

# Problems: Concentration in g/L | 9ST

1. Which of the following has the stronger concentration:

a. 5 g in 250 mL or 4 g in 100 mL

$$C = m/V = 5g/250\text{ mL} = 0.02\text{ g/mL} \quad C = \frac{m}{V} = \frac{4g}{100\text{ mL}} = 0.04\text{ g/mL}$$

b. 10 g in 200 mL or 12 g in 120 mL

$$C = m/V = 10g/200\text{ mL} = 0.05\text{ g/mL} \quad C = \frac{m}{V} = \frac{12g}{120\text{ mL}} = 0.1\text{ g/mL}$$

c. 30 g in 400 mL or 35 g in 500 mL?

$$C = m/V = 30g/400\text{ mL} = 0.075\text{ g/mL} \quad C = \frac{m}{V} = \frac{35g}{500\text{ mL}} = 0.07\text{ g/mL}$$

d. 9 g in 25 mL or 12 g in 40 mL?

$$C = m/V = 9g/25\text{ mL} = 0.36\text{ g/mL} \quad C = \frac{m}{V} = \frac{12g}{40\text{ mL}} = 0.3\text{ g/mL}$$

e. 0.5 kg in 2 L or 500 g in 1 L

$$C = m/V = 500g/2L = 250\text{ g/L} \quad C = \frac{m}{V} = \frac{500g}{1L} = 500\text{ g/L}$$

f. 2000 mg in 250 mL or 20 g in 500 mL

$$C = m/V = 2g/250\text{ mL} = 0.008\text{ g/mL} \quad C = m/V = 20g/500\text{ mL} = 0.04\text{ g/mL}$$

g. 40 mg in 1 L or 5 g in 1 L

$$40\text{ mg} \cdot \frac{1g}{1000\text{ mg}} = 0.04\text{ g} \quad C = \frac{m}{V} = \frac{0.04g}{1L} = 0.04\text{ g/L} \quad C = \frac{m}{V} = \frac{5g}{1L} = 5\text{ g/L}$$

2. What mass of solute is needed to prepare 300 mL of a 40 g/L aqueous solution?

$$C = 40\text{ g/L} \quad 300\text{ mL} \cdot \frac{1L}{1000\text{ mL}} = 0.3\text{ L}, \quad V \cdot C = \frac{m}{V} \cdot V \quad m = C \cdot V = 40\text{ g/L} \cdot 0.3\text{ L} = \boxed{12\text{ g}}$$

3. What mass of solute is needed to prepare 500 mL of a 30 g/L solution?

$$C = 30\text{ g/L} \quad 500\text{ mL} \cdot \frac{1L}{1000\text{ mL}} = 0.5\text{ L}, \quad m = C \cdot V = 30\text{ g/L} \cdot 0.5\text{ L} = \boxed{15\text{ g}}$$

4. What mass of sugar do you need to make 300 mL of a 5 g/L sugar solution?

$$C = 5\text{ g/L} \quad 300\text{ mL} \cdot \frac{1L}{1000\text{ mL}} = 0.3\text{ L} \quad m = C \cdot V = 5\text{ g/L} \cdot 0.3\text{ L} = \boxed{1.5\text{ g}}$$

5. How many grams of solute are needed to prepare 250 mL of 10 g/L HCl solution?

$$C = 10\text{ g/L} \quad 250\text{ mL} \cdot \frac{1L}{1000\text{ mL}} = 0.25\text{ L} \quad m = C \cdot V = 10\text{ g/L} \cdot 0.25\text{ L} = \boxed{2.5\text{ g}}$$

6. What volume of solution do you prepare if you dissolve 30 g of solute and make a 4 g/L solution?

$$C = 4\text{ g/L} \quad m = 30\text{ g} \quad V \cdot C = \frac{m}{V} \cdot V \quad \frac{V \cdot C}{C} = \frac{m}{C} \quad V = \frac{m}{C} = \frac{30\text{ g}}{4\text{ g/L}} = \boxed{7.5\text{ L}}$$

7. What volume of solution do you prepare if you dissolve 20g of solute and make a 2 g/L solution?

$$C = 2\text{ g/L} \quad m = 20\text{ g} \quad V = \frac{m}{C} = \frac{20\text{ g}}{2\text{ g/L}} = \boxed{10\text{ L}}$$

