**UNIT 4**

**A.3 INVESTIGATING MATTER: PROPERTIES OF WATER**

***Preparing to Investigate***

Determining the cause of the Riverwood fish kill will require knowledge of water’s properties and the chemistry of water-based solutions, commonly called **aqueous solutions**. In addition to explaining the fish kill, an understanding of water and the chemistry that occurs in water is vital to understanding the chemistry in your body. In this investigation, you will explore some properties of water and aqueous solutions. You will refer back to these investigations as you progress through the unit.

Before you begin, read *Gathering Evidence* to learn what you will need to do, and note safety precautions. *Gathering Evidence* also provides guidance about when you should collect and record data.

***Making Predictions***

After reading *Gathering Evidence*, prepare an appropriate data table. Predict what you think will happen in Investigations 1, 2, 5, and 7 and write down your predictions.

Investigation 1:

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Investigation 2

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Investigation 5

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Investigation 7

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***Gathering Evidence***

Before you begin, put on your goggles, and wear them properly throughout the investigation.

Six stations, A through F, have been set up around the laboratory. At each station, you will complete the investigation for that station. The stations can be completed in any order. When working at a particular station, though, you must complete the investigations at the station in the order indicated.

Follow these general instructions:

• Take note of how the station is set up before you begin. You will be expected to reset the station after you are finished.

• Re-read the procedure and safety reminders.

• Review your predictions.

• Complete the investigation.

• Record your data and observations. (*Note:* Do not try to explain your observations. The purpose of these activities is for you to make observations. As you progress through the unit, you will develop explanations for many of the phenomena you observe in this investigation.)

**Station A:**

*Investigation 1*

1. Pour water into a Petri dish until it is half-full.

2. Using the tongs provided, gently place a dry paperclip on the surface of the water. See Figure 4.3 in the textbook

3. Record your observations.

4. Repeat Steps 1 and 2 using a clean, dry Petri dish and 2-propanol instead of water.

5. Record your observations.

6. Remove the paper clips, dispose of the water and 2-propanol as directed by your teacher, and reset the station.

**Station B:**

*Investigation 2*

1. Rub the comb with the paper towel.

2. Open the buret so a stream of water is flowing into the container.

3. Bring the comb near (but not touching) the stream of water. See Figure 4.4 in the textbook.

4. Record your observations.

5. Refill the buret with water.

**Station C:**

*Investigation 3*

1. Using a dropper, form a small puddle of water (about the size of a dime) on the surface of a piece of wax paper.

2. Place the tip of the dropper in the center of the puddle and slowly drag the tip of the dropper around the wax paper.

3. Record your observations.

4. Using a different dropper, repeat the investigation using olive or corn oil.

5. Wipe off the wax paper for the next group.

*Investigation 4*

1. You have two beakers labeled A and B. Using tongs, place an ice cube in each beaker.

2. Record your observations, then remove the ice cubes from the beakers.

3. Reset the station according to your teacher’s instructions.

**Station D:**

*Investigation 5*

1. Pour 10 mL of cold water into the beaker labeled C.

2. Pour 10 mL of hot water into the beaker labeled H.

3. Begin adding cubes or packets of sugar to each beaker. After each addition, stir until dissolved. Keep adding cubes or packets until no more will dissolve.

4. Record the number of cubes or packets that dissolved in each beaker.

5. Dispose of each solution as directed by your teacher.

**Station E:**

At this station, you will find three solutions and three filtration setups. Your teacher has already poured some of each solution through the filter paper.

*Investigation 6*

1. Describe the appearance of the three original solutions.

2. For each solution, A, B, and C, shine a flashlight through the solution. See Figure 4.5 in the textbook.

3. Record your observations.

4. Describe what has been caught by the filter paper for each solution.

**Station F:**

*Investigation 7*

1. Half-fill the three labeled beakers with distilled water.

2. Test the pH and conductivity of the water (as directed by your teacher) in each beaker and record your value.

3. Add a small amount of Salt A to beaker A and stir until dissolved. Add a small amount of Salt B to beaker B and stir. Add a small amount of Salt C to beaker C and stir until dissolved.

4. Retest the pH and conductivity of each solution and record your values.

5. Dispose of your solutions as directed by your teacher.

***Interpreting Evidence***

1. For each investigation in which you made predictions,
2. describe how well your observations agreed with your predictions.

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1. propose explanations for any differences between your predictions and observed results.

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1. Did any of these investigations examine the tendency of water to “stick together”? Explain your answer using experimental evidence.

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1. How do particles filtered from the three mixtures in Investigation 6 differ?

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1. In Unit 2 Investigating Matter C.8 (page 216 in your textbook), you monitored the pH of water before and after adding CO2. Which salt in Investigation 7 had an effect similar to that of CO2 on the pH of the water?

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***Making Claims***

1. In Investigation 4, what claim can you make about the relative densities of the two liquids?

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1. Use your observations to either support or refute the claim that water has electrical properties.

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1. Based on your observations, is the following a justifiable claim: “More of a solid will always dissolve in hot water than in cold water.” Explain your reasoning.

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***Reflecting on the Investigation***

1. You have explored many properties of water and how it differs from other liquids. Using your answers to the questions above, write a paragraph that sums up what you know about water from this investigation.

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1. Write two questions about water that are still unanswered after this investigation.

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