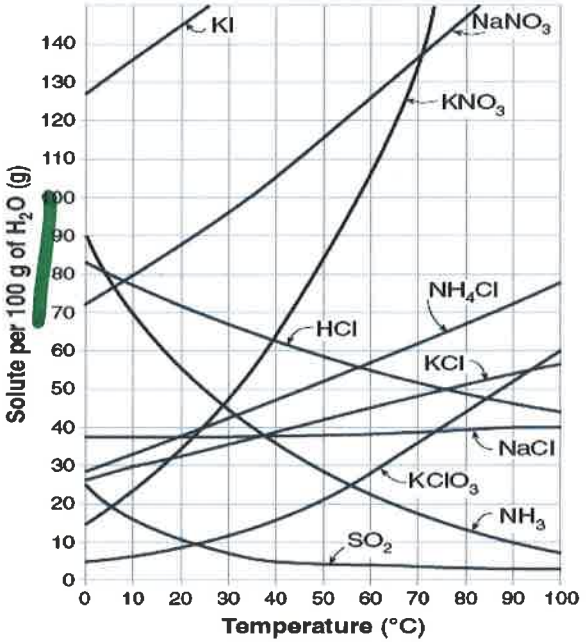
Solubility Questions - Reading a Graph



1) Any point on the line is considered saturated

2) Any point above the line is considered supersaturated

3) Any point below the line is considered unsaturated

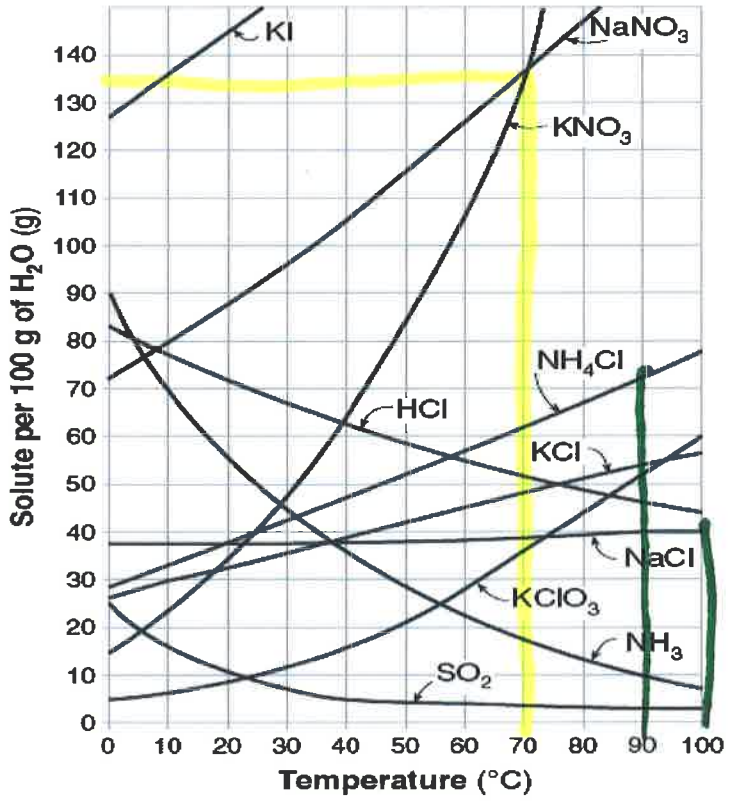
g

4) What mass of solute will dissolve in 100mL of water at the following temperatures?

