



Answers Chemical Reaction II

Year 9 Science

Chapter 6

p130	<ol style="list-style-type: none">1 Silicon dioxide2 Sulphur trioxide3 Nitrogen dioxide4 Nitrogen triiodide5 Phosphorous trichloride6 Sulphur trioxide7 Carbon monoxide8 Dihydrogen oxide9 Caesium chloride10 Phosphorous pentabromide11 Diarsenic pentoxide					
p131	<table><tr><td><ol style="list-style-type: none">1 Sodium hydroxide3 Sodium carbonate5 Sodium phosphate7 Ammonium phosphate9 Iron sulphate11 Iron sulphate13 Potassium nitrate15 Zinc hydroxide17 Zinc phosphate</td><td><ol style="list-style-type: none">2 Tin sulphate4 Sodium nitrate6 Copper sulphate8 Silver nitrate10 Calcium hydrogen carbonate12 Potassium sulphate14 Potassium carbonate16 Zinc sulphate18 Ammonium sulphate</td></tr></table>	<ol style="list-style-type: none">1 Sodium hydroxide3 Sodium carbonate5 Sodium phosphate7 Ammonium phosphate9 Iron sulphate11 Iron sulphate13 Potassium nitrate15 Zinc hydroxide17 Zinc phosphate	<ol style="list-style-type: none">2 Tin sulphate4 Sodium nitrate6 Copper sulphate8 Silver nitrate10 Calcium hydrogen carbonate12 Potassium sulphate14 Potassium carbonate16 Zinc sulphate18 Ammonium sulphate			
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p132	<ol style="list-style-type: none">1 Sodium ion (Na^+)2 Iodine ion (I^-)3 Lithium ion (Li^+)4 Fluorine ion (F^-)5 Potassium ion (K^+)6 Permanganate ion (MnO_4^-)7 Nitrite ion (NO_2^-)8 Hydroxide ion (OH^-)					
p133	<ol style="list-style-type: none">1 A copper atom has 29 electrons. A copper ion has lost electrons and has less than 29 electrons.2 Cu^{2+} indicates that the copper atom has lost two electrons.3 N^{3-} indicates that the nitrogen atom has lost three electrons.4 a) Ca^{2+} b) O^{2-} c) P^{3-} d) S^{2-} e) Al^{3+} f) Sn^{2+} g) Sn^{4+}					
p134	<table><tr><td><ol style="list-style-type: none">1 KCl6 Ag_2SO_4</td><td><ol style="list-style-type: none">2 KOH7 $\text{Cu}(\text{NO}_3)_2$</td><td><ol style="list-style-type: none">3 MgO8 ZnCl_2</td><td><ol style="list-style-type: none">4 CuCO_3</td><td><ol style="list-style-type: none">5 Na_2CrO_4</td></tr></table>	<ol style="list-style-type: none">1 KCl6 Ag_2SO_4	<ol style="list-style-type: none">2 KOH7 $\text{Cu}(\text{NO}_3)_2$	<ol style="list-style-type: none">3 MgO8 ZnCl_2	<ol style="list-style-type: none">4 CuCO_3	<ol style="list-style-type: none">5 Na_2CrO_4
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p136	<p>1 Acids are defined as substances that release hydrogen ions (H^+) when dissolved in water.</p> <p>2 Acetic acid, CH_3COOH or $C_2H_4O_2$ Citric acid, $C_6H_8O_7$ Lactic acid, $C_3H_6O_3$ Sulphuric acid, H_2SO_4 Nitric acid, HNO_3</p> <p>3 HF is an acid because it releases hydrogen ions (H^+) when dissolved in water.</p> <p>4 NaOH is not an acid because it doesn't release hydrogen ions (H^+) when dissolved in water.</p>
p137	<p>1 Acids are defined as substances that release hydrogen ions (H^+) when dissolved in water.</p> <p>2 An aqueous solution is a solution in which water is the solvent.</p> <p>3 The pH, power of Hydrogen, is a measure of the acidity of an aqueous solution.</p> <ul style="list-style-type: none"> • The pH scale ranges from 0 to 14. • Water has a pH of 7. • Acids have a pH less than 7. • The lower the pH number, the stronger the acid. <p>4 pH of pure water is 7.</p> <p>5 A pH of 3 indicates an acid.</p> <p>6 An acid does not have a pH of 8.</p> <p>7 Softdrink (pH=3) is a stronger acid (more H^+ ions) than milk (pH just under 7).</p> <p>8 a) Soil C is the least acidic. b) Soil B is the most acidic.</p>
p138	<p>1 Bases are defined as substances that release hydroxide ions (OH^-) when dissolved in water.</p> <p>2 Sodium hydroxide, NaOH Calcium hydroxide, CaOH Household ammonia, NH_4OH Sodium carbonate, Na_2CO_3</p> <p>3 Liquid drain cleaner is the stronger base.</p> <p>4 Ammonium hydroxide is a base because it releases hydroxide ions (OH^-) when dissolved in water.</p> <p>5 H_3PO_4 is an acid because it releases hydrogen ions (H^+) when dissolved in water.</p>
p139	<p>1 Acid + Base \rightarrow Salt + Water</p> <p>2 Neutralisation happens when an acid and a base are mixed to produce a neutral (pH = 7) solution.</p> <p>3 $HCl + NaOH \rightarrow NaCl + H_2O$</p> <p>4 a) $HCl + Mg(OH)_2 \rightarrow MgCl_2 + H_2O$ Balanced: $2HCl + Mg(OH)_2 \rightarrow MgCl_2 + 2H_2O$ b) $HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$ c) $H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + H_2O$ Balanced: $H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2H_2O$</p>
p141	<p>1 Acid + Metal \rightarrow Salt + Hydrogen</p> <p>2 A lit splint placed near the mouth of a test tube will give a 'pop' sound if hydrogen is in the test tube.</p> <p>3 a) hydrochloric acid + magnesium \rightarrow hydrogen chloride + hydrogen b) sulphuric acid + zinc \rightarrow zinc sulphate + hydrogen c) nitric acid + calcium \rightarrow calcium nitrate + hydrogen d) sulphuric acid + tin (II) \rightarrow tin sulphate + hydrogen e) hydrochloric acid + iron (III) \rightarrow iron chloride + hydrogen</p> <p>4 a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$ b) $2Na + 2HNO_3 \rightarrow 2NaNO_3 + H_2$ c) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$</p>

