

# CHEMISTRY MULTIPLE CHOICE QUESTIONS

---

J. Group II

---

2002 -2014

---

1.

Which equation represents the reaction that occurs when calcium nitrate is heated strongly?

- A  $\text{Ca}(\text{NO}_3)_2 \rightarrow \text{Ca}(\text{NO}_2)_2 + \text{O}_2$
- B  $\text{Ca}(\text{NO}_3)_2 \rightarrow \text{CaO} + \text{N}_2\text{O} + 2\text{O}_2$
- C  $\text{Ca}(\text{NO}_3)_2 \rightarrow \text{CaO}_2 + 2\text{NO}_2$
- D  $2\text{Ca}(\text{NO}_3)_2 \rightarrow 2\text{CaO} + 4\text{NO}_2 + \text{O}_2$

[2002 M/J (15)]

2.

Which statement explains the observation that magnesium hydroxide dissolves in aqueous ammonium chloride, but not in aqueous sodium chloride?

- A The ionic radius of the  $\text{NH}_4^+$  ion is similar to that of  $\text{Mg}^{2+}$  but not that of  $\text{Na}^+$ .
- B  $\text{NH}_4\text{Cl}$  dissociates less fully than  $\text{NaCl}$ .
- C The ions  $\text{Na}^+$  and  $\text{Mg}^{2+}$  are isoelectronic (have the same number of electrons).
- D The ion  $\text{NH}_4^+$  acts as an acid.

[2002 M/J (17)]

3.

Which properties would be expected for the Group II element, strontium, or its compounds?

- 1 When heated in oxygen, strontium does not burn.
- 2 On being heated, strontium carbonate decomposes to give strontium oxide.
- 3 When strontium oxide is added to water, the solution is alkaline.

[2002 M/J (36)]

4.

River water in a chalky agricultural area may contain  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{Cl}^-$ , and  $\text{NO}_3^-$  ions. In a waterworks, such water is treated by adding a calculated quantity of calcium hydroxide.

What will be precipitated following the addition of calcium hydroxide?

- A  $\text{CaCl}_2$
- B  $\text{CaCO}_3$
- C  $\text{MgCO}_3$
- D  $\text{Mg}(\text{NO}_3)_2$

[2002 O/N (16)]

Which of the following magnesium compounds lose mass when heated by a bunsen flame?

- 1 magnesium carbonate
- 2 magnesium nitrate
- 3 magnesium oxide

[2002 O/N (34)]

6.

What are the products of the thermal decomposition of magnesium nitrate?

- A magnesium nitride and oxygen
- B magnesium oxide and nitrogen
- C magnesium oxide, nitrogen and oxygen
- D magnesium oxide, nitrogen dioxide and oxygen

[2003 M/J (15)]

7.

The metals of Group II react readily with oxygen to form compounds of general formula  $\text{MO}$ .

When each of these oxides is added to water, which forms the most alkaline solution?

- A  $\text{MgO}$
- B  $\text{CaO}$
- C  $\text{SrO}$
- D  $\text{BaO}$

[2003 O/N (14)]

8.

A farmer spreads lime on land which has already been treated with a nitrogenous fertiliser.

Which reactions will occur over a period of time?

- 1  $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
- 2  $\text{Ca}(\text{OH})_2 + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + 2\text{H}_2\text{O}$
- 3  $\text{Ca}(\text{OH})_2 + 2\text{NH}_4^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + 2\text{NH}_3 + 2\text{H}_2\text{O}$

[2003 O/N (35)]

9.

Due to their similar ionic radii, the reactions of lithium and magnesium and their corresponding compounds are very similar.

Which statement concerning the reactions of lithium and its compounds is correct?

- A Lithium carbonate decomposes on heating at a relatively low temperature, forming lithium oxide and carbon dioxide.
- B Lithium nitrate decomposes on heating, forming lithium nitrite and oxygen.
- C Lithium only burns slowly in oxygen.
- D Lithium reacts violently with cold water, liberating hydrogen.

[2004 M/J (16)]

10.

Which reactions involving calcium and its compounds would produce **two** gaseous products?

- 1 heating solid anhydrous calcium nitrate
- 2 heating solid anhydrous calcium carbonate
- 3 adding calcium metal to water

[2004 O/N (35)]

11.

