1st: Determining Molar Yields of Species in Question: 1) Balance the Equation in Moles. 2) Write out the **Number of Moles**, **n**, of all species where this data is given. 3) Calculate the required **Number of Moles**, **n**, for the species in question (the eventual solute).
2nd: Calculating the Concentrations of Species in Question 4) Rewrite the information given in the text to restate the **Volume** (**V**) of the solution. 5) If required, convert the **Volume** (**V**) of the solution into liters. 6) Calculate the **Concentration** (**C** or **[ ]**) of the solute.

[ ] = n / V	**V = n / [ ]**	**n = [ ] x V**

Note #1: Show all work for all questions.

Note #2: Use the number of significant figures in your final answer that is justified by the number of significant figures of the data you were given.

Determine the number of moles of the indicated products and/or starting materials as requested:[1]

1. The combustion of 1.2 moles of C_4H_8 produces how many moles of water? If these were dissolved in 154 litters of Ethanol, what would be the concentration of water in ethanol?

_1_ C_4H_8 + _6_ O_2 → _4_ CO_2 + _4_ H_2O

n_{C4H8} = 1.2 moles

n_{H2O} = ???

n_{H2O} = 4 x n_{C4H8}

n_{H2O} = 4 x 1.2 mole = 4.8 moles

[H_2O] = ???

V = 154 l

[H_2O] = n / V

[H_2O] = 4.8 moles / 154 l =

[1] Note: The work & answers are shown in Red and/or Blue.

$[H_2O]$ = ~~0.031,168,8~~ m/l = 3.1×10^{-2} m/l

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2. When 0.024 moles of HF are reacted as follows in 2.67 litters of pentane solvent, how many moles of $C_2H_4F_2$ are produced and what is its concentration in pentane?

$$\_1\_\ C_2H_2 \quad + \quad \_2\_\ HF \quad \rightarrow \quad \_1\_ C_2H_4F_2$$

n_{HF} = 0.024 moles

n_{C2H5F} = ???

$n_{C2H4F2} = 0.5 \times n_{HF}$

n_{C2H4F2} = 0.5 x 0.024 moles = 0.012 moles

$[C_2H_4F_2]$ = ???

V = 2.67 l

$[C_2H_4F_2] = n / V$

$[C_2H_4F_2]$ = 0.012 moles / 2.67 l

$[C_2H_4F_2]$ = ~~0.004,494,38~~ m/l = 4.5×10^{-3} m/l

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3. If a person burns 0.24 moles of C_9H_{20} and traps the gasses in a 40 litter tank of water, how many moles of CO_2 will be produced and what will be the CO_2 concentration of that water?

$\_1\_\ C_9H_{20} \quad + \quad \_14\_\ O_2 \quad \rightarrow \quad \_9\_\ CO_2 \quad + \quad \_10\_\ H_2O$

n_{C9H20} = 0.24 moles

n_{CO2} = ???

$n_{CO2} = 9 \times n_{C9H20}$

n_{CO2} = 9 x 0.24 moles = ~~2.16 moles~~ = 2.2 moles

[CO_2] = ???

V = 40 l

[CO_2] = n / V

[CO_2] = 2.16 moles / 40 l

[CO_2] = 0.054 m/l = 5.4 x 10^{-2} m/l

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4. When the following reaction consumes 234 moles of oxygen, how many moles of C_5H_5N are produced? What would their concentration be if they were dissolved in 20 cubic meters of water? [2]

$$\_1\_\ C_5H_9N + \_1\_\ O_2 \rightarrow \_1\_\ C_5H_5N + \_2\_\ H_2O$$

n_{O2} = 234 moles

n_{C5H5N} = ???

n_{C5H5N} = 1 x n_{O2} = 234 moles

[C_5H_5N] = ???

V = 20 m^3

V = 20 m^3 x 1,000 l/m^3 = 20,000 l

[C_5H_5N] = n / V

[C_5H_5N] = 234 moles / 20,000 l

[C_5H_5N] = 0.0117 m/l = 1.17 x 10^{-2} m/l

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5. How many moles of NaOH are consumed in the following reaction to produce 0.22 moles of Na_2SO_4? What would be the starting concentration of that NaOH if the reaction were carried in12.0 liters of water?

[2] Note: Under standard conditions, a cubic meter of a substance is composed of exactly 1,000 liters of that substance.

$$\_1\_\ H_2SO_4 + \_2\_\ NaOH \rightarrow \_1\_\ Na_2SO_4 + \_2\_\ H_2O$$

n_{Na2SO4} = 0.22 moles

n_{NaOH} = ???

n_{NaOH} = 2 x n_{Na2SO4}

n_{NaOH} = 2 x 0.22 moles = 0.44 moles

[NaOH] = ???

V = 12.0 l

[NaOH] = n / V

[NaOH] = ~~0.0366666~~ m/l = 3.7×10^{-2} m/l

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6. If one wants to produce 17 moles of $Ca_3(PO_4)_2$, how many moles of H_3PO_4 should one use? If this reaction were done in 46 litters of water, what would the starting concentration of H_3PO_4 be?

$$\_2\_\ H_3PO_4 + \_3\_\ Ca(OH)_2 \rightarrow \_1\_\ Ca_3(PO_4)_2 + \_6\_\ H_2O$$

$n_{Ca3(PO4)2}$ = 17 moles

n_{H3PO4} = ???

n_{H3PO4} = 2 x $n_{Ca3(PO4)2}$

n_{H3PO4} = 2 x 17 moles = 34 moles

[H_3PO_4] = ???

V = 46 l

[H_3PO_4] = n / V

[H_3PO_4] = 34 moles / 46 l

[H_3PO_4] = ~~0.7391304~~ m/l = 7.4×10^{-1} m/l

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7. How many moles of BH_3 are consumed in the following reaction to produce 12 moles of SiH_4? If this reaction were carried out in 17 litters of pentane, what would the initial concentration of BH_3 be?

$$\_4\_\ BH_3 + \_3\_\ SiCl_4 \rightarrow \_4\_\ BCl_3 + \_3\_\ SiH_4$$

n_{SiH4} = 12 moles

n_{BH3} = ???

n_{BH3} = 4/3 x n_{SiH4}

n_{BH3} = 4/3 x 12 moles = 16 moles

[BH_3] = ???

V = 17 l

[BH_3] = n_{BH3} / V

[BH_3] = 16 moles / 17 l

[BH_3] = ~~0.9411764~~ m/l = 9.4×10^{-1} m/l