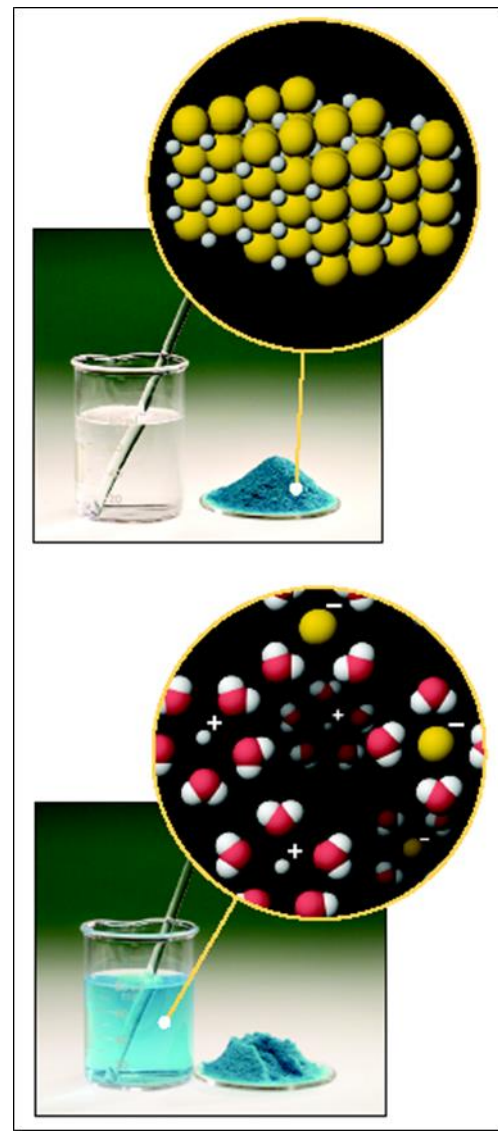


[4.1] Solubility and Solutions



Solution Chemistry

- **Solution chemistry** is the study of chemical reactions in solutions
- A solution is a **homogeneous** mixture
- **solvents** are components present in **larger** amounts
- **solutes** are components present in **smaller** amounts
- A **solute** is **soluble** in a solvent if it dissolves to form a **homogenous** mixture



Types of Solutions

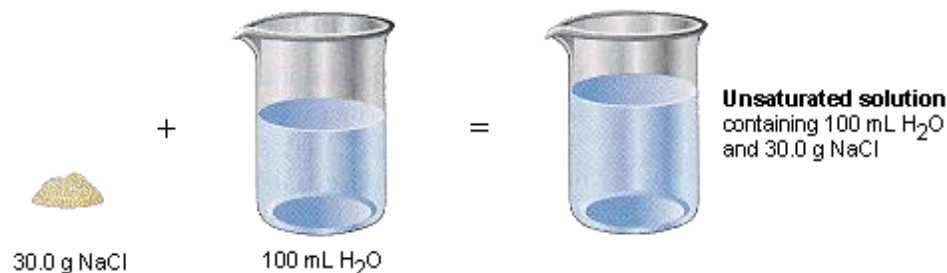
- Solutions can be found in **solid, liquid** or **gaseous** forms
- Solid solutions are referred to as **alloys**
 - **Example: Brass (Tin + Copper); such as in coins**
- We will focus mostly on **Solid in Liquid** solutions



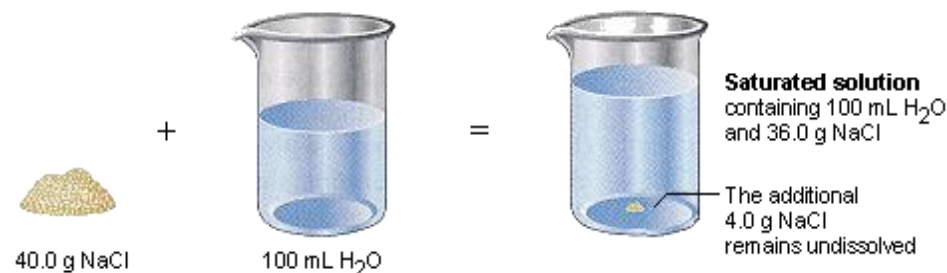
Classification of Solutions

Solutions can be classified as **saturated** or **unsaturated**.

