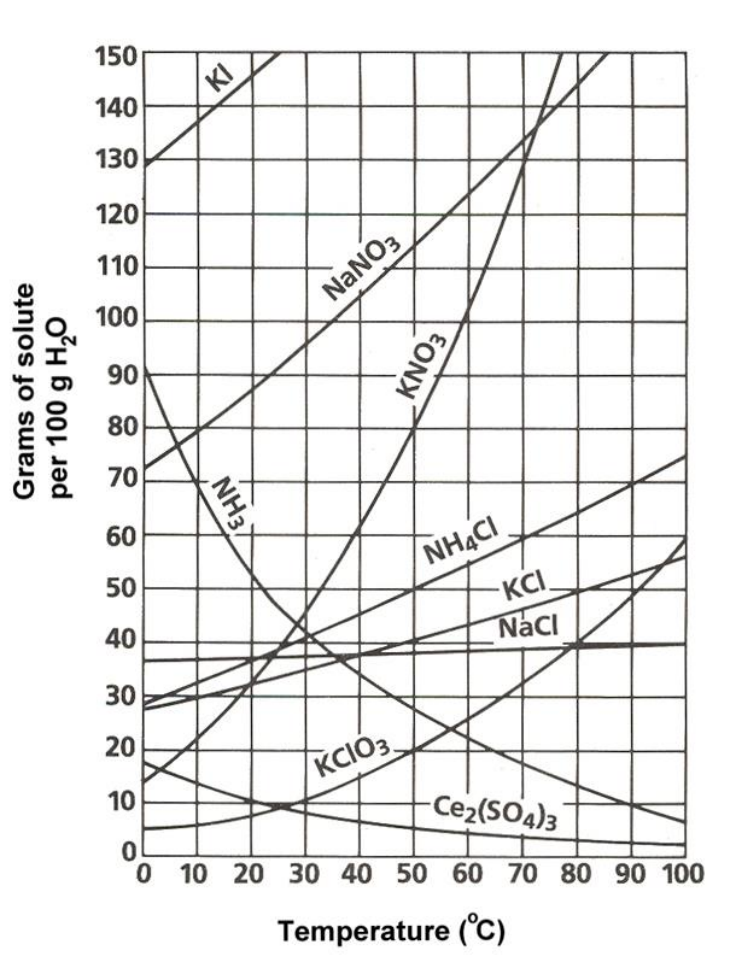
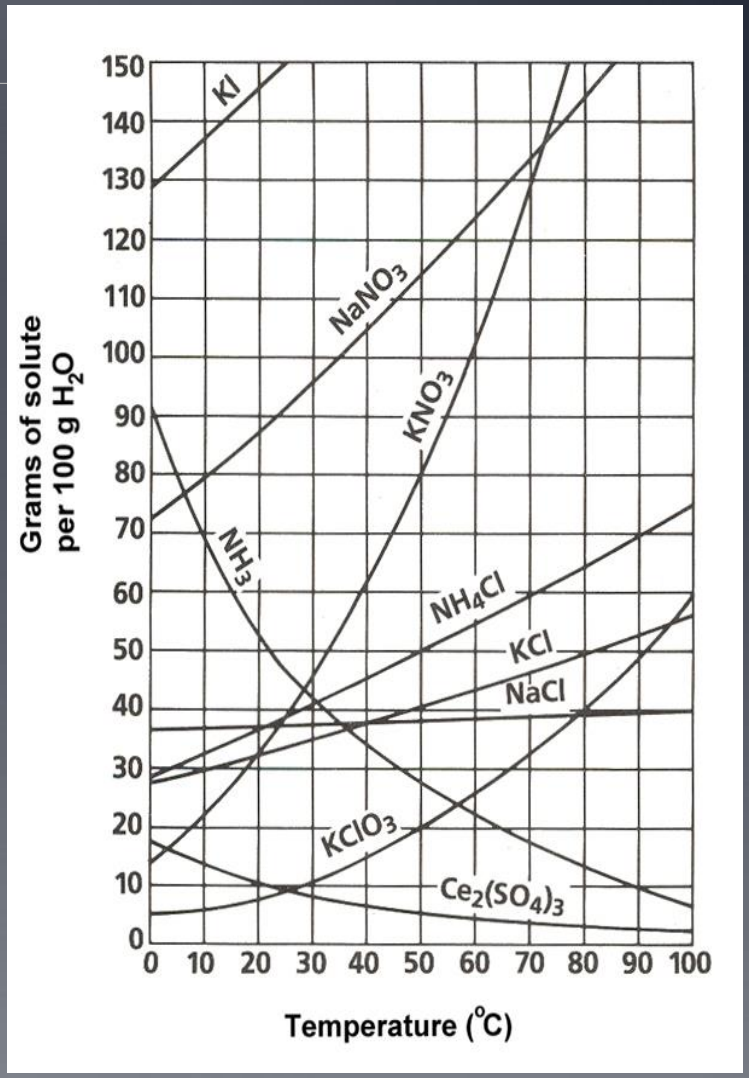
SOLUBILITY CURVES



WHAT DO THESE GRAPHS MEAN?

- Each line shows how much stuff (CALLED **SOLUTE**) can be dissolved in 100 mL OF WATER (CALLED **SOLVENT**) at a bunch of different **temperatures**.
- Why at a bunch of different temperatures?
  - **Because, as the lifesaver lab showed, hotter water is better at dissolving stuff. So, hot water not only dissolves a solute faster, but it can also dissolve A GREATER MASS OF SOLUTE, in the same volume of water.**



WHAT DOES THE LINES REPRESENT?

- They represents **SATURATED SOLUTIONS at a given temperature:**
  - **SATURATED = cannot dissolve any more solute**

WHAT DO THE LINES REPRESENT?

