Molarity Problem Set Key

These are answers to the Molarity Homework Quiz that is on the Ohio State University Website. Each Quiz is generated from a list of questions. These are the answers to 5 of the questions. I do not have a key for the 1 dilution problem. We will go over that in lecture on Friday.

A solution used as a preservative for biological specimens is prepared by dissolving 9.30×10^2 g of formaldehyde (HCHO) in water to prepare 2.50 L of solution. What is the molarity?(Atomic weights: H = 1.008, O = 16.00, C = 12.01).

1. Find the # of moles in 9.30×10^2 g CH₂O

$$MMCH_2O = 1(12.01g/mole) + 2(1.008g/mole) + 1(16.00g/mole)$$

$$9.30 \times 10^2 gCH_2 O\left(\frac{1moleCH_2O}{30.026gCH_2O}\right) = 30.973molesCH_2O$$

2. Calculate the Molarity of CH_2O in the 2.5L solution.

 $\begin{pmatrix} \frac{30.973 moles CH_2 O}{2.50 L solution} \end{pmatrix} = \begin{pmatrix} \frac{12.389 moles CH_2 O}{1L} \end{pmatrix}$ $= 12.4 M CH_2 O$

Myocrisin (Na₂C₄H₃O₄SAu) is used to treat rheumatoid arthritis. A patient receives an injection from a solution that contains 50.0 mg of Myocrisin, in 0.500 mL. What is the molarity of myocrisin?(Atomic weights: Na = 22.99, Au = 197.0, C = 12.01, H = 1.008, O = 16.00, S = 32.06).

1. Find the # of moles in 50mg Myocrisin

$$MMMyo. = 2(22.99g/mole) + 4(12.01g/mole) + 3(1.008g/mole) + 4(16.00g/mole) + 1(32.06g/mole) + 1(197.0g/mole) = 390.10g/mole 50mgMyo \left(\frac{1g}{1000mg}\right) \left(\frac{1moleMyo}{300.10gMyo}\right) = 1.28172 \times 10^{-4} molesMyo.$$

2. Calculate the Molarity of Myocrisin in the 0.005ml solution.

$$\left(\frac{1.28172 \times 10^{-4} \,moles \text{Myo.}}{0.500 \,mlsolution}\right) \left(\frac{1000 \,ml}{1L}\right) = \left(\frac{2.5634 \times 10^{-1} \,moles \text{Myo.}}{1L}\right)$$
$$= 2.56 \times 10^{-1} \,M$$

Rubbing alcohol contains 595 g of isopropyl alcohol (C_3H_7OH) in 1.00 L of solution. What is the molarity of isopropyl alcohol?(Atomic weights: C = 12.01, H = 1.008, O = 16.00).

1. Find the # of moles in 595g g C_3H_80

$$MMC_{3}H_{8}O = 3(12.01g/mole) + 8(1.008g/mole) + 1(16.00g/mole)$$

= 60.094g/mole

$$595 \text{gC}_{3}\text{H}_{8}\text{O}\left(\frac{1 \text{moleC}_{3}\text{H}_{8}\text{O}}{60.094 \text{gC}_{3}\text{H}_{8}\text{O}}\right) = 9.9012 \text{molesC}_{3}\text{H}_{8}\text{O}$$

2. Calculate the Molarity of C_3H_8O in the 2.5L solution.

$$\left(\frac{9.9012moleC_{3}H_{8}O}{1.00Lsolution}\right) = 9.90MC_{3}H_{8}O$$

Dioctylphthalate $(C_{24}H_{38}O_4)$, a platicizer, is dissolved in water to form a solution containing 2.5 mg in 500.0 mL of liquid. What is the molarity of dioctylphthalate?(Atomic weights: C = 12.01, H = 1.08, O = 16.00)

1. Find the # of moles in 2.5mg dioctylphthalate

$$MMDio. = 24(12.01g/mole) + 38(1.008g/mole) + 4(16.00g/mole) = 390.544g/mole$$

$$2.5mgDio\left(\frac{1g}{1000mg}\right)\left(\frac{1moleDio.}{399.544gDio.}\right) = 6.25713 \times 10^{-6} molesDio.$$

2. Calculate the Molarity of dioctylphthalate
in the 500ml solution.
$$\left(\frac{6.25713 \times 10^{-6} molesDio.}{500ml}\right)\left(\frac{1000ml}{1L}\right) = \left(\frac{1.251427 \times 10^{-5} molesDio}{1L}\right)$$

$$\frac{6.25713 \times 10^{-7} moles D10}{500 ml} \left(\frac{1000 ml}{1L} \right) = \left(\frac{1.251427 \times 10^{-7} moles D10}{1L} \right)$$
$$= 1.3 \times 10^{-5} M \text{Dio}.$$

The maximum permissable amount of cadmium (Cd²⁺) in drinking water is 0.01 mg/L. What is the molarity of such a solution?(Atomic weight: Cd = 112.41).

$$\left(\frac{0.01mgCd^{2+}}{1Lsolution}\right) \left(\frac{1g}{1000mg}\right) \left(\frac{1moleCd^{2+}}{112.41gCd^{2+}}\right) = \left(\frac{8.89 \times 10^{-8} molesCd^{2+}}{1Lsolution}\right)$$
$$= 9 \times 10^{-8} MCd^{2+}$$