

Dr Clays A-level Chemistry

UNIT 2 TOPIC 1& 2
GROUP 2 & THE GROUP 7 ELEMENTS

Dr Chris Clay
http://drclays-alevelchemistry.com/

Unit 2 Topic 1& 2 – Group 2 & Group 7 Elements

Exercise 1 – Group II Chemistry

1. By what name are the group II metals also known?
2. State and explain the trend in atomic radius down group II
3. State and explain the trend in first ionization energy down group II
4. State and explain the trend in melting point down group II
5. a) State and explain how the reactivity of the group II elements to water changes down the group.
   b) Write equations for:
      i) the reaction of magnesium with steam
      ii) the reaction of calcium with water
      iii) the reaction of barium with water
   c) State two differences you would observe in the reactions of calcium and barium with water.
6. a) State the trend in the solubility of the Group II sulphates
   b) State the trend in the solubility of the Group II hyrdoxides
   c) Hence state what you would observe when the following solutions are mixed, and write ionic equations for any reactions you observe:
      i) barium chloride and sulphuric acid
      ii) barium chloride and sodium hydroxide
      iii) magnesium chloride and sodium hydroxide
      iv) calcium chloride and sodium hydroxide
      v) calcium chloride and sulphuric acid
      vi) magnesium chloride and sulphuric acid
   d) Hence describe a suitable test for sulphate ions in solution
   e) Hence explain how $BaSO_4$ is used in medicine
   f) Hence explain how $MgSO_4$ is used in medicine
7. Write equations for the following reactions:
   a) magnesium hydroxide with hydrochloric acid
   b) calcium hydroxide with hydrochloric acid
   c) calcium oxide with sulphur dioxide
   d) calcium carbonate with sulphur dioxide
8. Explain a useful application of each of the reactions in question 7.
9. Explain the use of magnesium in the extraction of titanium from $TiCl_4$

Unit 2 Topic 1& 2 – Group 2 & Group 7 Elements

Exercise 2 – Reactions of Halogens and Halides

1) By what name are the elements F_2, Cl_2, Br_2 and I_2 collectively known?
2) By what name are the ions F^-, Cl^-, Br^- and I^- collectively known?
3) State and explain the trend in electronegativity of the Group 7 elements
4) State and explain the trend in boiling point of the Group 7 elements
5) Explain why the halogens are all oxidizing agents and state and explain the trend in oxidizing ability of the halogens
6) Explain why the halides are all reducing agents and state and explain the trend in reducing ability of the halides
7) Predict whether or not a reaction would take place between the following pairs of solutions. If a reaction does take place, state what you would observe and write an ionic equation for the reaction taking place:

a) Sodium chloride and iodine
b) Sodium iodide and chlorine
c) Sodium bromide and iodine
d) Sodium iodide and bromine
e) Potassium chloride and bromine
f) Potassium bromide and chlorine

8) Write a half-equation for the following half-reactions:

a) I^- to I_2
b) Br^- to Br_2
c) H_2SO_4 to SO_2
d) H_2SO_4 to H_2S

9) Chloride ions cannot reduce concentrated sulphuric acid
Bromide ions reduce concentrated sulphuric acid to sulphur dioxide
Iodide ions reduce concentrated sulphuric acid to hydrogen sulphide

Explain these observations in terms of the relative reducing ability of the halides and write equations to show the reactions between:

a) Iodide ions and concentrated sulphuric acid
b) Bromide ions and concentrated sulphuric acid

10) Chloride ions react with concentrated sulphuric acid to give hydrogen chloride gas. Write an equation for this reaction and show that it is not a redox reaction.

Unit 2 Topic 1& 2 – Group 2 & Group 7 Elements

Exercise 3 – Uses of chlorine and chlorate (I)

1. a) Write an equation to show the reaction between chlorine and water to make chloric (I) acid

   b) State what is oxidized and what is reduced in this reaction

   c) State an application of this reaction

2. a) State what happens when chlorine is added to water in the presence of bright sunlight

   b) State what is oxidized and what is reduced in this reaction

3. Explain why chlorine is added to the water supply

4. State one advantage and one disadvantage of adding chemicals to the water supply

5. a) Write an equation to show the reaction between chlorine and sodium hydroxide to make sodium chlorate (I)

   d) State what is oxidized and what is reduced in this reaction

   e) State an application of this reaction

Unit 2 Topic 1& 2 – Group 2 & Group 7 Elements

Exercise 4 – Qualitative Analysis

1. Tests for anions

Anion	Reagent	Observation	Ionic equation
Cl^-			
Br^-			
I^-			
CO_3^{2-}			
SO_4^{2-}			
OH^-			

2. Tests for cations

Cation	Reagent	Observation	Ionic equation
Mg^{2+}			
Ca^{2+}			
Sr^{2+}			
Ba^{2+}			
NH_4^+			
H^+			