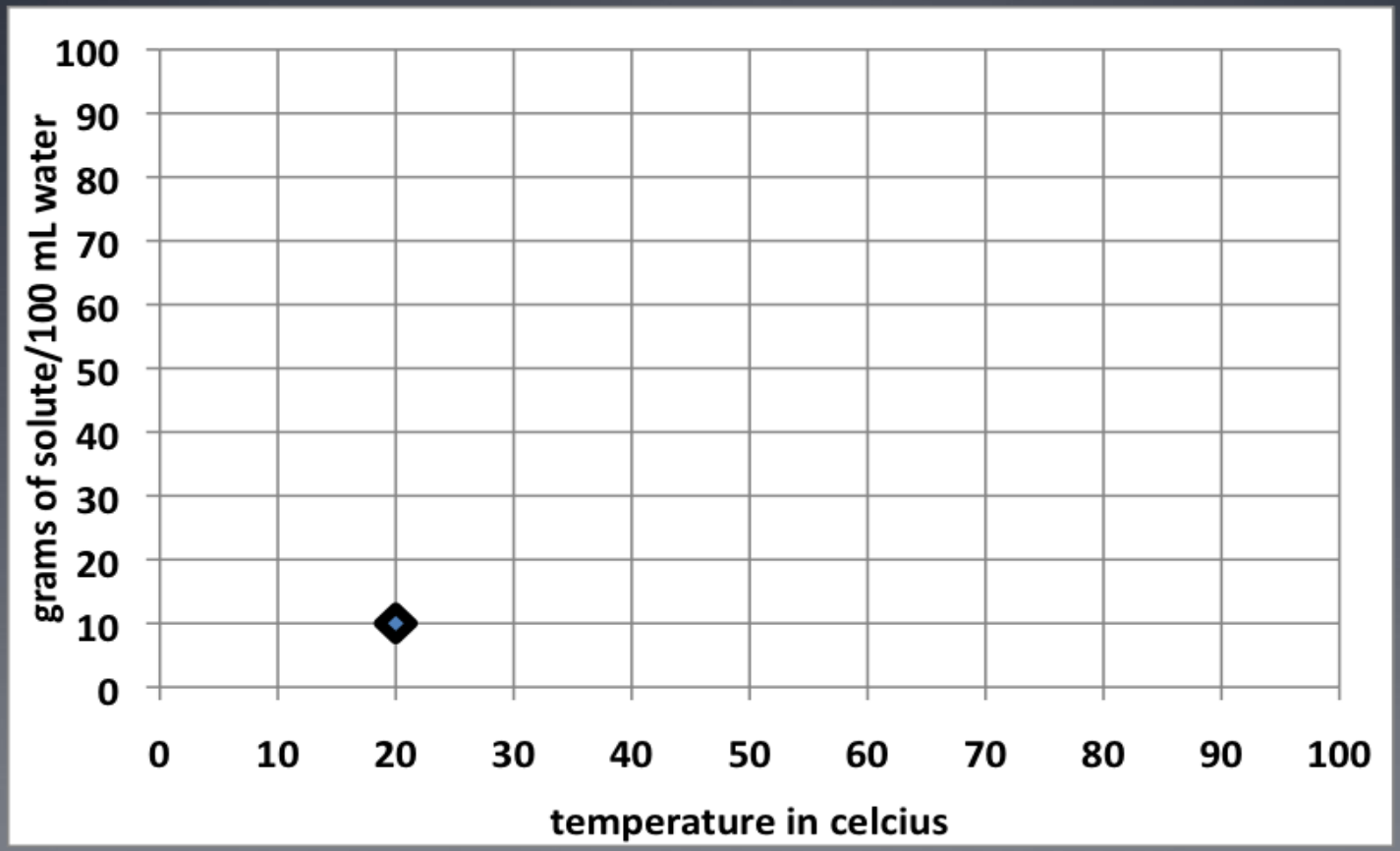
continued

For example, let's say I put a 10 grams of powdered lemonade mix into a 100 ml glass of water, and stir until dissolved

I then try to add 1 more gram, but it won't dissolve – it just piles up on the bottom of the glass.

- This shows me that at a water temperature of 20° celcius, 100 mL of water is saturated by 10 grams of lemonade mix – it cannot dissolve 11 grams (or more) of mix

- I will plot this information on a graph – my point will be: x = 20° celcius, y = 10 grams of solute.

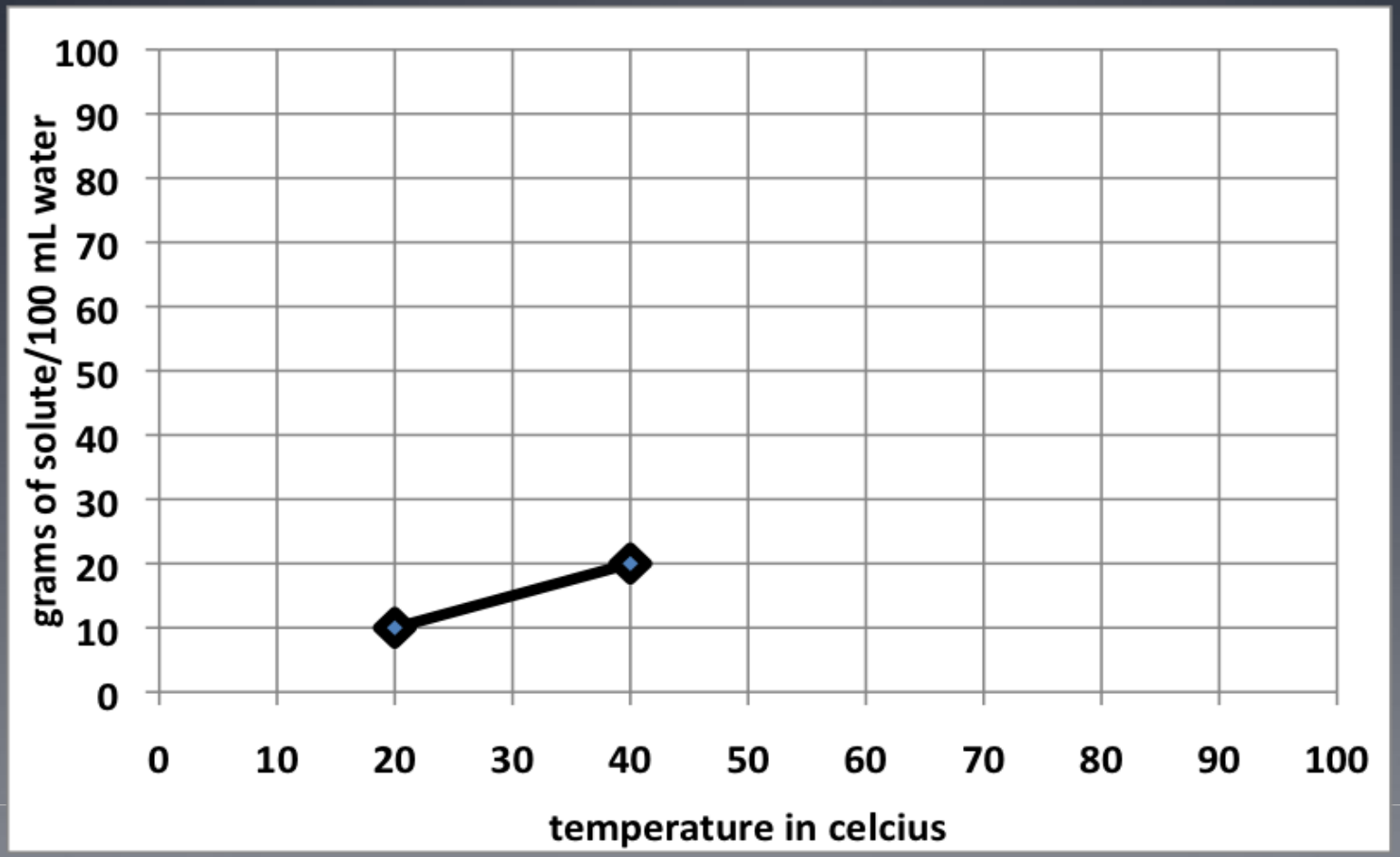


Next, I heated 100 mL of water up to 40° celcius, and I added 20 grams of powdered lemonade mix into the heated glass of water, and I stirred until it all dissolved