a. KNO_3 at 70°C = ~136g

b. NaCl at 100°C= 40g

c. NH_4Cl at 90°C= 72g

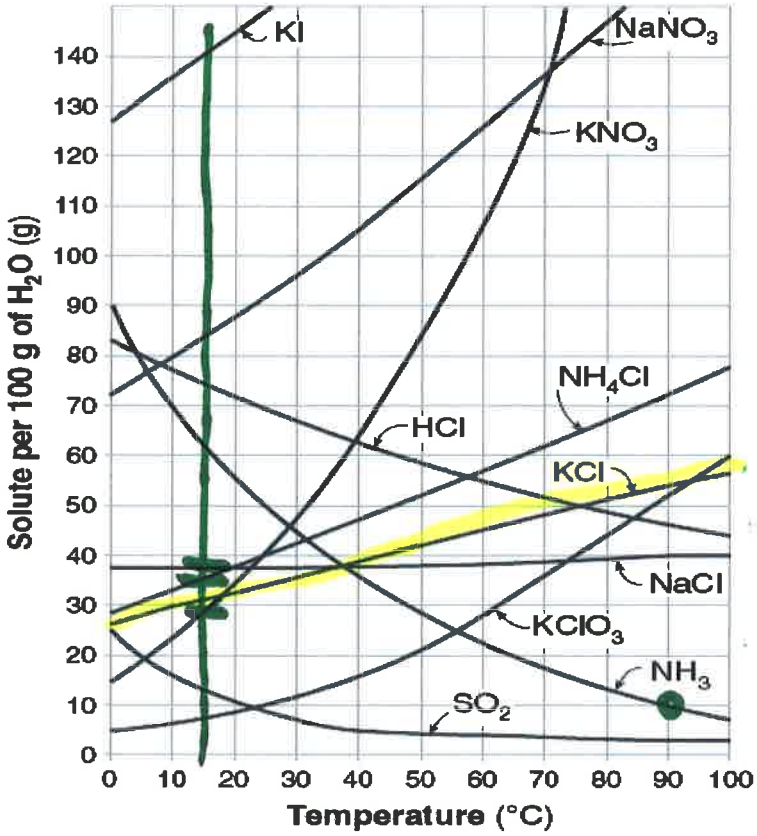


d. Which of the **above** three substances (KNO_3, NaCl, or NH_4Cl) is most soluble in water at 15°C. NaCl

5) At 90°C, you dissolved 10 g of KCl in 100. g of water.

a. Is this solution saturated, supersaturated, or unsaturated? unsaturated

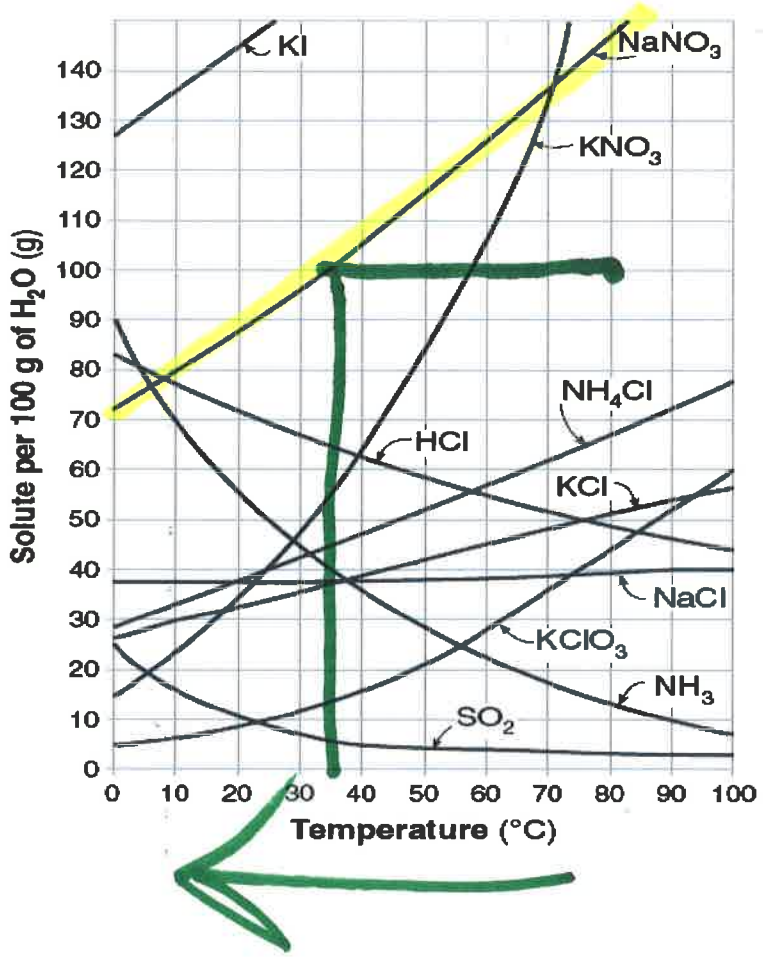
b. How do you know? b/c the point is below the solubility line.



