

## Quebec - Achievements and Competencies

### Learning Outcomes

Cycle 1 (Gr. 7-8)	Cycle 2 (Gr. 9-10)	Chemistry (Sec. 5)
Properties of matter	Properties of matter	Reaction rate
Chemical changes	Chemical changes	

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

### Specific Expectations

#### GENERAL EDUCATION PATH

#### CYCLE 1 (Gr. 7-8) — Secondary 1 and 2

#### MATERIAL WORLD

##### A. Properties

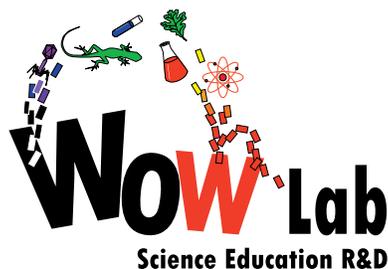
1. Properties of matter
  - c. Temperature
    - i) Describes the effect of heat on the degree of agitation of particles

In *Quanta of Colour*, students will discover that changing the temperature affects the size of the molecules formed, which in this case are the quantum dots. The size of the quantum dots relates to the colour that is visible under the UV light. Depending on the grade level, teachers can address this learning outcome with varying levels of scientific content and explanation.

##### B. Changes

3. Chemical changes
  - a. Chemical changes
    - ii) Explains a chemical change based on the changes in the properties of the substances involved

Students recognize that a chemical change is occurring. They may explain that when heat is added, the rate of the reaction increases.



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## Quanta of Colour - Quebec - Achievements and Competencies

### **CYCLE 2 (Gr. 9-10) — Secondary 3 and 4**

#### MATERIAL WORLD

##### A. Properties

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  - c. Temperature
    - i) Describes the effect of heat on the degree of agitation of particles

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3. Chemical changes
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### **APPLIED GENERAL EDUCATION PATH**

### **CYCLE 1 (Gr. 7-8) — Secondary 1 and 2**

#### MATERIAL WORLD

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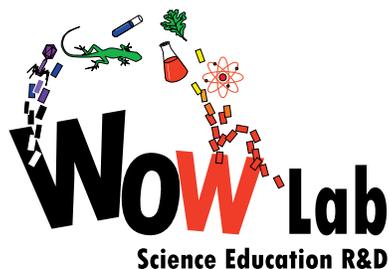
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### **CHEMISTRY - Optional Program**

#### **Secondary 5**

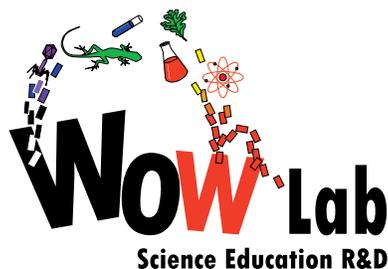
#### REACTION RATE

1. Factors that influence the reaction rate
  - i) Determines experimentally the factors that influence the reaction rate

In *Quanta of Colour*, students determine the factors that influence the reaction rate. An increase in temperature increases the reaction rate, causing the quantum dots to change in size.

- d. Temperature
  - i) Explains the effect of the temperature of the reactants on the reaction rate

Students will come to understand that an increase in temperature increases the rate of reaction, which changes the size of the quantum dots. The heated reaction is visible under the UV light, displaying different colours depending on the size of the quantum dots.



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## 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)
- d. Using measuring instruments
  - i) Adopts the appropriate position for reading an instrument
  - iii) Measures the volume of a liquid using the appropriate graduated cylinder
  - v) Measures temperature using a graduated thermometer

### C) Techniques common to Science and Technology

- a. Verifying the repeatability, accuracy and sensitivity of measuring instruments
  - i) Takes the same measurement several times to check the repeatability of the instrument used
  - ii) Carries out the required operations to ensure the accuracy of a measuring instrument (e.g. cleans and calibrates a balance, dries out a graduated cylinder, rinses and calibrates a pH-meter)

## Strategies

### A. EXPLORATION STRATEGIES

6. Formulating questions
7. Putting forward hypotheses (e.g. individually, in teams, as a class)
9. Anticipating the results of his or her approach
11. Taking into account the constraints involved in solving a problem or making an object (e.g. specifications, available resources, time allotted)
13. Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
14. Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses)
15. Ensuring that the procedure is appropriate and safe and making the necessary adjustments

### 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

### 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 assess their relevance (e.g. full-group discussion)