**Questions**

**Q1.**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.

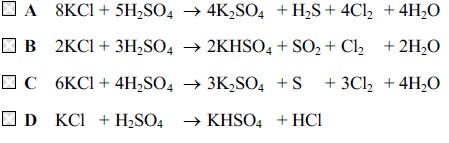
   **C**    silver chloride.

   **D**    sodium chloride.

**(Total for Question = 1 mark)**

**Q2.**

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



**(Total for question = 1 mark)**

**Q3.**

Which of these statements about fluorine is **not** correct?

   **A**     It is a gaseous element at room temperature and pressure.

   **B**     It can react with chloride ions to form chlorine.

   **C**     It forms salts with Group 1 metals.

   **D**     It is less electronegative than chlorine.

**(Total for question = 1 mark)**

**Q4.**

Which of the following statements is **true**?

   **A**     Calcium hydroxide is more soluble in water than magnesium hydroxide.

   **B**     Chlorine is more electronegative than fluorine.

   **C**     Iodine is a stronger oxidizing agent than bromine.

   **D**     The first ionization energy of barium is greater than that of strontium.

**(Total for question = 1 mark)**

**Q5.**

Which of the following is **not** a true statement about hydrogen iodide?

   **A**     It forms steamy fumes in moist air.

   **B**     It dissolves in water to form an acidic solution.

   **C**     It forms a cream precipitate with silver nitrate solution.

   **D**     It forms dense white smoke with ammonia.

**(Total for question = 1 mark)**

**Q6.**

What are the products, other than water, when chlorine is passed through cold, dilute aqueous sodium hydroxide solution?

   **A**     NaCl and NaClO

   **B**     NaClO and NaClO3

   **C**     NaCl and NaClO3

   **D**     NaClO and NaClO4

**(Total for question = 1 mark)**

**Q7.**

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

   **A**    4LiNO3 → 2Li2O + 4NO2 + O2

   **B**    4NaNO3 → 2Na2O + 4NO2 + O2

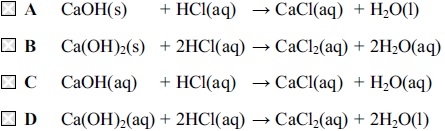
   **C**    Mg(NO3)2 → Mg(NO2)2 + O2

   **D**    Ba(NO3)2 → Ba(NO2)2 + O2

**(Total for question = 1 mark)**

**Q8.**

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



**(Total for question = 1 mark)**

**Q9.**

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

   **A**    

   **B**    

   **C**    

   **D**    

**(Total for Question = 1 mark)**

**Q10.**

When a flame test is carried out on calcium iodide, the colour of the flame is

   **A**    yellow-red.

   **B**    pale green.

   **C**    purple.

   **D**    crimson.

**(Total for question = 1 mark)**

**Q11.**

      The colour observed in a flame test is due to

   **A**      electrons jumping to a higher energy level, absorbing energy.

   **B**      electrons jumping to a higher energy level, emitting energy.

   **C**      electrons dropping from a higher energy level, absorbing energy.

   **D**      electrons dropping from a higher energy level, emitting energy.

**(Total for question = 1 mark)**

**Q12.**

Which of these metals will give a lilac flame colour?

   **A**     Sodium

   **B**     Calcium

   **C**     Potassium

   **D**     Magnesium

**(Total for question = 1 mark)**

**Q13.**

The flame produced by a compound containing barium in a flame test is

   **A**      colourless.

   **B**      green.

   **C**      red.

   **D**      yellow.

**(Total for question = 1 mark)**

**Q14.**

Which concentrated acid would be best for mixing with a salt to carry out a flame test?

   **A**      Hydrochloric acid

   **B**      Nitric acid

   **C**      Phosphoric(V) acid

   **D**      Sulfuric acid

**(Total for question = 1 mark)**

**Q15.**

Chlorides of Group 1 elements produce coloured flames when

   **A**     electrons become excited to a higher energy level.

   **B**     excited electrons move from a higher to a lower energy level.

   **C**     an outer electron leaves the atom.

   **D**     electrons move between the negative and positive ions.

**(Total for question = 1 mark)**

**Q16.**

This question is about the following compounds.