6) A mass of 100 g of $NaNO_3$ is dissolved in 100 g of water at 80°C.

a) Is the solution saturated, supersaturated, or unsaturated? unsat.

b) As the solution is cooled, at what temperature should solid first appear in the solution? ~35°C



* if solid is present, the solution is saturated

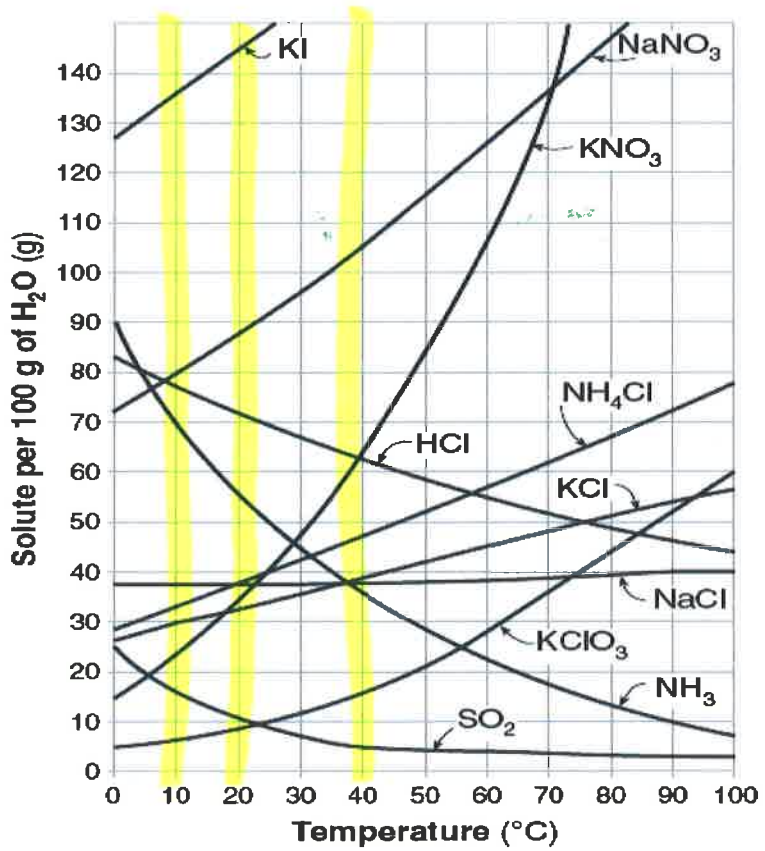
highest line

7) Which compound is most soluble at 20 °C? KI

lowest line

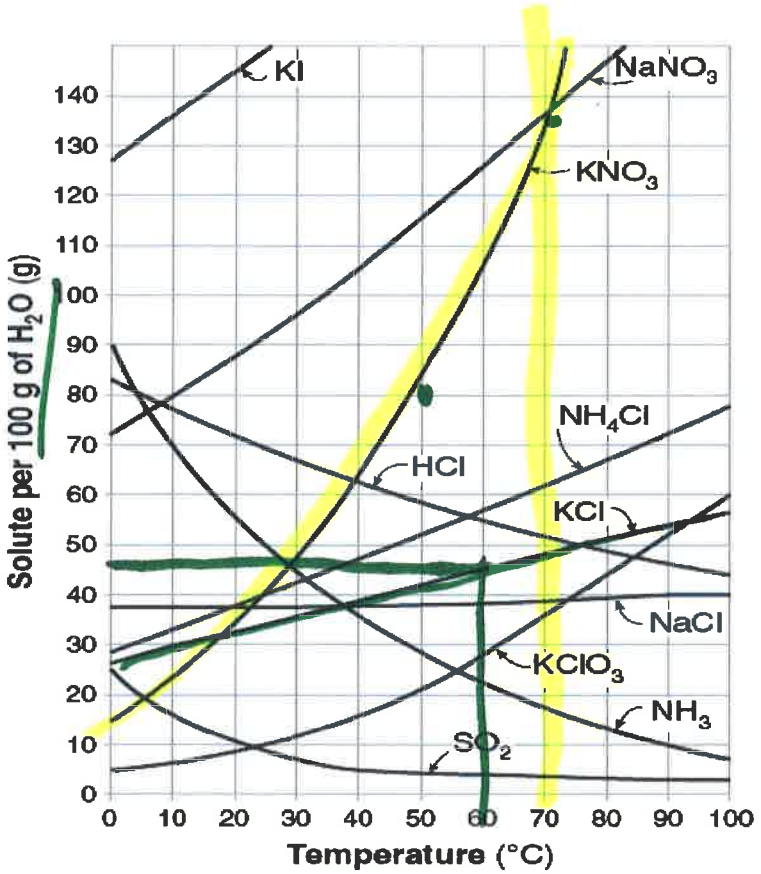
8) Which is the least soluble at 40 °C? SO_2

9) Which substance on the graph is **least** soluble at 10°C? $KClO_3$



