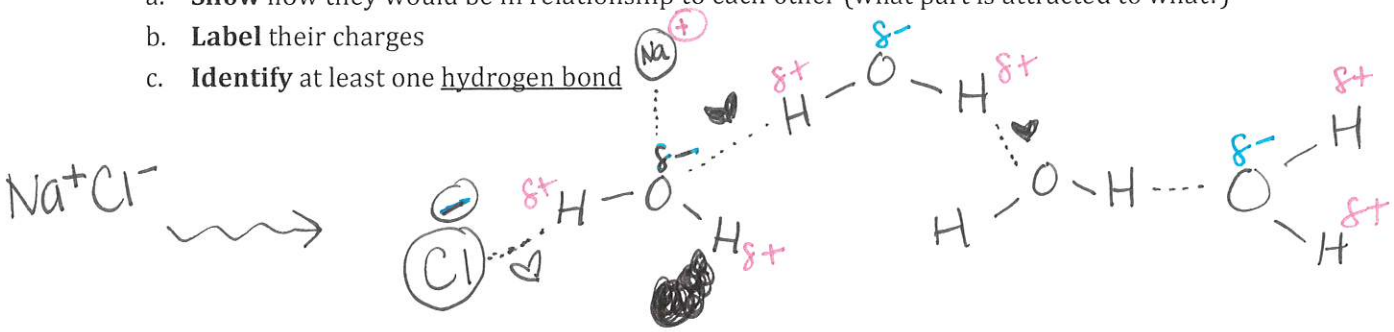
Solutions Review

opposites attract!

1. **Draw** FOUR H_2O molecules in the space below (check your notes!) and:
   a. **Show** how they would be in relationship to each other (what part is attracted to what?)
   b. **Label** their charges
   c. **Identify** at least one hydrogen bond



   d. **Add** one NaCl to your picture above: don't forget to show what happens to the salt in water!
   ↳ will dissociate (separate)

2. Water has unbalanced, partial positive and negative charges, which causes the property called polarity.
3. When a salt dissolves in water, we can say that it dissociates (or separates into ions). + −
4. A solution is a homogeneous mixture. It has two parts: the solute (smaller amount that gets dissolved) and the solvent (larger amount that does the dissolving).

solute
solvent

How can the rate of dissolution be increased? (How do you make it dissolve faster?)	
Solid	**Gas** CO_2 in soda
1. agitation (stir)	1. (Increase or decrease?) pressure
2. hot (Increase or decrease?) temperature	2. (Increase or decrease?) temperature cold
3. Increase surface area (crush)	

↑ this chart is on the test ↑

5. How does soap work?

↓
polar head attracts H_2O, non-polar tail attracts oil/grease etc.

6. Identify the type of each compound (ionic/covalent) and if it is an electrolyte or a NONelectrolyte.

Compound	Type	Elec/Non
a. LiOH m poly	+ I −	E
b. $SiBr_4$	C	NON
c. Na_2SO_3 m poly	+ I −	E
d. $C_{12}H_{22}O_{11}$	C	NON

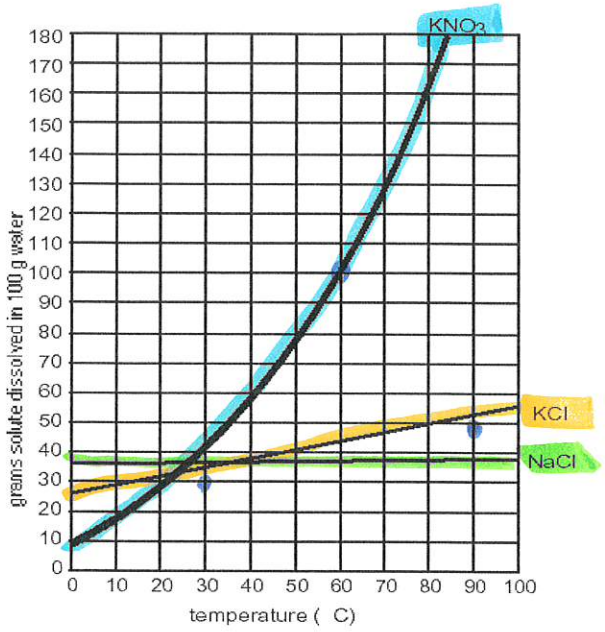
Compound	Type	Elec/Non
e. NaOH m poly	+ I −	E
f. $CaCO_3$ m poly	+ I −	E
g. P_2O_3	C	NON
h. $Ba(NO_3)_2$ m poly	+ I −	E

7. Use the graph on the right to determine if the following **UN**: unsaturated or **SAT**: saturated

a) At 90°C, 50 g KCl UN (under)

b) At 30°C, 30 g NaCl UN (under)

c) At 60°C, 100 g KNO_3 SAT (on / above)



8. Identify the salt (compound):

- 40g of an unknown salt is dissolved at 30°C. KNO3
- 50 g of an unknown salt is dissolved at 80°C. KCl
- At 70°C, 130g of an unknown salt dissolves. KNO3

9. A solid (sugar) is dissolved into a liquid (tea). Will MORE or LESS dissolve when:

a. The temperature is decreased?	MORE	or	LESS
b. The solid is left as one large chunk?	MORE	or	LESS
c. The solid is stirred into the solvent?	MORE	or	LESS

