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**GCSE Combined Science**

**(and Chemistry)**

**Student Revision Booklet**

**Using resources**

**Contents:**

1. Student checklist and RAG sheet
2. Pre-revision Multiple Choice Quiz
3. Key Questions, 5 sentences, 5 words
4. Exam Question Practice
5. Progress checkpoint - Post-revision Multiple Choice Quiz
6. Student checklist and RAG sheet

**Student Checklist and RAG Sheet**

**Using resources**

**Read each statement below and colour the box that best describes your current understanding.**

**(R – red: low understanding, A – amber: some understanding, G - green: good understanding)**

**Combined and Separate Chemistry**

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| --- | --- | --- | --- |
| **Checklist statement** | **R** | **A** | **G** |
| State what humans use Earth's resources for, give some examples of natural resources that they use |  |  |  |
| Define the term finite and distinguish between finite and renewable resources |  |  |  |
| Explain what sustainable development is and discuss the role chemistry plays in sustainable development, including improving agricultural and industrial processes |  |  |  |
| State examples of natural products that are supplemented or replaced by agricultural and synthetic products |  |  |  |
| HT ONLY: Name and describe alternative biological methods for extracting metals, including phytomining and bioleaching |  |  |  |
| HT ONLY: Evaluate alternative methods for extracting metals |  |  |  |
| Describe, carry out and interpret a simple comparative life cycle assessment (LCA) of materials or products |  |  |  |
| Discuss the advantages and disadvantages of LCAs |  |  |  |
| Carry out simple comparative LCAs for shopping bags made from plastic and paper |  |  |  |

**Pre-Revision**

**Multiple Choice Questions**

**Using Resources**

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| **INSTRUCTIONS Score: /10** |

* **Read the question carefully.**
* **Circle the correct letter.**
* **Answer all questions.**

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| 1. | A natural resource is one that: | |
|  | a. | Will eventually run out. |
|  | b. | Can be replaced within our lifetime. |
|  | c. | Is made in a lab by scientists. |
|  | d. | Occurs naturally and is not made synthetically. |
| 2. | A finite resource is one that: | |
|  | a. | Will eventually run out. |
|  | b. | Can be replaced within our lifetime. |
|  | c. | Is made in a lab by scientists. |
|  | d. | Occurs naturally and is not made synthetically. |
| 3. | Sustainable development is: | |
|  | a. | Improving industries with no regard for the limitations of our resources. |
|  | b. | Improving industries to meet our needs now. |
|  | c. | Improving industries to meet our needs now without endangering the needs of future generations. |
|  | d. | Improving industries to exceed our needs now. |
| 4. | Which of the following is not a natural resource: | |
|  | a. | Linseed oil. |
|  | b. | Silk. |
|  | c. | Polyester. |
|  | d. | Wool. |
| 5. | Metals can be removed from their ores by: | |
|  | a. | Oxidation with carbon. |
|  | b. | Reduction with carbon. |
|  | c. | Combustion with carbon. |
|  | d. | Neutralisation with carbon. |
| 6. | Reduction with carbon occurs when: | |
|  | a. | The metal has the same reactivity as carbon. |
|  | b. | The metal is more reactive than carbon. |
|  | c. | The metal is less reactive than carbon. |
|  | d. | The metal is found native. |
| 7. | Electrolysis can occur in: | |
|  | a. | Molten or dissolved ionic compounds. |
|  | b. | Molten or dissolved covalent compounds. |
|  | c. | Solid ionic compounds. |
|  | d. | Solid covalent compounds. |
| 8. | In electrolysis metal ions go to the negative electrode because: | |
|  | 1. They need to gain electrons. | |
|  | 1. They need to lose electrons. | |
|  | 1. They are a gas. | |
|  | 1. Opposites attract. | |
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| 9. | When low grade copper is found this method can be used to extract it: | |
|  | a. | Mining. |
|  | b. | Phytomining. |
|  | c. | Drilling. |
|  | d. | Combustion. |
|  |  | |
| 10. | Life cycle analysis assesses the environmental impact of a product caused by: | |
|  | a. | Extracting and processing raw materials, making the product, using and maintaining the  product and disposing of the product. | |
|  | b. | Only making the product. | |
|  | c. | Making and disposing of the product. | |
|  | d. | Use, reuse and maintenance of the product. | |
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**Key questions, 5 sentences, 5 words**

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| **INSTRUCTIONS** |

* **For each statement, use either the suggested website or your own text book to write a 5-point summary. In examinations, answers frequently require more than 1 key word for the mark, so aim to include a few key words.**
* **It is important to stick to 5 sentences. It is the process of selecting the most relevant information and summarizing it that will help you remember it.**
* **Write concisely and do not elaborate unnecessarily, it is harder to remember and revise facts from a big long paragraph.**
* **Finally, identify 5 key words that you may have difficulty remembering and include a brief definition. You might like to include a clip art style picture to help you remember it.**

