Solution worksheet

1. You have a 15g/L solution, you want to make a 350 mL solution. How much solute will you need?

$\frac{15g}{1000mL} = \frac{xg}{350mL}$ 5.25g

2. You have 13 mg/L of saltwater. What is the concentration in ppm?

13ppm

3. Put the following concentrations in order from weakest to strongest. D B C A
   A) 7.5% B) 33 g/L C) 11 g/ 200 mL D) 0.003 ppm

$\frac{33g}{1000} = \frac{x}{100}$ $\frac{11g}{200} \times 100$ $\frac{.003}{1000000} = \frac{x}{100}$

7.5% 3.3% 5.5% .000 000 3%

4. You have a 25 g/L solution. You want to make a 400 mL solution. Solve and explain the process of making the solution.

$\frac{25g}{1000mL} = \frac{x}{400} = 10g$

① Weigh 10g of Solute
② Put 10g of solute in 400mL flask
③ Add water + swirl
④ Add water to 400ml line
⑤ Check meniscus.

5. Convert the following units to ppm
   a) 8.75 % b) 19 g/L c) 6 mg/L

$\frac{8.75}{100} = \frac{x}{1000000}$ $\frac{19g}{1000} = \frac{x}{1000000}$ 6ppm

87500ppm 19 000 ppm

6. Rank the following in increasing order of concentration:
   a) 14% b) 32 g/L c) 1 200 ppm

$\frac{32g}{1000} = \frac{x}{100}$ $\frac{1200}{1000000} = \frac{x}{100}$

3.2% 0.12%

C-B-A

7. You are making yourself a glass of chocolate milk and you decide to add 4 g of powder to 250 ml of milk. What is the concentration of your chocolate milk in g/L, % and ppm?

$\frac{4g}{250} = \frac{x}{1000} = 16g$ $\frac{16g}{1000} = \frac{x}{1000000} = 16000\ ppm$ $\frac{4}{250} = \frac{x}{100} = 1.6\%$

8. The label on a bottle of water says that the water contains 45 ppm of sodium.

A- What does this mean?

45g of sodium in 1000000mL of water.

B- What is the concentration of sodium in g/L?

$\frac{45}{1000000} = \frac{x}{1000} = 0.045g$

9. Janine has a sheepdog with big droopy ears. The veterinarian advised her to clean her dog's ears regularly. She noticed that the solution she uses contains 0.15% m/v salicylic acid, which is one of the main ingredients in aspirin. What is the equivalent concentration in ppm?

$\frac{0.15}{100} = \frac{x}{1000000} = 1500\ ppm$

10. Drinking water usually contains calcium carbonate ($CaCO_3$). Water is said to be 'hard' starting at a $CaCO_3$ concentration of 200 ppm. In this case, the water should be treated with a softener to reduce its calcium carbonate concentration. Four samples of water were analyzed. The calcium carbonate concentration of each sample is given below.

1) Sample 1: C = 0.4 g/L 400 ppm
2) Sample 2: C = 300 g/1 000 L 300PPM
3) Sample 3: C = 10 mg/L 10 ppm
4) Sample 4: C = 0.005% 50ppm

Which of these samples need to be treated to reduce the hardness of the water?

A) Samples 1 and 2
B) Samples 1 and 3
C) Samples 2 and 4
D) Samples 3 and 4

11. The water in a lake is contaminated. To determine the concentration of the contaminant, a technician takes a 50-mL sample of the water. After several tests, he concludes that the sample contains 3.75 mg of contaminant. Calculate the concentration of the contaminant, in ppm?

3.75 ÷ 1000 = .00375g

$\frac{.00375g}{50mL} = \frac{x}{1000000} = 75\ ppm$

12. Chlorine is sometimes used in a city's water filtration system to kill micro-organisms. To ensure fish in an aquarium are not affected by the chlorine, tap water could be left sitting for 24 hours to allow the chlorine to evaporate. The lethal dose of chlorine for most goldfish is 0.05 mg/L. Most water filtration systems use 45.5 ppm to kill micro-organisms. Do you need to let the water sit for 24 hours so the chlorine could evaporate?

Lethal Dose = .05 ppm

45.5 ppm is lethal - needs to sit out to evaporate

13. The nearby ocean is being tested for two dangerous substances. Lethal concentrations and sample

	Lethal concentration	Sample taken
Contaminant 1	0.004 mg/L .004 ppm	0.003 ppm ✓
Contaminant 2	0.04 g/L 40 ppm	0.2 ppm ✓

Good.