10) A mass of 80 g of KNO_3 is dissolved in 100 g of water at 50 °C. The solution is heated to 70°C. How many more grams of potassium nitrate must be added to make the solution saturated? 54g additional

11) At that temperature will 45 g of potassium chloride (KCl) become a saturated solution? 60°C



~134 g sat
- 80

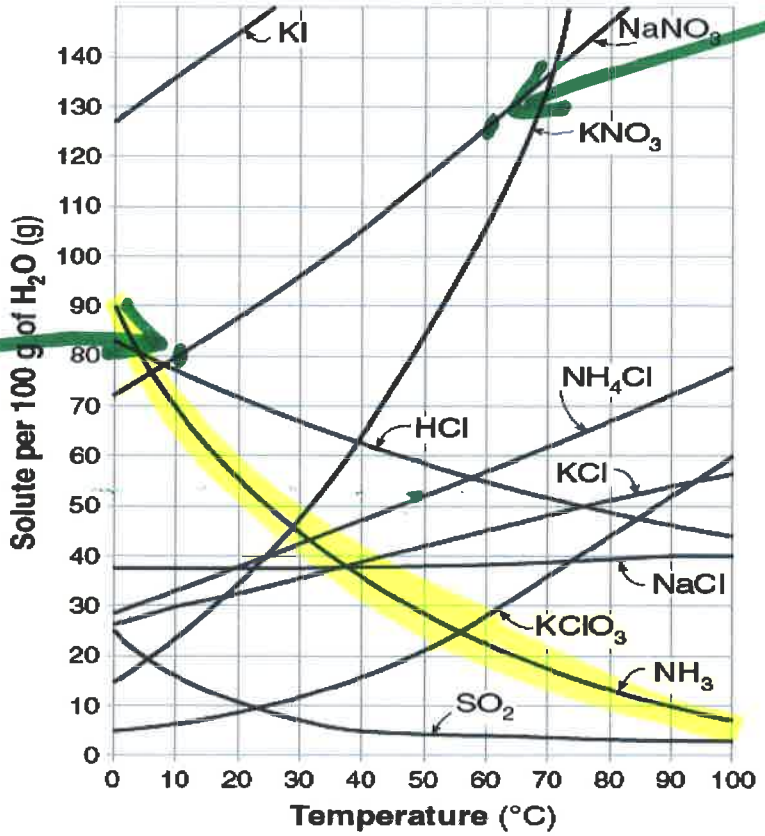
12) How many grams of sodium nitrate ($NaNO_3$) will fall out of a saturated solution that contains 100 g of water at 60°C if the solution is cooled to 10°C?

on the line

45 g will fall out

13) NH_3 must be a gas because why?

the solubility decreases as the temp. increases.