*Use of the Data Booklet is relevant to this question.*

Which is true for calcium or its compounds compared with the corresponding statements for magnesium?

- A Calcium has a smaller atomic radius.
- B Calcium oxide reacts less vigorously with water.
- C Calcium reacts more vigorously with water.
- D The sum of the first two ionisation energies of calcium is greater.

[2005 M/J (14)]

Limestone,  $\text{CaCO}_3$ , has been used as a building material for thousands of years, and was used on the Pyramids in Egypt. In the past hundred years many limestone buildings have begun to suffer damage.

What is the cause of this damage?

- A hydrocarbon emissions from motor vehicles
- B increased temperature due to global warming
- C increased ultraviolet radiation as the ozone layer is destroyed
- D sulphur dioxide from fossil fuels forming 'acid rain'

[2005 M/J (17)]

13.

When a mineral was heated in a Bunsen flame to constant mass, a colourless gas that turned lime water milky was evolved. The remaining solid was cooled and then added to aqueous hydrochloric acid. Vigorous effervescence was seen.

What was the mineral?

- A aragonite,  $\text{CaCO}_3$
- B artinite,  $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$
- C barytocalcite,  $\text{BaCO}_3 \cdot \text{CaCO}_3$
- D dolomite,  $\text{CaCO}_3 \cdot \text{MgCO}_3$

[2005 O/N (16)]

14.

What properties enable magnesium oxide to be used as a refractory lining in a furnace?

- 1 It has a high melting point.
- 2 It has a low thermal conductivity.
- 3 It does not react with basic slags.

[2005 O/N (35)]

15.

Hydroxyapatite, a basic calcium phosphate,  $\text{Ca}(\text{OH})_2 \cdot 3\text{Ca}_3(\text{PO}_4)_2$ , is the mineral found in bone.

In older people, calcium ions can be lost from the hydroxyapatite, weakening the bone structure. In such cases, strontium salts are administered to strengthen the bone. The strontium ions replace the lost calcium ions in the hydroxyapatite.

Which statements are correct?

- 1 Strontium ions are nearly the same size as calcium ions and so may easily replace them in the hydroxyapatite.
- 2 Strontium hydroxide is less soluble than calcium hydroxide and so will precipitate better in the bone structure.
- 3 There is ionic, covalent and metallic bonding in hydroxyapatite which gives it strength.

[2006 M/J (35)]

16.

Magnesium oxide may be used for the lining of an electric furnace for making crockery.

Which properties of magnesium oxide help to explain this use?

	strong forces between particles	ionic bonding	electrical conductor
<b>A</b>	yes	yes	no
<b>B</b>	yes	no	yes
<b>C</b>	no	yes	no
<b>D</b>	no	no	yes

[2006 O/N (7)]

17.

Steam is passed over heated magnesium to give compound **X** and hydrogen.

What is **not** a property of compound **X**?

- A** It has a high melting point.
- B** It is a basic oxide.
- C** It is a white solid.
- D** It is very soluble in water.

[2006 O/N (13)]

18. A 5.00 g sample of an anhydrous Group II metal nitrate loses 3.29 g in mass on strong heating.

Which metal is present?

- A** magnesium
- B** calcium
- C** strontium
- D** barium

[2006 O/N (14)]

19.

Which magnesium compounds lose mass when heated by a Bunsen flame?

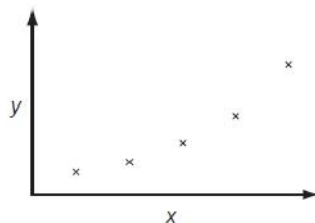
- 1 magnesium carbonate
- 2 magnesium nitrate
- 3 magnesium oxide

[2006 O/N (34)]

20.

Use of the Data Booklet is relevant to this question.

The sketch graph shows the variation of one physical or chemical property with another for the Group II elements.



What are the correct labels for the axes?

	x-axis	y-axis
A	atomic number	mass number
B	atomic number	melting point
C	first ionisation energy	atomic number
D	first ionisation energy	atomic radius

[2007 O/N (14)]

21.

The chemical properties of an element at the top of a group in the Periodic Table are often different from those of the rest of the elements in the group.

Of the following properties of beryllium and its compounds, which property is typical of the elements below it in Group II?

