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**GCSE Combined Science**

**Student Revision Booklet**

**Chemical Analysis**

**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**

**Chemical analysis**

**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 Science**

|  |  |  |  |
| --- | --- | --- | --- |
| **Checklist statement** | **R** | **A** | **G** |
| Define a pure substance and identify pure substances and mixtures from data about melting and boiling points |  |  |  |
| Describe a formulation and identify formulations given appropriate information |  |  |  |
| Describe chromatography, including the terms stationary phase and mobile phase and identify pure substances using paper chromatography |  |  |  |
| Explain what the Rf value of a compound represents, how the Rf value differs in different solvents and interpret and determine Rf values from chromatograms |  |  |  |
| ***Required practical 12:*** *investigate how paper chromatography can be used to separate and tell the difference between coloured substances (inc calculation of Rf values)* |  |  |  |
| Explain how to test for the presence of hydrogen, oxygen, carbon dioxide and chlorine |  |  |  |

**Multiple Choice Questions**

**GCSE Chemistry – Chemical analysis**

|  |
| --- |
| **INSTRUCTIONS Score: /10** |

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

|  |  |  |
| --- | --- | --- |
| 1. | The process of distillation involves: | |
|  | a. | Evaporation then freezing. |
|  | b. | Evaporation then melting. |
|  | c. | Evaporation then condensation. |
|  | d. | Evaporation. |
| 2. | To separate a solid from a solvent you use the process: | |
|  | a. | Distillation. |
|  | b. | Filtration. |
|  | c. | Crystallisation. |
|  | d. | Fractional distillation. |
| 3. | Chromatography included a: | |
|  | a. | Mobile and static phase. |
|  | b. | Water phase and stationary phase. |
|  | c. | Mobile and immobile phase. |
|  | d. | Mobile and stationary phase. |
| 4. | Impurities affect the boiling point by: | |
|  | a. | Making it higher. |
|  | b. | Having no effect. |
|  | c. | Making it lower. |
|  | d. | Changing the structure. |
| 5. | The conservation of mass principle is: | |
|  | a. | Gases escape because they are light. |
|  | b. | The mass of the products can go down. |
|  | c. | Atoms are lost as by-products. |
|  | d. | Atoms are not created or destroyed, they are rearranged. |
| 6. | The mass can change because: | |
|  | a. | Some of the reactants have not reacted. |
|  | b. | A gas has been produced and escaped. |
|  | c. | A gas has been produced and is lighter than a solid. |
|  | d. | Some of the product sticks to the glassware. |
| 7. | One mole of water weighs: | |
|  | a. | 18g. |
|  | b. | 10g. |
|  | c. | 8g. |
|  | d. | 20g. |
| 8. | Flame tests identify: | |
|  | a. | Negative metal ions. | |
|  | b. | Negative metal atoms. | |
|  | c. | Positive metal ions. | |
|  | d. | Negative metal atoms. | |
|  |  |  | |
| 9. | The flame test colour for potassium is: | |
|  | a. | Brick red. |
|  | b. | Green. |
|  | c. | Crimson. |
|  | d. | Lilac. |
|  |  | |
| 10. | The flame test colour for copper is: | |
|  | a. | Brick red. |
|  | b. | Green. |
|  | c. | Crimson. |
|  | d. | Lilac. |
|  |  | |
|  |  | |
|  |  | |

**Key questions, 5 sentences, 5 words**

|  |
| --- |
| **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 picture to help you remember it.**

