

# THE PROBLEM

## INTERVIEW

Lumber Cottage Construction Inc. is looking for apprentices to team up with building electricians.

The employer calls interested applicants to an interview during which he shows them an electrical circuit assembly. The circuit is installed in a cottage and consists of:

- 2 light bulbs simulating the lights in the kitchen and the bedroom
- heating element simulating a space heater
- 1.5-V motor simulating an electric-fan motor or some other motor

The employer says that the circuit components are powered by a current source and adds that he has noted a problem in the circuit. He asks the applicants to find the defective electrical function. He also wants them to propose modifications that will make the circuit functional and compliant with the specifications. Lastly, he has them draw a circuit diagram for the corrected electrical circuit.

In this situation, you play the role of an applicant called for an interview.

# THE PROBLEM *(continued)*

## ELECTRICAL CIRCUIT SPECIFICATIONS

### Overall function

- The electrical circuit is installed in a cottage and consists of two light bulbs, a ceramic heating element and a motor.

### Material constraints

- The circuit has two light bulbs of the same intensity. Each one is controlled by a switch.
- The circuit has a switch-controlled resistance heater.
- The circuit has a switch-controlled motor.
- The circuit is powered by a current source.
- The circuit is made from insulated electrical wires with crocodile clips.
- The light bulbs supply light of equal intensity, but they are controlled separately.

### Environmental constraint

- The use of recycled materials must be the first choice.

### Human constraint

- The circuit must not be hazardous to health and must be safe in all respects.

Group: \_\_\_\_\_

Group: \_\_\_\_\_



Name: \_\_\_\_\_

Group: \_\_\_\_\_

# GATHERING INFORMATION

## I do research

1. Name and draw the symbols for the circuit components.

Name	Symbol

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Group:

## I do research

[illegible]

Name: \_\_\_\_\_

Group: \_\_\_\_\_

## GATHERING INFORMATION *(continued)*

### I analyze my results

3. What is the overall function of the electrical circuit?

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4. Name the components of the circuit assembly that you will represent and define their functions.

1. Component: Sample answer: Current source fuse

Function: Protection: automatically interrupts the flow of electric current in  
an abnormal situation.

2. Component:

Function:

3. Component:

Function:

4. Component:

Function:

5. Component:

Function:

6. Component:

Function:

7. Component:

Function:

8. Component:

Function:





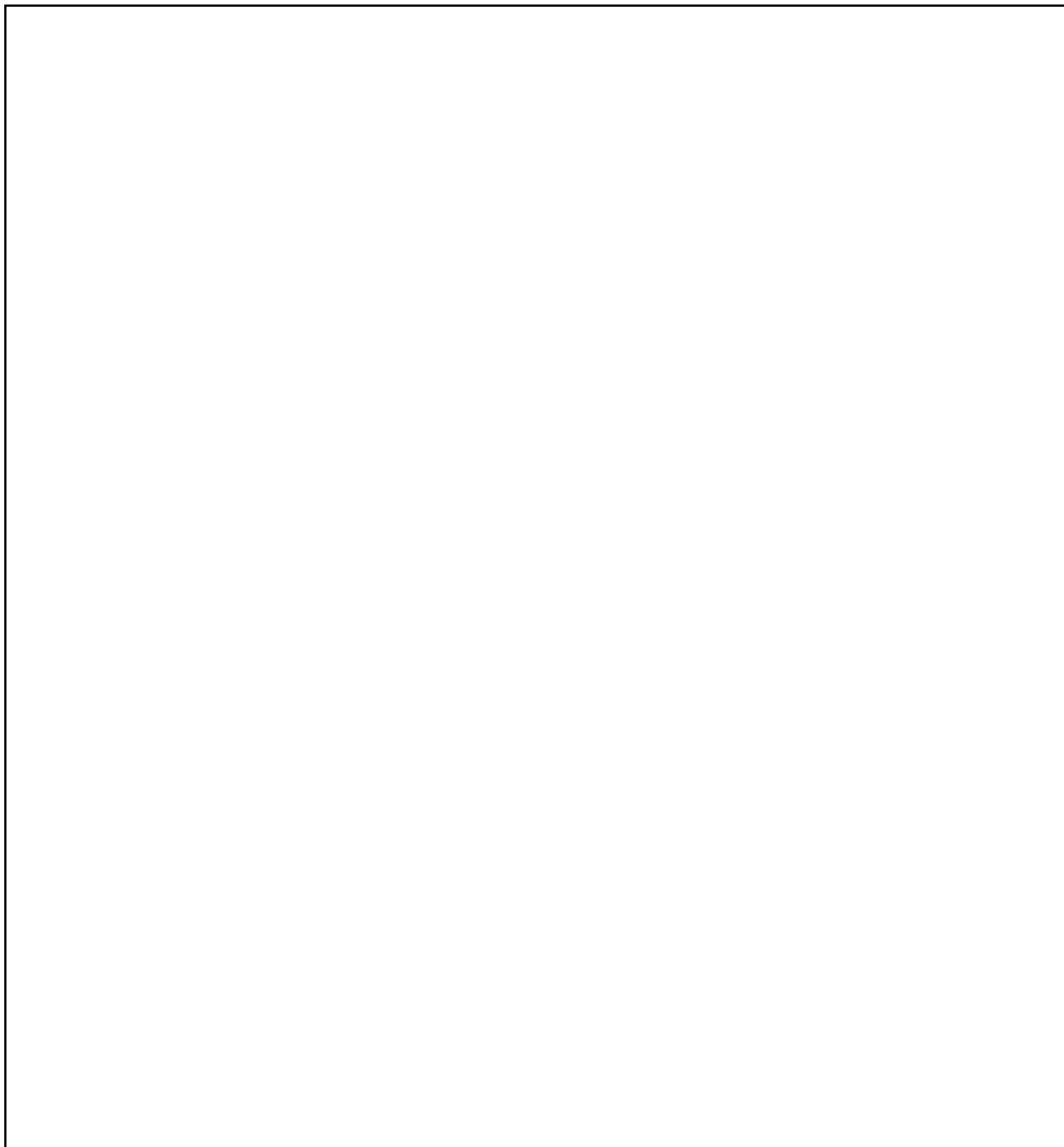
Name: \_\_\_\_\_

Group: \_\_\_\_\_

## GATHERING INFORMATION *(continued)*

### I analyze my results

5. Draw a circuit diagram for the electrical circuit assembly you have been shown.



Name: \_\_\_\_\_

Group: \_\_\_\_\_

## GATHERING INFORMATION *(continued)*

6. Does the circuit fulfill the overall function of the electrical circuit? Justify your answer.

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7. Are the material, environmental and human constraints in the specifications satisfied? Justify your answer.

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8. Propose a few modifications to make the circuit assembly functional.

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### Reflection

Have I clearly understood the following:

- the power supply function?
- the conduction, insulation and protection functions?
- the control function?

Yes

No

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Name: \_\_\_\_\_

Group: \_\_\_\_\_

# COMPLETING THE PROBLEM SOLVING

## I make suggestions

1. Which circuit function is affected by the problem you observed? Justify your answer.

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2. How will you modify the circuit to make it functional and compliant with the specifications?

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Name: \_\_\_\_\_

Group: \_\_\_\_\_

## COMPLETING THE PROBLEM SOLVING

(continued)

3. If applicable, draw another circuit diagram for the circuit assembly, including your proposed modifications.



### Reflection

- Have I considered various solutions to correct the circuit?
- Have I considered several ways of drawing the circuit?

Yes

☐☐

No

☐☐

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Group: \_\_\_\_\_

# VALIDATING THE PROBLEM SOLVING

## I justify my approach

1. Considering the defective function, explain why you propose making these modifications to the electrical circuit assembly.

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2. How could you improve the quality of your diagram drawing?

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Name: \_\_\_\_\_

Group: \_\_\_\_\_

# MY EVALUATION

Use the evaluation grid on the next page for your self-evaluation. Write A, B, C, D or E in the appropriate spaces in this table.

SSC 2 Makes the most of his/her knowledge of science and technology				
Criteria*	Observable indicators	Me	Teacher	Comments
1	<b>Creating the context</b>		<input type="checkbox"/> With help	
	Definition of the goal and formulation of questions for solving the problem			
2	<b>Gathering information</b>		<input type="checkbox"/> With help	
	Identification of the components, definition of their function and drawing of the circuit diagram			
3	<b>Completing the problem solving</b>		<input type="checkbox"/> With help	
	Relevance of the defective function and the proposed modifications			
4	<b>Validating the problem solving</b>		<input type="checkbox"/> With help	
	Justification of the proposed modifications			

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Name: \_\_\_\_\_


Group: \_\_\_\_\_

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**\* Evaluation criteria**

1. Formulation of appropriate questions
2. Appropriate use of scientific and technological concepts, laws, models and theories
3. Relevant explanations, solutions or actions
4. Suitable justification of explanations, solutions or actions

# EVALUATION GRID

 <b>SSC2</b> Makes the most of his/her knowledge of science and technology						
Criteria*	Observable indicators	A	B	C	D	E
<b>1</b>	<b>CREATING THE CONTEXT</b> Definition of the goal and formulation of questions for solving the problem	The goal is very clear, and all the questions are relevant.	The goal is clear, and most of the questions are relevant.	The goal is more or less clear, or a few questions are more or less relevant.	The goal is more or less clear, and the questions are more or less relevant.	The work needs to be redone.
<b>2</b>	<b>CREATING INFORMATION</b> Identification of the components, definition of their function and drawing of the diagram	All the components are identified and their function is very clearly defined AND the diagram is drawn very well and representative of the circuit assembly	All the components are identified and their function is clearly defined AND the diagram is drawn well and representative of the circuit assembly.	A few components are identified and their function is more or less well defined OR the diagram is drawn more or less well and representative of the circuit assembly.	Most components are not identified and their function is more or less well defined AND the diagram is drawn more or less well and representative of the circuit assembly.	The work needs to be redone.
<b>3</b>	<b>COMPLETING THE PROBLEM SOLVING</b> Relevance of the defective function and the proposed modifications	The defective function and the modifications are relevant and very clearly defined.	The defective function and the modifications are relevant and well defined.	The defective function or most modifications are more or less relevant and defined.	The defective function and most modifications are more or less relevant and defined.	The work needs to be redone.
<b>4</b>	<b>VALIDATING THE PROBLEM SOLVING</b> Justification of the proposed modifications	All the justifications are relevant.	Most of the justifications are relevant.	A few of the justifications are relevant.	The justifications are not relevant.	The work needs to be redone.

## \* Evaluation criteria

- 1 Formulation of appropriate questions
- 2 Appropriate use of scientific and technological concepts, laws, models and theories
- 3 Relevant explanations, solutions or actions
- 4 Suitable justification of explanations, solutions or actions