Solns, Colloids & Membranes FB Key

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 ng = 1 g)

$$1.5\text{ L soln} \left| \frac{10^3\text{ mL}}{1\text{ L}} \right| \frac{45\text{ ng testos.}}{\text{mL soln}} \left| \frac{1\text{ g}}{10^9\text{ ng}} \right| = 6.75\times10^{-5}\text{ g}$$

$$\Downarrow 2\text{ sf}$$

$$6.8\times10^{-5}\text{ g testost.}$$

2. Potassium bitartrate, an ionic compound preset 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?

"KBt"

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

$$\Downarrow 1\text{ sf}$$

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

3. How many grams of insulin are present in 25 mL of a 0.45 %(m/v) solution?

0.45 g insulin = 100 mL soln

$$25\text{mL soln} \left| \frac{0.45\text{g insulin}}{100\text{mL soln}} \right| = 0.1125\text{ g insulin}$$

$$\Downarrow 2\text{ sf}$$

$$0.11\text{ g insulin}$$

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

$$\frac{40.0\text{ g NaI}}{95.0\text{ mL}} \left| \frac{1\text{ mol NaI}}{149.89\text{ g}} \right| \frac{10^3\text{ mL}}{1\text{ L}} = 2.8\text{ M NaI}$$

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.

$$250\text{mL blood} \left| \frac{1\text{ L}}{10^3\text{ mL}} \right| \frac{3.0\text{ mEq } Mg^{2+}}{1\text{ L blood}} \left| \frac{24.31\text{ mg } Mg^{2+}}{2\text{ mEq } Mg^{2+}} \right| = 18.23\text{ mg}$$

$$\Downarrow$$

$$18\text{ mg } Mg^{2+}$$

$1\text{ mmol } Mg^{2+} = 2\text{ mEq } Mg^{2+} = 24.31\text{ mg } Mg^{2+}$

$1\ mmol\ Ca^{2+} = 2\ mEq\ Ca^{2+} = 40.08\ mg\ Ca^{2+}$

6. What is the concentration in mmol/L of a Ca^{2+} solution that is 2.50 mEq/L?

$$\frac{2.50\ mEq\ Ca^{2+}}{1\ L} \left| \frac{1\ mmol\ Ca^{2+}}{2\ mEq\ Ca^{2+}} \right. = \boxed{1.25\ \frac{mmol\ Ca^{2+}}{L}}$$

$C_3H_6O_3$
90.08 g/mol

7. There is 0.027 g of lactic acid ($C_3H_6O_3$) found in a 250 mL blood serum sample.
   a. What is the lactic acid concentration in molarity?

$$\frac{0.027\ g\ C_3H_6O_3}{250\ mL} \left| \frac{10^3\ mL}{1\ L} \right| \frac{1\ mol\ C_3H_6O_3}{90.09\ g} = .001199\ M$$

$\Downarrow$

$\boxed{0.0012\ M\ C_3H_6O_3}$

   b. If the normal range for lactic acid is 0.6 to 1.8 mmol/L, is this sample within the normal range. Show the conversion of the lactic acid concentration to mmol/L to support your answer.

$$\frac{0.0012\ mol\ C_3H_6O_3}{L} \left| \frac{10^3\ mmol}{1\ mol} \right. = \boxed{1.2\ \frac{mmol}{L}\ \text{yes normal}}$$

8. The dosage for the heart drug digitalis is 20. micrograms per kilogram of body weight. How many milligrams of digitalis should a 160 lb patient receive?

$$\frac{160\ lb\ body\ wt}{} \left| \frac{1\ kg}{2.2\ lb} \right| \frac{20.\ \mu g\ digitalis}{1\ kg\ body\ wt} \left| \frac{1\ mg}{10^3\ \mu g} \right. = 1.455\ mg$$

$\Downarrow$ 2 sf

$\boxed{1.5\ mg\ digitalis}$

9. A diabetic patient suffering from hyperglycemia is receiving an insulin solution by IV at a rate of 2.3 mL/hr. The concentration of the insulin solution is 200. units in every 500. mL. How many units of insulin per hour is the patient receiving?

$$\frac{2.3\ mL\ IV\ soln}{hr} \left| \frac{200.\ unit\ insulin}{500\ mL\ IV\ soln} \right. = \boxed{0.92\ \frac{units}{hr}}$$