Name: _____ Group: _____

THE PROBLEM

PRESS RELEASE

Shawinigan – September 7, 2009

Getting Students Involved

Last night a series of mysterious thefts occurred in a number of the town's businesses. A variety of objects, often of very little value, were stolen. This morning municipal authorities asked a group of tech-lab students if they would be interested in participating in the investigation. The students were happy to be able to have a hand in solving the crime and responded enthusiastically. The authorities gave them the following mission: to identify the samples collected by investigators on-site in the different stores and thus find the guilty party.

Among the tasks set out for them, students are to identify four substances by means of experiments and tests:

- a dense solid (i.e. one that is not soluble in water)
- a solid in the form of a powder
- a liquid
- a gas

In this learning situation, you will play the role of a tech-lab student.

Notes _____

Name: _____ Group: _____

CREATING THE CONTEXT

I ask myself questions

1. What is a characteristic property?

_____

_____

_____

2. Name some characteristic properties.

_____

_____

_____

3. How can we identify a substance?

_____

_____

_____

4. What do we need to do to identify the substances of the samples collected by the investigators?

_____

_____

_____

_____

_____

I must

5. What is the goal of the legal investigation?

_____

_____

_____

_____

Name: _____ Group: _____

CREATING THE CONTEXT (*continued*)

I think

6. Which characteristic properties can you find for the following substances?

a) a dense solid not soluble in water?

_____

_____

_____

b) a powdered solid?

_____

_____

_____

c) a liquid?

_____

_____

_____

d) a gas?

_____

_____

_____

Reflection

	Yes	No
Do I have a good understanding of:		
• characteristic physical properties?	☐	☐
• characteristic chemical properties?	☐	☐
• pure substances?	☐	☐

Name: _____ Group: _____

PLANNING THE PROBLEM SOLVING

I plan

1. Plan each test that you will do on the substances given to you.

a) Specify the goal for each test.

b) List the materials needed for each test.

c) Give the steps for each test.

d) Indicate your observations for each test in a table of results.

2. What safety rules must be followed for each test?

Reflection

	Yes	No
Can I think of any other possibilities?	☐	☐

Name: _____ Group: _____

INITIATING THE PROBLEM SOLVING

I experiment

1. Perform the tests on the substances. Be sure to follow the steps you listed earlier.
2. If necessary, modify your action plan. Be sure to record and explain your changes, and have them approved by the person in charge.
3. Record your observations and the results of your tests. If necessary, include your calculations.
4. Did you perform the tests safely? Explain your answer giving two examples.

Reflection

	Yes	No
Did I write down and explain all the changes I made to my action plan?	☐	☐

Name: _____ Group: _____

ANALYZING RESULTS AND DRAWING CONCLUSIONS

1. Relate the tests you performed with the results you obtained in order to identify the substances.

Dense solid Code: _____ Name of substance: _____

Tests performed	Final results

Powdered solid Code: _____ Name of substance: _____

Tests performed	Final results

Liquid Code: _____ Name of substance: _____

Tests performed	Final results

Gas Code: _____ Name of substance: _____

Tests performed	Final results

2. Are your results similar to the data in the tables of properties? If so, explain your answer.

_____

_____

3. Who committed the thefts?

_____

Name: _____ Group: _____

LIST OF SUSPECTS

SUSPECT No. 1

Age: 42
Height: 1.72 m
Weight: 85 kg

This man manufactures zinc eavestroughs. He loves the colour green, but he hates fire and is always on the lookout for one that needs to be extinguished. He routinely chews antacids to soothe his heartburn.

SUSPECT No. 2

Age: 34
Height: 1.50 m
Weight: 56 kg

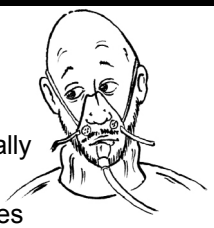
This man devours alcohol-filled candies. He collects potassium-based explosives and stores them in aluminum boxes. His mother is seriously ill and is hooked up to a respirator.