125 g

80 g

125
- 80
45 g

14) Determine the solubility of the following salts dissolved in 100 g of water.

a. potassium iodide (KI) at 10°C 136g

b. ammonium chloride(NH_4Cl) at 70°C 61g

c. potassium chlorate ($KClO_3$) at 20°C 8g

15) Determine if the following solutions are saturated, unsaturated, or supersaturated.

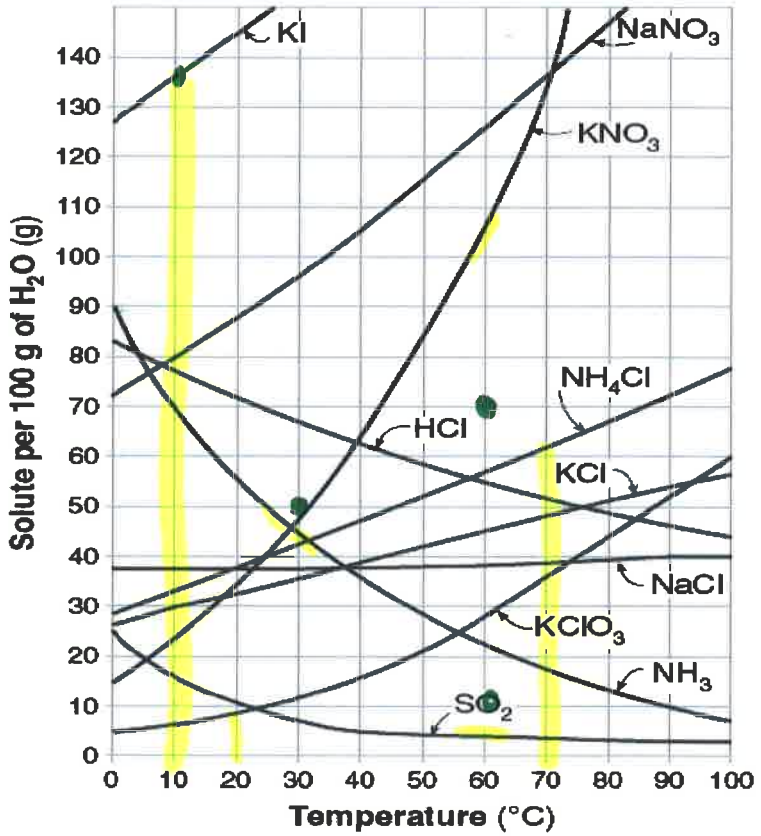
a. 50 g of NH_3/100 g of water at 30°C supersat.

b. 35 g of KNO_3/50 g of water at 60°C unsat.

c. 20 grams SO_2/200 g water at 60°C supersat.

