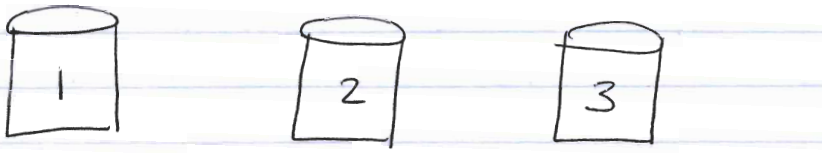
CST: - - -
Chem: 6b,c

Finding Solutions

ChemCatalyst

Q: What is the same/different?
Q: Which solution has the most molecules? #1,2
[greatest] (all same)? weighs the most? #2



1	2	3
1.0L	1.0L	500mL
1.0M $C_6H_{12}O_6$	1.0M $C_{12}H_{22}O_{11}$	1.0M $C_{12}H_{22}O_{11}$
(glucose)	(sucrose)	(sucrose)

Notes:

- Solution vs. Mixture Demo

DEMO!
3 Beakers of H_2O:
- add ¼c NaCl
- add ¼c SiO_2
- add ¼c Kool-aid

	(salt) Beaker #1	(sand) Beaker #2	(Kool-aid) Beaker #3
• solvent?	water	water	water
solute?	salt	sand	Kool-aid
dissolves?	yes	no	yes
homogenous/heterogenous?	homogenous	heterogenous	homogenous
solution or mixture?	solution	mixture	solution

- **solvent**: substance found in [greatest]: does the dissolving
- **solute**: substance found in [least]: gets dissolved
- **homogenous**: a solution in which all substances are distributed uniformly
- **heterogenous**: a mixture that is NOT uniform throughout
- **solubility**: the ability to dissolve

- what is **Molarity**?
  - a chemistry term that means concentration [ ]
  - unit for molarity is M
  - $M = \frac{mol}{L}$

  - 1.0M means you have 1 mole per 1 liter of solution

Finding Solutions

Name: _____

Period:_____ Date: _____

Purpose: You will prepare four solutions by two different methods.

Volume conversion: 1 L = 1000 mL

Part I: How much solute?

Your task is to create 100 mL each of two simulated blood sugar solutions by calculating and measuring the correct amount of solute for each one. Solution A should be a 0.10 M sugar solution (tenth molar). Solution B should be a 0.010 M sugar solution (hundredth molar).

Procedure:

1. The following table shows the relationship between mass of sugar, moles of sugar, volume of sugar solution, and the molarity of sugar solution. The molecular formula for sugar (sucrose) is $C_{12}H_{22}O_{11}$. Complete the table.

	Mass	Moles	Volume	Molarity
	342 g	**1.0 mole**	**1.0 L**	**1.0 M**
	34.2 g	0.10 mole	1.0 L	0.10 M
A	3.42 g	0.010 moles	100 mL (.1L)	.10 M
B	0.342 g	0.0010 mole	100mL (.1L)	0.010 M

2. Use the table to help you determine how many grams of sugar you will need to make 100 mL of 0.10 M sugar (Solution A).
3. Use a scale to measure out this amount of sugar (you will be using Kool-Aid®, which is mostly sugar). Use a weigh boat to hold the powder on the scale.
4. Carefully pour the powder into a 250-mL beaker.
5. Add about 80 mL of water into the beaker. Stir.
6. When the powder is fully dissolved, carefully pour the solution into a 100-mL graduated cylinder.
7. Use a water bottle to add water to as close to the desired volume of 100 mL as possible.
8. Now carefully transfer this solution back into the 250-mL beaker. Label it as Solution A – 0.10 M sugar.
9. Repeat the above steps to make 100 mL of 0.010 M sugar (Solution B). Use the table to help you determine how many grams of sugar you will need. Measure out this amount of powder. Create the solution. Label it Solution B – 0.010 M sugar.

Part II: How much solvent?

Your task is to create two more solutions of simulated blood sugar. This time, however, you will be diluting solutions that already exist. You will begin with the 0.10 M sugar solution (Solution A) and the 0.010 M sugar solution (Solution B) you created in Part I. You will dilute these solutions to create two new solutions, a 0.010 M sugar solution (Solution C) and a 0.0010 M sugar solution (Solution D).