**A**     Barium carbonate

**B**     Lithium nitrate

**C**     Potassium bromide

**D**     Potassium nitrate

(a) Which compound gives a green colour in a flame test?

**(1)**

   **A**

   **B**

   **C**

   **D**

(b) Which compound gives a lilac colour in a flame test and does **not** decompose on heating?

**(1)**

   **A**

   **B**

   **C**

   **D**

**(Total for question = 2 marks)**

**Q17.**

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)**

**Q18.**

Which of the following does **not** apply to the elements Mg, Ca, Sr and Ba in Group 2 of the Periodic Table?

   **A**     Their oxides, MO, are all basic.

   **B**     Their metal hydroxides, M(OH)2, become more soluble down the group.

   **C**     Their oxides, MO, react with water to form the metal hydroxide, M(OH)2.

   **D**     Their carbonates, MCO3, all decompose on gentle heating.

**(Total for question = 1 mark)**

**Q19.**

      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)**

**Q20.**

Compound **X** is a white solid. On heating this compound, a colourless, acidic gas is the only gaseous product. A flame test is carried out on the solid residue and a reddish flame is observed.

Compound **X** is

   **A**     calcium nitrate.

   **B**     calcium carbonate.

   **C**     magnesium carbonate.

   **D**     strontium nitrate.

**(Total for question = 1 mark)**

**Q21.**

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)**

**Q22.**

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)**

**Q23.**

Which of the following statements about the elements in Group 7 is **incorrect**?

   **A**     They all show variable oxidation states in their compounds.

   **B**     They all form acidic hydrides.

   **C**     Electronegativity decreases as the group is descended.

   **D**     They all exist as diatomic molecules.

**(Total for question = 1 mark)**

**Q24.**

When concentrated sulfuric acid is added to solid sodium bromide, bromine is produced.

When concentrated sulfuric acid is added to solid sodium chloride, **no** chlorine is produced.

The reason for this difference is

   **A**     sulfuric acid is a strong acid.

   **B**     hydrogen chloride is a weak acid.

   **C**     the chloride ion is a weaker reducing agent than the bromide ion.

   **D**     bromine is less volatile than chlorine.

**(Total for question = 1 mark)**

**Q25.**What would be the experimental observations if chlorine gas was bubbled through potassium iodide solution, followed by the addition of cyclohexane?

   **A**    The solution turns brown, then two layers are produced and the top layer is purple.

   **B**    A white precipitate is formed, which then dissolves to leave a colourless solution.

   **C**    Bubbles of gas are seen and then a brown precipitate is formed.

   **D**    The solution remains colourless, and then two layers are seen with the bottom layer being brown.

**(Total for Question = 1 mark)**

**Q26.**

Which of the following properties of the elements chlorine, bromine and iodine **increases** with increasing atomic number?

   **A**  Boiling temperature

   **B**  Bond enthalpy

   **C**  Electronegativity

   **D**  First ionization energy

**(Total for question = 1 mark)**

**Q27.**

      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)**

**Q28.**

When samples of magnesium nitrate, Mg(NO3)2, and calcium nitrate, Ca(NO3)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)**

**Q29.**

What colour precipitate would you expect to see if 1-bromopropane was heated with a  
 solution of silver nitrate?

   **A**     Orange

   **B**     White

   **C**     Yellow

   **D**     Cream

**(Total for question = 1 mark)**

**Q30.**

What would be the colour of the solution when iodine is dissolved in a hydrocarbon  
 solvent?

