# End of topic quiz

# Topic C3: Chemical Reactions

## Instructions and answers for teachers

These instructions cover the learner activity section which can be found on [page 10](#_Chapter:_P4_of). This end of topic quiz supports OCR GCSE (9–1) Combined Science A (J250), Topic C3.

**When distributing the activity section to the learners either as a printed copy or as a Word file you will need to remove the teacher instructions section.**

### The Activity

This end of topic quiz is a teaching and learning resource comprised of 44 marks covering a range of question types. The quiz starts with some multiple choice questions (MCQs) and then moves on to some short answer questions and then finally on to some longer answer questions.

This resource can be used to test and consolidate understanding at the end of teaching the topic or to revisit and refresh knowledge at a later point in the course.

### Learning Outcomes

This end of topic quiz relates to the specification learning outcomes in Topic C3: Chemical Reactions. The questions in this quiz cover a range of the following topics:

C3.1 Introducing chemical reactions

C3.2 Energetics

C3.3 Types of chemical reaction

C3.4 Electrolysis

### Topic: C3 of J250

**Total marks: 43**

1. Calcium forms Ca2+ ions. What is the formula of calcium chloride? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | CaC*l* |  |
| **B** | CaC*l*2 |  |
| **C** | Ca2C*l* |  |
| **D** | Ca2C*l2* |  |

Your answer

**B**

1. Which statement best describes neutralisation? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | An acid reacting with an alkali and a salt to form water. |  |
| **B** | An acid reacting with water and a salt to form an alkali or base. |  |
| **C** | An acid reacting with an alkali or base to form a salt plus water. |  |
| **D** | An acid reacting with a salt to form an alkali or base. |  |

Your answer

**C**

1. What is the correct formula for sodium chloride? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Na2C*l*2 |  |
| **B** | NaC*l*2 |  |
| **C** | Na2C*l* |  |
| **D** | *NaCl* |  |

Your answer

**D**

1. Which of the following is an ionic compound? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Ammonia |  |
| **B** | Carbon dioxide |  |
| **C** | Magnesium Oxide |  |
| **D** | Methane |  |

Your answer

**C**

1. What are the symbols s, l, g and aq used to describe? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Chemical properties |  |
| **B** | Elements |  |
| **C** | Physical states |  |
| **D** | Molecules |  |

Your answer

**C**

1. Bill weighs a piece of magnesium. He then heats it in air, where it reacts with oxygen. Bill weighs the product of the reaction.

|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** | **(i)** | What are the chemical symbols for magnesium and oxygen? **[1 mark]** | |
|  |  | **Magnesium** | **Mg** |
|  |  |  | |
|  |  | **Oxygen** | **O or O2** |
|  |  |  | |
|  | **(ii)** | Write a balanced symbol equation for the reaction of magnesium with oxygen.  **[1 mark]** | |
|  |  | 2Mg + O2 🡪 2MgO | |
|  |  |  | |
| **(b)** | **(i)** | How much product is made if 5.0g of magnesium reacts with 5.0 g of oxygen?  **[4 marks]**  Give your answer to 2 significant figures. | |
|  |  | moles of Mg = 5.0 ÷ 24.3 = 0.20576…  moles of O2  = 5.0 ÷ 32 = 0.15625✓  Reaction ratio 2 : 1 : 2✓  Max moles of MgO made = 0.20576…✓  RMM of MgO = 40.3g  Mass of MgO made = 0.20576… × 40.3g  = 8.3g to 2 sig figs✓ | |

1. Jill mixes ethanoic acid and sodium carbonate together. She measures the temperature of the reaction and draws a graph of the energy against progress of reaction.

|  |  |  |
| --- | --- | --- |
| Graph showing the energy against progress of reaction when mixing ethanoic acid and sodium carbonate | | |
| **(a)** | **(i)** | What is the type of reaction in Jill’s experiment? **[1 mark]** |
|  |  | Endothermic✓ |
|  |  |  |
|  | **(ii)** | Why does the graph peak at **A**? **[2 marks]** |
|  |  | Activation energy ✓  The energy required for a reaction to occur OWTTE ✓ |
|  |  |  |
| **(b)** | **(i)** | Jill does another experiment. She notices the reaction mixture gets warm. Sketch the reaction profile below for this experiment. **[2 marks]** |
|  |  | Sketch of the reaction profile  right shape ✓  right labels✓ |
|  |  |  |
|  | **(ii)** | How and why are endothermic and exothermic reactions different? **[4 marks]** |
|  |  | *Exothermic*:  Transfers energy to surroundings✓  More energy released when making new bonds than breaking bonds✓  *Endothermic:*  Takes in energy from the surroundings✓  More energy required for breaking bonds than making new bonds✓ |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. Manraj studies how iron is extracted from iron ore in his science lesson. His teacher writes this equation on the board.