8. What is the concentration in g/L if 200 g of solute is in a 500 mL solution?

$$C = x \quad m = 200\text{ g} \quad V = 500\text{ mL} = 0.5\text{ L} \quad C = \frac{m}{V} = \frac{200\text{ g}}{0.5\text{ L}} = \boxed{400\text{ g/L}}$$

$$0.5\text{ kg} \cdot \frac{1000\text{ g}}{1\text{ kg}} = 500\text{ g}$$

$$2000\text{ mg} \cdot \frac{1\text{ g}}{1000\text{ mg}} = 2\text{ g}$$

Problems: Concentration in g/L 9ST

- What is the concentration of a 200 mL salt solution made with 25 g of salt?  
 $C = \frac{m}{V}$   
 $C = \frac{25g}{200mL} = 0.125 \text{ g/mL}$
- What is the concentration of a solution made from 2 g of acid and has a volume of 1.2 L?  
 $C = \frac{m}{V} = \frac{2g}{1.2L} = 1.66 \text{ g/L}$
- How concentrated is a 500 mL solution containing 14 g of base?  
 $C = \frac{m}{V} = \frac{14g}{500mL} = 0.028 \text{ g/mL}$
- What is the concentration of a 100 mL solution that contains 1.2 g of solute?  
 $C = \frac{m}{V} = \frac{1.2g}{100mL} = 0.012 \text{ g/mL}$
- How much acid is needed to make a 400 mL acid solution whose concentration is 5 g/L?  
 $m = CV$   
 $400mL \cdot \frac{5g}{1000mL} = 0.4L$   
 $m = CV = 5 \frac{g}{L} \cdot 0.4L = 2g$
- What mass of solute is needed to make a 4 L of a 1.5 g/L solution?  
 $m = CV = 1.5 \frac{g}{L} \cdot 4L = 6g$
- What mass of solute is needed to make 2.5 L of 3.5 g/L salt solution?  
 $m = CV = 3.5 \frac{g}{L} \cdot 2.5L = 8.75g$
- To make 150 mL of a 4 g/L solution, how much solute is needed?  
 $m = CV = 4 \frac{g}{L} \cdot 0.15L = 0.6g$
- What is the concentration in g/L if 60 g of solute is in a 250 mL solution?  
 $C = \frac{m}{V} = \frac{60g}{250mL} = 0.24 \text{ g/mL}$   
 $\frac{0.24g}{1mL} \cdot \frac{1000mL}{1L} = 240 \text{ g/L}$

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- If a 6.2 g/L sugar solution is made from 0.2 g of sugar, what is the volume of the solution?  
 $C = \frac{m}{V}$   
 $6.2 \frac{g}{L} = \frac{0.2g}{V}$   
 $V = \frac{0.2g}{6.2 \frac{g}{L}} = 0.032 \text{ L}$
- Water is added to 3.4g of salt and makes a 6 g/L solution, what is the volume of this solution?  
 $C = \frac{m}{V}$   
 $6 \frac{g}{L} = \frac{3.4g}{V}$   
 $V = \frac{3.4g}{6 \frac{g}{L}} = 0.566 \text{ L}$
- Which solution is more concentrated:  
  - A 300 mL solution that contains 4 g of sugar.  
 $C = \frac{m}{V} = \frac{4g}{300mL} = 0.0133 \frac{g}{mL}$
  - A 400 mL solution that contains 4 g of sugar.  
 $C = \frac{m}{V} = \frac{4g}{400mL} = 0.01 \frac{g}{mL}$

13. Which solution is more concentrated:  
  - A 4 L solution that contains 300 g of salt.  
 $C = \frac{m}{V} = \frac{300g}{4L} = 75 \frac{g}{L}$
  - A 1.5 L solution that contains 8 g of salt.  
 $C = \frac{m}{V} = \frac{8g}{1.5L} = 5.33 \frac{g}{L}$

14. Which solution is more concentrated:  
  - A 10 mL solution that contains 2 g of acid.  
 $C = \frac{m}{V} = \frac{2g}{10mL} = 0.2 \frac{g}{mL}$
  - A 10 L solution that contains 80 g of acid.  
 $C = \frac{m}{V} = \frac{80g}{10000mL} = 0.008 \frac{g}{mL}$