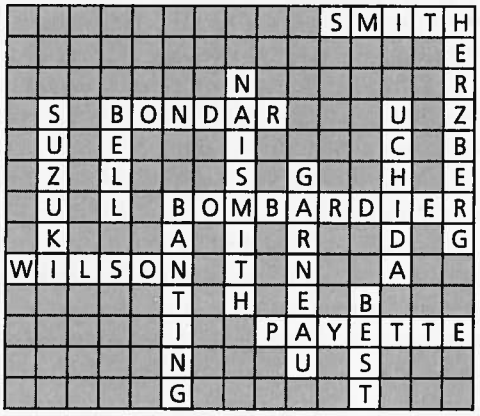
WS 1.0-1 Who Are These Canadians?

Canadian Scientists



WS 1.1-1 Try This: Urban Legend or Science?

Answers are provided in the Teacher's Resource on pages 6 to 7.

BLM 1.2-2 Making a Scientific Hypothesis

1. Sample answers
   (a) If bacteria are allowed to grow on mascara, the population will increase over time.
   (b) The dependent variable is the bacteria population, and the independent variable is time.
   (c) If this is a controlled experiment, variables that should be controlled include temperature, light, type of mascara, and the amount of mascara in each sample.
2. Sample answers
   (a) If the mass of the jar is increased, it will roll farther.
   (b) The dependent variable is the distance the jar rolls, and the independent variable is the mass of the jar.
   (c) Variables that should be controlled include the force with which the jar is pushed (e.g., same ramp angle) and the surface area on which the jar is rolled.
   (d) Based on the data in the graph, the jar will roll 23 m if it has a mass of 230 g, and 15 m if it has a mass of 190 g.
3. Sample answers
   (a) Plants grown under red light will grow faster than plants grown under green light.
   Plants grown under green light will grow faster than plants grown under red light.
   The colour of light will have no effect on the rate of plant growth.
   (b) The dependent variable is the amount of plant growth. The independent variable is the colour of the light.
   (c) A possible control is to have plants growing under white light or normal sunlight.
   (d) Variables that should be controlled include the amount of water, the amount of fertilizer, the type of soil, and the temperature.

WS 1.2-1 Qualitative or Quantitative Observations

Observations	QL ✓	QT ✓	Comment/ Explanation
1. The candle is cylindrical in shape.	✓		
2. It is about 2 cm in diameter.		✓	
3. The length is about 15 cm.		✓	
4. The length decreased during the observation period.	✓		
5. The amount of decrease was about 0.5 cm per half hour.		✓	
6. The candle is translucent.	✓		
7. It is white.	✓		
8. It has a slight odour.	✓		
9. It is solid.	✓		
10. It is soft enough to be scratched with a fingernail.	✓		
11. A relatively thick string extends about 1 cm from the upper end of the candle.	✓	✓	
12. The string or wick ignites when a lighted match is held next to it for a few seconds.	✓		
13. The burning candle makes no sound.	✓		
14. When the flame flickers, smoke comes from it occasionally.	✓		
15. When no currents disturb it, the flame is shaped like an elongated teardrop.	✓		
16. The flame begins about 1 cm above the top of the candle.		✓	
17. The flame is a shade of blue at its base.	✓		
18. Immediately around the wick in a region about 1 cm wide and extending about 1 cm above the top of the wick, the flame is dark.	✓	✓	

Observations	QL ✓	QT ✓	Comment/ Explanation
19. This dark region is roughly conical in shape.	✓		
20. The flame has sharply defined sides but a ragged top.	✓		
21. The last 2 mm of the wick glow red.	✓	✓	
22. Heat is emitted by the flame.	✓		
23. Enough heat is emitted so that it warms a finger uncomfortably when held for 10 or 20 seconds about 0.5 cm to one side or 7–10 cm above the flame.	✓	✓	
24. The top of the burning candle becomes wet with a colourless liquid.	✓		
25. The liquid gradually becomes solid, attaching itself to the outside of the candle.	✓		

WS 1.2-2 Prediction, Inference, and Hypothesis

1. Sample answer
   Prediction: The wire will break when it is tested with a 100 kg object in the hot oven.
   Hypothesis: If the temperature of a wire is increased, its strength will decrease.
2. Sample answer
   Inference: The environment (competition or no competition) determines how large goldfish will grow.
   Hypothesis: If goldfish are reared individually, then they will grow larger than if they are reared in a group.
3. Sample answer
   Prediction: Adding a large amount of baking soda to a glass of water will cause the mixture to bubble over.
   Hypothesis: The number of gas bubbles formed when baking soda is added to water is proportional to the amount of baking soda added. If you add more baking soda, then more gas bubbles will form.
4. Sample answer
   Inference: Something from the chemical plant is causing lung cancer in people who live within a 5 km radius of the plant.
   Hypothesis: If you live within 5 km of a chemical plant, your risk of developing lung cancer is increased.

WS 1.2-3 Examining an Experiment

(a) The control group is Group A—normal plants with tips on the stems. The experimental group is B—plants with tips cut from the shoots.
(b) The independent variable is the lack of tips on the stems. The dependent variable is the plants' response (bending toward the light).
(c) After a period of time the normal plants with tips on the stems bent toward the light. The plants that had the tips cut off did not grow as well and did not bend toward the light.
(d) In the second experiment, Lee and Jill were testing Lee's hypothesis that the plants with the tips cut off did not respond to the light because they were using all their energy trying to repair themselves.
(e) In the second experiment, the normal plants bent toward the light. The plants with their tips covered in foil did not respond to the light.
(f) Lee believed that his first hypothesis was no longer correct because the evidence provided by the second experiment did not support his hypothesis that the plants were using all their energy to repair themselves.
(g) Based on the results of the second experiment, one could conclude that the mechanism for phototropism is found in the tips of plant leaves. If no light reaches the tips of the leaves, the plant will not bend toward the light.

Chapter 1 Quiz

Part A: Matching

1. (e)
2. (d)
3. (b)
4. (f)
5. (a)
6. (c)

Part B: True/False

7. False. The investigator controls the independent variable in an experiment.
8. False. In a negative correlation, variable B decreases as variable A increases. (or, In a negative correlation, variable B increases as variable A decreases.)
9. False. A scientific investigation in which the investigator purposefully controls the variables is called a controlled experiment.
10. True
11. False. Invention is to technology as discovery is to science. (or, Discovery is to science as invention is to technology.)
12. True

Part C: Multiple Choice

13. (c)
14. (c)
15. (b)
16. (d)
17. (d)
18. (c)
19. (d)