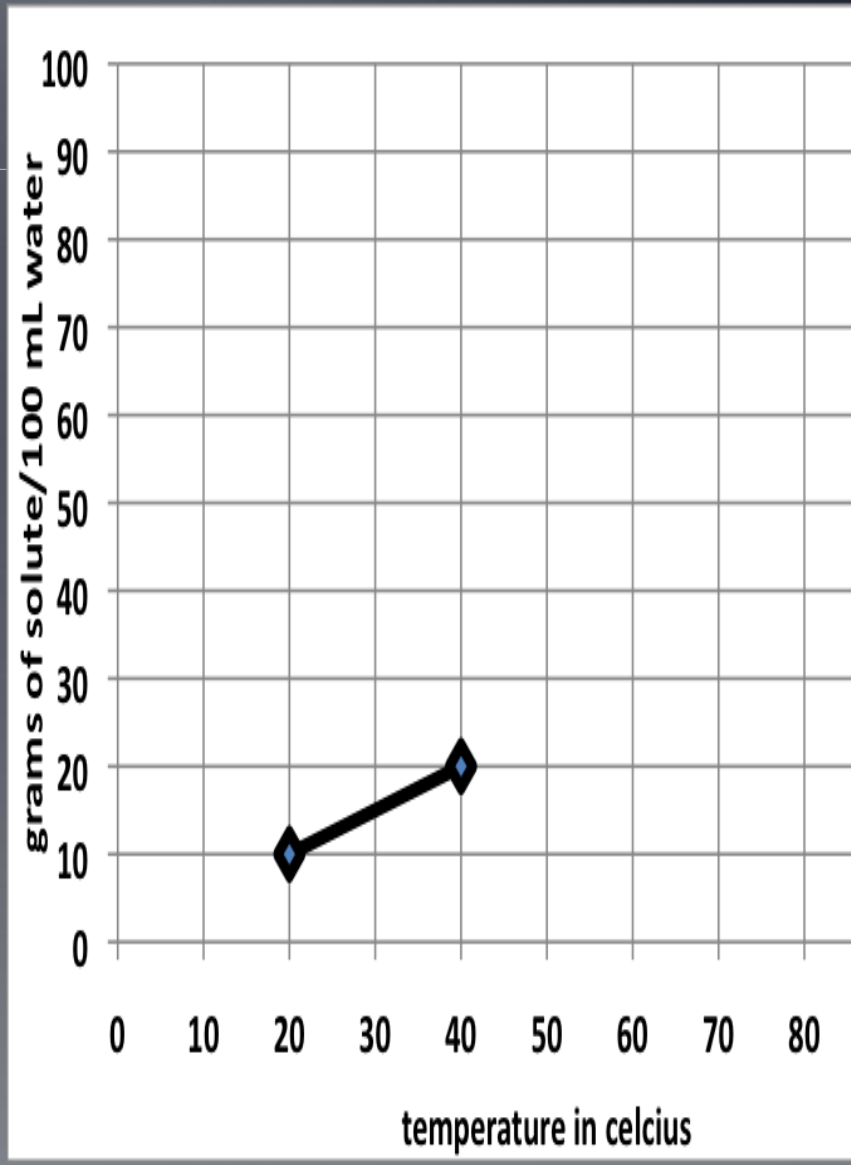
I then try to add 1 more gram, but it won't dissolve – it just piles up on the bottom of the glass.

- This shows me that at a water temperature of 40^{o} celcius, 100 mL of water ***is <u>SATURATED</u>*** by 20 grams of lemonade mix – it cannot dissolve 21 grams (or more) of mix

- I will plot this information on a graph – my point will be: x = 40° celcius, y = 20 grams of solute.



This is a SATURATION curve – it's a line that shows how much lemonade mix (the SOLUTE) ***saturates*** 100 mL of water at different temperatures (so far, I've tried 2 temperatures)







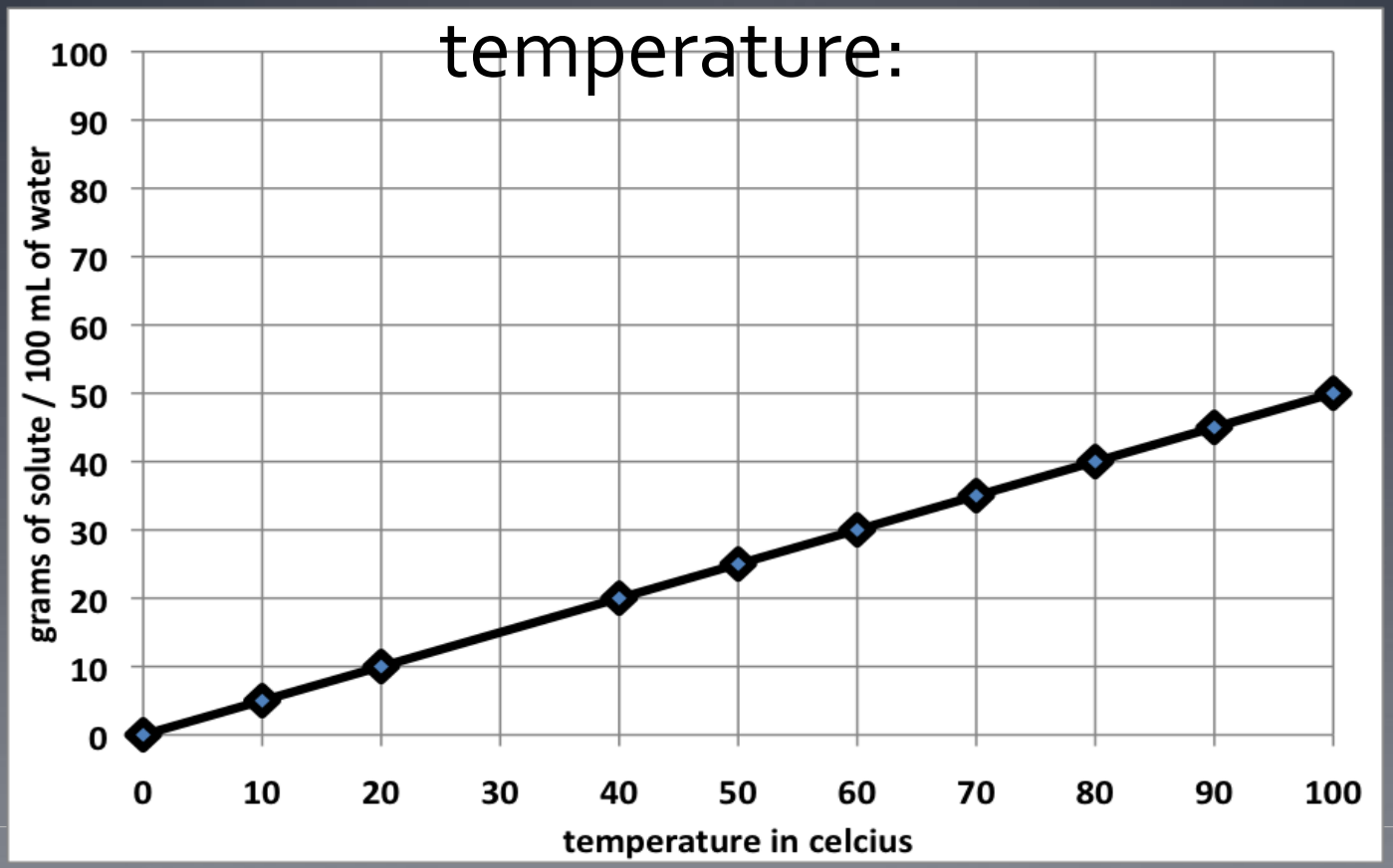

Next, I continued to heat 100 mL of water up by 10° celcius, and I kept adding grams of powdered lemonade mix into the heated glass of water, and I stirred until it all dissolved.