|  |  |  |
| --- | --- | --- |
| Fe2O3 + 3CO 🡪 2Fe + 3CO2 | | |
| **(a)** | **(i)** | Define the term ‘oxidation’. **[1 mark]** |
|  |  | Gain of oxygen or loss of electrons✓ |
|  |  |  |
|  | **(ii)** | Manraj’s teacher says there is a reducing agent in this reaction.  Which substance is the reducing agent in this reaction? What does it do? **[2 marks]** |
|  |  | Carbon monoxide is the reducing agent✓  It loses/donates electrons to another (ion) (reducing the other species)✓ |
|  |  |  |
| **(b)** | **(i)** | Which reactant is reduced? **[1 mark]** |
|  |  | Fe2O3 or Iron oxide✓ |
|  |  |  |
|  | **(ii)** | Complete the half equation for this reaction. **[1 mark]** |
|  |  | 2Fe3++……**6**…. e-🡪……**2**…. Fe✓ |

1. pH scales are often used in laboratories.

|  |  |  |
| --- | --- | --- |
| **(a)** |  | Complete the sentences. Use the words from the list below. **[2 marks]**  **hydrogen acidity hydroxide alkalinity alkali corrosive** |
|  |  | The pH scale is used to measure the relative …**acidity**….or.... **alkalinity**....  of a substance.✓  Acids form ... **hydrogen**... ions when they dissolve in water, and solutions of  alkalis contain ..... **hydroxide**..... ions.✓ |
|  |  |  |
| **(b)** |  | Why is water formed in neutralisation reactions? **[1 mark]** |
|  |  | Hydrogen ion (from acid) react with hydroxide ions (in alkalis) to form water✓ |
|  |  |  |
| **(c)** |  | A bottle is labelled as concentrated acid and has a hazard symbol on it.  What does the term ‘concentrated’ mean? **[1 mark]** |
|  |  | The amount of acid compared to the volume of the solution✓ |
|  |  |  |

1. The picture shows electrolysis of sodium chloride solution.

|  |  |  |
| --- | --- | --- |
| Diagram showing electrolysis of sodium chloride solution | | |
| **(a)** | **(i)** | The electrolysis reaction above uses inert electrodes. What does ‘inert’ mean?  **[1 mark]** |
|  |  | Unreactive✓ |
|  |  |  |
|  | **(ii)** | At which electrode do the cations form? **[1 mark]** |
|  |  | Cathode/negative electrode✓ |
|  |  |  |
| **(b)** | **(i)** | What are the products of electrolysis of sodium chloride solution? **[3 marks]** |
|  |  | Chlorine gas✓  Hydrogen (gas)✓  Sodium hydroxide✓ |
|  |  |  |
|  | **(ii)** | In electrolysis, what happens at each electrode? **[2 marks]** |
|  |  | *Cathode:*  Positive ions gain electrons/are reduced✓  *Anode:*  Negative ions lose electrons/are oxidised✓ |
|  |  |  |

1. Neutralisation can be used to produce salts.

Sodium hydroxide and sulfuric acid react together to produce sodium sulfate.

|  |  |  |
| --- | --- | --- |
| **(a)** |  | Complete the balanced symbol equation. **[1 mark]** |
|  |  | ...**2**... NaOH + H2SO4 🡪 .. **Na2SO4**... + 2H2O✓ |
|  |  |  |
| **(b)** |  | What is mass sodium hydroxide needed to make 25.0g of sodium sulfate?  **[3 marks]**  Use the periodic table to help you. |
|  |  | Mr of Na2SO4 =142.1  and  Mr of NaOH = 40.0 ✓  Amount of NaOH needed = (25.0 ÷ 142.1) × 2 × 40.0✓  = 14.1✓ |
|  |  |  |

