

Solutions

def: Is a homogeneous mixture where different phases are not seen and is made up of a solute and solvent.

Solvent



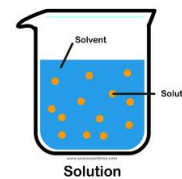
+

Solute

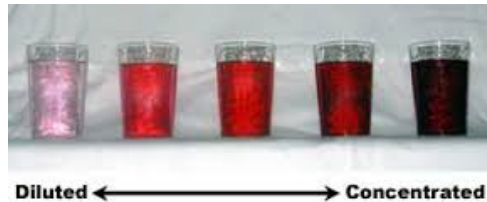


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Solutions



Concentration: is the proportion of solute/solvent in solution.



How can you make a drink more concentrated?

1. Add more solute
2. add less solvent

How can you make a drink more diluted?

1. add less solute
2. add more solvent


Solutes, solvents, solutions and scallywags.mp4



Formula to solve for concentrations

$$C = m/v$$

$\begin{matrix} C \\ \downarrow \\ \text{Concentration} \end{matrix}$
 $\begin{matrix} m \\ \downarrow \\ \text{mass} \end{matrix}$
 $\begin{matrix} v \\ \downarrow \\ \text{Volume of Solution} \end{matrix}$

Solution $\left\{ \begin{array}{l} 15g \leftarrow \text{mass} \\ 300mL \leftarrow \text{volume} \end{array} \right.$


Conversions:

1- to go from L to ml you must $\times 1\,000$

ex: $5\text{ L} = 5\,000\text{ ml}$ $2.5\text{ L} = 2\,500\text{ mL}$



500 ml or 0.5 L

2- to go from mg to g you must $\div 1\,000$

ex: $5\text{ mg} = 0.005\text{ g}$ $0.4\text{ mg} = 0.0004\text{ g}$

Units used

%	ppm	g/L	mg/L
20% \downarrow $\frac{20g}{100\text{ mL}}$	20ppm \downarrow $\frac{20g}{1\,000\,000\text{ mL}}$	20g/L \downarrow $\frac{20g}{1\,000\text{ mL}}$	20mg/L \downarrow $\frac{.02g}{1\,000\text{ mL}}$

When doing the math you are making the concentration proportional. How?



Because the ratio
of solute/solvent
will be kept constant.
 $7\text{g/L} = 14\text{g}/2\text{L} = 21\text{g}/3\text{L}$

Travel Pictures



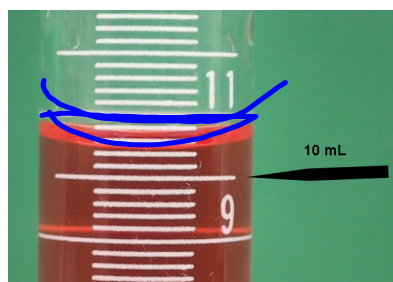
Procedure to make a solution



1. Weigh 1.5g of solute
2. Put solute in 100mL volumetric flask

3. add some solvent + swirl

4. Add water to line.
5. Check meniscus



Solution Problems

1. You have a 7g/L solution, but you only want to use 150 g of solute. What will the new solution be?

$$\frac{7g}{L} = \frac{150g}{x} \quad \text{have WANT}$$

$$x = \frac{150g}{7} = 21.4L$$

2. You have a 15 g/ 200 mL solution. How much solute is necessary if you want to use 450 mL only?

$$\frac{15g}{200mL} = \frac{x}{450mL} = 33.8g$$

3. Convert the following to percent concentration

150 g/L	25 ppm	37 g / 400 ml	14 mg/L
$\frac{150g}{1000mL} = \frac{x}{100mL}$ 15% or $\frac{15g}{100mL}$	$\frac{25g}{1000000mL} = \frac{x}{100mL}$.0025% $\frac{.0025g}{100mL}$	$\frac{37g}{400mL} = \frac{x}{100mL}$ 9.25% $\frac{9.25g}{100mL}$	$\frac{.014g}{1000mL} = \frac{x}{100mL}$.0014% $\frac{.0014g}{100mL}$

4. Convert the following to ppm.

12 %	28 ppm	30 g / 500 ml	24 mg / L
$\frac{12g}{100mL} = \frac{x}{1000000mL}$ 1200000ppm	28ppm	$\frac{30g}{500mL} = \frac{x}{1000000mL}$ 600000ppm	$\frac{.024g}{1000mL} = \frac{x}{1000000mL}$ 24ppm

5. Convert 0.5 mg/L to ppm.

$$\frac{0.0005}{1000mL} = \frac{x}{1000000mL} \quad * \text{mg/L} = \text{ppm}$$

$$0.5ppm \quad \frac{7mg}{L} = 7ppm$$

6. Determine the order from least to most concentrated for the following solutions.

a- 0.4 %	b- 10 g/L	c- 35 ppm	d- 15 mg/L
$\frac{.4}{100} = \frac{x}{1000000}$ 4000ppm	$\frac{10}{1000} = \frac{x}{1000000}$ 10000ppm	35ppm	15ppm
.4%	$\frac{10g}{1000} = \frac{x}{100}$ 1%	$\frac{35}{1000000} = \frac{x}{100}$.0035%	$\frac{.015}{1000} = \frac{x}{100}$.0015%

d → c → a → b

7. You have a 15 g/L solution, **explain the process** used when making the solution in a percent concentration.

procedure
5 steps

$$\frac{15g}{1000mL} = \frac{x}{100mL}$$

$$1.5\% \text{ or } 1.5g \leftarrow$$

8. What is the difference between a 15% concentration and a 20% concentration?

20% is 5% more concentrated, has 5g more of solute dissolved in solvent

9. If blue algae in a lake reaches 7 ppm the water is considered dangerous to swim in and the lake must be closed. You test the water for the contaminant and find the algae is at 0.003 g/L. Is the water contaminated?

10. You have 2 types of soil. Soil A has a mercury concentration is 0.03 ppm and soil B has a concentration of 1.6%. If the lethal concentration of mercury is 0.0005 g/L determine if either soil is contaminated.

11. You have 25 mg of a solute dissolved in 40 L of water. What is the concentration in ppm?

Past exam Questions

1. A lake is considered polluted if the concentration of mercury exceeds 8 ppm.

You take a sample of three different lakes to verify if any are polluted.

Results from samples taken from lakes

Lake	Mercury concentration
Lake 1	0.0005%
Lake 2	2.5 mg/L
Lake 3	0.085 g/L

Determine if any of the lakes have a lethal concentration of mercury.

2. Two lakes are being tested for different pollutants that can harm aquatic life. Below shows the pollutants with their lethal doses.

Lethal dose for pollutants




Pollutant 1	20 ppm
Pollutant 2	0.4 ppm
Pollutant 3	0.9 ppm

The table below shows the results of sample water taken from the 4 lakes and each pollutant.

	Pollutant 1	Pollutant 2	Pollutant 3
Lake 1	.015 g/L	0.006 %	18 mg/L
Lake 2	0.15 g/L	0.00003 %	1.6 mg/L

Determine if either lake has any pollutants in it.

Attachments

-  Concentration.mp4
-  Solutes__solvents__solutions_and_scallywags.mp4
-  Solutes, solvents, solutions and scallywags.mp4