**Example:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **QUESTION:** | **Explain how chromatography occurs.** | | | | |
| **Sources:** | **Website –**  <http://www.explainthatstuff.com/chromatography.html>  <https://www.khanacademy.org/test-prep/mcat/chemical-processes/separations-purifications/a/principles-of-chromatography> | | | | |
| 1. **Chromatography is an analytical tool that separates dyes.** 2. **It involves a mobile phase, which moves.** 3. **It involves a stationary phase that does not move.** 4. **The solvent dissolves the sample and carries it up the paper; how attracted to the paper it is impacts on how far it travels.** 5. **The Rf value can be used to identify the component.** | | | | | |
| **Rf** | | **Stationary** | **mobile** | **attraction** | **dissolves** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **QUESTION 1:** | | **Describe, using chemistry definitions, the difference between pure substances and mixtures and explain what a formulation is, giving examples.** | | | |
| **Sources:** | | **Website –**   1. [**http://www.chemistryforkids.net/mixtures/what-is-a-pure-substance**](http://www.chemistryforkids.net/mixtures/what-is-a-pure-substance) 2. [**http://www.chemistryexplained.com/Fe-Ge/Formulation-Chemistry.html**](http://www.chemistryexplained.com/Fe-Ge/Formulation-Chemistry.html) 3. [**http://www.docbrown.info/page01/ExIndChem/FormulationChemistry.htm**](http://www.docbrown.info/page01/ExIndChem/FormulationChemistry.htm) | | | |
|  | | | | | |
| **Pure** | **Mixture** | | **Formulation** | **Desirable properties** | **Fixed melting / boiling point** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **QUESTION 2:** | | **Describe how to test for oxygen, hydrogen, carbon dioxide and chlorine, include any safety measures that should be considered and the positive result for each test.** | | | |
| **Sources:** | | **Website –**   1. <http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel_pre_2011/chemicalreactions/preparinggasesrev4.shtml> 2. <https://www.youtube.com/watch?v=jVkGKurtaiE> | | | |
|  | | | | | |
| **Oxygen** | **Hydrogen** | | **Carbon dioxide** | **Chlorine** |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **QUESTION 3:** | | **Describe how flame tests are used to identify cations.** | | | |
| **Sources:** | | **Website –**   1. <http://chemguide.co.uk/inorganic/group1/flametests.html> 2. <https://www.youtube.com/watch?v=1EXr_L7Ojqg> | | | |
|  | | | | | |
| **Flame test** | **Cation** | | **Nichrome wire loop** | **Hydrochloric acid** |  |

**Chemical analysis**

**Exam Practice**

**This question is about analysing chromatograms:**

A student investigated a food colouring using paper chromatography.

This is the method used.

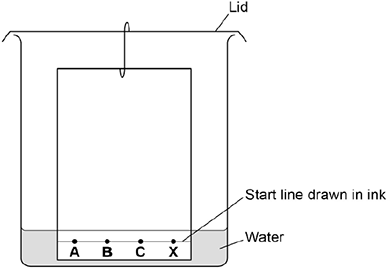
1.       Put a spot of food colouring **X** on the start line.

2.       Put spots of three separate dyes, **A**, **B** and **C**, on the start line.

3.       Place the bottom of the paper in water and leave it for several minutes.

(a)     **Figure 1** shows the apparatus the student used.

**Figure 1**



Give **two** mistakes the student made in setting up the experiment.

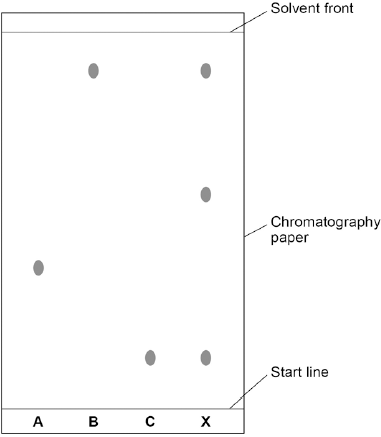
|  |  |  |
| --- | --- | --- |
|  | Tick **two** boxes. |  |
|  | The lid was on the beaker. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |
|  | The paper did not touch the bottom of the beaker. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |
|  | The spots were too small. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |
|  | The start line was drawn in ink. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |
|  | The water level was above the spots. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |

**(2)**

(b)     Another student set the experiment up correctly.

**Figure 2** shows the student’s results.

**Figure 2**



How many dyes were in **X**?

Tick **one** box.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **1** |  |  | **3** |  |  | **4** |  |  | **6** |  |

**(1)**

(c)     Which dye, **A**, **B** or **C**, is **not** in **X**?

|  |  |  |
| --- | --- | --- |
|  | Write your answer in the box. | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img02.png |

**(1)**

(d)     Use **Figure 2** to complete the table below.