1. Combustion is another type of chemical reaction. Hydrogen can be oxidised by combustion.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | **Bond** | **Bond Energy (kJ/mol)** | | --- | --- | | H-H | 426 | | O=O | 495 | | H-O-H | 920 | | | |
| **(a)** |  | Using the bond energies in the table above, show that the oxidation of hydrogen is exothermic. **[3 marks]** |
|  |  | Energy to break bonds:  (2 × 426) + 495= -1347 kJ/mol ✓  Energy to make bonds:  2 × 920 = +1840 kJ/mol ✓  Energy of the reaction:  -1347+1840 = (+)493 kJ/mol ✓ |
|  |  |  |

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If you are looking for examination practice materials, you can find the Sample Assessment Materials (SAMs) on the qualification webpage: [Combined Science A (9–1).](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/)

# End of topic quiz

# Topic C3: Chemical Reactions

## Learner Activity

### Topic: C3 of J250

**Total marks: 43**

1. Calcium forms Ca2+ ions. What is the formula of calcium chloride? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | CaC*l* |  |
| **B** | CaC*l*2 |  |
| **C** | Ca2C*l* |  |
| **D** | Ca2C*l2* |  |

Your answer

1. Which statement best describes neutralisation? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | An acid reacting with an alkali and a salt to form water. |  |
| **B** | An acid reacting with water and a salt to form an alkali or base. |  |
| **C** | An acid reacting with an alkali or base to form a salt plus water. |  |
| **D** | An acid reacting with a salt to form an alkali or base. |  |

Your answer

1. What is the correct formula for sodium chloride? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Na2C*l*2 |  |
| **B** | NaC*l*2 |  |
| **C** | Na2C*l* |  |
| **D** | *NaCl* |  |

Your answer

1. Which of the following is an ionic compound? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Ammonia |  |
| **B** | Carbon dioxide |  |
| **C** | Magnesium Oxide |  |
| **D** | Methane |  |

Your answer

1. What are the symbols s, l, g and aq used to describe? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Chemical properties |  |
| **B** | Elements |  |
| **C** | Physical states |  |
| **D** | Molecules |  |

Your answer

1. Bill weighs a piece of magnesium. He then heats it in air, where it reacts with oxygen. Bill weighs the product of the reaction.

|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** | **(i)** | What are the chemical symbols for magnesium and oxygen? **[1 mark]** | |
|  |  | **Magnesium** |  |
|  |  |  | |
|  |  | **Oxygen** |  |
|  |  |  | |
|  | **(ii)** | Write a balanced symbol equation for the reaction of magnesium with oxygen.  **[1 mark]** | |
|  |  |  | |
|  |  |  | |
| **(b)** | **(i)** | How much product is made if 5.0g of magnesium reacts with 5.0 g of oxygen?  **[4 marks]**  Give your answer to 2 significant figures. | |
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| Fe2O3 + 3CO 🡪 2Fe + 3CO2 | | |
| **(a)** | **(i)** | Define the term ‘oxidation’. **[1 mark]** |
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|  | **(ii)** | Manraj’s teacher says there is a reducing agent in this reaction.  Which substance is the reducing agent in this reaction? What does it do? **[2 marks]** |
|  |  |  |
|  |  |  |
| **(b)** | **(i)** | Which reactant is reduced? **[1 mark]** |
|  |  |  |
|  |  |  |
|  | **(ii)** | Complete the half equation for this reaction. **[1 mark]** |
|  |  | 2Fe3++………. e-🡪………. Fe |

1. pH scales are often used in laboratories.

|  |  |  |
| --- | --- | --- |
| **(a)** |  | Complete the sentences. Use the words from the list below. **[2 marks]**  **hydrogen acidity hydroxide alkalinity alkali corrosive** |
|  |  | The pH scale is used to measure the relative …………….….or.........................  of a substance.  Acids form ....................... ions when they dissolve in water, and solutions of  alkalis contain ......................... ions. |
|  |  |  |
| **(b)** |  | Why is water formed in neutralisation reactions? **[1 mark]** |
|  |  |  |
|  |  |  |
| **(c)** |  | A bottle is labelled as concentrated acid and has a hazard symbol on it.  What does the term ‘concentrated’ mean? **[1 mark]** |
|  |  |  |
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|  |  |  |
|  |  |  |
|  | **(ii)** | At which electrode do the cations form? **[1 mark]** |
|  |  |  |
|  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
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