- A Be does not react with hot water.
- B  $\text{BeCl}_2$  is covalent.
- C  $\text{Be}(\text{NO}_3)_2$  produces BeO on thermal decomposition.
- D BeO dissolves in alkalis.

[2007 O/N (15)]

When a firework is lit a fuel and an oxidising agent react.

In such a firework, magnesium is the fuel and barium nitrate is the oxidising agent.

Which solid products are produced when the firework is lit?

- 1 BaO
- 2 MgO
- 3  $\text{Mg}(\text{NO}_3)_2$

[2007 O/N (35)]

23.

The electronic structure of the outer shell of the element radium is  $7s^2$ .

Which statements will be correct for radium within its group?

- 1 The element will decompose water, liberating hydrogen.
- 2 The element will show an oxidation number of +2 in all its compounds.
- 3 Radium has the highest first ionisation energy.

[2008 M/J (35)]

24.

Due to their similar ionic radii, the reactions of lithium and magnesium and their corresponding compounds are very similar.

Which statement concerning the reactions of lithium and its compounds is correct?

- A Lithium carbonate decomposes on heating at a relatively low temperature, forming lithium oxide and carbon dioxide.
- B Lithium nitrate decomposes on heating, forming lithium nitrite and oxygen.
- C Lithium burns only slowly in oxygen.
- D Lithium reacts violently with cold water, liberating hydrogen.

[2008 O/N (16)]

25.

Which statement explains the observation that magnesium hydroxide dissolves in aqueous ammonium chloride, but not in aqueous sodium chloride?

- A The ionic radius of the  $\text{NH}_4^+$  ion is similar to that of  $\text{Mg}^{2+}$  but not that of  $\text{Na}^+$ .
- B  $\text{NH}_4\text{Cl}$  dissociates less fully than  $\text{NaCl}$ .
- C The  $\text{Na}^+$  and  $\text{Mg}^{2+}$  ions are isoelectronic (have the same number of electrons).
- D The  $\text{NH}_4^+$  ion acts as an acid.

[2008 O/N (19)]

26.

Which statements concerning the Group II elements magnesium, calcium and barium are correct?

- 1 Their reactivity increases with increasing relative atomic mass.
- 2 The oxidation number exhibited in their stable compounds is +2.
- 3 On strong heating, their nitrates give off oxygen only.

[2008 O/N (34)]

27.

In some fireworks there is a reaction between powdered aluminium and powdered barium nitrate in which heat is evolved and an unreactive gas is produced.

What is the equation for this reaction?

- A  $2\text{Al} + \text{Ba}(\text{NO}_3)_2 \rightarrow \text{Al}_2\text{O}_3 + \text{BaO} + 2\text{NO}$
- B  $4\text{Al} + 4\text{Ba}(\text{NO}_3)_2 \rightarrow 2\text{Al}_2\text{O}_3 + 4\text{Ba}(\text{NO}_2)_2 + \text{O}_2$
- C  $10\text{Al} + 3\text{Ba}(\text{NO}_3)_2 \rightarrow 5\text{Al}_2\text{O}_3 + 3\text{BaO} + 3\text{N}_2$
- D  $10\text{Al} + 18\text{Ba}(\text{NO}_3)_2 \rightarrow 10\text{Al}(\text{NO}_3)_3 + 18\text{BaO} + 3\text{N}_2$

[2009 M/J (11)]

28.

River water in a chalky agricultural area may contain  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{Cl}^-$  and  $\text{NO}_3^-$  ions. In a waterworks, such water is treated by adding a calculated quantity of calcium hydroxide.

What will be precipitated following the addition of calcium hydroxide?

- A  $\text{CaCl}_2$
- B  $\text{CaCO}_3$
- C  $\text{Ca}(\text{NO}_3)_2$
- D  $\text{Mg}(\text{NO}_3)_2$

[2009 M/J (13)]

29.

The rock *dolomite* is a double carbonate of magnesium and calcium,  $\text{CaCO}_3 \cdot \text{MgCO}_3$ .

When heated strongly, a product called *calcined dolomite* is formed which is used to line some furnaces for the production of metals.

Why is *calcined dolomite* used for this purpose?

