

Exercises

1. A sample contains 45 ng/mL of testosterone. How many grams of testosterone are found in 1.5 L of this sample? ($10^9 \text{ ng} = 1 \text{ ng}$)

$$\frac{1.5 \text{ L sol'n} \mid 10^3 \text{ mL} \mid 45 \text{ ng testos.} \mid 1 \text{ g}}{\mid 1 \text{ L} \mid \text{ mL sol'n} \mid 10^9 \text{ ng}} = 6.75 \times 10^{-5} \text{ g}$$

↓ 2sf

$6.8 \times 10^{-5} \text{ g testost.}$

2. Potassium bitartrate, an ionic compound present in wine sediment, can be used as a laxative. What is the % (w/v) of 80 mL of solution that contains 0.25 g of potassium bitartrate?

$$\frac{0.25 \text{ g Kbt}}{80 \text{ mL}} \times 100 = 0.31250 \% \text{ (w/v)}$$

↓ 1sf

$0.3 \% \text{ (w/v)}$

3. How many grams of insulin are present in 25 mL of a 0.45 % (m/v) solution?
- $45 \text{ g insulin} = 100 \text{ mL sol'n}$

$$\frac{25 \text{ mL sol'n} \mid 0.45 \text{ g insulin}}{\mid 100 \text{ mL sol'n}} = 0.1125 \text{ g insulin}$$

↓ 2sf

0.11 g insulin

4. Veterinarians can use sodium iodide to treat animals with ringworm. What is the Molarity of 95 mL aqueous solution that contains 40 g sodium iodide?

$$\frac{40.0 \text{ g NaI} \mid 1 \text{ mol NaI} \mid 10^3 \text{ mL}}{95.0 \text{ mL} \mid 148.89 \text{ g} \mid 1 \text{ L}} = 2.8 \text{ M NaI}$$

2.8 M NaI

5. Blood plasma typically contains 3.0 mEq/L of Mg^{2+} , calculate how many milligrams of Mg^{2+} are in 250 mL of blood plasma.

$$\frac{250 \text{ mL blood} \mid 1 \text{ L} \mid 3.0 \text{ mEq Mg}^{2+} \mid 24.3 \text{ mg Mg}^{2+}}{\mid 10^3 \text{ mL} \mid 1 \text{ L blood} \mid 2 \text{ mEq Mg}^{2+}} = 18.23 \text{ mg}$$

↓

18 mg Mg^{2+}

$1 \text{ mmd Mg}^{2+} = 2 \text{ mEq Mg}^{2+} = 24.3 \text{ mg Mg}^{2+}$ ↗

31. Red blood cells have an osmotic pressure equal to 0.30M total solute concentration.

a) What is the concentration in Molarity of an isotonic saline solution (NaCl)?

$$\frac{0.30 \text{ mole total ions}}{1 \text{ L}} \Bigg| \frac{1 \text{ mole NaCl}}{2 \text{ moles ions}} = \boxed{0.15 \text{ M NaCl}}$$

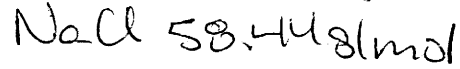
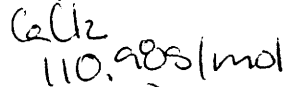
b) What is the total solute concentration in % (m/v) for an isotonic saline solution?

$$\frac{0.15 \text{ mol NaCl}}{1 \text{ L sol'n}} \Bigg| \frac{58.44 \text{ g NaCl}}{1 \text{ mol}} \Bigg| \frac{1 \text{ L sol'n}}{10^3 \text{ mL sol'n}} \times 100 = \boxed{0.88\% \text{ (m/v)}}$$

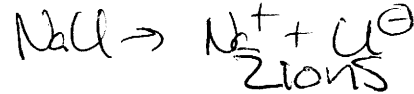
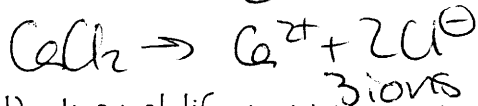
note
0.9% (m/v)
for 1st

c) Is a 0.9% (w/v) CaCl₂ solution isotonic to red blood cells? Explain your reasoning.

No, 1) molar masses are different



2) ion ratios are different



d) In a real-life emergency, we run out of 0.9% (w/v) saline solution. There is KCl and distilled water available. Would it be acceptable to make a 0.9% (w/v) solution of KCl to use for the intravenous infusion? Explain.

No, b/c NaCl & KCl have different molar masses.

0.9g NaCl ≠ 0.9g KCl
when we compare the # of ions

32. How would we prepare 1.0 L of an isotonic solution using the KCl and distilled water?

$$\frac{1 \text{ L sol'n}}{1 \text{ L sol'n}} \Bigg| \frac{0.15 \text{ M KCl}}{1 \text{ L sol'n}} \Bigg| \frac{74.55 \text{ g KCl}}{1 \text{ mol KCl}} = 11.18 \text{ g}$$

↓ 2sf

11g KCl

* 0.30M total solute
1 mole KCl → 1K⁺ + 1Cl⁻
2 moles solutes