<p>p143</p>	<p>1 acid + carbonate → salt + water + carbon dioxide</p> <p>2 Lime water turns milky in the presence of carbon dioxide (CO₂). Lime water is a saturated solution of calcium hydroxide (Ca(OH)₂).</p> <p>3 a) hydrochloric acid + magnesium carbonate → magnesium chloride + water + carbon dioxide b) sulphuric acid + zinc carbonate → zinc sulphate + water + carbon dioxide c) nitric acid + calcium carbonate → calcium nitrate + water + carbon dioxide d) sulphuric acid + tin (II) carbonate → tin sulphate + water + carbon dioxide e) hydrochloric acid + iron (III) carbonate → iron chloride + water + carbon dioxide f) hydrochloric acid + magnesium carbonate → magnesium chloride + water + carbon dioxide g) sulphuric acid + potassium carbonate → potassium sulphate + water + carbon dioxide h) nitric acid + tin (II) carbonate → tin (II) nitrate + water + carbon dioxide</p> <p>4 a) $2\text{HCl} + \text{MgCO}_3 \rightarrow \text{MgCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ b) $2\text{HNO}_3 + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$ c) $\text{H}_2\text{SO}_4 + \text{CaCO}_3 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$</p>
<p>p145</p>	<p>1 Oxidation was originally used to describe a reaction in which oxygen combines with other elements or compounds to form an oxide.</p> <p>2 An oxide is a compound that contains at least one oxygen atom. Examples of oxides are water (H₂O - hydrogen oxide), rust (Fe₂O₃ - iron (III) oxide, carbon dioxide (CO₂)).</p> <p>3 Which of the following are oxides? a) CaO is an oxide b) MgO is an oxide c) NaCl is not an oxide d) Fe₂O₃ is an oxide</p> <p>4 Complete the following word equations: a) C + O₂ → CO₂ carbon + oxygen → carbon dioxide b) 2Ca + O₂ → 2CaO calcium + oxygen → calcium oxide</p> <p>5 Burning of Natural gas: CH₄ + 2O₂ → CO₂ + 2H₂O Methane + oxygen → carbon dioxide + water vapour Respiration: C₆H₁₂O₆ + 6O₂ → 6CO₂ + 6H₂O organic food compounds + oxygen → carbon dioxide + water vapour Rusting: 4Fe + 3O₂ + 2H₂O → 2Fe₂O₃.H₂O iron + oxygen + moisture → iron (III) oxide combined with water</p> <p>6 Many oxidation reactions, for example burning, are exothermic. The heat of the reaction produces water in the form of vapour.</p>
<p>p147</p>	<p>1 Combustion, or burning, is an exothermic chemical reaction involving a fuel and an oxidant.</p> <p>2 A fuel and an oxidant are two reactants that are always needed in a combustion reaction?</p> <p>3 Combustion is an exothermic reaction.</p> <p>4 The following forms of energy are likely to be produced in the combustion of wood? a) kinetic energy b) light energy c) sound energy f) heat energy</p> <p>5 C + O₂ → CO₂ + energy coal + oxygen → carbon dioxide + energy</p> <p>6 Complete the following word equation: methane + oxygen → carbon dioxide + water + energy</p> <p>7 The equation is unbalanced: C₆H₁₀O₅ + 6O₂ → 6CO₂ + 7H₂O + energy</p> <p>8 C₇H₁₆ + 11O₂ → 7CO₂ + 8H₂O + energy heptane + oxygen → carbon dioxide + water + energy</p>