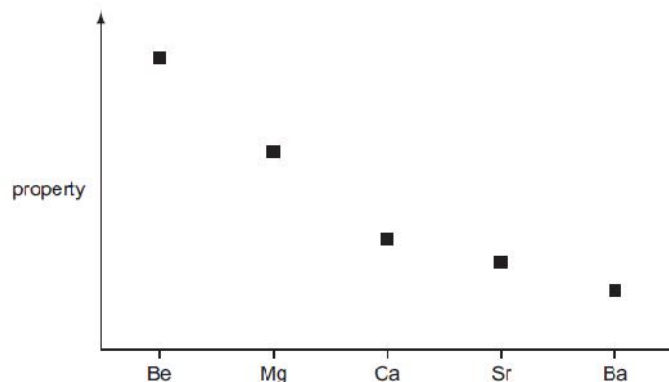
- 1 It is a refractory material.
- 2 It will absorb acidic impurities in metallurgical processes.
- 3 It will reduce metallic oxides to metals.

[2009 M/J (35)]

30.

*Use of the Data Booklet is relevant to this question.*

The graph represents the variation of a property of the Group II elements.



What is this property?

- A ionic radius
- B ionisation energy
- C neutron/proton ratio
- D rate of reaction with water

[2009 O/N-11 (3)]

31.

Which property of Group II elements (beryllium to barium) decreases with increasing atomic number?

- A reactivity with water
- B second ionisation energy
- C solubility of hydroxides
- D stability of the carbonates

[2010 M/J-11 (17)]

32. When magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2 \cdot 7\text{H}_2\text{O}$ , is heated, which three gases are given off?

- A dinitrogen oxide, oxygen, water vapour
- B hydrogen, nitrogen, oxygen
- C hydrogen, nitrogen dioxide, oxygen
- D nitrogen dioxide, oxygen, water vapour

[2010 O/N-11 (14)]

33.

Which property of beryllium and its compounds is typical of the elements below it in Group II?

- A Be does not react with hot water.
- B  $\text{BeCl}_2$  is covalent.
- C  $\text{Be}(\text{NO}_3)_2$  produces BeO on thermal decomposition.
- D BeO dissolves in alkalis.

[2010 O/N-11 (19)]

34.

Samples of calcium and barium are separately added to beakers of cold water containing a few drops of litmus solution.

Which observations will be made with **only** the calcium and **not** with the barium?

- 1 A white suspension appears in the water.
- 2 The solution turns blue.
- 3 A gas is evolved.

[2010 O/N-11 (34)]

35.

*Use of the Data Booklet is relevant to this question.*

Which mass of solid residue can be obtained from the thermal decomposition of 4.10 g of anhydrous calcium nitrate?

- A 0.70g
- B 1.00g
- C 1.40g
- D 2.25g

[2010 O/N-12 (14)]

36.

Which statement explains the observation that magnesium hydroxide dissolves in aqueous ammonium chloride, but not in aqueous sodium chloride?

- A The ionic radius of the  $\text{NH}_4^+$  ion is similar to that of  $\text{Mg}^{2+}$  but not that of  $\text{Na}^+$ .
- B  $\text{NH}_4\text{Cl}$  dissociates less fully than  $\text{NaCl}$ .
- C The  $\text{Na}^+$  and  $\text{Mg}^{2+}$  ions are isoelectronic (have the same number of electrons).
- D The  $\text{NH}_4^+$  ion can donate a proton.

[2010 O/N-12 (15)]

37.

Steam is passed over heated magnesium to give compound X and hydrogen.

What is **not** a property of compound X?

- A It has an  $M_r$  of 40.3.
- B It is basic.
- C It is a white solid.
- D It is very soluble in water.

[2011 M/J-11 (14)]

38.

*Use of the Data Booklet is relevant to this question.*

A 5.00 g sample of an anhydrous Group II metal nitrate loses 3.29 g in mass when heated strongly.

Which metal is present?

- A magnesium
- B calcium
- C strontium
- D barium

[2011 O/N-11 (15)]

Lime mortar is made from quicklime, water and sand. Over a period of time, lime mortar changes into a much harder form. Both fresh and old lime mortar react with aqueous hydrochloric acid but only the old lime mortar effervesces during the reaction.

Which equation describes the change from fresh to old lime mortar?