   **A**     Grey

   **B**     Brown

   **C**     Yellow

   **D**     Purple

**(Total for question = 1 mark)**

**Q31.**

When solutions of iodine are titrated with aqueous sodium thiosulfate solution, Na2S2O3(aq), the thiosulfate ions are oxidized to

   **A**     S2O42−

   **B**     S2O62−

   **C**     S2O82−

   **D**     S4O62−

**(Total for question = 1 mark)**

**Q32.**

For barium, the third ionization energy is higher than the second ionization energy because

   **A**    there is an increase in the number of protons.

   **B**    there is an increase in the shielding.

   **C**    the ionic radius is greater.

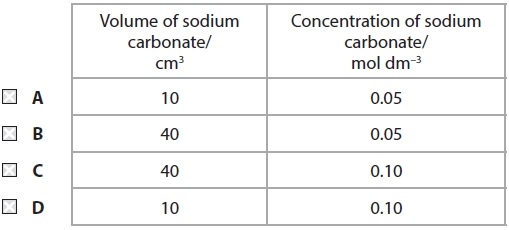
   **D**    the electron being removed is closer to the nucleus.

**(Total for question = 1 mark)**

**Q33.**Hydrochloric acid and sodium carbonate solution react as shown below.

2HCl(aq) + Na2CO3(aq) → 2NaCl(aq) + CO2(g) + H2O(l)

Which sample of sodium carbonate solution will be neutralized by 20 cm3 of 0.05 mol dm−3 hydrochloric acid?



**(Total for Question = 1 mark)**

**Q34.**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)**

**Q35.**

Iodine can react with sodium hydroxide solution to form NaIO3(aq), according to the  
 equation below.



Which of the statements about the reaction is **false**?

   **A**     The oxidation number of some iodine atoms goes up.

   **B**     At high temperatures NaIO(aq) also forms.

   **C**     Sodium ions are spectator ions.

   **D**     The oxidation number of some iodine atoms goes down.

**(Total for question = 1 mark)**

**Q36.**

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)**

**Q37.**

Which of the following reactions is the most likely to occur with chlorine in hot, concentrated sodium hydroxide solution?

   **A**    Cl2 + 2NaOH → NaCl + NaClO + H2O

   **B**    2Cl2 + 4NaOH → 3NaCl + NaClO2 + 2H2O

   **C**    3Cl2 + 6NaOH → 5NaCl + NaClO3 + 3H2O

   **D**    4Cl2 + 8NaOH → 7NaCl + NaClO4 + 4H2O

**(Total for question = 1 mark)**

**Q38.**

Which silver halide is a cream coloured solid which darkens in sunlight and dissolves in concentrated ammonia solution?

   **A**    AgF

   **B**    AgCl

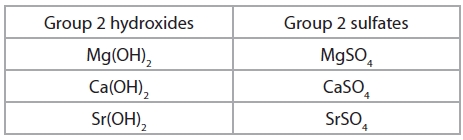
   **C**    AgBr

   **D**    AgI

**(Total for Question = 1 mark)**

**Q39.**

Consider the following Group 2 compounds.



The solubility

   **A**    increases down the group for both hydroxides and sulfates.

   **B**    increases down the group for hydroxides but increases up the group for sulfates.

   **C**    increases up the group for hydroxides but increases down the group for sulfates.

   **D**    increases up the group for both hydroxides and sulfates.

**(Total for question = 1 mark)**

**Q40.**

Which of these metal hydroxides is the most soluble in water?

   **A**     Barium hydroxide

   **B**     Calcium hydroxide

   **C**     Magnesium hydroxide

   **D**     Strontium hydroxide

**(Total for question = 1 mark)**

**Q41.**

      The best way to confirm the presence of **iodine** in an aqueous solution is

   **A**      adding hexane to form a purple layer.

   **B**      adding hexane to form an orange layer.

   **C**      adding acidified silver nitrate solution to form a yellow precipitate which is soluble in concentrated ammonia.

   **D**      adding acidified silver nitrate solution to form a yellow precipitate which is insoluble in concentrated ammonia.

**(Total for question = 1 mark)**

**Q42.**

Starch is often used as an indicator in titrations between sodium thiosulfate and iodine  
 solutions.  What colour change would you see at the end-point as sodium thiosulfate is  
 added to iodine solution in the presence of starch?