p148	<p>1 Carbon dioxide dissolves in the oceans, rivers, and lakes?</p> <p>2 Complete the following word equation: $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$ carbon dioxide + water → hydrogen carbonate or carbonic acid</p> <p>3 It is thought that the acidity of the oceans is increasing because it is thought that there is more carbon dioxide in the atmosphere which is dissolving in the ocean and producing more carbonic acid..</p> <p>4 A greenhouse gas traps heat energy from the sun in the Earth's atmosphere.</p> <p>5 Greenhouse gases are water vapour, methane, nitrous oxide, and ozone.</p> <p>6 It is suggested that the increasing amount of carbon dioxide in the atmosphere will gradually increase the Earth's surface temperature through carbon dioxide trapping the heat energy from the sun.</p>
p149	<p>1 Incomplete combustion generally happens when there isn't enough oxygen for all of the fuel to burn completely to produce carbon dioxide and water.</p> <p>2 What are the products of incomplete combustion of methane? $3\text{CH}_4 + 4\text{O}_2 \rightarrow \text{C} + 2\text{CO} + 6\text{H}_2\text{O}$ methane + oxygen → carbon + carbon monoxide + water</p> <p>3 Incomplete combustion tends to produce toxic products such as carbon particles (soot) and carbon monoxide (CO).</p> <p>4 The higher temperature, 1600°C, most likely represents complete combustion as more heat would be produced by complete burning of the fuel.</p>
p151	<p>1 Cellular respiration is the process in which the chemical energy in food is released. This energy is used for cell growth and repair.</p> <p>2 $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ glucose + oxygen → carbon dioxide + water</p> <p>3 What two ingredients are needed for respiration to occur?</p> <ul style="list-style-type: none"> • Foods such as glucose, taken to the cells by a circulatory system. • Oxygen, from the air, taken from the lungs/stomata to the cells by a circulatory system. <p>4 Respiration supports the life of plants and animals by producing energy for cell growth and repair. Without respiration life, as we know it, would not exist.?</p> <p>5 The following indicates that respiration is taking place?</p> <ol style="list-style-type: none"> b) oxygen is being reduced. d) fuel is being reduced. e) carbon dioxide is being produced.
p153	<p>1 Photosynthesis is the process by which green plants make food using sunlight.</p> <p>2 $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ carbon dioxide + water → glucose + oxygen</p> <p>3 The four ingredients needed for photosynthesis to occur?</p> <ul style="list-style-type: none"> • Carbon dioxide from the air. • Water travels to the leaves from the roots of the plant. • The sun as the source of energy. • Chlorophyll to absorb the energy from the sun. <p>4 Photosynthesis produces food for plants and also food for consumers and carnivores throughout the food chain.</p> <p>5 Pond weed is set up as shown and placed in sunlight:</p> <ol style="list-style-type: none"> a) The gas that is likely to be collected in the test tube is oxygen. b) The amount of carbon dioxide, dissolved in the water, is likely to be decreased. c) If bromothymol blue is added to the water, is likely to turn blue green and then possibly yellow.

