**Classification of Substances into Structure Types**

The bonding between particles in a substance determines its structure type, which consequently defines the properties of the substance.

**Purpose of Task**

* To classify unknown substances according to their structure type.
* To examine how the structure of materials affects their uses.

**Part A: Pre-Laboratory Activity**

The six compounds listed in the table below are all white powders.

Find the information to complete the table, using the stations for each compound set up around the laboratory and data books.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Compound** | **Formula** | **m.pt. (oC)** | **Flame Colour** | **Solubility in water** | **Electrical Conductivity**  **(yes/no)** | | |
| **solid** | **molten** | **water** |
| sodium chloride |  |  |  | soluble |  |  |  |
| sodium carbonate |  |  |  | soluble |  |  |  |
| lithium chloride |  |  |  | soluble |  |  |  |
| benzoic acid |  |  | N/A | insoluble |  |  |  |
| silicon dioxide |  |  | N/A | insoluble |  |  |  |
| glucose |  |  | N/A | soluble |  |  |  |

Hence, classify each of these six compounds as either metallic, ionic, covalent lattice or covalent molecular:

sodium chloride

sodium carbonate

lithium chloride

benzoic acid

silicon dioxide

glucose

**Part B: Investigation Design**

Use the information from your completed tableto design a series of simple tests to determine the structure type of two white powders **X** and **Y**.

Note**:** The two white powders **X** and **Y** are two of the compounds listed in your table.

List of equipment

Method

Explain three safety procedures you will carry out during this investigation.

**Part C: Results**

Carry out your tests and record your observations in an appropriate format.

**Part D: Conclusion and Discussion**

Use your results to explain the likely structure types of powders **X** and **Y**.

Use your results to determine the identity of powders **X** and **Y**.

**X**

**Y**

**Part E: Questions**

1. Explain why materials with ionic lattice structures can be used as electrical insulators but not as electrical conductors at room temperature.

*2*. Explain why materials with metallic lattice structures can be used to make wires and connections that conduct electricity in electrical circuits.

**Assessment Conditions for this task:**

Students will work individually in all components of this task.

Three lessons are allocated for the task, which will be completed in class time.

**Assessment Design Criteria**

Investigation, Analysis and Evaluation: IAE 1, 2, 3 Knowledge and Application: KA 1

**Performance Standards for Stage 1 Chemistry**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **A** | **B** | **C** | **D** | **E** |
| **Investigation, Analysis and Evaluation** | **1**  **2**  **3**  **4** | Critically deconstructs a problem and designs a logical, coherent, and detailed chemistry investigation.  Obtains records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effects on data. | Logically deconstructs a problem and designs a well-considered and clear chemistry investigation.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effects on data. | Deconstructs a problem and designs a considered and generally clear chemistry investigation.  Obtains, records, and represents data, using generally appropriate conventions and formats with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effects on data. | Prepares a basic deconstruction of a problem and an outline of a chemistry investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | Attempts a simple deconstruction of a problem and a procedure for a chemistry investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. |
| **Knowledge and Application** | **1**  **2**  **3**  **4** | Demonstrates deep and broad knowledge and understanding of a range of chemical concepts.  Applies chemical concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of chemistry coherently with highly effective use of appropriate terms, conventions and representations. | Demonstrates some depth and breadth of knowledge and understanding of a range of chemical concepts.  Applies chemical concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of chemistry mostly coherently with effective use of appropriate terms, conventions, and representations. | Demonstrates knowledge and understanding of a general range of chemical concepts.  Applies chemical concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of chemistry generally effectively using some appropriate terms, conventions, and representations. | Demonstrates some basic knowledge and partial understanding of chemical concepts.  Applies some chemical concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic chemical information, using some appropriate terms, conventions, and/or representations. | Demonstrates some limited recognition and awareness of chemical concepts.  Attempts to apply chemical concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about chemistry. |