   **A**     Yellow to colourless

   **B**     Colourless to yellow

   **C**     Blue-black to colourless

   **D**     Colourless to blue-black

**(Total for question = 1 mark)**

**Q43.**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)**

**Q44.**The concentration of a solution of potassium iodate(V) can be determined by the liberation of iodine, followed by titration with sodium thiosulfate.

A suitable indicator is

   **A**    methyl orange.

   **B**    phenolphthalein.

   **C**    starch.

   **D**    universal indicator.

**(Total for Question = 1 mark)**

**Q45.**

10.0 cm3 of 0.250 mol dm−3 potassium hydroxide solution was placed in a conical flask  
 and titrated with 0.200 mol dm−3 hydrochloric acid solution, using phenolphthalein as an  
 indicator.

(a)  What colour would phenolphthalein turn at the end-point in this titration?

**(1)**

   **A**     Colourless

   **B**     Pink

   **C**     Yellow

   **D**     Orange

(b)  The best piece of apparatus to accurately measure out 10.0 cm3 is a

**(1)**

   **A**     pipette

   **B**     burette.

   **C**     syringe.

   **D**     measuring cylinder.

(c)  What volume of 0.200 mol dm−3 hydrochloric acid solution was added by the  
       end-point?

**(1)**

   **A**     8.00 cm3

   **B**     10.00 cm3

   **C**     12.50 cm3

   **D**     25.00 cm3

**(Total for question = 3 marks)**

**Q46.**

During a titration, when the solution in a pipette is transferred to a conical flask, a small amount of liquid remains in the tip of the pipette. This situation should be dealt with by

   **A**   leaving the liquid in the pipette which is calibrated to allow for it.

   **B**   slightly over-filling the pipette to compensate for the additional volume.

   **C**   carefully blowing the liquid out of the pipette to ensure that it is empty.

   **D**   repeating the titration.

**(Total for question = 1 mark)**

**Q47.**

A series of titrations is carried out using the same conical flask. Before carrying out each titration, the conical flask **must** be

   **A**   rinsed with ethanol.

   **B**   rinsed with distilled or deionised water.

   **C**   rinsed with the solution that it will contain.

   **D**   dried to remove all traces of liquid.

**(Total for question = 1 mark)**

**Q48.**

The tolerance of a 25 cm3 pipette is ±0.06 cm3. The percentage error in the measurement of 25 cm3 using this pipette is

   **A**   ±0.06%

   **B**   ±0.12%

   **C**   ±0.24%

   **D**   ±0.48%

**(Total for question = 1 mark)**

**Q49.**

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)**

**Q50.**

20 cm3 of sulfuric acid, concentration 0.25 mol dm−3, was neutralized in a titration with barium hydroxide, concentration 0.50 mol dm−3. The equation for the reaction is



(a)  The volume of barium hydroxide required was

**(1)**

   **A**     10 cm3

   **B**     20 cm3

   **C**     25 cm3

   **D**     40 cm3

(b)  During the titration, the barium hydroxide was added until it was present in excess.  
       The electrical conductivity of the titration mixture

**(1)**

   **A**     increased steadily.

   **B**     decreased steadily.

   **C**     increased and then decreased.

   **D**     decreased and then increased.

**(Total for question = 2 marks)**

**Q51.**

Calculate the volume of dilute sulfuric acid, concentration 0.500 mol dm−3, required to neutralize 20.0 cm3 aqueous sodium hydroxide, concentration 0.100 mol dm−3.