- An **unsaturated** solution contains **less** than the maximum amount of solute that can dissolve at a particular **temperature**



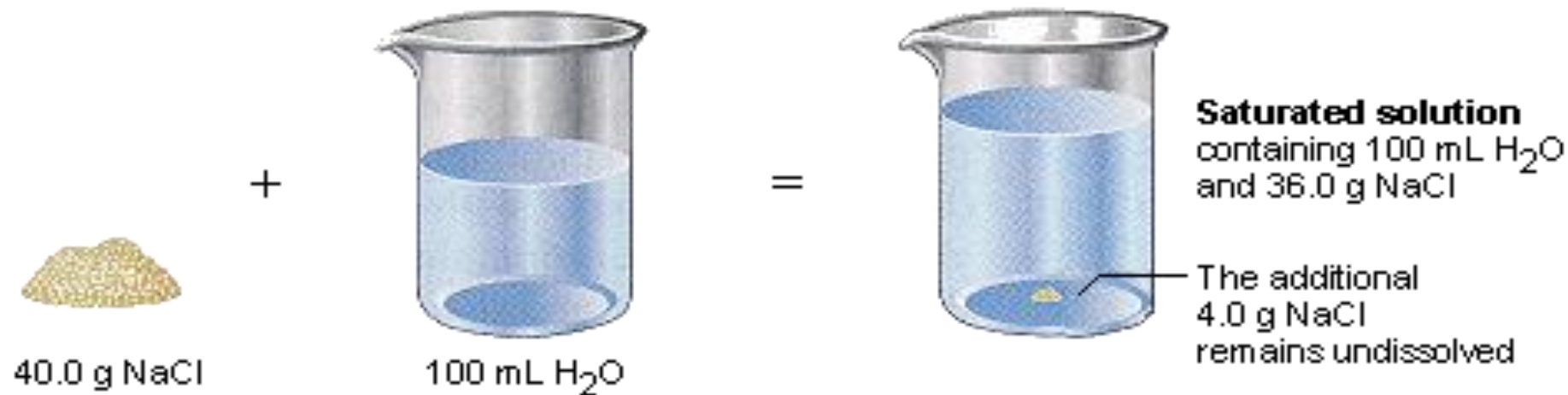
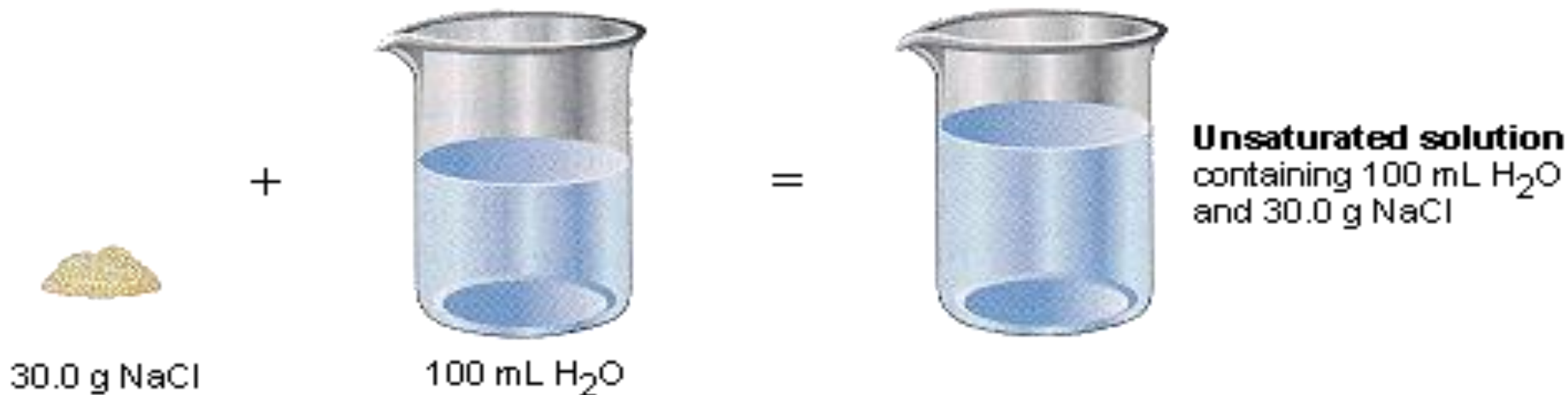
- A **saturated** solution contains the **maximum** quantity of solute that dissolves at that **temperature**.