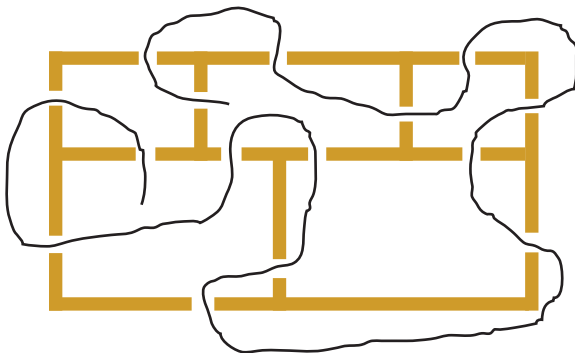
p154	<ol style="list-style-type: none"> 1 Reflux is a common problem in which acidic stomach contents escape from the stomach and leak up into the Oesophagus. 2 During reflux, the acidic stomach contents irritate the delicate wall of the oesophagus and can cause heartburn. 3 A solution of baking soda, NaHCO_3, is likely to reduce heartburn by neutralising the acid and reducing the effect of the acid. 4 Fatty foods, such as cheese, increase the risk of acid reflux because fatty foods take longer to digest and the stomach stays full for longer. 5 Lying on your right left side is more likely to help the flow of stomach acid into the oseophagus. The stomach is on your left side, and a right side lie raises the level of the stomach.
p155	<ol style="list-style-type: none"> 1 Rain is normally slightly acidic due to carbon dioxide dissolved in the raindrops. 2 Emissions of sulphur dioxide and nitrogen oxides from power stations, industry, and motor vehicles can make rain more acidic than normal. 3 The chemicals in acid rain can cause paint to peel, cause bridges and steel structures to corrode, cause statues to weather faster, stunt the growth of forests, kill aquatic animals, cause asthma, bronchitis, and heart problems in people. 4 Complete the following word equations for the formation of acid rain: <ol style="list-style-type: none"> a) $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$ sulphur dioxide + water \rightarrow sulphurous acid b) $\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_3 + \text{NO}$ nitrogen dioxide + water \rightarrow nitric acid + nitrogen oxide
p158	<ol style="list-style-type: none"> 1 SiO_2 silicon dioxide 2 NO_2 nitrogen dioxide 3 SO_3 sulphur trioxide 4 CO carbon monoxide 5 H_2O dihydrogen oxide or water 6 As_2O_5 diarsenic pentoxide 7 NaOH sodium hydroxide) 8 FeSO_4 iron sulphate 9 $\text{Zn}(\text{OH})_2$ zinc hydroxide 10 NaNO_3 sodium nitrate 11 $\text{Zn}_3(\text{PO}_4)_2$ zinc posphate 12 $\text{Ca}(\text{HCO}_3)_2$ calcium hydrogen carbonate 13 a) Na^+ b) I^- c) NO_3^- d) OH^- e) O^{2-} f) Sn^{2+} g) Sn^{4+} 14 Cu^{2+} indicates that Cu has lost two electrons. 15 N^{3-} indicates that N has gained three electrons. 16 a) KCl b) MgO c) NaOH d) $\text{Cu}(\text{NO}_3)_2$ e) FeO f) Fe_2O_3
p159	<ol style="list-style-type: none"> 1 Acids are defined as substances that release hydrogen ions (H^+) when dissolved in water. 2 Bases are defined as substances that release hydroxide ions (OH^-) when dissolved in water. 3 HF is an acid because it releases hydrogen ions (H^+) when dissolved in water. 4 NH_4OH is a base because it releases hydroxide ions (OH^-) when dissolved in water. 5 The pH, power of Hydrogen, scale measures how acidic or basic a substance is. The pH scale ranges from 0 to 14. 6 A solution with a pH of 3 is an acid. 7 A solution with a pH of 8 is a base. 8 The sample with a pH of 3 has the higher concentration of H^+ ions. 9 Acid + Base \rightarrow Salt + Water 10 Neutralisation happens when an an acid and a base are mixed to produce a neutral (pH = 7) solution. 11 a) $\text{HCl} + \text{Mg}(\text{OH})_2 \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$ Balanced: $2\text{HCl} + \text{Mg}(\text{OH})_2 \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$ b) $\text{HNO}_3 + \text{NaOH} \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$ c) $\text{H}_2\text{SO}_4 + \text{Ca}(\text{OH})_2 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O}$ Balanced: $\text{H}_2\text{SO}_4 + \text{Ca}(\text{OH})_2 \rightarrow \text{CaSO}_4 + 2\text{H}_2\text{O}$ 12 Acid + Metal \rightarrow Salt + Hydrogen 13 Copy and complete the following acid-metal equations: <ol style="list-style-type: none"> a) hydrochloric acid + magnesium \rightarrow magnesium chloride + hydrogen b) sulphuric acid + zinc \rightarrow zinc sulphate + hydrogen