- A  $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$
- B  $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
- C  $\text{Ca}(\text{OH})_2 \rightarrow \text{CaO} + \text{H}_2\text{O}$
- D  $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

[2011 O/N-12 (18)]

40.

*Use of the Data Booklet is relevant to this question.*

Which properties would be expected for radium,  ${}_{88}\text{Ra}$ , or its compounds?

- 1 Radium carbonate would not decompose at the temperature of a Bunsen flame.
- 2 Radium hydroxide is very insoluble.
- 3 Radium does not react with cold water.

[2011 O/N-12 (34)]

41.

When a firework is lit, a fuel and an oxidising agent react together.

In one such firework, magnesium is the fuel and barium nitrate is the oxidising agent.

Which solids are produced when the firework is lit?

- 1 BaO
- 2 MgO
- 3  $\text{Mg}(\text{NO}_3)_2$

[2011 O/N-12 (35)]



42.

*Use of the Data Booklet is relevant to this question.*

When a mineral was heated in a Bunsen flame to constant mass, a colourless gas that turned lime water milky was evolved. The remaining solid was cooled and then added to aqueous hydrochloric acid. Vigorous effervescence was seen.

What was the mineral?

- A aragonite,  $\text{CaCO}_3$
- B artinite,  $\text{MgCO}_3 \cdot \text{Mg(OH)}_2 \cdot 3\text{H}_2\text{O}$
- C barytocalcite,  $\text{BaCO}_3 \cdot \text{CaCO}_3$
- D dolomite,  $\text{CaCO}_3 \cdot \text{MgCO}_3$

[2012 M/J-11 (13)]

43.

*Use of the Data Booklet is relevant to this question.*

The reaction between aluminium powder and anhydrous barium nitrate is used as the propellant in some fireworks. The metal oxides and nitrogen are the only products.

Which volume of nitrogen, measured under room conditions, is produced when 0.783 g of anhydrous barium nitrate reacts with an excess of aluminium?

- A  $46.8 \text{ cm}^3$
- B  $72.0 \text{ cm}^3$
- C  $93.6 \text{ cm}^3$
- D  $144 \text{ cm}^3$

[2012 M/J-11 (14)]

44.

The oxides BaO, CaO, MgO and SrO all produce alkaline solutions when added to water.

Which oxide produces the saturated solution with the highest pH?

- A BaO(aq)
- B CaO(aq)
- C MgO(aq)
- D SrO(aq)

[2012 M/J-11 (15)]

45. What can be seen when a piece of magnesium ribbon is placed in cold water?

- A A vigorous effervescence occurs.
- B Bubbles of gas form slowly on the magnesium.
- C The magnesium floats on the surface of the water and reacts quickly.
- D The magnesium glows and a white solid is produced.

[2012 M/J-12 (17)]

46.

What are the trends in the stated properties as Group II is descended from magnesium to barium?

	decomposition temperature of the carbonate	first ionisation energy
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

[2012 O/N-11 (14)]

47.

*Use of the Data Booklet is relevant to this question.*

The nitrates of beryllium, calcium, magnesium, and strontium all decompose in the same way when heated. When 2.00 g of one of these anhydrous nitrates is decomposed, 1.32 g of gas is produced.

What is the nitrate?

- A beryllium nitrate
- B calcium nitrate
- C magnesium nitrate
- D strontium nitrate

[2012 O/N-11 (15)]

48.

Use of the Data Booklet is relevant to this question.

When 3.00 g of an anhydrous nitrate of a Group II metal is decomposed, 1.53 g of gas is produced.

What is the nitrate compound?

- A beryllium nitrate
- B calcium nitrate
- C magnesium nitrate
- D strontium nitrate

[2012 O/N-13 (14)]

49.

Rat poison needs to be insoluble in rain water but soluble at the low pH of stomach contents.

What is a suitable barium compound to use for rat poison?

- A barium carbonate
- B barium chloride
- C barium hydroxide
- D barium sulfate

[2012 O/N-13 (16)]

50.

In which row of the table are all statements comparing the compounds of magnesium and barium correct?

	solubility of hydroxides		solubility of sulfates	
	solubility of magnesium hydroxide	solubility of barium hydroxide	solubility of magnesium sulfate	solubility of barium sulfate
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

[2013 M/J-11 (13)]

51.

Use of the Data Booklet is relevant to this question.

Magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ , will decompose when heated to give a white solid and a mixture of gases. One of the gases released is an oxide of nitrogen, X.

7.4 g of anhydrous magnesium nitrate is heated until no further reaction takes place.

What mass of X is produced?

- A 1.5g
- B 2.3g
- C 3.0g
- D 4.6g

[2013 M/J-11 (16)]

52.

The Group II metals have higher melting points than the Group I metals.

Which factors could contribute towards the higher melting points?

- 1 There are smaller interatomic distances in the metallic lattices of the Group II metals.
- 2 More electrons are available from each Group II metal atom for bonding the atom into the metallic lattice.
- 3 Group II metals have a higher first ionisation energy than the corresponding Group I metal.

[2013 M/J-11 (32)]

53.

Solids W, X, Y and Z are compounds of two different Group II metals. Some of their applications are described below.

Compound W is used as a refractory lining material in kilns.

Compound X is used as a building material. It can also be heated in a kiln to form compound Y. When Y is hydrated, it forms compound Z which is used agriculturally to treat soils.

Which statements about these compounds are correct?

- 1 More acid is neutralised by 1 g of W than by 1 g of X.
- 2 The metallic element in W reacts with water more quickly than the metallic element in Y.
- 3 Adding Z to a soil decreases the pH of the soil.

[2013 M/J-11 (35)]

54.

Use of the Data Booklet is relevant to this question.

Magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ , will decompose when heated to give a white solid and a mixture of gases. One of the gases released is oxygen.

29.7 g of anhydrous magnesium nitrate is heated until no further reaction takes place.

What mass of oxygen is produced?

- A 3.2 g      B 6.4 g      C 12.8 g      D 19.2 g

[2013 M/J-12 (13)]

55.

In which row of the table are all statements comparing the compounds of calcium and barium correct?

	solubility of calcium hydroxide	solubility of barium hydroxide	thermal stability of calcium carbonate	thermal stability of barium carbonate
A	higher	lower	higher	lower
B	higher	lower	lower	higher
C	lower	higher	higher	lower
D	lower	higher	lower	higher

[2013 M/J-12 (14)]

56.

Solids **W**, **X**, **Y** and **Z** are compounds of two different Group II metals. Some of their applications are described below.

Compound **W** is used as a refractory lining material in kilns.

Compound **X** is used as a building material. It can also be heated in a kiln to form compound **Y**. When **Y** is hydrated, it forms compound **Z** which is used agriculturally to treat soils.

Which statements about these compounds are correct?

- Adding **W** to water has less effect on pH than adding **Y**.
- Adding **Z** to soil increases the pH of the soil.
- The metallic element in **Y** reacts with cold water more quickly than the metallic element in **W**.

[2013 M/J-12 (34)]

57.

Use of the Data Booklet is relevant to this question.

Anhydrous magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ , will decompose when heated, giving a white solid and a mixture of two gases **X** and **Y**.

**Y** is oxygen.

What is the ratio  $\frac{\text{mass of X released}}{\text{mass of Y released}}$ ?

- A  $\frac{1}{0.174}$       B  $\frac{1}{0.267}$       C  $\frac{1}{0.348}$       D  $\frac{1}{3.43}$

[2013 M/J-13 (12)]

58.

In which row of the table are all statements comparing magnesium and barium correct?

	fourth ionisation energy of magnesium	fourth ionisation energy of barium	reaction of magnesium with cold water	reaction of barium with cold water
A	higher	lower	faster	slower
B	higher	lower	slower	faster
C	lower	higher	faster	slower
D	lower	higher	slower	faster

[2013 M/J-13 (13)]

59.

Solids **W**, **X**, **Y** and **Z** are compounds of two different Group II metals. Some of their applications are described below.

Compound **W** is used as a refractory lining material in kilns.

Compound **X** is used as a building material. It can also be heated in a kiln to form compound **Y**. When **Y** is hydrated, it forms compound **Z** which is used agriculturally to treat soils.

Which statements about these compounds are correct?

- More acid is neutralised by 2.0 g of **X** than by 2.0 g of **W**.
- The  $M_r$  of **X** is greater than the  $M_r$  of **Y** by 440.
- The metallic element in **Y** reacts with cold water more quickly than the metallic element in **W**.

