










Learning scenario about **environmental awareness**

Title: **Water hidden in crystals**



General information

Topic(s)	Goals	Activity description
 Climate change	Objectives <ul style="list-style-type: none">To gain knowledge about crystal water and crystal water saltsTo practise doing simple experimentsTo practise using simple laboratory equipment	Student's profile (age): 13–18 years
 Biodiversity and conservation		Number of participants: 2–20 in pairs
 Waste management and recycling	Learning outcomes <p>By the end of this learning scenario, students will be able to:</p> <ul style="list-style-type: none">perform a simple chemical experimentunderstand what crystal water and crystal water salts areunderstand that water can be incorporated into the crystal lattice of ionic lattice surfacesunderstand that some metal ions have a characteristic colour when hydrated	Duration: ≈ 2x45 min
 <u>Water resources and quality</u>		Related subject of the school curriculum/Skill/Content: chemistry
 Sustainable agriculture and food security		Material needed: 2 test tubes, test tube clamp, test tube rack, Bunsen burner, match, a small beaker of water, dropper, copper sulphate, ferrous sulphate
 Environmental health and justice		#Hashtags crystal water, crystal water salts, coloured ions
 Energy use and transportation		





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Introduction



When we think of water in a solid form, we usually think of ice, but there are a number of ionic compounds that have water molecules embedded in their crystal lattice, and not in small quantities. The incorporated water is called crystal water and the ionic substances are called crystal salts.





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Kolb's cycle steps

1



FEELING

Engage students in hands-on activities and real-life examples related to the environmental topics.

CONCRETE EXPERIENCE

Students experiment with copper sulphate and iron sulphate, teacher facilitates.

1. Experimenting with copper sulphate

Copper sulphate is used in viticulture for spraying. Don't put it into your mouth because it is poisonous!

Observe and note down its colour.

Put a small piece of it into a test tube and start heating it. Don't stop until you see a change of colour.

Note down the change, and take a photo if possible.

Put the test tube aside and let it cool for some time.

If there is condensed water on the wall of the tube after heating, let it drop to the bottom of the tube! If

there is no condensed water, drop a few drops of water into the test tube!

Note down your experience.

(Explanation: water accounts for 36% of the mass of a copper sulphate crystal. When heated, the crystal loses its water content. Copper sulphate without water is white in colour. The blue colour of the Cu^{2+} ion is due to the water! Formula: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$)

2. Experiment with iron sulphate

Repeat the experiment with iron sulphate. Note down your experience.

What similarities did you observe in the two experiments?

(Explanation: Iron glycol = iron (II) sulphate heptahydrate, formula $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$.

Iron glycol is a fertilizer used for iron deficiency.)

Summary:





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The heating caused the crystals to lose water. In both cases this resulted in colour loss. The addition of water brought them back to their original colour. Some metals have a characteristic colour when hydrated.

Look for other, not necessarily coloured ionic crystal compounds that contain crystal water! How do they behave when crystal water is lost or water is added? What are they used for?

During the experiment, the students should record their experiences following the teacher's instructions and answering the questions. After the experiment, these notes should be shared and compared.

2



WATCHING

Encourage students to reflect on their experiences, observations, and emotions during the activities.

REFLECTIVE OBSERVATION







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<p>3</p>  <p>THINKING</p> <p>Guide students to analyze and conceptualize the information gathered, connecting it to broader concepts and theories</p>	<p>ABSTRACT CONCEPTUALIZATION</p>	<p>While answering the question "What similarities did you observe in the two experiments?", students establish regularities based on observations and experiences. The teacher facilitates.</p> <p>See explanation: The heating caused the crystals to lose water. In both cases this resulted in colour loss. The addition of water brought them back to their original colour. Some metals have a characteristic colour when hydrated.</p>
<p>4</p>  <p>DOING</p> <p>Provide opportunities for students to apply their knowledge and actively</p>	<p>ACTIVE EXPERIMENTATION</p>	<p>Students look for other, not necessarily coloured ionic crystal compounds that contain crystal water! They find out about how they behave when crystal water is lost or water is added? They also try to find out how and for what these materials are used for. The teacher facilitates, all possible resources might be used.</p> <p>(e.g. gypsum – the modelling gypsum is a white powder: $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$. When mixed with water to a pulp, it binds: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. It is used in construction work.)</p>





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experiment with sustainable practices in their daily lives.

Student pairs create a poster to present what compounds containing crystal water they have found, what is the everyday use of these materials.

Evaluation



Posters are exhibited and students vote for the best one.



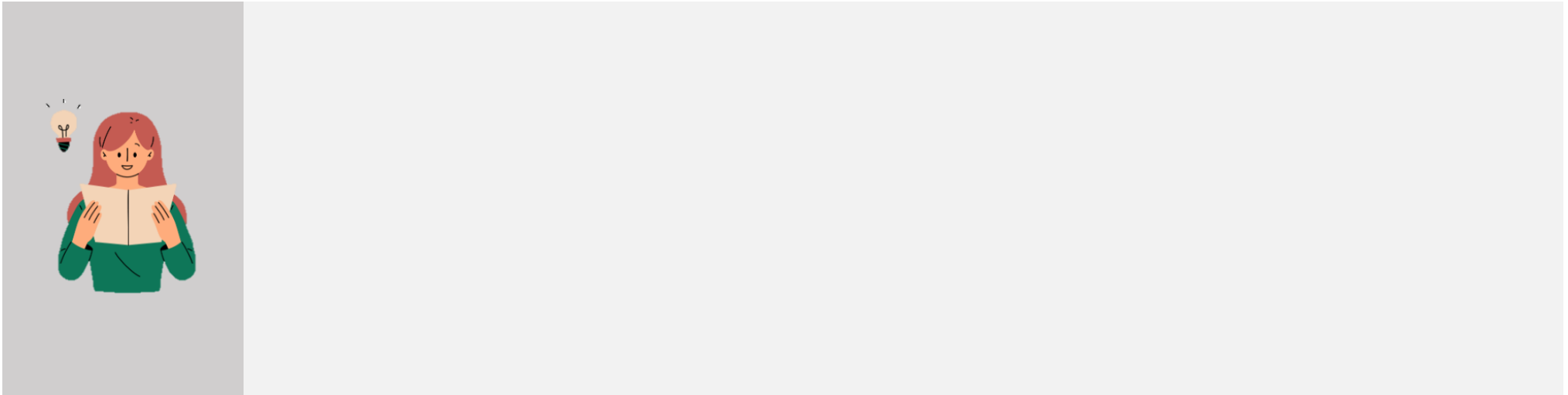









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Additional resources – Tips and tricks



PARTNERS							
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