Name:	Group:
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THE PROBLEM

PATIENCE IS A VIRTUE!

OTTAWA (CP) – A recent study demonstrates that fever increases the rate of reaction of the human immune system. When the body fights an infection, its temperature often rises, leading to a fever. A fever may bring discomfort, but according to researchers, it promotes healing and limits the proliferation of certain germs.

"The human body is a collection of physical and chemical changes. When a person eats a potato chip, we can see the salt dissolving in the mouth. When a person inhales, there is the oxidation of carbohydrates," explain the authors of the study. They claim that a rise in temperature speeds up the rate of reaction of physical and chemical changes in the human body.

In the event of a fever, the best advice is to rest the body and let the organism defend itself. The researchers emphasize, however, the importance of quick intervention if the body's temperature rises to 40°C.

WANTED: EXPERIMENT PROTOCOLS

Studies have shown that physical and chemical changes occurring in the human body speed up when a person has a fever. The magazine *Exploration* is organizing introductory science workshops to test if a rise in temperature provokes a similar effect on other physical and chemical changes. The editorial team is looking for experimental protocols that make it possible to observe the effects of a rise in temperature on the rate of reaction during dissolution, precipitation and oxidation.

The protocols must permit comparison of the rate of change at room temperature (about 25°C) and at 40°C. Experiments therefore must be able to be done at two temperatures. Individuals who wish to submit a proposal must demonstrate the effectiveness of their protocol and record their observations every minute for five minutes. The editorial team also wishes to receive the conclusions of the experiment.

A protocol must focus on one of the following experiments:

- Dissolution of 1 g sodium chloride in 20-mL distilled water NaCl solid → NaCl solution
- 2. Precipitation of mixture of 10-mL 142 g/L sodium sulphate solution with 10-mL 110 g/L calcium chloride solution Na₂SO₄ solution + CaCl₂ solution \rightarrow 2 NaCl solution + CaSO₄ solid
- 3. Oxidation of copper wire dipped in 20-mL 170 g/L silver nitrate solution Cu solid + 2 AgNO $_3$ solution \rightarrow 2 Ag solid + Cu (NO $_3$) $_2$ solution

In this learning situation, you will submit a report for one of the experiments.

CREATING THE CONTEXT

I ask myself questions

- 2. What is a chemical change?
- 3. What clues permit distinguishing between a chemical change and a physical change?
- 4. What is oxidation?
- 5. What is decomposition?
- 6. What is precipitation?
- 7. What is dissolution?

CREATING THE CONTEXT (continued)

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10. What form of energy is associated with a rise in temperature?

11. How can the effect of a rise in temperature on the rate of change be observed?

l must

12. Restate in your own words the goal of the problem solving.

13. What is the independent variable?

14. What is the dependent variable?

Name:	Group:	

CREATING THE CONTEXT (continued)

I think

15. What effect would a rise in temperature have on the rate of change being of	observed?	
Formulate a test hypothesis and explain.	Josei ved !	
16. What observations will be able to be made during the change?		
Reflection		
Do I understand?	Yes	No
forms of energy (thermal)		
physical change		
chemical change		
dissolution		
decomposition		
synthesis		
oxidation		

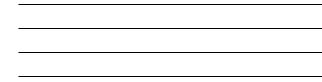
precipitation

PLANNING THE PROBLEM SOLVING

I plan

Make a list of materials and substances needed for your experiment.

2. Describe the protocol of your experiment.



WHEN THE TEMPERATURE RISES

Name: Group:

PLANNING THE PROBLEM SOLVING (continued)

3. Prepare a table for recording your observations; remember to give the table a title.

4. Which safety rules must you respect during your experiment?

Reflection Yes

Did I envision different possibilities?

6

No

INITIATING THE PROBLEM SOLVING

I experiment

- **1.** Perform your experiment and record your observations in the table you prepared.
- 2. Did you modify your plan of action during the experiment? If yes, explain your answer.

3. Did you work safely during the experiment? Explain giving two examples.

-			

Reflection Yes No

Did I note and explain each modification I made to my plan of action?

Name: Group:

ANALYZING RESULTS AND DRAWING CONCLUSIONS

I analyze my results

1.	Name the change observed during your experiment and explain how it occurred.
2.	What clues allowed you to conclude that the change observed was a physical change or a chemical change? Explain your answer.
3.	What is the effect of a rise in temperature on the change being observed? Explain your answer using the results of your experiment.
4.	Explain the effect of an increase in thermal energy on the rate of change.
5.	What are possible causes of errors in your experiment? Suggest ways to correct them.

ANALYZING RESULTS AND DRAWING CONCLUSIONS (continued)

I draw my conclusions

6.	Was your test hypothesis correct? Explain.
	What conclusions can you draw from your experiment? What is the effect of a rise in temperature on the change you observed?
8.	Does this conclusion allow you to confirm that a fever increases the rate of reaction of the body's immune system? Explain your answer.

MY EVALUATION

Use the evaluation grid on the following page to do a self-evaluation. Write A, B, C, D or E in the appropriate box in the table below.

	SSC1 Seeks answers o problems	r so	lutior	ns to scientific or technological
Criteria*	Observable indicators	νM	Teacher	Comments
1	Creating the context			
	Definition of the goal and formulation of a test hypothesis		□ With help	
2	Planning the problem solving			
	Relevance of the elements in the plan of action: materials and procedure		□ With help	
3	Initiating the problem solving			
	Accuracy of results and respect for safety rules		□ With help	
4	Analyzing results and drawing conclusions			
	Analysis of results and reflections on the problem solving		□ With help	

* Evaluation criteria

- **1** Appropriate representation of the situation
- 2 Development of a suitable plan of action for the situation
- 3 Appropriate implementation of the plan of action
- 4 Development of relevant conclusions, explanations or solutions

Group: _

EVALUATION GRID

Seeks answers or solutions to scientific or technological problems

Name:

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		Analysis of results and reflections on the problem solving	very deany. Relationship with fever is established very dearly.	dearly. Netationship with fever is established clearly.	not on less deany. OR Relationship with fever is not established.	AND A less deany. AND Relationship with fever is not established.	ne i edolie:

Evaluation criteria

- Appropriate representation of the situationDevelopment of a suitable plan of action for the situation
- 3 Appropriate implementation of the plan of action4 Development of relevant conclusions, explanations or solutions