- (you can see **some undissolved solid** at the bottom of the solution)

Supersaturated Solutions contain **more** solute than saturated solution

Classification of Solutions



SOLUBILITY is the amount of substance needed to saturate a solution. **What is solubility of salt in water?**

Solutes

1) Different **solutes** have different solubilities

The solubility of NaCl at 20°C is **35.7g/100ml**

The solubility of Ba(NO₃)₂ at 20°C is **63g/100ml**

2) Solutes have different solubilities at different **temperatures**

The solubility of Ba(NO₃)₂ at 20°C is **63g/100ml**

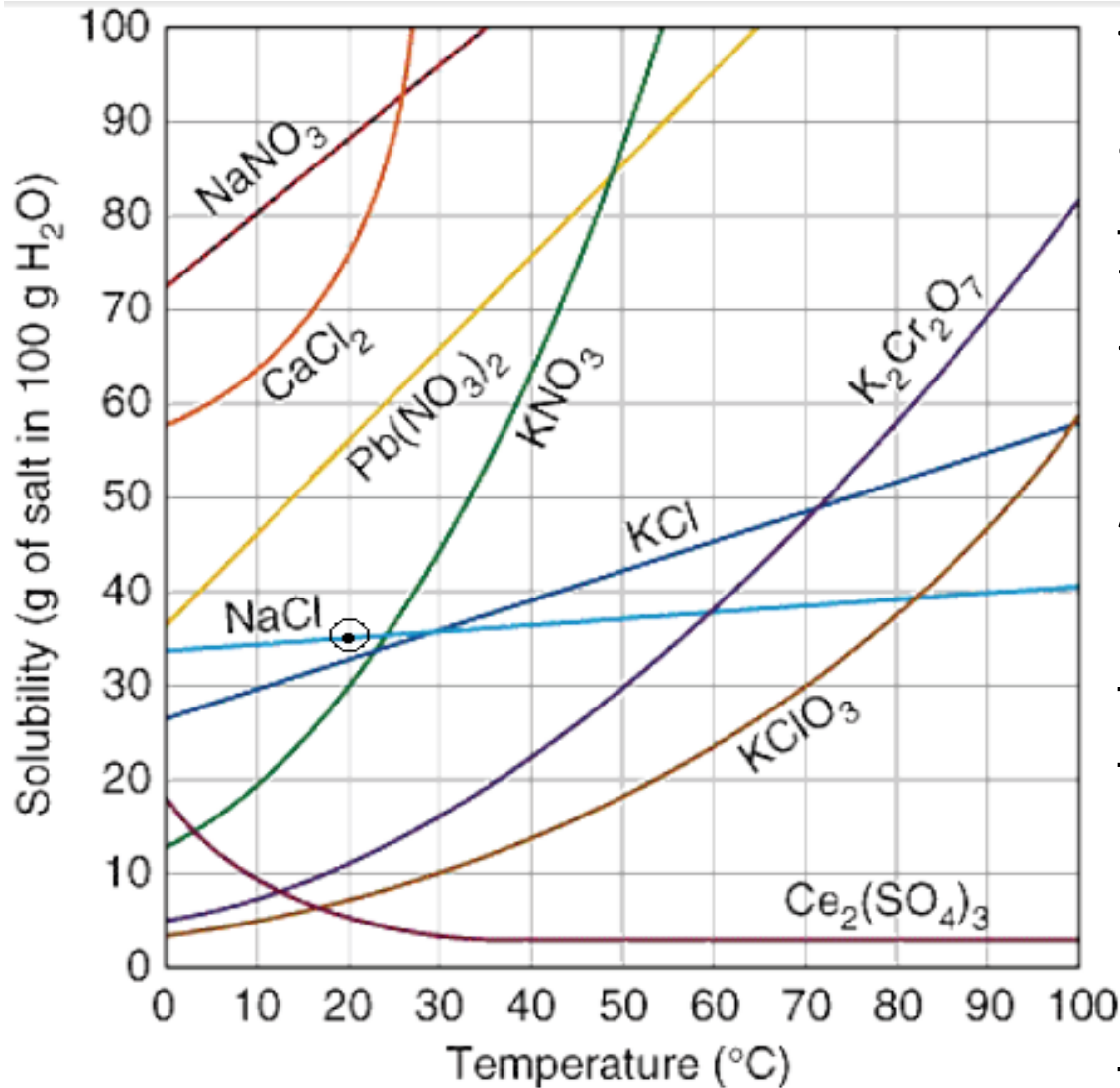
The solubility of Ba(NO₃)₂ at 80°C is **109.6 g/100 mL**