**Example:**

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| **QUESTION:** | **Discuss the advantages and disadvantages of LCAs.** | | | | |
| **Sources:** | **Website –**   1. <http://www.bbc.co.uk/schools/gcsebitesize/science/21c_pre_2011/materials/makinglifecycleassessmentsrev1.shtml> 2. [https://www.youtube.com/watch?v=cYOC8\_jJcII](https://www.youtube.com/watch?v=cYOC8_jJcII%20) | | | | |
| 1. **LCA is used to assess the environmental impact of a product.** 2. **Data can provide information about the impact of a product from extraction of raw materials through to its disposal at the end of its life.** 3. **Data is available for the use of energy, water, resources and production of some wastes.** 4. **Uncertainty arises from subjective judgements.** 5. **LCA’s do not take into account differences in cost or performance of products so is not always useful for judging which product is best.** | | | | | |
| **LCA** | | **Raw materials** | **Manufacturing** | **Maintenance** | **Waste management** |

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| **QUESTION 1:** | Describe sustainable development and discuss the role chemistry plays in sustainable development, including improving agricultural and industrial processes. | | | | |
| **Sources:** | **Website –**   1. <https://www.iisd.org/topic/sustainable-development> 2. <https://www.youtube.com/watch?v=3WODX8fyRHA> | | | | |
|  | | | | | |
| **Sustainable development** | | **Natural resources** | **Finite** | **Renewable** |  |

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| **QUESTION 2:** | **Describe the difference between natural resources and synthetic materials and state examples of natural products that have synthetic alternatives.** | | | | |
| **Sources:** | **Website –**   1. [**http://www.bbc.co.uk/schools/gcsebitesize/science/21c\_pre\_2011/materials/chemicalscrudeoilrev1.shtml**](http://www.bbc.co.uk/schools/gcsebitesize/science/21c_pre_2011/materials/chemicalscrudeoilrev1.shtml) | | | | |
|  | | | | | |
| **Natural resource** | | **Synthetic material** | **Polymers** | **Biodegradable** |  |

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| **QUESTION 3:** | **Compare alternative biological methods of metal extraction (bioleaching and phytomining) including the advantages and disadvantages of each.** | | | | |
| **Sources:** | **Website –**   1. <https://www.youtube.com/watch?v=6mVoiaTRdmk> 2. <http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/metalsanduses/extractingmetalsrev5.shtml> | | | | |
|  | | | | | |
| **High-grade ore** | | **Low-grade ore** | **Bioleaching** | **Phytomining** | **Displacement** |

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| **QUESTION 4:** | **Describe the process of carrying out a life cycle analysis on your school shoes. Summarise each step in relation to your school shoes.** | | | | |
| **Sources:** | **Website –**   1. <http://www.bbc.co.uk/schools/gcsebitesize/science/21c_pre_2011/materials/makinglifecycleassessmentsrev1.shtml> 2. [https://www.youtube.com/watch?v=cYOC8\_jJcII](https://www.youtube.com/watch?v=cYOC8_jJcII%20) | | | | |
|  | | | | | |
| **Raw material extraction** | | **Manufacture** | **Maintenance** | **Waste management** | **Environmental impact** |

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| **QUESTION 5:** | **Describe the process where a plastic is recycled for a different use, and explain why this is viable.** | | | | |
| **Sources:** | **Website –**   1. <https://getrevising.co.uk/resources/recycling_of_plastics> 2. <http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel/problems_in_environment/recyclingrev1.shtml> | | | | |
|  | | | | | |
| **Recycling** | | **Limited resources** | **Advantages** | **Disadvantages** |  |

**Using Resources**

**Exam Practice**

**This question is about Life cycle assessment:**

Ethene is used to make poly(ethene).

Poly(ethene) is used to make plastic bags.

The table below shows data from a Life Cycle Assessment (LCA) for a plastic bag and a paper bag.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Plastic bag** | **Paper bag** |
|  | Raw materials | Crude oil or natural gas | Wood |
|  | Energy used in MJ | 1.5 | 1.7 |
|  | Mass of solid waste in g | 14 | 50 |
|  | Mass of CO2 produced in kg | 0.23 | 0.53 |
|  | Volume of fresh water used in dm3 | 255 | 4 520 |

A company stated: ‘A Life Cycle Assessment shows that using plastic bags has less environmental impact than using paper bags’.

Evaluate this statement. Use your knowledge and the information from above the table above.

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(6)

**This question is about sustainability and phytomining:**

(Read the information about production of copper.

•        World demand for copper in 2014 was about 22 million tonnes.

•        World reserves of copper are about 700 million tonnes.

•        Most of the copper today is obtained from copper ores. The ores are mined.

•        Copper ore is heated in a furnace to produce copper sulfide. The furnace is heated by burning fossil fuels. Air is blown through the hot copper sulfide to produce copper and sulfur dioxide.

•        Some copper is extracted from low-grade ores by phytomining. Phytomining uses plants to absorb copper compounds. The plants are burned and copper is extracted from the ashes.

A scientist stated:

          ‘more copper should be extracted by phytomining.’

Use the information to justify the scientist’s statement.

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**(Total 6 marks)**

**Post-Revision**

**Multiple Choice Questions**

**Using Resources**

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| **INSTRUCTIONS Score: /10** |

* **Read the question carefully.**
* **Circle the correct letter.**
* **Answer all questions.**

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**Student Checklist and RAG Sheet**

**Using Resources**

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**Combined and Separate Chemistry**

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