

MiSP Solubility Worksheet #2 L2

Name _____

Date _____

We have considered some conditions that allow solutes to dissolve in solvents, but we have not yet considered the solubility of a solute. **Solubility is defined as the maximum mass of solute that can dissolve in a certain quantity of solvent at a specified temperature.** Below is a data table that shows the solubility of ammonium chloride (NH_4Cl) at various temperatures. Use the data table to construct a line graph (page 2). Remember to set up your axes and label appropriately.

Water Temperature ($^{\circ}\text{C}$)	Maximum Mass of Ammonium Chloride that can be dissolved in 100 grams of water (g)
0	30
20	37
40	46
60	55
80	65
100	76

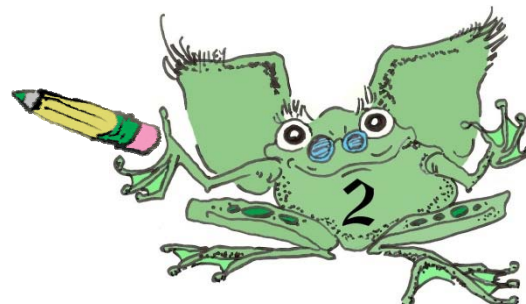
1. We want to know how many grams of ammonium chloride can dissolve in water at various temperatures. In this case, what are the independent and dependent variables?

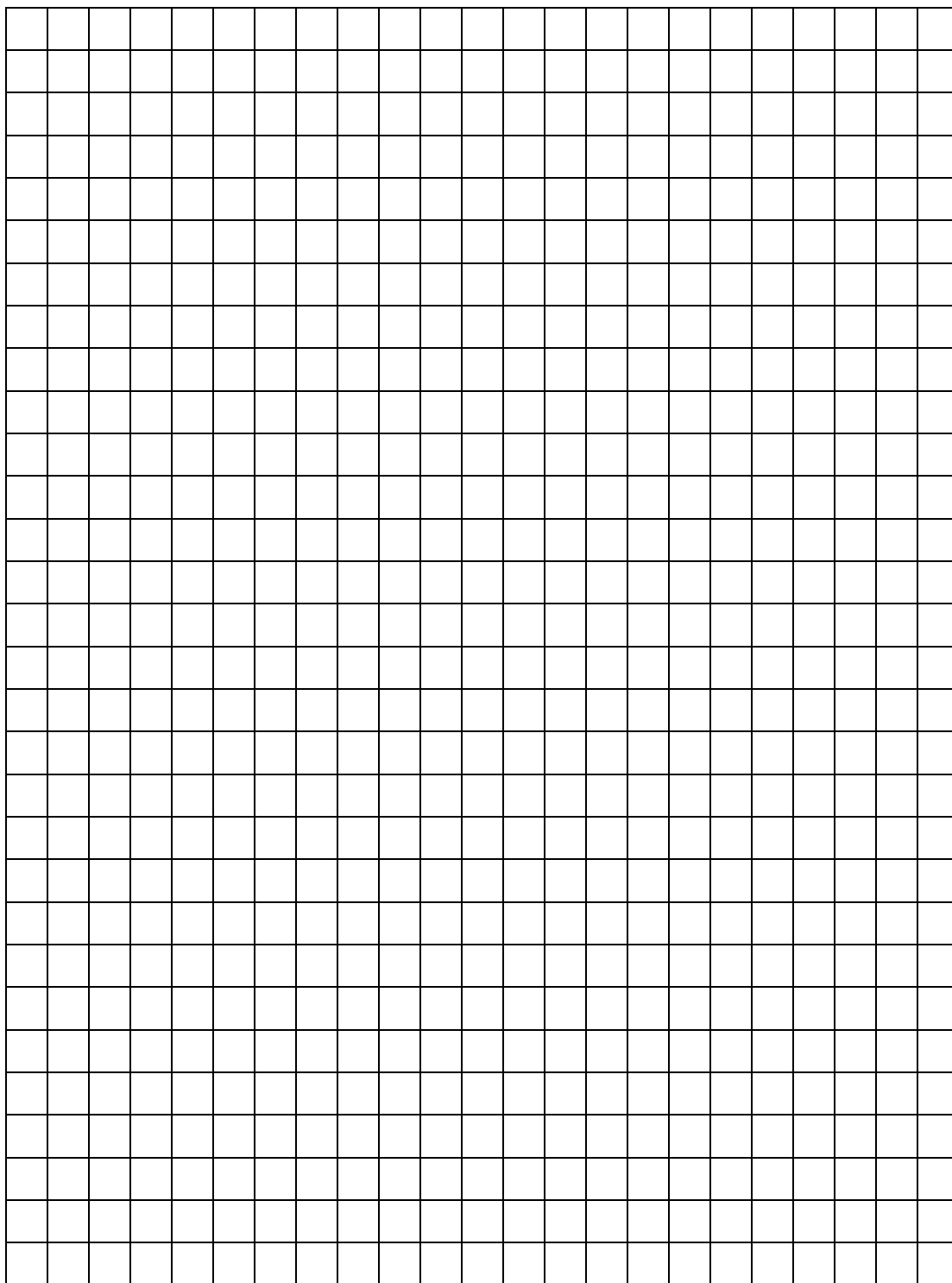
Independent variable _____

Dependent variable _____

Graph the data:

- Label your x - and y -axes.
- An appropriate scale and increments should be chosen.
- The x -values range from _____.
- The y -values range from _____.
- You may use increments of 5, 10, 20, or whatever you think is appropriate. Remember that every data point does not have to fall exactly on one of the numbered lines.
- Plot the data points and draw a best-fit line through the data points.
- Add a title to the graph.







Discussion Questions:

1. Use your best-fit line to determine how many grams of ammonium chloride will dissolve at a temperature of 70°C. _____ grams
2. What temperature would be necessary to dissolve 50 grams of ammonium chloride?
_____ °C
3. As the temperature increases from 20°C to 100°C on your best-fit line, the mass of the solute dissolved in grams increases by _____.
4. The unit rate of change is the change in the maximum amount of ammonium chloride in grams that can be dissolved for every 1°C change in temperature.

$$\text{Rate of Change} = \frac{\Delta \text{ Grams of Solute Dissolved}}{\Delta \text{ Temperature}}$$

Use the data table to calculate the unit rate of change in dissolved ammonium chloride between 20°C and 100°C.

$$\text{Rate of Change} = \frac{(\text{grams at } 100^\circ\text{C} - \text{grams at } 20^\circ\text{C})}{(100^\circ\text{C} - 20^\circ\text{C})} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$



5. You can also calculate the unit rate of change using the graph

$$\text{Unit Rate of Change (slope)} = \frac{\Delta y \text{ (grams)}}{\Delta x \text{ (}^\circ\text{C)}}$$

Pick an ordered pair on your best-fit line and calculate the unit rate of change.
Use the chart below.

Ordered Pair used for calculation (x_1, y_1) (x_2, y_2)	Δ Grams of solute dissolved Δy	Δ Temperature ($^\circ\text{C}$) Δx	Unit Rate of Change (slope) $\Delta y / \Delta x$

6. Use the information from the data table to calculate the rate of change between 20°C and 40°C .
Show the formula and your work.

7. Use the information from the data table to calculate the rate of change between 60°C and 80°C .
Show the formula and your work.



8. Are your calculated rates of change for the two temperature ranges (20°C – 40°C and 60°C – 80°C) the same or different? _____
What does this suggest?