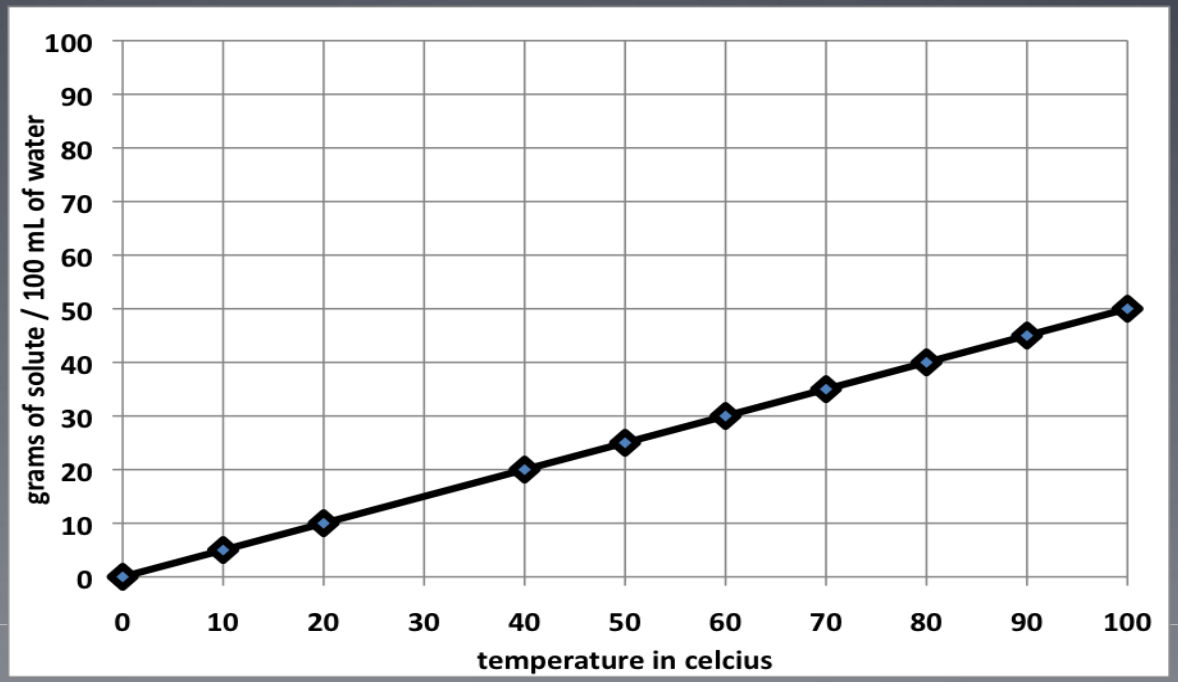

For each new temperature, I would then try to add 1 more gram, but it won't dissolve – it just piles up on the bottom of the glass. At that point, I'd heat up the water again, and repeat the process…..

- I then plotted all this information on my graph – with x points for every 10° celcius, and y points for the grams of solute that would completely dissolve at that water temperature:

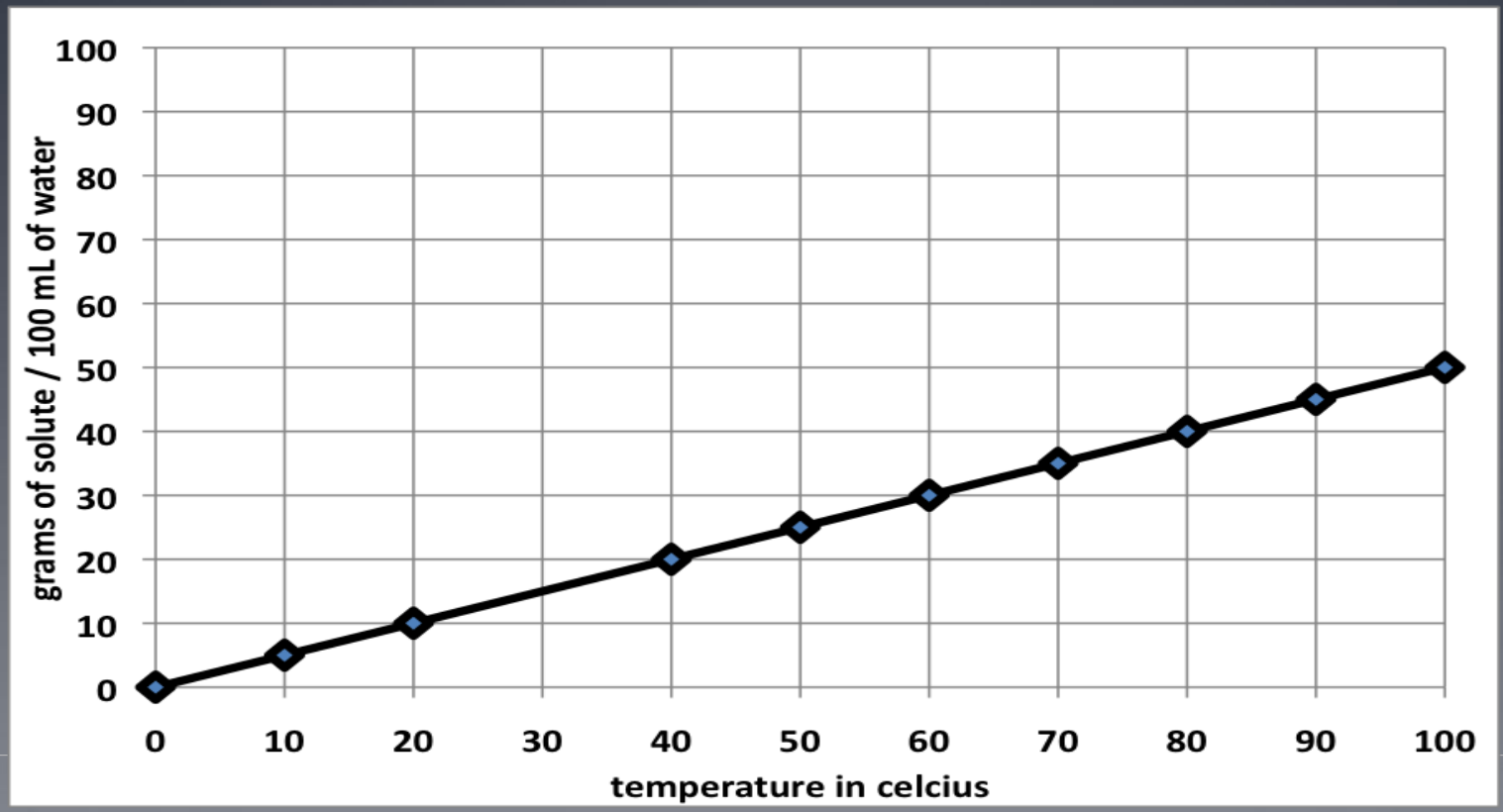


I now have a ***SOLUBILITY CURVE*** for Lemonade mix :