3) Solutes have different solubilities for different **solvents**

The solubility of Ba(NO₃)₂ in water at 20°C is **63g/100ml**

The solubility of Ba(NO₃)₂ in alcohol at 20°C is **1.6 g/100 mL**

Solubility Graphs

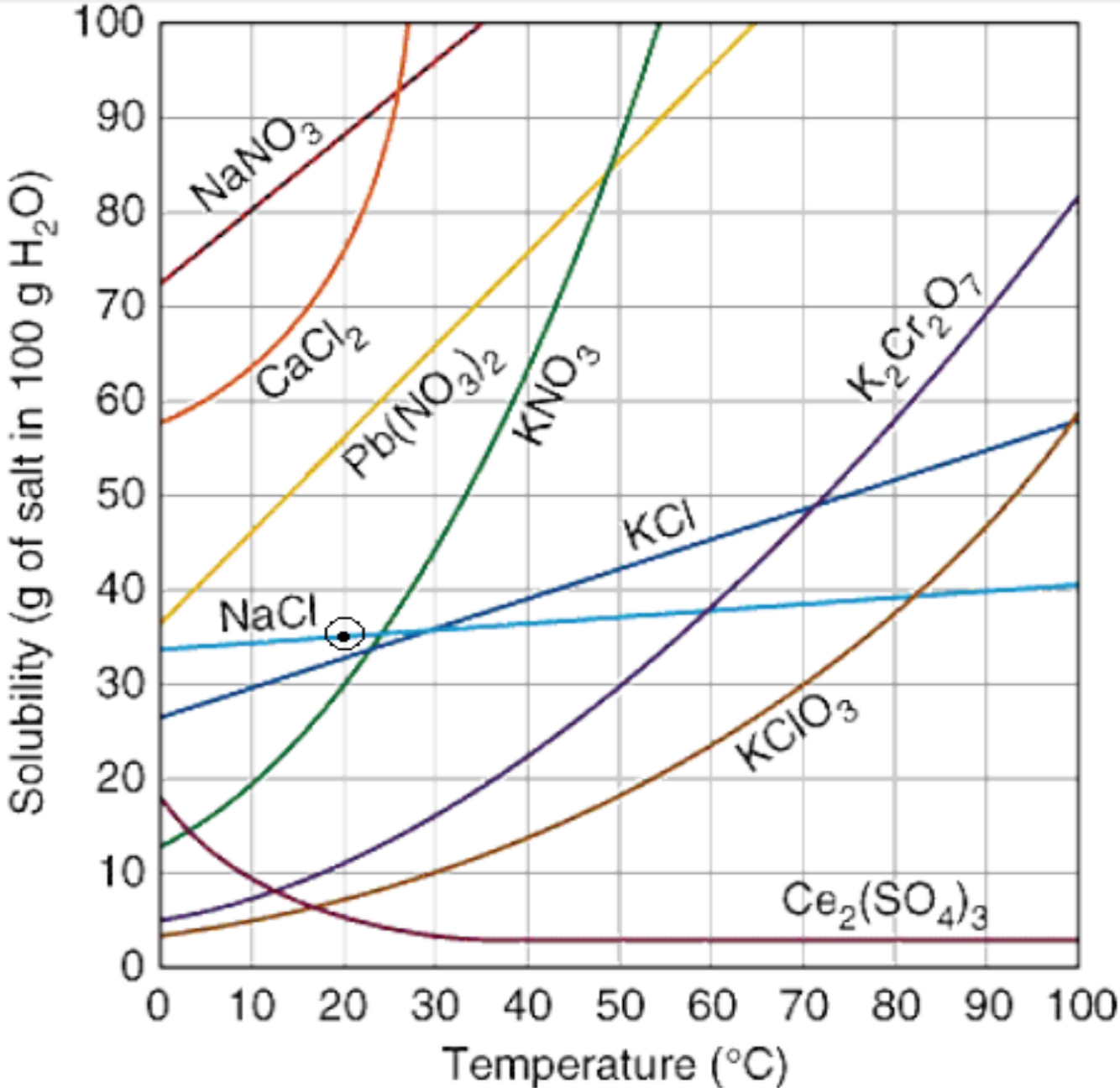


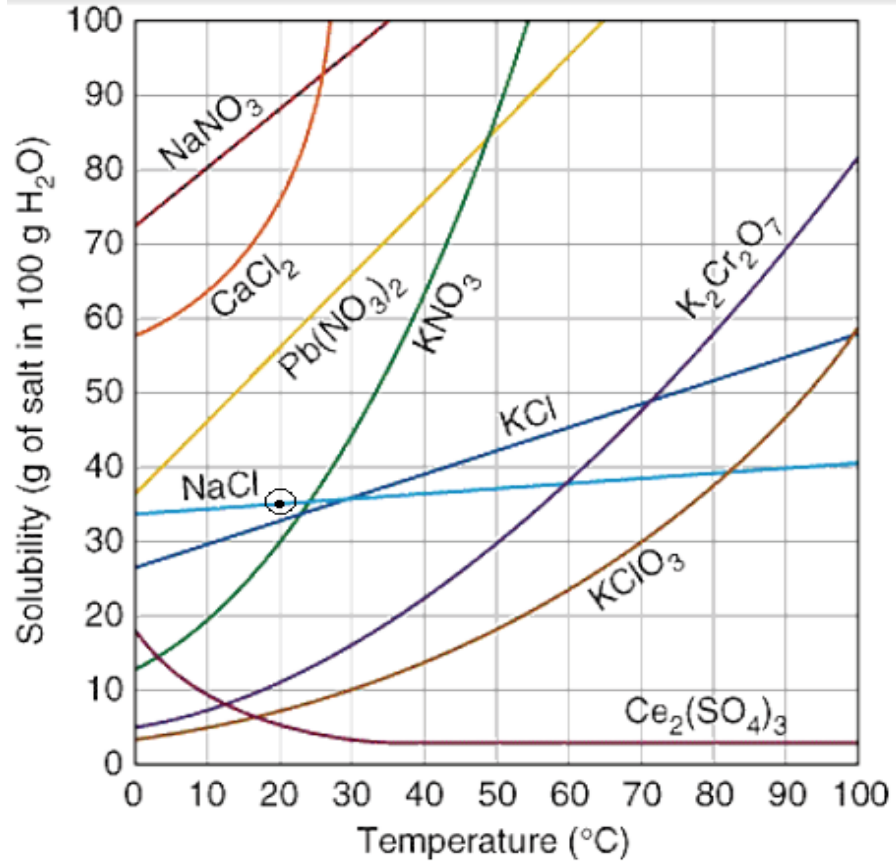
The curve of a solubility graph represents the **saturation point** for the solute at increasing temperatures.

