\text{Cl}_2 + 4\text{H}_2\text{O}$
- B $2\text{KCl} + 3\text{H}_2\text{SO}_4 \rightarrow 2\text{KHSO}_4 + \text{SO}_2 + \text{Cl}_2 + 2\text{H}_2\text{O}$
- C $6\text{KCl} + 4\text{H}_2\text{SO}_4 \rightarrow 3\text{K}_2\text{SO}_4 + \text{S} + 3\text{Cl}_2 + 4\text{H}_2\text{O}$
- D $\text{KCl} + \text{H}_2\text{SO}_4 \rightarrow \text{KHSO}_4 + \text{HCl}$

(Total for Question = 1 mark)

24 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)

25 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)

26 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)