SUSPECT No. 3

Age: 51
Height: 1.57 m
Weight: 51 kg

Always on the prowl for quality wine, this connoisseur needs to take a potassium supplement. She is always decked out in cheap jewellery and often takes trips in hot-air balloons.

SUSPECT No. 4



Age: 35
Height: 1.80 m
Weight: 95 kg

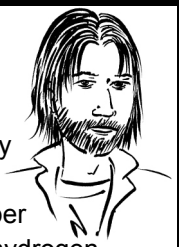
This man is clinically depressed and asthmatic. He takes lithium and is hooked up to an oxygen tank. In his spare time, he cleans iron with acid.

SUSPECT No. 5

Age: 48
Height: 168 m
Weight: 72 kg

This woman is very concerned about global warming. She makes explosives using carbon, potassium salts and sometimes nitroglycerine.

SUSPECT No. 6



Age: 29
Height: 1.82 m
Weight: 100 kg

This man craves salty food, and is always thirsty. He uses copper salt explosives with hydrogen detonators. He writes his ideas on pieces of paper with a lead pencil.

SUSPECT No. 7

Age: 49
Height: 1.75 m
Weight: 80 kg

This woman's favourite food treat is salty french fries. She hates fire and she often gargles with glycerine to stop her coughing. She installs aluminum siding.

SUSPECT No. 8

Age: 28
Height: 1.80 m
Weight: 89 kg

This loner is obsessed with zeppelins. His hands are permanently stained blue from copper salts. He hunts small animals with a lead pellet rifle. Afterwards he cleans his gun in a frenzy.

SUSPECT No. 9

Age: 61
Height: 1.60 m
Weight: 80 kg

This woman is always eating food and drinking water. Her every breath is filled with the odour of sulphur. Her shoes are often wet and stained with calcium salts.

Name: _____ Group: _____

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 or solutions to scientific or technological problems				
Criteria*	**Observable indicators**	**Me**	**Teacher**	**Comments**
1	**Creating the context** Definition of the goal and formulation of the test proposal for the substances to be identified		☐ With help	
2	**Planning the problem solving** Relevance of the elements of the plan of action: materials and procedures		☐ With help	
3	**Initiating the problem solving** Accuracy of the results and calculations		☐ With help	
4	**Analyzing results and drawing conclusions** Identification of substances and the guilty party		☐ 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

EVALUATION GRID

Name: _____ Group: _____

SSC1 Seeks answers or solutions to scientific or technological problems.

Criteria*	Observable indicators	A	B	C	D	E
1	**CREATING THE CONTEXT** Definition of the goal and formulation of the test proposal for the substances to be identified	Goal is defined very clearly and related to problem. Tests proposed for all substances are relevant.	Goal is defined clearly and related to problem. Tests proposed for all substances are relevant.	Goal is not defined clearly or not related to problem. OR Tests proposed for substances are more or less relevant.	Goal is not defined clearly and not related to problem. AND Tests proposed for substances are not relevant.	The work needs to be redone.
2	**PLANNING THE PROBLEM SOLVING** Relevance of the elements in the plan of action: materials and procedures	List of materials is complete. Procedures are formulated very clearly and relevant.	List of materials is complete. Procedures are formulated clearly and relevant.	List of materials is missing elements. OR Procedures are formulated more or less clearly and relevant.	List of materials is missing elements. AND Procedures are formulated poorly and not relevant.	The work needs to be redone.
3	**INITIATING THE PROBLEM SOLVING** Accuracy of the results and calculations	All results are noted and relevant. All calculations are done correctly.	All results are noted and relevant. Some calculations contain minor errors.	Some results are noted and relevant. Some calculations contain minor errors.	Calculations contain major errors.	The work needs to be redone.
4	**ANALYZING RESULTS AND DRAWING CONCLUSIONS** Identification of substances and the guilty party	All four substances and the guilty party are identified correctly.	All four substances are identified correctly.	Two or three substances are identified correctly.	One or no substance is identified correctly.	The work needs to be redone.

* 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