Above the line, any dissolved solute is a **supersaturated solution**

Below the line, any dissolved solute is an **unsaturated solution.**

Practice: Answer the following questions based on the graph





60 g KCl at 70 °C

Saturated

Unsaturated

Supersaturated

10 g KClO₃ at 60 °C

Saturated

Unsaturated

Supersaturated

80 g NaNO₃ at 10 °C

Saturated

Unsaturated

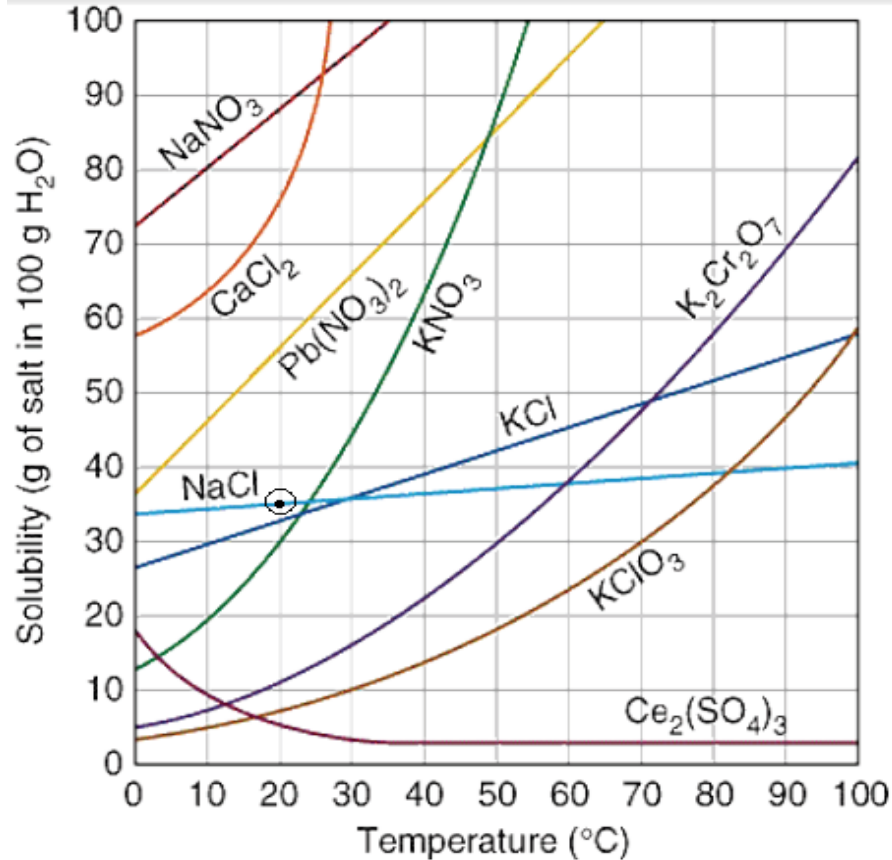
Supersaturated

70 g CaCl₂ at 20 °C

Saturated

Unsaturated

Supersaturated



60 g KCl at 70 °C

Saturated

Unsaturated

Supersaturated

10 g KClO₃ at 60 °C

Saturated

Unsaturated

Supersaturated

80 g NaNO₃ at 10 °C

Saturated

Unsaturated

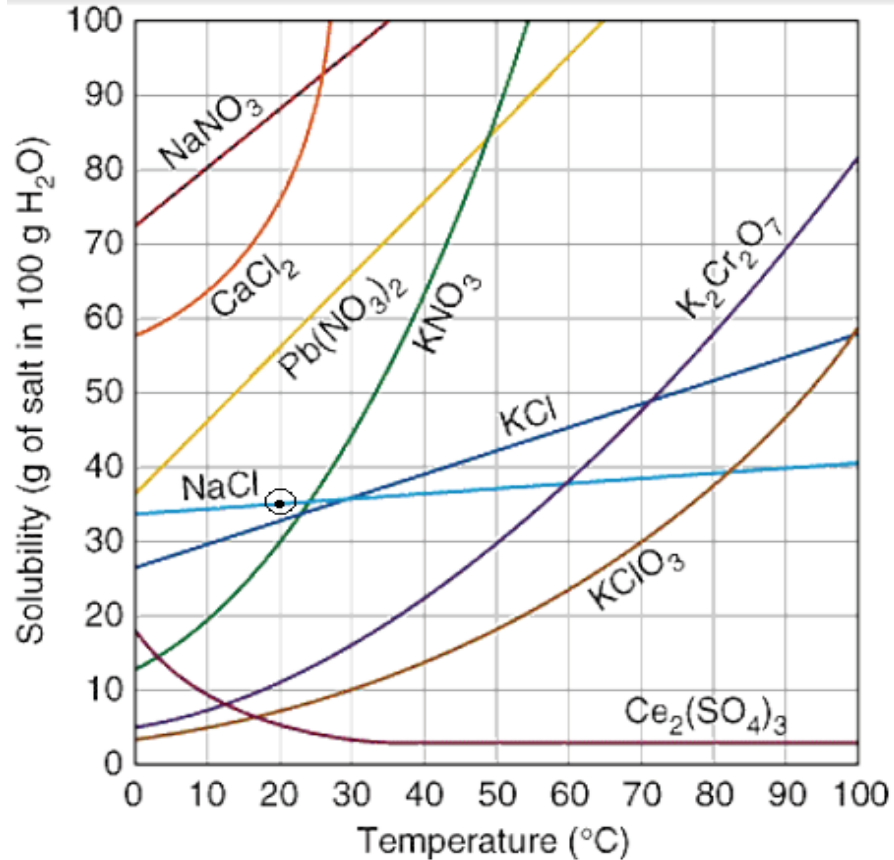
Supersaturated

70 g CaCl₂ at 20 °C

Saturated

Unsaturated

Supersaturated



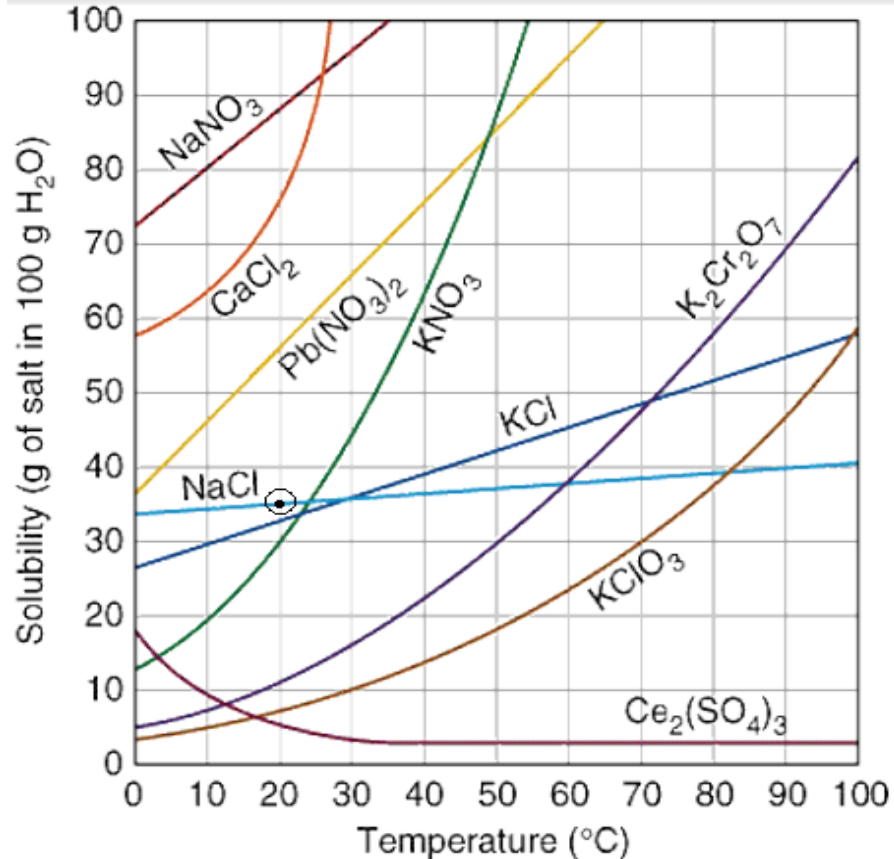