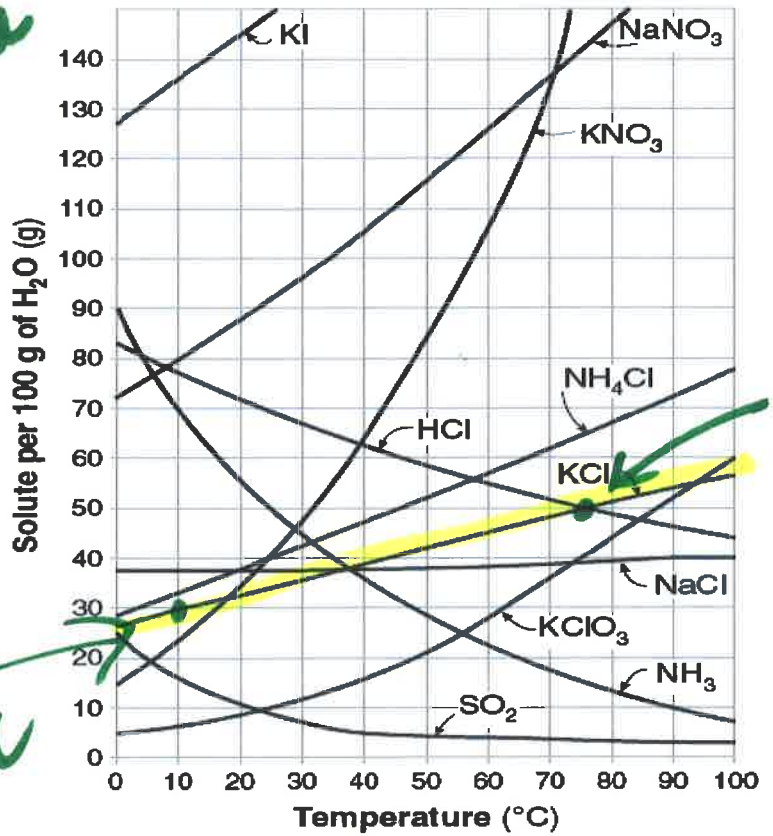
70 g/100g

10g/100g

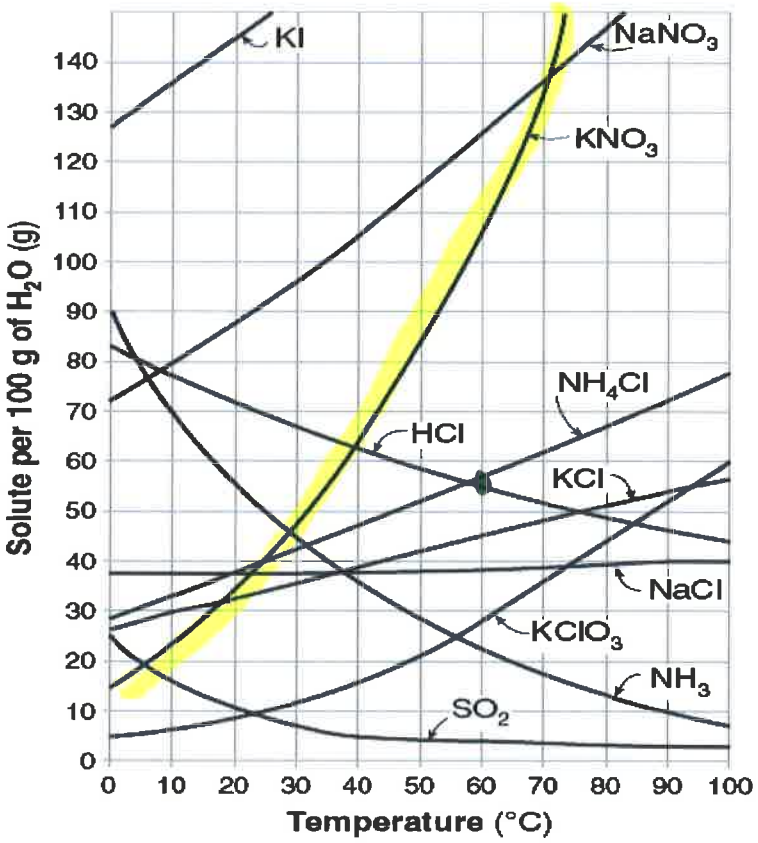


16) What becomes more soluble in water as the temperature increases? Gases or solids? (Circle one)

17) Determine how much potassium chloride (KCl) will precipitate out of solution if it goes from being saturated in 75°C to 10°C in 100 g water. Show all work.



18) Determine if a solution containing 55 grams of KNO_3 in 100 grams of water at 60°C is saturated, unsaturated, or supersaturated. unsaturated



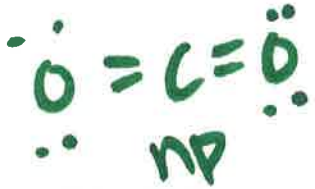
19) Predict whether hot or cold water will work better to clean your car. Explain your choice in terms of solubility.

Hot water will be better b/c it will dissolve more solid solute.