[2013 M/J-13 (35)]

60.

A metal, **X**, reacts with water to produce a colourless solution which gives a white precipitate when mixed with aqueous sulfuric acid.

What is metal **X**?

- A barium
- B magnesium
- C potassium
- D sodium

[2013 O/N-11 (13)]

61.

Which property **increases** in value going down Group II?

- A electronegativity
- B ionic radius
- C maximum oxidation number
- D second ionisation energy

[2013 O/N-11 (14)]

62.

Which row correctly identifies the uses of some of the compounds of Group II metals?

	used as a refractory lining in kilns	used in agriculture to increase the pH of a soil
A	CaO	Ca(OH) <sub>2</sub>
B	CaO	Mg(OH) <sub>2</sub>
C	MgO	Ca(OH) <sub>2</sub>
D	MgO	Mg(OH) <sub>2</sub>

[2013 O/N-11 (15)]

63.

*Use of the Data Booklet is relevant to this question.*

Which calcium compound contains 54.1% by mass of calcium?

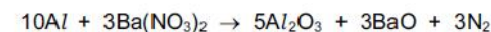
- A calcium hydroxide
- B calcium nitrate
- C calcium oxide
- D calcium sulfate

[2013 O/N-13 (11)]

64.

*Use of the Data Booklet is relevant to this question.*

The reaction between aluminium powder and anhydrous barium nitrate is used as the propellant in some fireworks. The reaction produces the metal oxides and nitrogen.



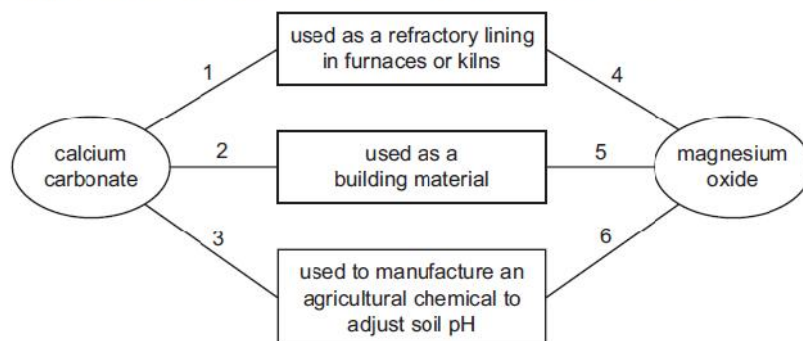
Which mass of barium oxide is produced when 5.40g of aluminium powder reacts with an excess of anhydrous barium nitrate?

- A 1.62g
- B 3.06g
- C 9.18g
- D 10.2g

[2013 O/N-13 (12)]

65.

The diagram shows some applications of compounds of Group II elements.



Which numbered links are correct?

	calcium carbonate	magnesium oxide
A	1, 2 and 3	4 and 5 only
B	1, 2 and 3	5 and 6 only
C	2 and 3 only	4 only
D	2 and 3 only	6 only

[2013 O/N-13 (13)]

66.

River water in a chalky agricultural area may contain  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{CO}_3^{2-}$ ,  $\text{HCO}_3^-$ ,  $\text{Cl}^-$  and  $\text{NO}_3^-$  ions. In a water treatment plant, such water is treated by adding a calculated quantity of calcium hydroxide.

What will be precipitated from the river water following the addition of calcium hydroxide?

- A  $\text{CaCl}_2$       B  $\text{CaCO}_3$       C  $\text{Ca}(\text{NO}_3)_2$       D  $\text{Mg}(\text{NO}_3)_2$

[2013 O/N-13 (14)]

67.

When equal volumes of saturated solutions of barium hydroxide and calcium hydroxide are mixed, a white precipitate, Y, forms. The mixture is filtered and carbon dioxide is bubbled through the filtrate, producing a second white precipitate, Z.

What are Y and Z?

	Y	Z
A	$\text{Ba}(\text{OH})_2$	$\text{Ca}(\text{OH})_2$
B	$\text{Ba}(\text{OH})_2$	$\text{CaCO}_3$
C	$\text{Ca}(\text{OH})_2$	$\text{BaCO}_3$
D	$\text{Ca}(\text{OH})_2$	$\text{Ba}(\text{OH})_2$

[2014 M/J-11 (13)]

68.

