

**LESSON TITLE: CHEMICAL AND PHYSICAL CHANGES (PART 1)**

**TOTAL TIME: TWO 60-MINUTE PERIODS (WITH THE SECOND BEING CLASS PRESENTATIONS)**

**BRIEF DESCRIPTION**

In the first class, students will watch *The House That STEM Built: Chemical and Physical Changes* video. Throughout the video, they will have a worksheet with a series of questions to answer. All answers can be found directly in the video. In the second class, students will create their own experiment to demonstrate a chemical and physical change.

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**CURRICULUM OUTCOMES**

Taken from the pre-2020 New Brunswick Grade 9 Science curriculum. Content in this video and lesson plan also applies to Chemistry 11 and 12.

GENERAL CURRICULUM OUTCOMES

Understanding a variety of scientific changes.

SPECIFIC CURRICULUM OUTCOMES

301-9: Identify changes that can be made to an object without changing the properties of the material of which it is made.

301-10: Identify and describe changes to materials that are reversible and some which are not.

301-11: Describe changes that occur in the properties of materials when materials interact with each other.

301-12: Identify examples of interactions between materials that result in the production of gas.

300-11: Relate the mass of a whole object to the sum of the mass of its parts.

## **NEW BRUNSWICK GLOBAL COMPETENCIES ACHIEVED<sup>1</sup>**

- Critical Thinking and Problem-Solving
  - Learners solve complex problems by taking concrete steps to design and manage solutions.
  - Learners see patterns, make connections, and transfer their learning from one situation to another, including real-world applications.
- Innovation, Creativity, and Entrepreneurship
  - Learners enhance concepts, ideas, or products through a creative process.

## **LEARNING OBJECTIVES**

The learner will be able to

- define physical change,
  - define chemical change,
  - identify examples of physical change, and
  - identify examples of chemical change.
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## **MATERIALS**

- Pencil or pen.
- Loose leaf paper.
- Handout titled “Grade 9 Video Questions For *Chemical and Physical Changes*”.

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<sup>1</sup> [https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t\\_QJknev0eD33rZ-foYYn6bmdmc](https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t_QJknev0eD33rZ-foYYn6bmdmc) also available at <https://tinyurl.com/nb-competencies>

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**BEFORE CLASS**

Print one copy of the handout titled “Grade 9 Video Questions for *Chemical and Physical Changes*” for each student.

**WARM-UP: 10 MINUTES**

Ask students what they think of when they hear the term “physical changes”. Write this term on the whiteboard so students can see it and reflect on it. Give students adequate time to reflect on the term.

Ask students to share some of the key things they thought of when hearing “physical changes”. As students are sharing, write their responses on the whiteboard.

Now, ask students what they think of when they hear the term “chemical changes”. Write this term on the whiteboard so students can see it and reflect on it. Give students adequate time to reflect on the term.

Ask students to share some of the key things they thought of when hearing “chemical changes”. As students are sharing, write their responses on the whiteboard.

Tell students that today they will be learning about what these two terms mean and that they will be learning different examples of each that can be found in their homes.

Pass out the worksheet titled “Grade 9 Video Questions for *Chemical and Physical Changes*”. Go over the directions of the worksheet with students.

As students are watching *The House That STEM Built: Chemical and Physical Changes* video, they are responsible for answering the ten questions. All the answers are directly from the video.

Teachers can use this worksheet as marks or as a formative assessment tool. This decision is up to the teacher.

### **ACTIVITY: 35 MINUTES**

Start watching *The House That STEM Built: Chemical and Physical Changes* video. The video will be played more than once. Therefore, no pauses are necessary. As students are watching the video, the teacher should be circulating to make sure students are focusing on the video, staying quiet, and answering the questions.

Once the video has finished playing through once, give students **7 minutes** to fill in some answers and check which answers they still need.

Start playing the video again. This will be the second time they have viewed the video.

After the video has finished the second time, provide approximately **7 minutes** for students to finish writing their answers.

The teacher will determine if the video needs to be played a third time based on the number of students who have not completed all 23 questions on the worksheet.