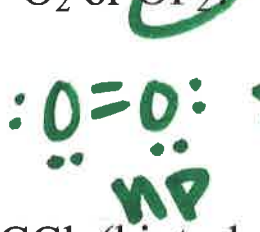
polar. will dissolve polar & ionic. "like dissolves like"

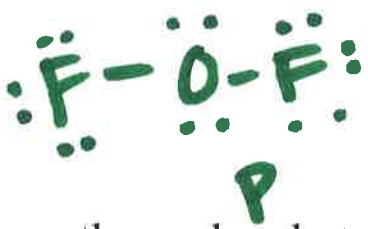
20) Which gas would have a higher solubility in water (hint: draw the molecule to figure it out!),

CO_2 or CO?



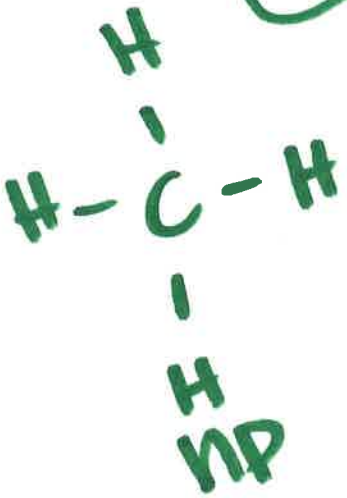
O_2 or OF_2?

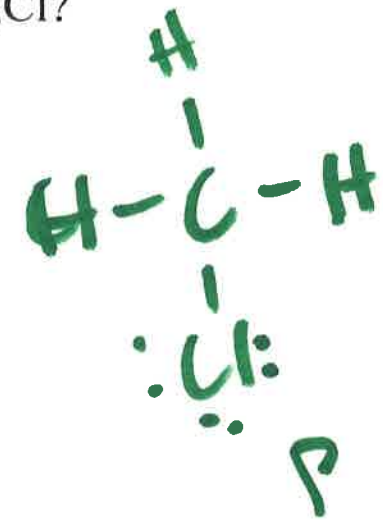


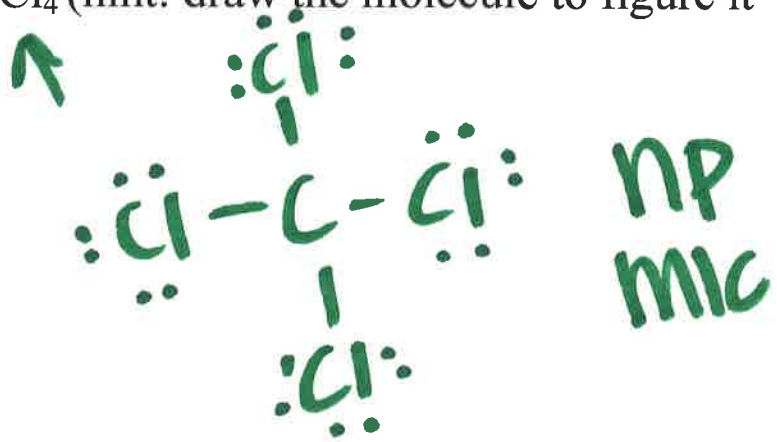


21) Which gas would have a higher solubility in CCl_4 (hint: draw the molecule to figure it out!),

CH_4 or CH_3Cl?







Like dissolves like!

22. Calculate the % Hydrate
Find the % of H_2O in each hydrate.

$$\% H_2O = \frac{\text{Mass of } H_2O}{\text{Mass of hydrate}} \times 100$$

nickel (II) chloride hexahydrate

$NiCl_2 \bullet 6H_2O \rightarrow$ _____ $\% H_2O$

Ni 1 x 58.7g = 58.7g
Cl 2 x 35.5g = 71.0g
H_2O 6 x 18.0g = 108.0g ← mass H_2O

$\frac{108.0g}{237.7g} \times 100 =$ **45.4% H_2O**

237.7g ← mass hydrate

copper(II) chloride dihydrate

$CuCl_2 \bullet 2H_2O \rightarrow$ _____ $\% H_2O$

Cu 1 x 63.5g = 63.5
Cl 2 x 35.5g = 71.0
H_2O 2 x 18.0g = 36.0g

$\frac{36.0g}{170.5g} \times 100 =$ **21.1% H_2O**

170.5g