**Science 20 Solutions Mini Labs**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_/30

**Purpose:** The purpose of these labs is to:

* Dissolve ionic and molecular substances in water and write the dissociation equation for ionic compounds and the dissolving equation for molecular compounds
* Examine the differences between ionic, molecular, and metallic substances by looking at conductivity and bendability (ductile & malleable)
* Experience that when two ionic substances are mixed, sometimes a low soluble precipitate is formed
* Make a 100mL of 0.100 mol/L copper (II) sulphate solution.
* Dilute the copper(II) sulphate solution to make 100mL of 0.0100mol/L

**Background: Complete the questions below before you enter the lab.**

1. Write the dissociation equation for lead (II) nitrate - Pb(NO3)2(s) & sodium chloride - NaCl(s) dissolving in water. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_( ) 🡪 H2O 🡪 \_\_\_\_\_\_\_\_( ) + \_\_\_\_\_\_\_\_ ( )

\_\_\_\_\_\_\_\_\_\_\_( ) 🡪 H2O 🡪 \_\_\_\_\_\_\_\_( ) + \_\_\_\_\_\_\_\_ ( )

1. Write the equation for sucrose, C12H22O11(s), dissolving in water. (1 mk)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_( ) 🡪 H2O 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_( )

1. Summarize the difference between ionic, molecular and metallic substances in the table below. (6 marks)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **IONIC** **Salt - NaCl(s)** | **MOLECULAR** **Sugar -** C12H22O11(s) | **METALLIC****Iron - Fe(s)** |
| Types of elements (metals, non-metals or metal & non-metal) |  |  |  |
| What happens to the electrons? |  |  |  |
| Do the solutions conduct electricity? |  |  |  |
| Do the solids bend? |  |  |  |

1. What is a precipitate? (1 mark)
2. What are the steps to making a 0.100L(100 mL) of 0.100 mol/L solution of copper (II) sulphate, CuSO4(aq) from a solid? Include the calculations. The molar mass is 249.72 g/mol (4 marks)

Step 1: Find the \_\_\_\_\_\_\_\_calculation:

Step 2: Find the \_\_\_\_\_\_\_ calculation:

Step 3: \_\_\_\_\_\_\_\_\_\_\_ the copper (II) sulphate using a scale

Step 4: Mix the copper (II) sulphate solid with 50 mL of water in a beaker. Add the solution to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Fill it up with water to the meniscus (stop) line using an eye dropper if necessary.

1. What are the steps to diluting the original, concentrated 0.100 copper (II) sulphate solution to make 100 mL of 0.0100mol/L diluted copper (II) sulphate solution? (3 marks)

Step 1: Find the \_\_\_\_\_\_\_\_\_\_\_calculation:

Step 2: Remove this volume using a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Step 3: Add this volume to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Fill it up with water to the meniscus (stop) line using an eye dropper if necessary.

**Materials per group:**

* 1 scoop of Sodium chloride, NaCl(s)
* 1 scoop of Lead (II) nitrate, PbNO3(s) with scupula
* 1 scoop of Sucrose sugar, C12H22O11(s)
* 1 L of Distilled water
* 3 100 mL cups; 2 500 mL beakers; 4 stirring rods
* 1 container of Copper (II) sulphate, CuSO4(aq)
* 100mL volumetric flask;10.0mL volumetric pipet with bulb; 1 eye dropper

**Procedure:**

**PART 1: Dissociation and dissolving ionic and molecular compounds**

1. Take a scoop of lead (II) nitrate and add it to about 100 mL of water in a cup LABELED #1. Stir with the stirring rod until it is completely dissolved. ***Record your observations*** in the table below.
2. Take a scoop of sodium chloride and add it to about 100 mL of water in a cup LABELED #2. Stir with the stirring rod until it is completely dissolved. ***Record your observations*** in the table below.
3. Take a scoop of sucrose sugar and add it to about 100 mL of water in a cup LABELED # 3. Stir with the stirring rod until it is completely dissolved. ***Record your observations*** in the table below.

**Dissolving Observation Table (3 marks)**

|  |  |
| --- | --- |
| Beaker # 1:Pb(NO3)2 |  |
| Beaker # 2:NaCl |  |
| Beaker # 3:C12H22O11 |  |

**PART 2: Differences between ionic, molecular and metallic compounds**

1. Place a conductivity meter into beaker 2 (NaCl) which is an ionic compound. Take a salt crystal and try to bend it. ***Record your observations*** in the table below.
2. Place a conductivity meter into beaker 3 (C12H22O11) which is a molecular compound. Take a sugar crystal and try to bend it. ***Record your observations*** in the table below.
3. Place a conductivity meter onto the piece of iron (Fe), which is a metallic compound. Take the piece of iron and try to bend it. ***Record your observations*** in the table below.

**Differences between ionic, molecular & metallic compounds (3 marks)**

|  |  |  |
| --- | --- | --- |
| Compounds | Conductivity | Bendable |
| Beaker/dish 2 – NaCl |  |  |
| Beaker/dish 3 - C12H22O11 |  |  |
| Dish 4 – Fe  |  |  |

**PART 3: A reaction where a precipitate forms**

1. Take the contents from beaker 1, Pb(NO3)2, and place them into a larger beaker. ***Record the color*** of the solution in the table below.
2. Take the contents from beaker 2, NaCl, and ***record the color*** of the solution in the table below. Add the NaCl to the larger beaker and ***record the new color*** of the mixture in the table below
3. ***Predict the formula or name*** of the precipitate that formed. HINT: Lead (II) ion is very attracted to the chloride ion.
4. Place the mixture into a waste beaker in the fumehood-**NOT the SINK**.

**Precipitate reactions (4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Pb(NO3)2 | NaCl | Mixture |
| COLOR |  |  |  |
| Precipitate name or formula | XXXXXXXXXXXX | XXXXXXXXXXXXX |  |

**PART 4: Making a 100 mL of 0.100 mol/L solution of copper (II) sulphate**

1. Weigh the exact mass of copper (II) sulphate calculated in the background section using a weight scale.
2. Add the powder into a 50 mL beaker and mix with a stirring stick
3. Pour the solution into a 100 mL VOLUMETRIC FLASK.
4. Fill the volumetric flask with water up to the neck of the flask. Fill the rest of the flask with water up to the meniscus line, using an eye dropper. Have your ***teacher verify*** the color and line. \_\_\_\_ (1 mark)
5. Pour the solution into a beaker.

**PART 5: Making a dilution using the concentrated 0.100 mol/L solution to make 100mL of diluted 0.0100 mol/L solution of copper (II) sulphate.**

1. Using a 10.0 mL volumetric pipet, remove 10.0 mL of the copper (II) sulphate solution from part 4.
2. Place it into the 100 mL VOLUMETRIC FLASK.
3. Fill the volumetric flask with water up to the neck of the flask. Fill the rest of the flask with water up to the meniscus line using an eye dropper.
4. ***Record******two*** differences between the solution in PART 4 and the solution in PART 5. Pour the solutions down the sink.

|  |  |  |
| --- | --- | --- |
| Differences (2 marks) |  |  |