   **A**     2.0 cm3

   **B**     4.0 cm3

   **C**     8.0 cm3

   **D**     20.0 cm3

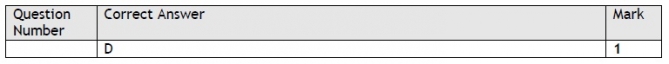
**(Total for question = 1 mark)**

**Mark Scheme**

**Q1.**



**Q2.**



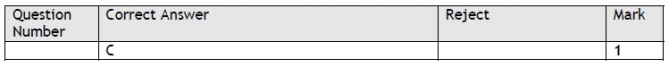
**Q3.**



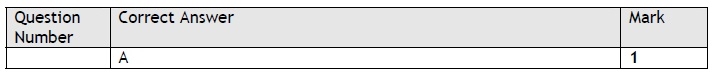
**Q4.**



**Q5.**



**Q6.**



**Q7.**



**Q8.**



**Q9.**



**Q10.**



**Q11.**



**Q12.**



**Q13.**



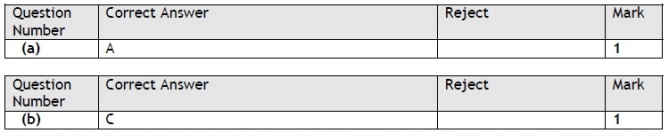
**Q14.**



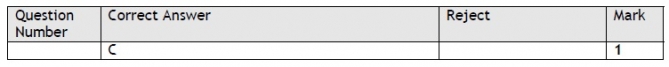
**Q15.**



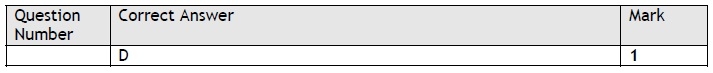
**Q16.**



**Q17.**



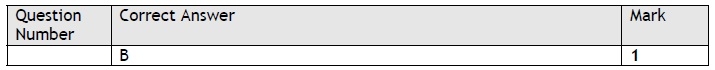
**Q18.**



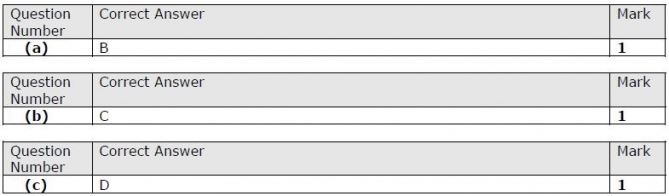
**Q19.**



**Q20.**



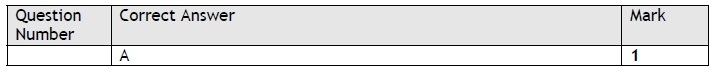
**Q21.**



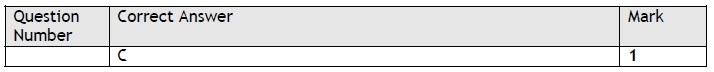
**Q22.**



**Q23.**



**Q24.**



**Q25.**



**Q26.**



**Q27.**



**Q28.**



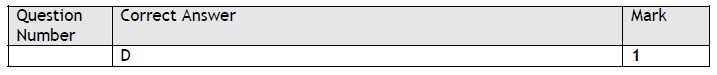
**Q29.**



**Q30.**



**Q31.**



**Q32.**



**Q33.**



**Q34.**



**Q35.**



**Q36.**



**Q37.**



**Q38.**



**Q39.**



**Q40.**



**Q41.**



**Q42.**



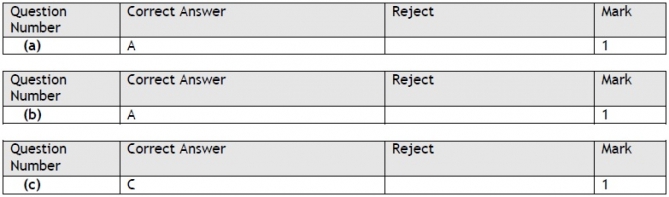
**Q43.**



**Q44.**



**Q45.**



**Q46.**



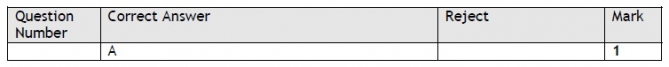
**Q47.**



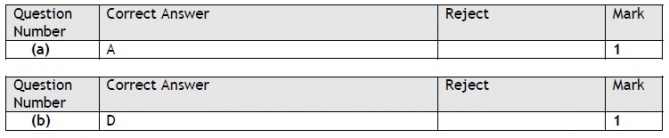
**Q48.**



**Q49.**



**Q50.**



**Q51.**

