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Glowing Veggies

Quebec - Achievements and Competencies

Learning Outcomes

Cycle 2 (Gr. 9-10)
Characteristic chemical properties
Transformation of energy
Properties of solutions
Electricity

The Quebec Achievements and Competencies are based on the Progression of Learning Outcomes derived from the Quebec Education Plan set by the Ministere de l'Education, du Loisir et du Sport.

Specific Expectations

GENERAL EDUCATION PATH

CYCLE 2 (Gr. 9-10) — Secondary 3

MATERIAL WORLD

A. Properties
    4. Characteristic chemical properties
        a. Reaction to indicators
            i. Recognizes a substance by its characteristic chemical properties (e.g. starch turns blue in the presence of an iodine solution, acidic solutions turn bromothymol blue yellow)

Glowing Veggies is an alternative project to the flame test done in most high school chemistry courses. Students can make a prediction about the emission spectrum of the various solutions used in this activity. The emission observed from the glowing vegetable will allow the students to identify the various metal ions present in the solutions.

B. Changes
    5. Transformation of energy
        a. Forms of energy
            ii. Identifies the forms of energy involved in a transformation (e.g. electrical to thermal in a toaster, electrical to radiation in an infrared lamp)

Students should recognize that the electrical current supplied to the metal-ion-soaked vegetables causes the emission of light. The light that is released is a specific colour due to the emission spectrum of the metal ion present in the solution.

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Secondary 4

MATERIAL WORLD

A. Properties
    3. Properties of solutions
        i. Ions
            i. Defines the concept of an ion

In *Glowing Veggies*, students will be investigating metal ion solutions. It is important for students to understand the concept of an ion for this activity.

F. Electricity and electromagnetism
    1. Electricity
        d. Electrical circuits
            i. Describes the function of different elements of an electrical circuit (e.g. the wires transmit electrons along the circuit, resistors transform electrical energy into another form of energy)

Students will describe why using an electrical current results in the release of a spectrum of light. As the current is travels through the ion-soaked vegetable, the electricity causes one or more valence shell electrons to temporarily jump to a higher energy level. When each electron falls back to its original energy level, it emits energy, in this case light, of a certain frequency and wavelength, and therefore a specific colour.

EST Secondary 4

MATERIAL WORLD

A. Properties
    3. Properties of solutions
        d. Concentration
            v. Determines the concentration of an aqueous solution (g/L, percentage, ppm, mol/L)

In the *Student Handout* for this activity, students will calculate the mass of halides required to make a solution of molarity 4 mol/L for a certain volume of solution. Teachers can use the *Handout Answers* to assist with student learning and address any challenges they may face.

C. Organization
    1. Structure of matter
        n. Concept of the mole
            i. Defines the mole as the unit of measure of the amount of a substance
            ii. Expresses an amount of a substance in moles

Students should be familiar with the concept of moles. They should know that a mole is used as a unit of measure of the amount of a substance. In the *Student Handout*, students will be doing calculations using moles. Teachers can use this activity to help teach and reinforce the concept of moles.

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APPLIED GENERAL EDUCATION PATH

CYCLE 2 (Gr. 9-10) — Secondary 3

MATERIAL WORLD

A. Properties
    4. Characteristic chemical properties
        a. Reaction to indicators
            i. Recognizes a substance by its characteristic chemical properties (e.g. starch turns blue in the presence of an iodine solution, acidic solutions turn bromothymol blue yellow)

Glowing Veggies is an alternative project to the flame test done in most high school chemistry courses. Students can make a prediction about the emission spectrum of the various solutions used in this activity. The emission observed from the glowing vegetable will allow the students to identify the various metal ions present in the solutions.

B. Changes
    4. Transformation of energy
        a. Forms of energy
            ii. Identifies the forms of energy involved in a transformation (e.g. electrical to thermal in a toaster, electrical to radiation in an infrared lamp)

Students should recognize that the electrical current supplied to the metal-ion-soaked vegetables causes the emission of light. The light that is released is a specific colour due to the emission spectrum of the metal ion present in the solution.

Secondary 4

MATERIAL WORLD

F. Electricity and electromagnetism
    1. Electricity
        d. Electrical circuits
            i. Describes the function of different elements of an electrical circuit (e.g. the wires transmit electrons along the circuit, resistors transform electrical energy into another form of energy)

Students will describe why using an electrical current results in the release of a spectrum of light. As the current is travels through the ion-soaked vegetable, the electricity causes one or more valence shell electrons to temporarily jump to a higher energy level. When each electron falls back to its original energy level, it emits energy, in this case light, of a certain frequency and wavelength, and therefore a specific colour.

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SE Secondary 4

MATERIAL WORLD

A. Properties
3. Properties of solutions
a. Solutions
iv. Determines the concentration of an aqueous solution (g/L, percentage, ppm, mol/L)

In the *Student Handout* for this activity, students will calculate the mass of halides required to make a solution of molarity 4 mol/L for a certain volume of solution. Teachers can use the *Handout Answers* to assist with student learning and address any challenges they may face.

d. Ions
i. Defines the concept of an ion

In *Glowing Veggies*, students will investigate metal ion solutions. It is important for students to understand the concept of an ion for this activity.

C. Organization
l. Concept of the mole
i. Defines the mole as the unit of measure of the amount of a substance
ii. Expresses an amount of a substance in moles

Students should be familiar with the concept of moles. They should know that a mole is used as a unit of measure of the amount of a substance. In the *Student Handout*, students will be doing calculations using moles. Teachers can use this activity to help teach and reinforce the concept of moles.

Techniques

B. SCIENCE
a. Safely using laboratory materials and equipment
i. Uses laboratory materials and equipment safely (e.g. allows hotplate to cool, uses beaker tongs)
ii. Handles chemicals safely (e.g. uses a spatula and pipette filler)

f. Preparing solutions
ii. Prepares an aqueous solution of a specific concentration given a concentrated aqueous solution

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Strategies

A. EXPLORATION STRATEGIES

2. Distinguishing between the different types of information useful for solving the problem
6. Formulating questions
7. Putting forward hypotheses (e.g. individually, in teams, as a class)
10. Imagining solutions to a problem in light of his or her explanations
13. Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
15. Ensuring that the procedure is appropriate and safe and making the necessary adjustments
17. Generalizing on the basis of several structurally similar cases

B. INSTRUMENTATION STRATEGIES

4. Using different tools for recording information (e.g. diagrams, notes, graphs, procedures, logbook)
5. Using a variety of observational techniques and tools
6. Selecting suitable techniques or tools for observation

C. ANALYTICAL STRATEGIES

3. Using different types of reasoning (e.g. inductive and deductive reasoning, comparison, classification, prioritization) in order to process information
4. Reasoning by analogy in order to process information and adapt scientific and technological knowledge

D. COMMUNICATION STRATEGIES

3. Exchanging information
4. Comparing different possible explanations for or solutions to a problem in order to asses their relevance (e.g. full-group discussion)
5. Using tools to display information in various formats (e.g. data tables, graphs, diagrams)