Tell **how many grams** of each solute must be **added** to 100 g of water to form a **saturated solution** at the given temperature.

5. Pb(NO₃)₂ at 10 °C _____

7. NaCl at 20 °C _____

6. Ce₂(SO₄)₃ at 50 °C _____

8. K₂Cr₂O₇ at 50 °C _____



Tell **how many grams** of each solute must be **added** to 100 g of water to form a **saturated solution** at the given temperature.

5. Pb(NO₃)₂ at 10 °C 47 g.

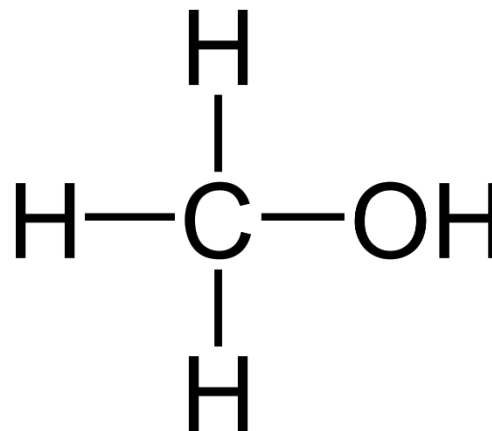
7. NaCl at 20 °C 35 g.

6. Ce₂(SO₄)₃ at 50 °C 2 g.

8. K₂Cr₂O₇ at 50 °C 30 g.

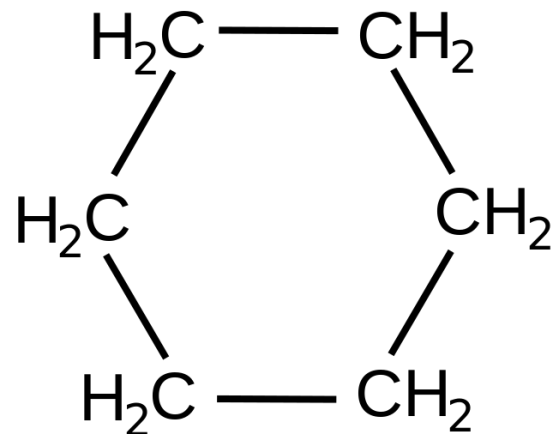
Types of Solvents

- Solvents can be classified as being either **polar** or **non-polar**
- **Polar solvents:** A solvent that contains molecules in which the atoms are arranged so that they have a **positive pole** & a **negative pole**.
 - **Examples:** water (H₂O), acetic acid, methanol (CH₃OH), ethanol