### **CONCLUSION: 15 MINUTES**

Introduce the following project to the students.

Students will need to demonstrate a chemical and physical change in front of the class. Students should be given approximately **5–7 minutes** to present both reactions to the class. This can be done in person, or the students can record themselves and present the video to the class.

- They must explain why their example meets the criteria of a physical change.
- They must explain why their example meets the criteria of a chemical change.

This can be done individually or in groups. This decision is up to the teacher. Each student (or group) must get approval for their example by the teacher before they can demonstrate it to the class. Provide a due date for the presentations.

Let students begin brainstorming their ideas.

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## **DIFFERENTIATION**

### CONTENT

Some students may struggle to keep up with the video and reading the questions on their handout. The teacher can turn on the subtitles for the video to help students follow along.

### PRACTICE

Some students may not be able to answer all 23 questions in the time given. Therefore, the teacher can assign half the questions if needed.

### PRODUCT

The teacher can choose whether some students only demonstrate either a physical change or a chemical change.

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## **EXTENSION**

Instead of students choosing and demonstrating a chemical and physical change, the teacher can demonstrate various examples of each. After the teacher has finished demonstrating, the students must write if the example was a chemical or physical change and explain why.

GRADE 9 VIDEO QUESTIONS FOR  
CHEMICAL AND PHYSICAL CHANGES

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**DIRECTIONS**

While watching *The House That STEM Built: Chemical and Physical Changes* video, answer the following questions. Hand this sheet into the teacher at the end of class.

1. What are physical changes?
2. What is an example of a physical change when building a house?
3. What is a characteristic of a physical change?
4. What is involved in a chemical reaction?
5. What is the result of a chemical reaction? A reaction occurs when one or more substances combine to change into one or more different substances.
6. What are two examples of a chemical reaction when building a house?

7. What is the process of curing as it pertains to concrete?
  
8. How do the workers ensure that the curing process is taking place while working with concrete?
  
9. What large industrial structure was discussed as an example of what happens when the wrong ingredients are used to create concrete? Where is this structure located?
  
10. What is needed to create a silica gel?
  
11. What are the main ingredients found in paint?
  
12. Titanium dioxide is a substance used in paint to create which colours?
  
13. Iron oxide is a substance used in paint to create which colours?
  
14. What is another name used for a binder?

15. What is another name used for solvent?
  
16. When you smell paint, which ingredient are you actually smelling?
  
17. What is the definition of a binder?
  
18. What type of paints are acrylic polymers used for?
  
19. What type of paints are alkyd polymers used for?
  
20. What type of paints are epoxy polymers used for?
  
21. When having a fire, what substances react to create carbon dioxide?
  
22. What happens during the process of internal combustion?
  
23. What products does internal combustion produce?

GRADE 9 VIDEO QUESTIONS FOR  
CHEMICAL AND PHYSICAL CHANGES ANSWER KEY

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**ANSWERS**

1. What are physical changes?

When objects or substances undergo a change that does not change their chemical composition.

2. What is an example of a physical change when building a house?

Using wood to make walls, roof trusses, and cabinets.

3. What is a characteristic of a physical change?

A physical change is semi-irreversible.

4. What process is involved in a chemical reaction?

Combining different substances.

5. What is the result of a chemical reaction? A reaction occurs when one or more substances combine to change into one or more different substances.

The result of a chemical reaction is a new substance with new chemical and physical properties.

6. What are two examples of a chemical reaction when building a house?

Concrete and paint.

7. What is the process of curing as it pertains to concrete?

Curing is the process of keeping adequate moisture and temperature in concrete after it has been poured.

8. How do the workers ensure that the curing process is taking place while working with concrete?

The workers spray water on the concrete while smoothing it out.

9. What large industrial structure was discussed as an example of what happens when the wrong ingredients are used to create concrete? Where is this structure located?

The Mactaquac Hydroelectric Dam. This example is located along the St. John River in New Brunswick.

10. What is needed to create a silica gel?

Silica + alkali = silica gel.

11. What are the main ingredients found in paint?

Pigments, binder, and solvent.

