

Q1.

This question is about the elements in Group 2.

- (a) Explain why the third ionisation energy of beryllium is **much** higher than the second ionisation energy of beryllium.

(3)

- (b) Magnesium reacts slowly with cold water but rapidly with steam.

Compare these reactions, in terms of the products formed.
You should identify one similarity in, and one difference between, these reactions.

Similarity _____

Difference _____

(2)

- (c) The reaction of calcium with water is a redox reaction.

Explain, in terms of oxidation states, why this reaction involves both oxidation and reduction.

(2)

(Total 7 marks)

Q2.

This question is about redox reactions.

- (a) State, in terms of electrons, the meaning of the term oxidising agent.

(1)

- (b) Give a half-equation to show the oxidation of copper to copper(II) ions.

(1)

- (c) Give a half-equation to show the reduction of NO_3^- ions in acidic solution to NO_2

(1)

- (d) Use your answers to part (b) and part (c) to deduce an overall equation for the reduction of NO_3^- ions by copper.

(1)

(Total 4 marks)

Q3.

This question is about chlorine.

- (a) Give an equation to show how chlorine forms an acidic solution in water.

_____ (1)

- (b) Give an equation for the reaction between chlorine and cold, dilute aqueous sodium hydroxide.

_____ (1)

- (c) In acidic conditions, ClO_3^- ions oxidise Cl^- ions to form Cl_2

Deduce a half-equation for the oxidation of Cl^- to Cl_2

Deduce a half-equation for the reduction of ClO_3^- to Cl_2

Deduce the overall equation for this reaction.

Half-equation for the oxidation of Cl^- to Cl_2

Half-equation for the reduction of ClO_3^- to Cl_2

Overall equation

_____ (3)

- (d) Give the equation for the reaction of solid sodium chloride with concentrated sulfuric acid.

State the role of the chloride ions in this reaction.

Equation

Role _____ (2)

- (e) Draw the shape of the Cl_3^- ion.
Include any lone pairs of electrons that influence the shape.

(1)

- (f) Chlorine forms an ion with the Group 3 element thallium (Tl).

State and explain the bond angle in TlCl_2^+

Bond angle _____

Explanation _____

(2)

(Total 10 marks)

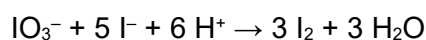
Q4.

Iodide ions can be oxidised to iodine using oxidising agents such as iodate(V) ions (IO_3^-) and concentrated sulfuric acid.

- (a) State, in terms of electrons, the meaning of the term oxidising agent.

(1)

In acidic solution, IO_3^- ions oxidise iodide ions to iodine.



- (b) Give a half-equation for the oxidation of iodide ions to iodine.

Deduce the half-equation to show the reduction process in this reaction.

Oxidation half-equation

Reduction half-equation

(2)

- (c) When iodide ions are oxidised using concentrated sulfuric acid, sulfur dioxide, a yellow solid and a foul-smelling gas are all formed.

Give an equation to show the reaction between iodide ions and concentrated sulfuric acid to form the yellow solid.

Identify the foul-smelling gas.

Equation

Identity of foul-smelling gas _____

(2)

(Total 5 marks)