**Activity Sheet Answers**

**Lesson 5**

**Part 1 - Can Liquids Dissolve in Water?**

***DEMONSTRATION***

1. Your teacher placed some food coloring in water. Did the food coloring dissolve in the water?

Yes, the food coloring dissolved in water.

How do you know when a solute, like food coloring, has dissolved in a solvent, like water?

You can tell that a solute has dissolved in a solvent when the solute is completely incorporated into the solvent and won’t settle out.

***ACTIVITY***2. Based on your observations of the way isopropyl alcohol, mineral oil, and corn syrup dissolve in water, would you say that solubility is a characteristic property of a liquid? Why?

Yes, solubility is a characteristic property of a liquid. This was demonstrated in the activity by the fact that each of the three liquids combined with water in different ways.

***EXPLAIN IT WITH ATOMS & MOLECULES***

Look at the structure of the molecules in isopropyl alcohol, corn syrup, and mineral oil. Explain why either dissolves or does not dissolve in water.

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| --- | --- |
| A molecule model with a red ball  Description automatically generated**Isopropyl Alcohol** | Isopropyl alcohol does dissolve in water because, like water, it is a polar molecule, with an area of slight positive and negative charge. |
| A black and white molecule  Description automatically generated**Mineral Oil** | Mineral Oil does not dissolve in water because it is a non-polar molecule. It does not have any areas of slight positive or negative charge. |
| A molecule of a substance  Description automatically generated with medium confidence**Glucose in corn syrup** | Glucose dissolves in water because it is a polar molecule. It has areas of slight positive and negative charge. |

3. In some salad dressings a layer of oil, like canola or olive oil, floats on top of a layer of vinegar, which is mostly water. If you shake the bottle of salad dressing, the liquids will temporarily combine. The oil and vinegar do not dissolve in one another because eventually the two liquids will separate out again. Knowing what you do about molecules and dissolving, why doesn’t the oil in these salad dressings dissolve in vinegar?

Oil and vinegar do not mix in salad dressing because oil is composed of non-polar molecules, while vinegar is composed of polar molecules.

4. Some people with diabetes may accidentally let their sugar level get too low. There are glucose tablets to help them with this problem. When a person eats one, do you think it will act quickly to increase his/her blood sugar level? Why or why not?

Yes, a glucose tablet should quickly increase a diabetic’s glucose level because glucose is a polar molecule and should quickly and easily dissolve in the person’s bloodstream.

***TAKE IT FURTHER***

5. What do you observe when the drop of alcohol and drop of water combine?

Answers will vary, but students should note how the alcohol and water appear to “shake” as they combine.

6. Your teacher combined 50 mL of isopropyl alcohol and 50 mL of water. What is surprising about the result?

When 50 mL of water and 50 mL of isopropyl alcohol are combined, you get about 97 mL of total solution! That means the sum seems to be less than the two parts.

**Activity Sheet Answers**

**Lesson 5**

**Part 2 - Can Gases Dissolve in Water?**

***DEMONSTRATION***

1. What gas is inside the bubbles you saw when your teacher opened a bottle of carbonated water?

Carbon dioxide

1. Where was this gas before the bottle was opened?

Before the bottle was opened, carbon dioxide molecules were dissolved in the water.

***EXPLAIN IT WITH ATOMS & MOLECULES***

1. Why does carbon dioxide dissolve in water?

Carbon dioxide dissolves in water because its molecules have areas of slight positive and negative charge. These are formed by an unequal sharing of electrons between the oxygen and carbon atoms in the molecule. These polar areas are attracted to the opposite areas of negative and positive charge on a water molecule resulting in dissolving.

1. Why does carbon dioxide gas come out of solution (opposite of dissolving) so easily?

Carbon dioxide comes out of solution easily because the attractions between individual carbon dioxide molecules and water molecules are weak.

***ACTIVITY***

1. What was it about the pipe cleaner and M&M that caused bubbles to form?

The pipe cleaner and M&M candy caused bubbles to form in the carbonated water because they contain rough areas where carbon dioxide molecules can collect. When enough carbon dioxide molecules join together, they form a bubble.

1. While drinking soda pop with a straw, you may have noticed that bubbles form on the outside of the straw. Now that you have done this activity, why do you think these bubbles form on the straw?

Bubbles form on a straw in soda because although the straw seems smooth, it has tiny bumpy areas at the molecular level. These tiny bumps allow carbon dioxide molecules to collect, which eventually form bubbles.

1. What causes the fantastic “fountain” when a roll of Mentos mints is dropped in a bottle of Diet Coke?

When Mentos are dropped in a bottle of Diet Coke, tiny ridges on the surface of the candies act as nucleation points where carbon dioxide molecules can collect. As the carbon dioxide molecules quickly gather at these points, the dissolved CO2 in the soda comes out of solution very quickly making bubbles and shooting out of the top of the bottle.

1. Now that you know more about the characteristics of water and carbon dioxide molecules, what do you think is the first step in the process of ocean acidification?

As carbon dioxide in the air contacts the ocean, the first step in ocean acidification is the carbon dioxide dissolving into the ocean water.