12. Titanium dioxide is a substance used in paint to create which colours?

Titanium dioxide creates bright white.

13. Iron oxide is a substance used in paint to create which colours?

Iron oxide creates yellow, red, brown, and orange.

14. What is another name used for a binder?

Binder can also be called resin.

15. What is another name used for solvent?

Solvent can also be called thinner.

16. When you smell paint, what part of the paint are you actually smelling?

If you walk into a room and smell paint, you are actually smelling the solvent being evaporated into the air.

17. What is the definition of a binder?

Binder is the substance used to make the paint stick to the wall.

18. What type of paints are acrylic polymers used for?

Acrylic polymers are used for the ceiling, wall, and industrial paints.

19. What type of paints are alkyd polymers used for?

Alkyd polymers are used for glossy paints for doors and cabinets.

20. What type of paints are epoxy polymers used for?

Epoxy polymers are used for industrial coating paints.

21. When having a fire, what substances react to create carbon dioxide?

Carbon, oxygen, and hydrogen react to create carbon dioxide.

22. What happens during the process of internal combustion?

During internal combustion, the fuel and air mix together.

23. What products does internal combustion produce?

Internal combustion produces many different substances such as  $\text{CO}_2$ , carbon monoxide, nitrogen, hydrogen, and oxygen.

**LESSON TITLE: CHEMICAL AND PHYSICAL CHANGES (PART TWO)**

**TOTAL TIME: TWO 60-MINUTE PERIODS (WITH THE SECOND BEING CLASS PRESENTATIONS)**

**BRIEF DESCRIPTION**

In this second class, students will present their examples of chemical and physical changes.

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**CURRICULUM OUTCOMES**

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SPECIFIC CURRICULUM OUTCOMES

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## **NEW BRUNSWICK GLOBAL COMPETENCIES ACHIEVED<sup>2</sup>**

- Innovation, Creativity and Entrepreneurship
  - Learners enhance concepts, ideas, or products through a creative process.

## **LEARNING OBJECTIVES**

The learner will be able to

- define physical change,
  - define chemical change,
  - identify examples of physical change, and
  - identify examples of chemical change.
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## **MATERIALS**

- Pencil or pen.
  - Loose leaf paper.
  - Handout titled “*Chemical and Physical Changes Exit Slip*”.
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## **BEFORE CLASS**

Print out one copy of “*Chemical and Physical Changes Exit Slip*” for each student.

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<sup>2</sup> [https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t\\_QJkenev0eD33rZ-foYYn6bmdmc](https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t_QJkenev0eD33rZ-foYYn6bmdmc) also available at <https://tinyurl.com/nb-competencies>

### **WARM-UP: 10 MINUTES**

Show students *The House That STEM Built: Chemical and Physical Changes* video without any pauses.

Have a student share the definition of a physical change. Write the definition on the board. Definition:

→ A physical change occurs when objects or substances undergo a change that does not alter their chemical composition.

Have a student share the definition of a chemical change. Write the definition on the board. Definition:

→ A chemical change involves combining different substances which react to produce a new substance.

### **ACTIVITY: 40 MINUTES**

Students will use this time to present their projects to the class. Remind students to keep their presentations within the **5-7-minute** time restriction.

Remind students that while others are presenting, they must sit quietly and be respectful of the presenters.

The presenters must present their chemical and physical change and explain to the class how it meets the criteria for both changes.

### **CONCLUSION: 10 MINUTES**

Hand out the worksheet titled "*Chemical and Physical Changes Exit Slip*". Have students complete the exit slip and hand back to the teacher before they leave.

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## **DIFFERENTIATION**

### CONTENT

Some students could only demonstrate a physical change or a chemical change.

### PRACTICE

Students can be given the option to work in a group or work together.

### PRODUCT

Some students may choose to demonstrate their change in front of the class or they record their change happening and present the video to the class.

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## **EXTENSION**

Instead of students choosing and demonstrating a chemical and physical change, the teacher can demonstrate various examples of each. After the teacher has finished demonstrating, the students must write if the example was a chemical or physical change and explain why.

