**Copper compounds**

1. Here are three different compounds.

  

copper carbonate copper oxide copper sulfate

* 1. For each copper compound, use the formula to write down the types of atom it is made from. Write your answers in the table below.

|  |  |  |
| --- | --- | --- |
| **Compound** | **Formula** | **Atoms** |
| copper carbonate | CuCO3 |  |
| copper oxide | CuO |  |
| copper sulfate | CuSO4 |  |

* 1. Explain why the compounds are called ‘copper compounds’.
  2. Look at the picture of copper below.



Explain why the copper compounds have different properties to copper.

* 1. Explain why the copper compounds have different properties to each other.

*Chemistry > Big idea CCR: Chemical reactions > Topic CCR1: Chemical change > Key concept CCR1.1: Formation of new substances*

|  |
| --- |
| **Response activity** |
| **Copper compounds** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | During a chemical reaction a new substance (or substances) are formed with different properties. |
| Observable learning outcome: | Explain observations of a thermal decomposition reaction. |
| Activity type: | application and practice |
| Key words: | compound, formula, atom |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic question:

* Heating a compound

**What does the research say?**

Research (Talanquer, 2007) found that many students have an additive framework of understanding about compounds. They think that compounds are a mixture of elements and that the properties of a compound are a combination of those of its individual component elements (see key concept: CPS2.1 Atoms and molecules). In contrast emergent properties cannot be easily predicted from the properties of the individual parts. They emerge from that particular arrangement of atoms.

In order to understand chemical reactions students need to link their observation of new properties (for example a colour change) with the rearrangement of atoms and hence the formation of a new substance.

**Ways to use this activity**

This activity may be carried out as a pencil and paper exercise but you may wish to provide samples of the compounds for students to see.

This activity gives students the opportunity to practise applying their understanding and to clarify their thinking through discussion. To support this, students should complete the activity in pairs or small groups. The focus should be on student responses to part c.

It may be beneficial to ask each group of students to report back their answer to part c to the whole class. After each group has fed back, the class could develop even better answer. Alternatively, you could model an improved answer.

*Differentiation*

This activity could be carried out through verbal discussion either one to one or in small groups.

**Equipment**

For the class:

* Samples of copper and copper compounds (optional)

Practical work should be carried out in accordance with local health and safety requirements, guidance from manufacturers and suppliers, and guidance available from CLEAPSS.

**Expected answers**

1a

|  |  |  |
| --- | --- | --- |
| **Compound** | **Formula** | **Atoms** |
| copper carbonate | CuCO3 | copper, carbon, oxygen |
| copper oxide | CuO | copper, oxygen |
| copper sulfate | CuSO4 | copper, sulfur, oxygen |

b All of the compounds contain copper atoms.

c Copper atoms do not have the same properties as copper. Copper is made up entirely of copper atoms. This gives rise to the specific properties of copper. In copper compounds the copper atoms are joined with other types of atom so the properties cannot be the same as the element copper.

d The copper compounds are all made up of a different combination of types of atom so they have different properties.

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Developed by Helen Harden (UYSEG).

Images:

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**References**

Talanquer, V. (2007). Students' predictions about the sensory properties of chemical compounds: Additive versus emergent frameworks. *Science Education,* 92(1)**,** 96-114.