

Concentration of Solutions

1. What is a solute? Give 2 examples.
- substance that is dissolved in a solution
① salt ② sugar
2. What is a solvent? Give 2 examples.
- substance that does the dissolving (in a solution)
① water ② nitrogen (air)
3. List 4 units in which we can express the concentration of a solution?
① g/L ③ ppm
② % ④ mol/L
4. List two ways to decrease the concentration of a solution.
↑ solvent
↓ solute.
5. You are making yourself a glass of iced tea. You add 3 g of powder to 250 ml of water. What is the concentration of your iced tea in g/L, %, ppm?

① $\frac{3g}{250ml} : \frac{xg}{1000ml} \rightarrow 12g \rightarrow \boxed{12g/L}$

② $\frac{3g}{250ml} : \frac{xg}{100ml} \rightarrow 1.2g \rightarrow \boxed{1.2\%}$

③ $\frac{3g}{250ml} : \frac{xg}{1000000ml} \rightarrow 12000g \rightarrow \boxed{12000ppm!}$

6. You need to make 250 ml of a 15 g/L solution. Describe the steps you would take and show the calculations to support your method.

① calculate amount of solute needed.

$$\left(\frac{15g}{1000ml} : \frac{xg}{250ml} \rightarrow 3.75g \right)$$

- ② Mass 3.75g of solute
- ③ Put solute in a 250 ml volumetric flask.
- ④ Fill flask half-way up bulb with water.
- ⑤ Swirl until the solute is dissolved.
- ⑥ Add water up to the 250 ml mark.
- ⑦ mix.

7. Calculate the mass of solute (g) needed to make the following solutions:

a) 100 ml of a 3 % solution

$$\frac{3g}{100ml} : \frac{xg}{100ml} \rightarrow \boxed{3g}$$

b) 300 ml of 47 g/L solution

$$\frac{47g}{1000ml} : \frac{xg}{300ml} \rightarrow \boxed{14.1g}$$

c) 150 ml of a 1450 ppm solution

$$\frac{1450g}{1000000ml} : \frac{xg}{150ml} \rightarrow \boxed{0,2175g}$$

d) 275 ml of a 15% solution

$$\frac{15g}{100ml} : \frac{xg}{275ml} \rightarrow \boxed{41.25g}$$

e) 500 ml of an 18 g/L solution

$$\frac{18g}{1000ml} : \frac{xg}{500ml} \rightarrow \boxed{9g}$$

8. What would be the concentration in g/L of a solution if 500mL of this solution contains 2g of salt?

$$\frac{2g}{500ml} : \frac{xg}{1000ml} \rightarrow 4g \rightarrow \boxed{4g/L}$$

9. What is the percent concentration of a solution if 50g of solute was used to make 3L of the solution?

$$\frac{50g}{3000ml} : \frac{xg}{100ml} \rightarrow 1.67g \rightarrow \boxed{1.67\%}$$

10. How much solute is required to prepare 2L of a 5% solution?

$$\frac{5g}{100ml} : \frac{xg}{2000ml} \rightarrow \boxed{100g}$$

11. How much solution will be prepared if 40g of sugar are used to make an 8% solution?

$$\frac{8g}{100ml} : \frac{40g}{xml} \rightarrow \boxed{500ml}$$

12. Which of the following has the highest concentration? Show your work.

a) 37% $\rightarrow \frac{37g}{100ml} : \frac{xg}{1000000ml} \rightarrow 370000 \text{ ppm}$

b) 150 g/L

c) 375 ppm

$\frac{150g}{1000ml} : \frac{xg}{1000000ml} \rightarrow 150000 \text{ ppm}$

13. Rank the following in increasing order of concentration. Show your work.

a) 14%

b) 32 g/L

c) 1200 ppm

$\frac{14g}{100ml} : \frac{xg}{1000000ml} \rightarrow 140000 \text{ ppm}$

$\frac{32g}{1000ml} : \frac{xg}{1000000ml} \rightarrow 32000 \text{ ppm}$

C → B → A

14. Convert the following units to ppm

a) 8.75 %

$\frac{8.75g}{100ml} : \frac{xg}{1000000ml} \rightarrow \boxed{87500 \text{ ppm}}$

b) 19 g/L

$\frac{19g}{1000ml} : \frac{xg}{1000000ml} \rightarrow \boxed{19000 \text{ ppm}}$

15. Convert the following units to %

a) 425 g/L

$\frac{425g}{1000ml} : \frac{xg}{100ml} \rightarrow 42.5g \rightarrow \boxed{42.5\%}$

b) 225 ppm

$\frac{225g}{1000000ml} : \frac{xg}{100ml} \rightarrow 0.0225g \rightarrow \boxed{0.02\%}$

16. Convert the following units to g/L

a) 63%

$\frac{63g}{100ml} : \frac{xg}{1000ml} \rightarrow 630g \rightarrow \boxed{630g/L}$

b) 1576 ppm

$\frac{1576g}{1000000ml} : \frac{xg}{1000ml} \rightarrow 1.576 \rightarrow \boxed{1.576g/L}$