Pre-AP Chemistry – Unit 1 Chemical Math Practice Quiz

Objective 1: Students will show competency at conversions and calculations involving scientific measures and quantities. [NS.35.C.1]

Objective 2: Students will make and record scientific measurements with appropriate significant figures. [NS.35.C.2]

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1. Perform the following conversions involving the metric system:

   (a) 435.6 km x $\frac{1000m}{1\ km}$ x $\frac{10^9 nm}{1\ m}$= 4.356 x 10^{14} nm

   (b) 625 pm x $\frac{1m}{10^{12}pm}$ x $\frac{10^6\ \mu m}{1\ m}$ = .000625 μm

   (c) 125 cm x $\frac{1\ m}{100\ cm}$ x $\frac{1000\ mm}{1\ m}$ = 1250 mm

2. Billy runs the 100 meters in 11.9 seconds. What is his speed in miles/hour?

   $\frac{100\ m}{11.9\ s}$ x $\frac{1km}{1000m}$ x $\frac{1\ mile}{1.61\ km}$ x $\frac{60\ s}{1\ min}$ x $\frac{60\ min}{1\ hr}$ = 20 $\frac{miles}{hr}$

3. Answer the following about molarity:

   (a) Determine number of moles of NaCl in 2.75L of a 0.62M solution of salt water

   2.75L x $\frac{.62\ mol}{1\ L}$ = 1.7 moles NaCl

   (b) What mass of LiBr is needed to make 200mL of a 0.35M solution.

   Molar mass of LiBr = 6.941 + 79.904 = 86.845 g/mol

   200mL x $\frac{1L}{1000mL}$ x $\frac{.35\ mol}{1\ L}$ x $\frac{86.845\ g}{1\ mol}$ = 6 g

   (c) I need 15 grams of $CaCl_2$ from a 0.025M solution. How many milliliters of the solution should I measure out?

   Molar Mass of $CaCl_2$ = 40.078 + 2(35.453) = 110.98 g/mol

   $\frac{15\ g}{1}$ x $\frac{1\ mol}{110.98\ g}$ x $\frac{1\ L}{.025\ mol}$ x $\frac{1000mL}{1\ L}$ = 5.4x 10^3 mL

   (d) If I take 45 g of KOH and add water to the volume of 750 mL. What is the molarity of my solution?

   M= $\frac{mol}{L}$ $\frac{45\ g}{1}$ x $\frac{1\ mol}{56\ g}$ = .803 mol $\frac{750\ mL}{1}$ x $\frac{1\ L}{1000\ mL}$ = .75 L M= $\frac{mol}{L}$ = $\frac{.803\ mol}{.75L}$ = 1.1 M

Objective 2

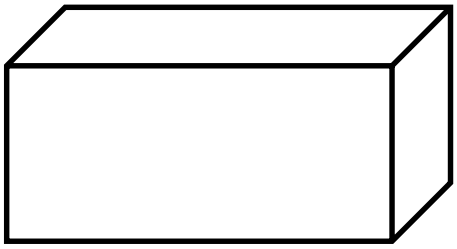
4. Determine the number of significant figures in the following:

   (a) 1234.4 5 sig figs

   (b) .0001202 4 sig figs

   (c) 12000 2 sig figs

5. Answer the following using the correct number of significant digits.
   (a) 100 x 3.24 = 300
   (b) 0.00203/ 0.0000102= 199
   (c) 0.012 + 1.3 = 1.3
6. Determine the volume of the following box in cubic centimeters and liters with the proper number of significant figures.



V= l·w·h = 5.11cm· 2.31cm·1.12 cm= 13.2cm^3

1 cm^3= 1mL

13.2 cm^3 x $\frac{1mL}{1cm^3}$ x $\frac{1\ L}{1000mL}$ = .0132 L

7. If the box above was really supposed to be a block of gold with a mass of 54.3g then what is the density of the block (proper significant figures)? Is it really gold, if density of gold is 19.3 g/cm^3?

Density of gold is 19.3 g/cm^3

D= $\frac{m}{v}$ = $\frac{54.3g}{13.2\ cm^3}$ = 4.11 g/ cm^3

No it is not gold.

8. Explain the difference between accuracy and precision.
   Accuracy is how close a measurement is to the true value. Precision is how consistent measurements are. Precision also speaks to how exact a measurement is. It is possible to be both or one but not the other.

9. Determine the moles of $MgCl_2$ in 89.6 g of the compound.

$\frac{89.6\ g}{1}$ x $\frac{1\ mol}{95.21\ g}$ = .941 mol

10. Determine the number of formula units in 4.5 g of $Ca(NO_3)_2$.

$\frac{4.5\ g}{1}$ x $\frac{1\ mol}{164\ g}$ x $\frac{6.02\ x\ 10^{23}\ formula\ units}{1\ mol}$ = 1.6 x 10^{22} formula units

11. Determine the number of mole of gas present in 578 mL at STP.

$\frac{578\ mL}{1}$ x $\frac{1\ L}{1000mL}$ x $\frac{1\ mol}{22.4\ L}$ = .0258 mol

12. Determine the mass of CH_4 present if there 8.6 x 10^{35} atoms of hydrogen in the sample.

$\frac{8.6\ x\ 10^{35}\ atoms}{1}$ x $\frac{1\ mol\ H}{6.02\ x\ 10^{23}\ atoms}$ x $\frac{1mol}{4\ mol\ H}$ x $\frac{16\ g}{1\ mol}$ = 5.7 x 10^{12} g