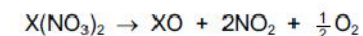
When calcium is burnt in oxygen, what colour is the flame?

- A green  
B red  
C white  
D yellow

[2014 M/J-11 (15)]

69.

Group II nitrates undergo thermal decomposition according to the following equation.



Which Group II nitrate requires the highest temperature to bring about its thermal decomposition?

- A barium nitrate  
B calcium nitrate  
C magnesium nitrate  
D strontium nitrate

[2014 M/J-11 (17)]

70.  
When barium is burnt in oxygen, what colour is the flame?

- A green
- B orange
- C red
- D white

[2014 M/J-12 (12)]

71.  
Which statement about the oxides and hydroxides of the Group II elements Mg, Ca, Sr and Ba is correct?

- A Each of the oxides reacts readily with water to form a solution of pH 12 or above.
- B Magnesium oxide is used as a furnace lining because it has a giant molecular structure and hence a high melting point.
- C The hydroxides are produced directly by the thermal decomposition of the corresponding nitrates.
- D The solubility of the hydroxides increases from  $\text{Mg}(\text{OH})_2$  to  $\text{Ba}(\text{OH})_2$ .

[2014 M/J-12 (15)]

72.  
A test-tube of  $\text{HBr}(\text{g})$  and a test-tube of  $\text{HI}(\text{g})$  are heated to the same temperature.

Which combination of observations is possible?

	tube of $\text{HBr}(\text{g})$	tube of $\text{HI}(\text{g})$
A	a brown vapour appears	no change is apparent
B	a purple vapour appears	no change is apparent
C	no change is apparent	a brown vapour appears
D	no change is apparent	a purple vapour appears

[2014 M/J-12 (18)]

73.  
*Use of the Data Booklet is relevant to this question.*

X is an s-block element. X forms an insoluble carbonate with the formula  $\text{XCO}_3$ . X forms a hydroxide that is more soluble than strontium hydroxide.

What could be the identity of X?

- A barium
- B calcium
- C cobalt
- D rubidium

[2014 M/J-13 (13)]

74.  
Which substance will **not** be a product of the thermal decomposition of hydrated magnesium nitrate?

- A dinitrogen monoxide
- B magnesium oxide
- C oxygen
- D steam

[2014 M/J-13 (15)]

75.  
When strontium is burnt in oxygen, what colour is the flame?

- A green
- B red
- C white
- D yellow

[2014 M/J-13 (19)]

76.

Use of the Data Booklet is relevant to this question.

Sir Humphrey Davy discovered boron, calcium, magnesium and sodium.

Which of these elements has the **second** smallest atomic radius in its group and the **third** lowest first ionisation energy in its period?

- A boron
- B calcium
- C magnesium
- D sodium

[2014 O/N-11 (14)]

77.

Which statements about calcium oxide are correct?

- 1 It reacts with cold water.
- 2 It is produced when calcium nitrate is heated.
- 3 It can be reduced by heating with magnesium.

[2014 O/N-11 (36)]

78.

Pieces of calcium and magnesium are reacted separately with cold water.

Pieces of calcium and magnesium are also burned separately with oxygen.

Which row correctly describes the observations from these reactions?

	calcium with cold water	magnesium with cold water	calcium with oxygen	magnesium with oxygen
A	rapid bubbling	slow bubbling	red flame	white flame
B	rapid bubbling	slow bubbling	white flame	red flame
C	slow bubbling	rapid bubbling	red flame	white flame
D	slow bubbling	rapid bubbling	white flame	red flame

[2014 O/N-13 (13)]

79.

X is a mixture of two compounds of Group II elements.

X can undergo thermal decomposition to produce a white solid and only two gaseous products. One of the gaseous products relights a glowing splint.

What could be the components of mixture X?

- A  $MgCl_2$  and  $CaCO_3$
- B  $MgCO_3$  and  $Ca(NO_3)_2$
- C  $Mg(NO_3)_2$  and  $Ca(NO_3)_2$
- D  $MgO$  and  $CaSO_4$

[2014 O/N-13 (16)]

[Online Classes : Megalecture@gmail.com](mailto:Megalecture@gmail.com)

[www.youtube.com/megalecture](http://www.youtube.com/megalecture)

[www.megalecture.com](http://www.megalecture.com)