Calculate the value for Rf for dye **A**.

|  |  |  |
| --- | --- | --- |
|  |  | **Distance in mm** |
|  | Distance moved by dye **A** | .............................. |
|  | Distance from start line to solvent front | .............................. |

Use the equation:

https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F04_files/img04.png

Give your answer to two significant figures.

........................................................................................................................

........................................................................................................................

........................................................................................................................

          Rf value = ................................................................

**(5)**

**(Total 9 marks)**

**This question is about gas tests:**

This question is about mixtures and analysis.

(a)     Which **two** substances are mixtures?

|  |  |  |
| --- | --- | --- |
|  | Tick **two** boxes. |  |
|  | Air | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Carbon dioxide | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Graphite | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Sodium Chloride | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Steel | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |

**(2)**

(b)     Draw **one** line from each context to the correct meaning.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Context** |  | **Meaning** |
|  |  |  | A substance that has had nothing added to it |
|  | **Pure** substance in chemistry |  | A single element or a single compound |
|  |  |  | A substance containing only atoms which have different numbers of protons |
|  | **Pure** substance in everyday life |  | A substance that can be separated by filtration |
|  |  |  | A useful product made by mixing substances |

**(2)**

(c)     What is the test for chlorine gas?

|  |  |  |
| --- | --- | --- |
|  | Tick **one** box. |  |
|  | A glowing splint relights | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | A lighted splint gives a pop | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Damp litmus paper turns white | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |
|  | Limewater turns milky | https://app.doublestruck.eu/content/AG_CHM/HTML/Q/QSP182F01_files/img01.png |

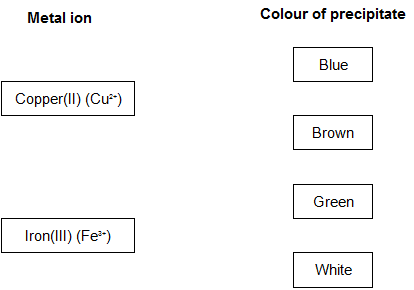
**(1)**

**This question is about cation tests:**

This question is about chemical tests.

(a)     Solutions of copper(II) ions and iron(III) ions produce coloured precipitates with sodium hydroxide solution.

Draw **one** line from each metal ion to the colour of the precipitate it produces.



**(2)**

(b)     Sodium hydroxide solution was added to a solution containing ions of a metal.

A white precipitate was produced. The white precipitate dissolved in excess sodium hydroxide solution.

Use the correct answer from the box to complete the sentence.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **aluminium** | **magnesium** | **potassium** |

The ions in the solution were ions of ............................................................ .

**(1)**

(c)     Low sodium salt contains sodium chloride and potassium chloride.

A student used a flame test on low sodium salt.

(i)      What is the colour produced by sodium ions in a flame test?

...............................................................................................................

**(1)**

(ii)     What is the colour produced by potassium ions in a flame test?

...............................................................................................................

**(1)**

(iii)    Why is it **not** possible to tell from the flame test that both ions are present in low sodium salt?

...............................................................................................................

...............................................................................................................

**(1)**

**(Total 6 marks)**

**Post-Revision**

**Multiple Choice Questions**

**Chemical analysis**

|  |
| --- |
| **INSTRUCTIONS Score: /20** |

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

|  |  |  |
| --- | --- | --- |
| 1. | The process of distillation involves: | |
|  | a. | Evaporation then freezing. |
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| 2. | To separate a solid from a solvent you use the process: | |
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|  |  |  | |
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|  |  | |
|  |  | |

**Student Checklist and RAG Sheet**

**Chemical analysis**

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**Combined Science**

|  |  |  |  |
| --- | --- | --- | --- |
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| Describe a formulation and identify formulations given appropriate information |  |  |  |
| Describe chromatography, including the terms stationary phase and mobile phase and identify pure substances using paper chromatography |  |  |  |
| Explain what the Rf value of a compound represents, how the Rf value differs in different solvents and interpret and determine Rf values from chromatograms |  |  |  |
| ***Required practical 12:*** *investigate how paper chromatography can be used to separate and tell the difference between coloured substances (inc calculation of Rf values)* |  |  |  |
| Explain how to test for the presence of hydrogen, oxygen, carbon dioxide and chlorine |  |  |  |