10. A gas (CO_2) is dissolved into a liquid (soda). Will MORE or LESS dissolve when:

a. The temperature is decreased?	MORE	or	LESS
b. The pressure is decreased?	MORE	or	LESS

11. Identify the solute and solvent in the following solutions:

a. 15.0 g of salt & 50.0 mL of water — solute: salt solvent: water

b. 60 mL of water & 6.0 g of $C_6H_{12}O_6$ — solute: $C_6H_{12}O_6$ solvent: water

c. 200 mL of acetone & 500 mL of water — solute: acetone solvent: water

d. 3.0 g of CO_2 & 150 mL of soda — solute: CO_2 solvent: soda

12. Calculate the volume (V_1) of 10.2 M (M_1) HCl that must be used if you want to create 500 ml (V_2) of 3.00 Molar (M_2) HCl.

$M_1V_1 = M_2V_2$ $\quad 10.2(V_1) = 3(500)$

$V_1 =$

13. How many grams of NH_4Br are needed to make 7.65 L of a 1.25 M solution?

SKIP ☺

→ need P.T.

14. What is the molarity of a solution created by dissolving 123.5 g of $CaSO_4$ in 2.5 L of water?

$123.5\,g \times \frac{1\,mol}{136.14} = 0.91\,mol$ $\quad M = \frac{mol}{L}$ $\quad \frac{0.91}{2.5}$

→ need P.T.

$\boxed{0.36\,M}$

15. What volume of a 0.130 M solution can be made from 156 g of Li_2CO_3?

$156\,g \times \frac{1\,mol}{73.89\,g} = 2.11\,mol$ $\quad M = \frac{mol}{L}$ $\quad 0.130 = \frac{2.11}{L}$

$\boxed{16.24\,L}$

✱ advice: always check alkali metals first!!! ✱

16. Write the state of matter in the parenthesis.

	Is there a precipitate?		What is the precipitate?
a. $CaCl_2(aq) + Na_2CO_3(aq) \rightarrow CaCO_3(s) + 2\,NaCl(aq)$	YES	NO	PPT $CaCO_3$
b. $BaCl_2(aq) + Cs_2S(aq) \rightarrow BaS(aq) + 2\,CsCl(aq)$	YES	NO	PPT X
c. $2\,HNO_3(aq) + Ba(CN)_2(aq) \rightarrow Ba(NO_3)_2(aq) + 2\,HCN(aq)$	YES	NO	PPT X
d. $MgSO_4(aq) + 2\,NaOH(aq) \rightarrow Mg(OH)_2(s) + Na_2SO_4(aq)$	YES	NO	PPT $Mg(OH)_2$
e. $3\,RbNO_3(aq) + Li_3PO_4(aq) \rightarrow Rb_3PO_4(aq) + 3\,LiNO_3(aq)$	YES	NO	PPT X
f. $KI(aq) + AgNO_3(aq) \rightarrow KNO_3(aq) + AgI(s)$	YES	NO	PPT AgI
g. $LiOH(aq) + NH_4CN(aq) \rightarrow LiCN(aq) + NH_4OH(aq)$	YES	NO	PPT X
h. $2\,NH_4NO_3(aq) + ZnCl_2(aq) \rightarrow Zn(NO_3)_2(aq) + 2\,NH_4Cl(aq)$	YES	NO	PPT X
i. $PbCl_2(aq) + Na_2SO_4(aq) \rightarrow PbSO_4(s) + 2\,NaCl(aq)$	YES	NO	PPT $PbSO_4$

17. If you have 2.3 moles of $Al(OH)_3$ in 0.15 L of water, what is the concentration of your solution?

(molarity)

$M = \frac{mol}{L}$ $\quad M = \frac{2.3}{0.15}$ ☜ $\quad \boxed{15.33\,M}$

18. If a 0.6 M solution of $NaNO_3$ is created in 1.2 L of water, how many moles of solute were needed?

$M = \frac{mol}{L}$ $\quad 0.6 = \frac{mol}{1.2}$ $\quad$ 0.72 mol

follow up question

19. What volume of water must be added to 55ml of 1.2 M $Zn(OH)_2$ to reduce the concentration to 0.15 M?

V_1 M_1 M_2

$M_1V_1 = M_2V_2$

$1.2(55) = 0.15(V_2)$

$V_2 = 440$ mL

-55

385 mL water

20. If 22 mol of NaCl are used to create a 0.35 M solution, what volume of water would be needed?

$M = \frac{mol}{L}$ $\quad 0.35 = \frac{22}{L}$ $\quad$ 62.86 L

(cross-multiply!)

21. Water is added to 0.150 L of a 4.45 M solution of NaOH until the final volume is 2.65 L. What is the molarity of the resulting solution?

V_1 M_1 V_2 M_2?

$M_1V_1 = M_2V_2$ $\quad 4.45(.150) = M_2(2.65)$

$M_2 = 0.25M$

22. You need to create a solution capable of conducting an electrical current, and you have the choice between three chemicals: $SrCl_2$, H_2, and OCl_2. Which one would you choose and **why**?

↓

Ionic

(+) (−)

charges

(+) (−)

m + non

m + polyatomic