Procedure:

1. To dilute a solution, you take a certain volume of the starting solution and then dilute it to a new volume with a new molarity. The following table shows how the molarity changes when a certain volume of solution is diluted to a new volume. Complete the table.

Volume		Molarity		Moles		Dilute to	New molarity
100 mL	×	**1.0 M**	=	**0.10 moles**	÷	**1.0 L**	**0.10 M**
100 mL	×	0.10 M	=	0.010 moles	÷	1.0 L	0.01 M
C 10 mL	×	0.10 M (A)	=	0.0010 moles	÷	100 mL (1L)	0.01 M
D 10 mL	×	0.010 M (B)	=	0.0001 mol	÷	100 mL (1L)	0.001 M

2. Use the table to help you determine how many mL of 0.10 M sugar solution (Solution A) you will need to make 100 mL of 0.010 M sugar (Solution C).
3. Measure out this amount of the 0.10 M sugar solution in a 100-mL graduated cylinder. Use a pipette to get as close to the desired volume of Solution A as possible.
4. Add water to make 100 mL of solution. Use a water bottle to add water to as close to the desired volume of 100 mL as possible.
5. Pour this solution into a clean 250 mL beaker. Label it 0.010 M sugar - Solution C.
6. Repeat the above steps to make 100 mL of 0.0010 M sugar (Solution D). Use the table to help you determine how many mL of 0.010 M sugar solution (Solution B) you will need to make 100 mL 0.0010 M sugar (Solution D). Make the solution. Label it Solution D – 0.0010 M sugar.

Fill in the following table:

	Method of preparation	**Concentration**	**Color**
Solution A	weighed 3.42 g sugar, diluted to 100 mL	0.10 M	dark red
Solution B	weighed 0.342g sugar, diluted to 100mL	.010 M	red
Solution C	pour out 10mL solution A (.1M) & add 90mL H_2O	.010M	light red
Solution D	pour out 10 mL solution B (.01M) & add 90mL H_2O	.0010 M	pink

Answer the following questions:

1. Is the color of the solution consistent with the concentration? Explain your thinking. Yes, the ↓ [ ] the lighter the color
2. Normal blood sugar concentrations are about 0.0056 M. Which of the four solutions are above the normal healthy range? A, B, C

Making sense:

Describe two ways to make a 0.010 M sugar solution.

If you finish early…

How could you dilute Solution A to make 100 mL of a 0.0010 M sugar solution?

Making Sense Notes:

- What is Molarity?
  - Molarity means concentration
  - $M = \frac{mol}{L}$

- How do I solve for **molarity**?
  - If given # of moles: $M = \frac{mol}{L}$
  - If given # of grams: ① convert grams to moles ② $M = \frac{mol}{L}$

  *always make sure the volume is in Liters!
  - 1 L = 1,000 mL

- How do I solve for **moles**?
  - moles = M × L

- How do I solve for **liters**?
  - If given # of moles: $L = \frac{mol}{M}$
  - If given # of grams: ① convert grams to moles ② $L = \frac{mol}{M}$

- How do I solve for **grams**?
  ① Find # of moles: mol = M × L
  ② convert moles to grams

  - ex: How many grams of sucrose ($C_{12}H_{22}O_{11}$) are in 1.0 L of soda w/ molarity of 0.75 M?

  ① mol = M × L = 0.75 M × 1.0 L = 0.75 moles $C_{12}H_{22}O_{11}$

  ② $0.75 \text{ moles } C_{12}H_{22}O_{11} \mid \frac{342.0 \text{ g } C_{12}H_{22}O_{11}}{1 \text{ mol } C_{12}H_{22}O_{11}} = \boxed{260 \text{ g } C_{12}H_{22}O_{11}}$

Check-In:

① How many moles of sucrose does 100 mL of a 0.10 M solution contain?

moles = M × L
= 0.10 M × 0.10 L
= **0.010 moles**