

Writing Word Equations

Mark Scheme



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Section 1: Introduction To Word Equations

1. For each question below, write the complete word equation in the space provided.

a. Magnesium metal reacts with hydrochloric acid to produce magnesium chloride and hydrogen gas.

magnesium + hydrochloric acid → magnesium chloride + hydrogen	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

b. Sodium hydroxide solution is neutralised by sulfuric acid to create sodium sulfate and water.

sodium hydroxide + sulfuric acid → sodium sulfate + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

c. When heated, iron powder reacts with sulfur powder to form the single product, iron sulfide.

Iron + sulfur → iron sulfide	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

d. Methane gas burns in oxygen to form carbon dioxide and water.

methane + oxygen → carbon dioxide + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

e. Calcium carbonate (marble chips) reacts with nitric acid to produce calcium nitrate, water, and carbon dioxide.

calcium carbonate + nitric acid → calcium nitrate + water + carbon dioxide	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

Total for Question 1 = 10 marks

2. For each question below, write the complete word equation in the space provided.

a. When copper is heated in air, it reacts with oxygen to form copper oxide.

copper + oxygen → copper oxide	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

b. Zinc metal is added to sulfuric acid. The reaction makes zinc sulfate and hydrogen gas.

zinc + sulfuric acid → zinc sulfate + hydrogen	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

c. Hydrogen gas and chlorine gas react together to form hydrogen chloride.

hydrogen + chlorine → hydrogen chloride	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

d. Potassium carbonate reacts with hydrochloric acid to produce potassium chloride, carbon dioxide, and water.

potassium carbonate + hydrochloric acid → potassium chloride + carbon dioxide + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

e. Sodium reacts with water to form sodium hydroxide and hydrogen gas.

sodium + water → sodium hydroxide + hydrogen	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

f. A piece of zinc metal is added to copper sulfate solution. A displacement reaction occurs, producing zinc sulfate and copper metal.

zinc + copper sulfate → zinc sulfate + copper	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

Total for Question 2 = 12 marks

Section 2: Standard Word Equations

3. For each question below, write the complete word equation in the space provided.

a. A strip of magnesium ribbon is dropped into a beaker of dilute sulfuric acid.

Write the word equation for this reaction, which produces a salt and hydrogen gas.

magnesium + sulfuric acid → magnesium sulfate + hydrogen	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

b. A student adds hydrochloric acid to a lump of calcium carbonate.

Write the word equation for this reaction, which also produces a salt and water.

calcium carbonate + hydrochloric acid → calcium chloride + carbon dioxide + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

c. Ethanol, a type of alcohol, undergoes complete combustion when it burns in a plentiful supply of air.

ethanol + oxygen → carbon dioxide + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

d. A solution of potassium hydroxide is neutralised by adding dilute nitric acid.

Write the word equation for this reaction.

potassium hydroxide + nitric acid → potassium nitrate + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

e. An iron nail is placed into a blue solution of copper sulfate.

Write the word equation for this displacement reaction.

iron + copper sulfate → iron sulfate + copper	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

f. When solid copper carbonate is heated, it thermally decomposes.

It breaks down to form a solid metal oxide and a gas.

copper carbonate → copper oxide + carbon dioxide	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct products.	1 mark
	Total: 2 marks

Total for Question 3 = 12 marks

4. For each question below, write the complete word equation in the space provided.

- a. A student mixes a solution of silver nitrate with a solution of sodium chloride. A white solid precipitate is formed, leaving a soluble salt in the solution. Write the word equation for this precipitation reaction.

silver nitrate + sodium chloride → silver chloride + sodium nitrate	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct product silver chloride.	1 mark
Award 1 mark for the correct product sodium nitrate.	1 mark
	Total: 3 marks

- b. When a mixture of solid ammonium chloride and sodium hydroxide solution is gently warmed, a pungent gas is evolved which turns damp red litmus paper blue.

A salt and one other simple molecule are also formed. Write the word equation for this reaction.

ammonium chloride + sodium hydroxide → ammonia + sodium chloride + water	
Award 1 mark for each of the correct products.	3 marks
	Total: 3 marks

- c. To make a sample of a soluble salt, a student adds an excess of a black, insoluble metal oxide powder (Copper(II) oxide) to warm, dilute sulfuric acid. The powder reacts and disappears, and the colourless acid turns into a blue solution. Write the word equation for the neutralisation reaction that takes place.

copper(II) oxide + sulfuric acid → copper(II) sulfate + water	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct product copper(II) sulfate.	1 mark
Award 1 mark for the correct product water.	1 mark
	Total: 3 marks

- d. Chlorine gas is bubbled through a colourless solution of potassium bromide. The solution turns orange-brown, indicating that a less reactive halogen has been displaced from its salt.

Write the word equation for the displacement reaction that takes place.

chlorine + potassium bromide → bromine + potassium chloride	
Award 1 mark for the correct reactants.	1 mark
Award 1 mark for the correct product bromine.	1 mark
Award 1 mark for the correct product potassium chloride.	1 mark
	Total: 3 marks

Total for Question 4 = 12 marks

Section 3: Challenging Word Equations

5. For each question below, write the complete word equation in the space provided.

- a. In a blast furnace, the main reducing agent is a toxic gas formed from the incomplete combustion of coke (carbon).

This gas reduces the iron(III) oxide found in haematite ore to produce molten iron, which collects at the bottom of the furnace.

iron(III) oxide + carbon monoxide → iron + carbon dioxide	
Award 1 mark for identifying carbon monoxide as the other reactant.	1 mark
Award 1 mark for the correct product iron.	1 mark
Award 1 mark for the correct product carbon dioxide.	1 mark
	Total: 3 marks

- b. A gas with the characteristic smell of rotten eggs is prepared and then bubbled through a colourless solution of lead(II) nitrate. A dense black precipitate is immediately formed.

Write the word equation for the reaction that forms the black precipitate.

hydrogen sulfide + lead(II) nitrate → lead(II) sulfide + nitric acid	
Award 1 mark for identifying hydrogen sulfide as the other reactant.	1 mark
Award 1 mark for the correct product lead sulfide.	1 mark
Award 1 mark for the correct product nitric acid.	1 mark
	Total: 3 marks

- c. An investigation into the identity of an unknown green solid is carried out. When a strong, nitric acid is added to the green powder, vigorous fizzing is observed and the gas produced turns limewater cloudy. As the reaction proceeds, the green solid disappears and the solution turns a distinctive blue colour.

Write the word equation for this reaction.

copper(II) carbonate + nitric acid → copper(II) nitrate + carbon dioxide + water	
Award 1 mark for identifying copper carbonate as the other reactant.	1 mark
Award 1 mark for the correct copper nitrate.	1 mark
Award 1 mark for the correct product water.	1 mark
	Total: 3 marks

Total for Question 5 = 9 marks