p160

- 1 acid + carbonate \rightarrow salt + water + carbon dioxide
- 2 Lime water turns milky in the presence of carbon dioxide (CO_2). Lime water is a saturated solution of calcium hydroxide ($\text{Ca}(\text{OH})_2$).
- 3 a) hydrochloric acid + magnesium carbonate \rightarrow magnesium chloride + water + carbon dioxide
b) sulphuric acid + zinc carbonate \rightarrow zinc sulphate + water + carbon dioxide
c) nitric acid + calcium carbonate \rightarrow calcium nitrate + water + carbon dioxide
- 4 a) $2\text{HCl} + \text{MgCO}_3 \rightarrow \text{MgCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
b) $2\text{HNO}_3 + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$
c) $\text{H}_2\text{SO}_4 + \text{CaCO}_3 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$
- 5 **Oxidation** was originally used to describe a reaction in which oxygen combines with other elements or compounds to form an **oxide**.
- 6 Which of the following are oxides?
a) CaO is an oxide b) MgO is an oxide
c) NaCl is not an oxide d) Fe_2O_3 is an oxide
- 7 Many oxidation reactions, for example burning, are exothermic. The heat of the reaction produces water in the form of vapour.
- 8 **Combustion**, or burning, is an exothermic chemical reaction involving a fuel and an oxidant.
- 9 A fuel and an oxidant are two reactants that are always needed in a combustion reaction?
- 10 Combustion is an exothermic reaction.
- 11 The following forms of energy are likely to be produced in the combustion of wood?
a) kinetic energy b) light energy c) sound energy f) heat energy
- 12 $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{energy}$
coal + oxygen \rightarrow carbon dioxide + energy

p145

- 1 a) Both the right-hand rule and the left-hand rule works on this maze.
b) The right-hand rule and the left-hand rule will not work on a maze that has separate sections within the maze.
- 2 The bottle should be thrown backwards to reduce the forward motion of the bottle provided by the forward motion of the train.
- 3



<p>p162</p>	<p>1 Cellular respiration is the process in which the chemical energy in food is released. This energy is used for cell growth and repair.</p> <p>2 $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ glucose + oxygen \rightarrow carbon dioxide + water</p> <p>3 What two ingredients are needed for respiration to occur?</p> <ul style="list-style-type: none"> • Foods such as glucose, taken to the cells by a circulatory system. • Oxygen, from the air, taken from the lungs/stomata to the cells by a circulatory system. <p>4 Respiration supports the life of plants and animals by producing energy for cell growth and repair. Without respiration life, as we know it, would not exist.?</p> <p>5 The following indicates that respiration is taking place?</p> <p>b) oxygen is being reduced. d) fuel is being reduced. e) carbon dioxide is being produced.</p> <p>6 Photosynthesis is the process by which green plants make food using sunlight.</p> <p>7 $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ carbon dioxide + water \rightarrow glucose + oxygen</p> <p>8 The four ingredients needed for photosynthesis to occur?</p> <ul style="list-style-type: none"> • Carbon dioxide from the air. • Water travels to the leaves from the roots of the plant. • The sun as the source of energy. • Chlorophyll to absorb the energy from the sun. <p>9 Photosynthesis produces food for plants and also food for consumers and carnivores throughout the food chain.</p> <p>10 Pond weed is set up as shown and placed in sunlight:</p> <p>a) The gas that is likely to be collected in the test tube is oxygen. b) The amount of carbon dioxide, dissolved in the water, is likely to be decreased. c) If bromothymol blue is added to the water, is likely to turn blue green and then possibly yellow.</p>
<p>p163</p>	<p>1 b) 44 grams</p> <p>2 d) $25 \times 32 = 800$ grams</p> <p>3 c) $16 \times 44 = 704$ grams</p> <p>4 a) burning 12 grams of carbon produces 44 grams of carbon dioxide burning 1 gram of carbon produces $44 \div 12 = 3.7$ grams of carbon dioxide</p>
<p>p164</p>	<p>1 a) Soil C is least acidic b) Soil B is most acidic</p> <p>2 a) $C_6H_{12}O_6$ b) Combustion reactions are typically exothermic reactions. c) 6 molecules of carbon dioxide are produced for every molecule of cellulose burned.</p> <p>3 a) acid + base \rightarrow salt + water (There are many other ways of producing a salt). b) Burn carbon or a carbon based fuel is one way of producing carbon dioxide. c) acid + metal \rightarrow salt + hydrogen</p> <p>4 a) H_2CO_3 b) $H_2CO_3 \rightarrow HCO_3^- + H^+$</p> <p>5 b) carbon dioxide + water</p> <p>6 b) red litmus turns blue in lemon juice</p> <p>7 a) Eating cake makes the mouth fluids weakly acidic for some time after eating.</p>