Determine if the water is contaminated by each dangerous substance.

$\frac{.04}{1000} = \frac{x}{1000\,000}$ = 40 ppm.

14. City regulations state that municipal pools must be closed when the concentration of chlorine in the water is less than 0.3 ppm or greater than 5 ppm. The table below lists the concentration of chlorine in water samples taken from four swimming pools.

Table 1- Chlorine results

Less than 3 ↓ Pool 1 | Pool 2 | Pool 3 | Pool 4 ↓ More than 5

	Pool 1	Pool 2	Pool 3	Pool 4
Concentration	0.00002 %	0.0004%	0.0004 g/L	0.0058 g/L

1 & 4 need to close

Determine which pools need to be closed because they do not conform to the regulations.

① $\frac{.00002}{100} = \frac{x}{1000000}$ = 0.2 ppm

② $\frac{.0004}{100} = \frac{x}{1000\,000}$ = 4 ppm

③ $\frac{.0004}{1000} = \frac{x}{1000000}$ = 0.4 ppm

④ $\frac{.0058}{1000} = \frac{x}{1000000}$ = 5.8 ppm

15. A water sample is taken from a source of drinking water. Tests show that there are 0.14 mg of fluoride in 200 mL of this water sample. In ppm, what is the concentration of the drinking water?

$\frac{0.00014}{200} = \frac{x}{1000\,000}$ = .7 ppm

$\frac{0.14\text{ mg}}{0.2\text{ L}} = 0.7\text{ ppm}$

16. You want to verify the soil around different areas of a national park to determine the quantity of contaminants. The table below shows the maximum amount of contaminant the soil can hold before it becomes dangerous to the plants growing in the park.

Table1: Lethal concentration of different forms of nitrogen

Form of nitrogen	Molecular formula	Lethal concentration
Mercury	Hg	0.02 mg/L
Lead	Pb	0.04 g/L

0.02 ppm

$\frac{0.04}{1000} = \frac{x}{1000000}$ = 40ppm

You test the soil for the quantity of mercury and lead at three different places in the park. The table below shoes the results that were found.

Table2: Results contaminants

Bad Bad

	Test area 1	Test area 2	Test area 3
Mercury	0 ppm ✓	45 ppm *	0.03 g/L *
Lead	0.15 ppm ✓	2.5 ppm ✓	0.006 mg/L ✓

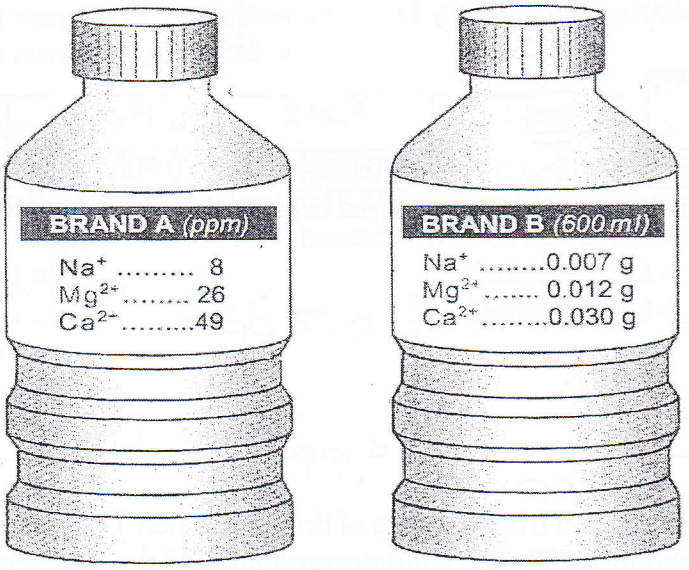
Determine for each sample area whether there is too much lead or mercury.

Mercury is high in test area 2 & 3

Lead is fine in all areas!

$\frac{.03}{1000} = \frac{x}{1000000}$ = 30 ppm

17. The diagram below shows two bottles of spring water with different concentrations of ions.



Determine which brand of spring water contains the greatest concentration of **calcium** ions.

Brand B

49 (A) ppm

$\frac{.03}{600} = \frac{x}{1000000}$

(B) 50ppm