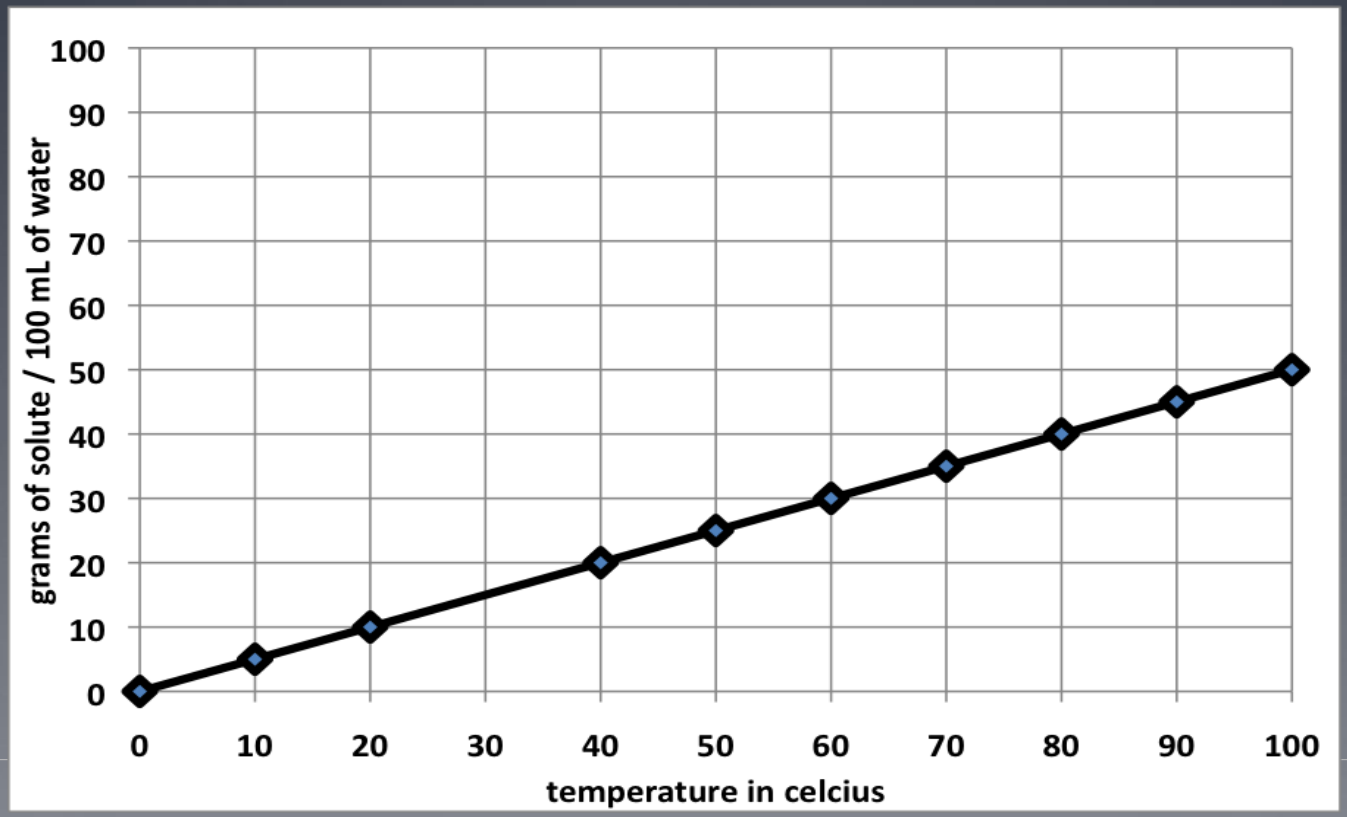
- The LINE ITSELF represents a SATURATED SOLUTION, which is the maximum mass of solute dissolved in 100 mL of water at a given temperature:



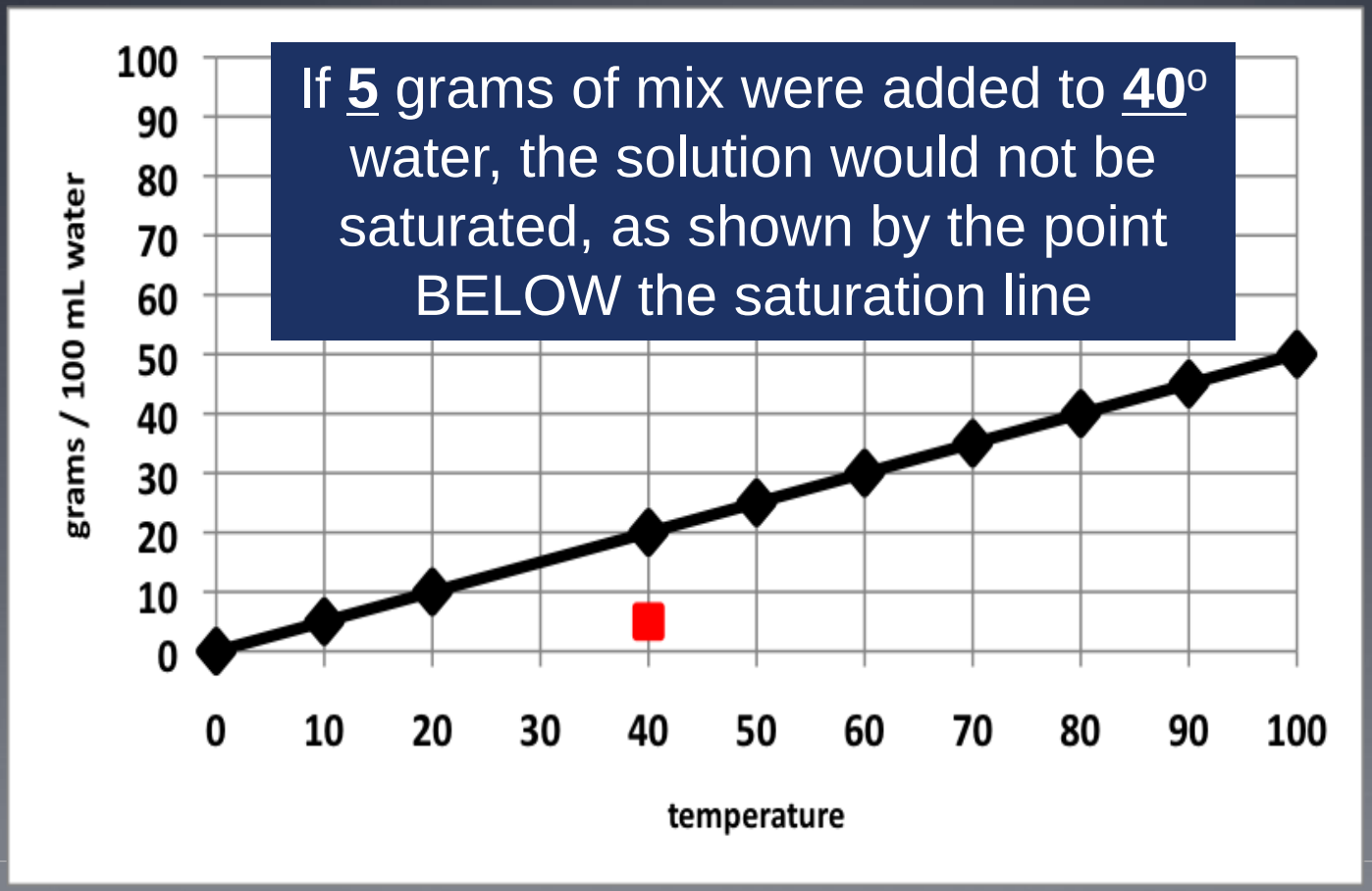
- Remember, water becomes a better solvent as it is heated, so it can dissolve more solute at higher temperatures – that's why the curve has a positive slope:



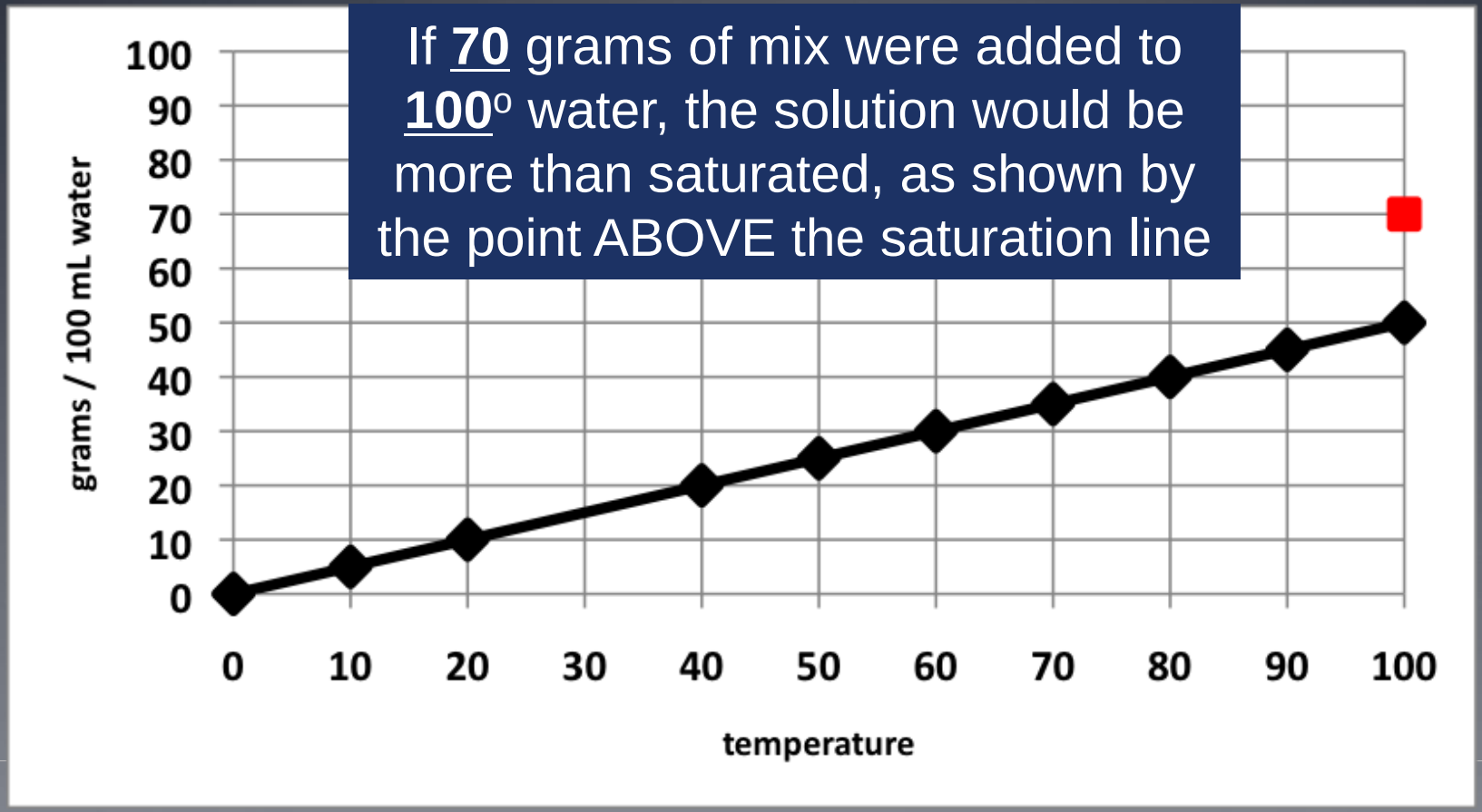
- The LINE ITSELF also represents a "perfect" SOLUTION; that is, a solution with the EXACT amount of solute that will saturate 100 mL of water:

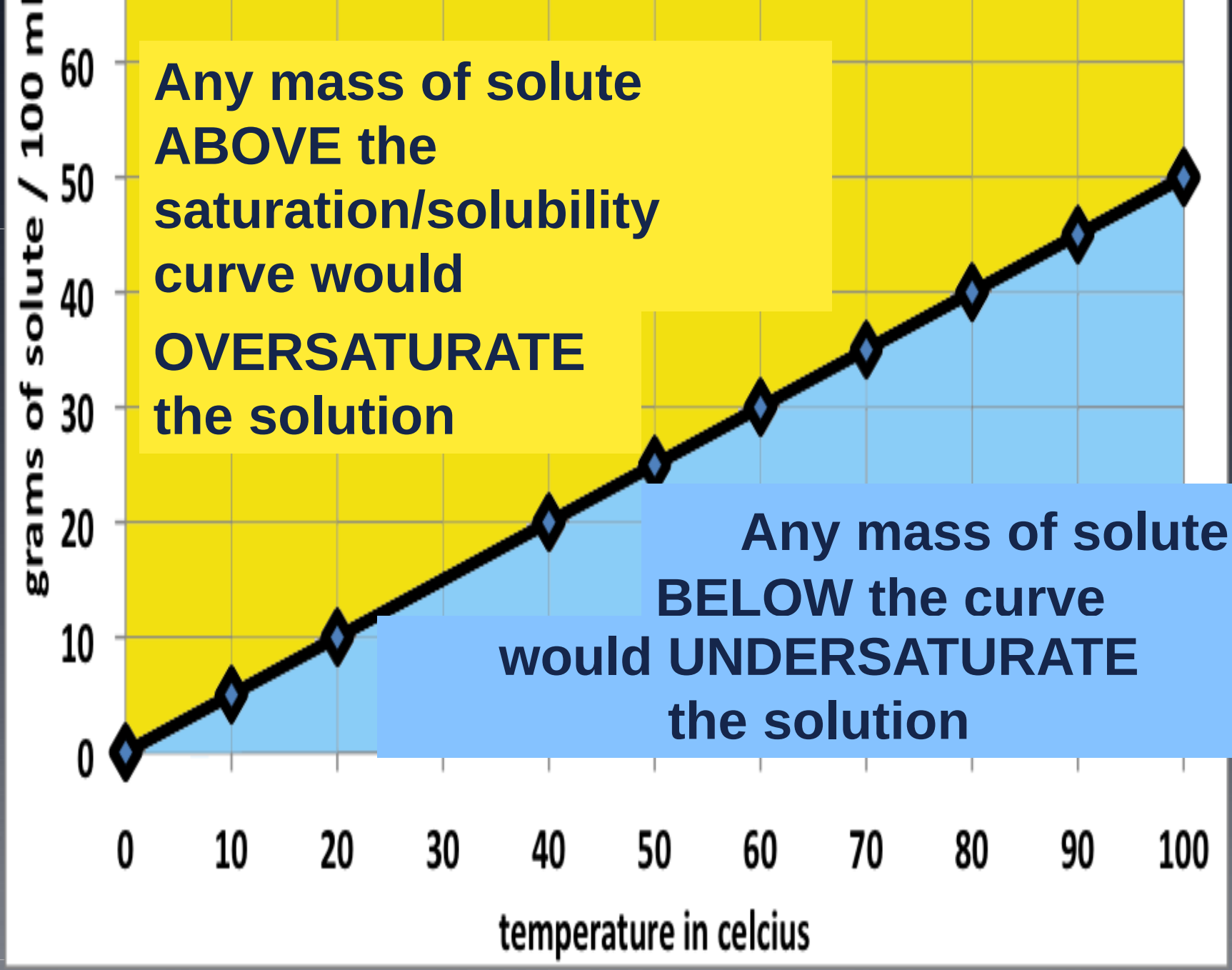


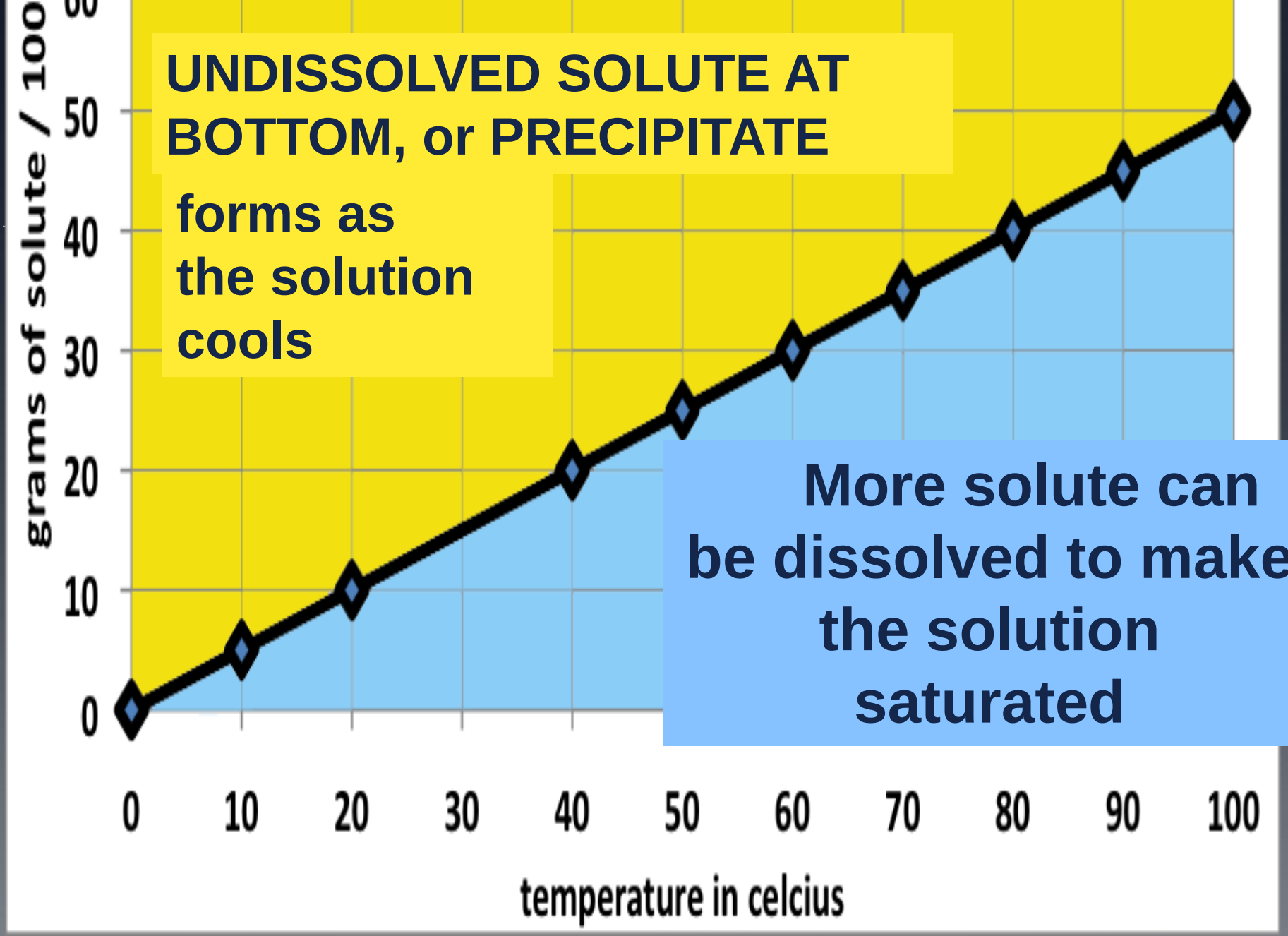
- At any temperature, any **LESS** solute than the value on the line would produce an **UNSATURATED** solution
  - (points **below** the line)