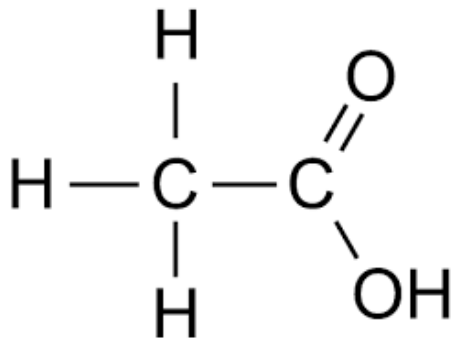
Types of Solvents

- Solvents can be classified as being either **polar** or **non-polar**
- **Non-polar solvents:** A solvent that contains molecules in which the atoms are arranged so that there are **no poles**
 - **Examples:** pentane, benzene, cyclohexane

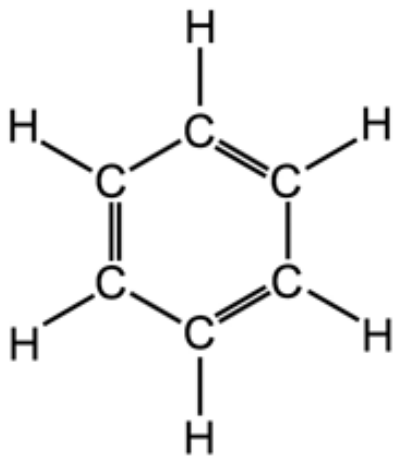


Think, Pair & Share

Determine if the following two solvents are polar or non-polar



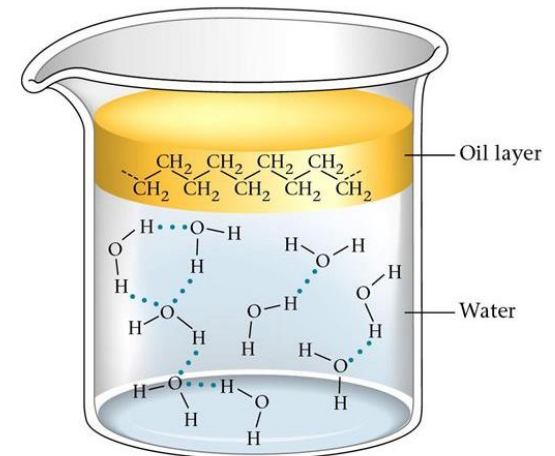
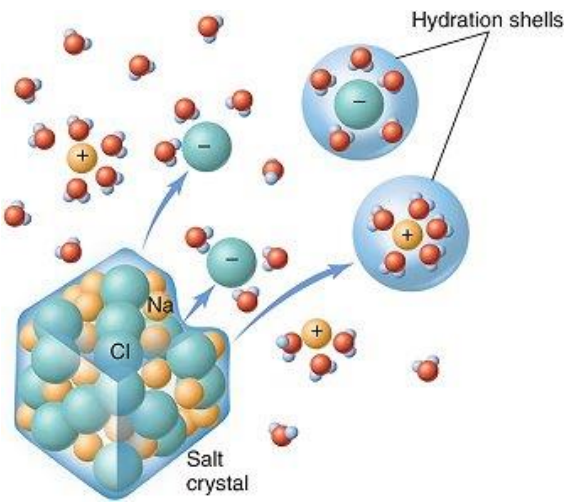
Polar or Non-Polar



Polar or Non-Polar

Solubility Rules

- **Solubility:** A chemical property referring to the ability of a substance (**solute**) to **dissolve in a solvent**
- **The rule: “Like dissolves like”**
 - **Polar solutes** dissolve in **polar solvents**
 - **Non-polar solutes** dissolve in **non-polar solvents**



HOMework

- **Textbook:** Hebden
- **Page:** 194
- **Questions:** 1 - 4