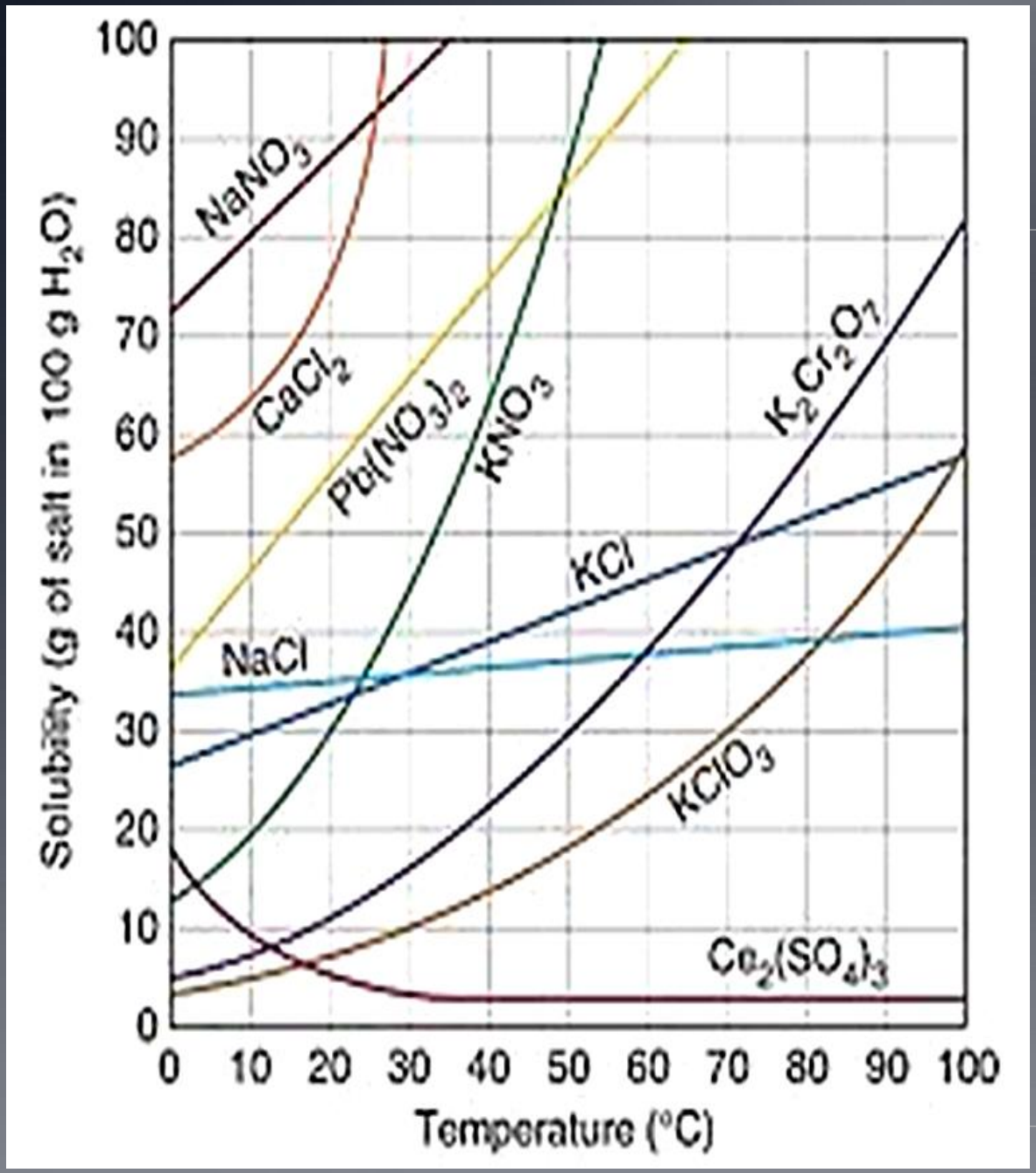


- At any temperature, any **MORE** solute than the value on the line would produce an **OVERSATURATED** solution
  - (points **above** the line)




Any mass of solute ABOVE the saturation/solubility curve would OVERSATURATE the solution
Any mass of solute BELOW the curve would UNDERSATURATE the solution
grams of solute / 100 ml
0
10
20
30
40
50
60
0
10
20
30
40
50
60
70
80
90
100
temperature in celcius

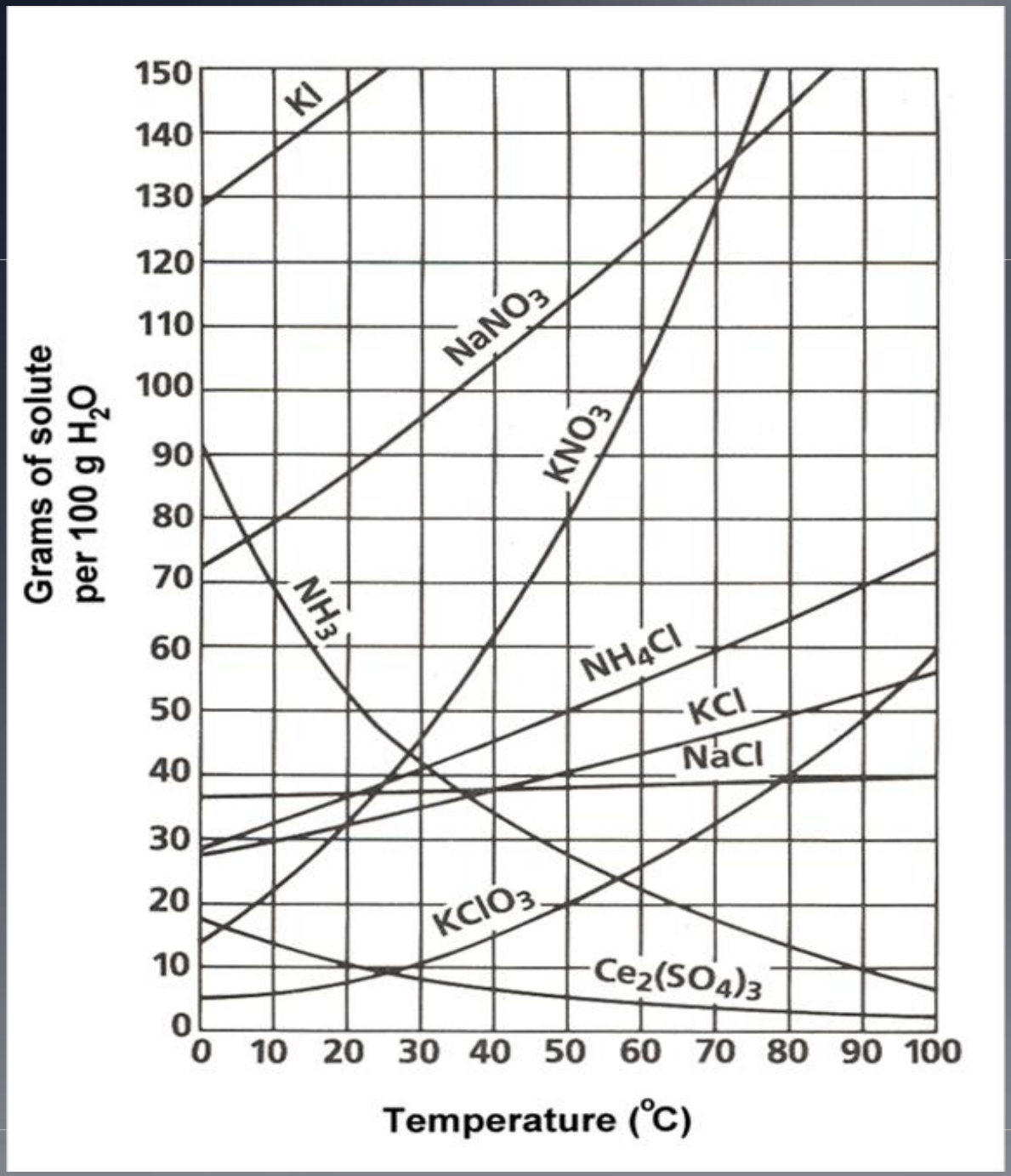

UNDISSOLVED SOLUTE AT BOTTOM, or PRECIPITATE
forms as the solution cools
More solute can be dissolved to make the solution saturated
grams of solute / 100
0
10
20
30
40
50
60
70
80
90
100
temperature in celcius



HOMEWORK SHEET "A"

Q: WHAT IS THE MAXIMUM AMOUNT OF NaCl THAT CAN BE DISSOLVED AT 50^{O}C?

A: approx 35g/100mL:
See graph, start at 50^{O}C line on x axis, move up until get to NaCl line, then across to Y axis, = 35g/100mL



MYSTERY SUBSTANCE LAB SOLUTION:

GIVEN: 40g OF SOLUTE.

WHY LOOK FOR A PRECIPITATE?

WHY IS THE PRECIPITATE TEMPERATURE IMPORTANT?

WHICH LINE DOES YOUR POINT BELONG TO?

HOW DOES YOUR GRAPH DEPICT REALITY?