

Mole Review

How many moles are there in 100 grams of KMnO_4 ?

$$100 \text{ g KMnO}_4 \times \frac{1 \text{ mol}}{158.0336 \text{ g KMnO}_4} = \boxed{0.633 \text{ mol KMnO}_4}$$

How many litres of Chlorine gas would be present if I have 10.25 moles at STP?

$$10.25 \text{ mol Cl}_2 \times \frac{22.4 \text{ L Cl}_2}{1 \text{ mol Cl}_2} = \boxed{229.6 \text{ L Cl}_2}$$

How many particles of NaCl are there in 0.000256 moles?

$$0.000256 \text{ mol NaCl} \times \frac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mol NaCl}} = \boxed{1.54 \times 10^{20} \text{ particles NaCl}}$$

If I have 0.124 L of oxygen gas at STP, how many moles is that?

$$0.124 \text{ L O}_2 \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} = \boxed{0.00554 \text{ mol O}_2}$$

How many moles are present in 5.6×10^{20} particles of FeSO_4 ?

$$5.6 \times 10^{20} \text{ particles FeSO}_4 \times \frac{1 \text{ mol FeSO}_4}{6.02 \times 10^{23} \text{ part.}} = \boxed{0.0009302 \text{ mol FeSO}_4}$$

How many grams of $\text{Ca(NO}_3)_2$ are there in 0.1056 moles?

$$0.1056 \text{ mol Ca(NO}_3)_2 \times \frac{164.0898 \text{ g Ca(NO}_3)_2}{1 \text{ mol Ca(NO}_3)_2} = \boxed{17.33 \text{ g Ca(NO}_3)_2}$$

How many litres of chlorine gas at STP would there be if it weighed 100.02 grams?

$$100.02 \text{ g Cl}_2 \times \frac{1 \text{ mol}}{70.906 \text{ g}} \times \frac{22.4 \text{ L Cl}_2}{1 \text{ mol Cl}_2} = \boxed{31.65 \text{ L Cl}_2}$$

How many particles of GaCl_2 would there be in 23.5 grams of it?

$$23.5 \text{ g GaCl}_2 \times \frac{1 \text{ mol GaCl}_2}{140.626 \text{ g GaCl}_2} \times \frac{6.02 \times 10^{23} \text{ part.}}{1 \text{ mol GaCl}_2} = \boxed{1.006 \times 10^{23} \text{ particles GaCl}_2}$$

How many particles of oxygen gas would there be if I have 0.052L of it at 0°C and 1 atm?

$$0.052 \text{ L O}_2 \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} \times \frac{6.02 \times 10^{23} \text{ part. O}_2}{1 \text{ mol O}_2} = \boxed{1.398 \times 10^{21} \text{ particles O}_2}$$

How many atoms of oxygen would there be in 120.56 grams of KMnO₄?

$$120.56 \text{ g KMnO}_4 \times \frac{1 \text{ mol KMnO}_4}{158.0336 \text{ g KMnO}_4} \times \frac{6.02 \times 10^{23} \text{ part.}}{1 \text{ mol KMnO}_4} \times \frac{4 \text{ atoms Oxygen}}{1 \text{ particle KMnO}_4} = \boxed{1.84 \times 10^{24} \text{ atoms O}_x$$

Calculate the percent composition of each element in CaSO₄•2H₂O.

M.M = 172.1644 g/mol

$\% \text{Ca} = \frac{40.08}{172.1644} \times 100 = \boxed{23.6\%}$	$\% \text{S} = \frac{32.06}{172.1644} \times 100 = \boxed{18.6\%}$	$\% \text{O} = \frac{6(15.9994)}{172.1644} \times 100 = \boxed{55.8\%}$	$\% \text{H} = \frac{4(1.007)}{172.1644} \times 100 = \boxed{2.3\%}$
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Calculate the percent composition of each element in NaCH₃COO.

$\% \text{Na} = \frac{22.9898}{82.0314} \times 100 = \boxed{28.0\%}$	$\% \text{C} = \frac{2(12.011)}{82.0314} \times 100 = \boxed{29.3\%}$	$\% \text{H} = \frac{3(1.007)}{82.0314} \times 100 = \boxed{3.7\%}$	$\% \text{O} = \frac{2(15.999)}{82.0314} \times 100 = \boxed{39.0\%}$
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What would the molarity of 500mL of a KCl solution created with 0.189 moles of it?

$$M = ? \quad M = \frac{\text{mol}}{V_L} \quad M = \frac{0.189 \text{ mol}}{0.500 \text{ L}} = \boxed{0.378 \text{ M}}$$

mol = 0.189
V_L = 0.500L

What would be the molarity of a solution created by adding enough water to 1.56 grams of NaOH to make the volume 500mL?

$$M = ? \quad M = \frac{0.039 \text{ mol}}{0.500 \text{ L}} = \boxed{0.078 \text{ M}}$$

mol = 0.039 ← 1.56g NaOH × $\frac{1 \text{ mol}}{39.9962 \text{ g}}$
V_L = 0.500L

What would be the volume necessary to create a 4.56M from 1.23 moles of HCl?

$$M = \frac{\text{mol}}{V_L} \quad V_L = \frac{\text{mol}}{M} \quad V_L = \frac{1.23 \text{ mol}}{4.56 \text{ M}} = \boxed{0.2697 \text{ M}}$$

What would be the new molarity of solution if 100mL of water were added to 50mL of a 0.056M solution?

$$M_c V_c = M_d V_d$$

$$M_d = \frac{V_c M_c}{V_d} = \frac{50 \text{ mL} (0.056 \text{ M})}{150 \text{ mL}} = \boxed{0.019 \text{ M}}$$

M_c = 0.056M
V_c = 50 mL
M_d = ?
V_d = 150 mL

How much water must be added to 145mL of a 10M solution of HCl to make molarity 0.05M?

$$V_d = \frac{M_c V_c}{M_d} \quad \text{water} = V_d - V_c$$

$$V_d = \frac{(10M)(0.145L)}{0.05M} = 29L \quad = 29L - 0.145L$$

$$\boxed{= 28.86L}$$

What volume would be necessary to create a 1.12M solution with 0.25 moles of NaNO₃?

$$M = \frac{\text{mol}}{V_L} \quad V_L = \frac{\text{mol}}{M} = \frac{0.25 \text{ mol}}{1.12M}$$

$$\boxed{= 0.223L}$$

How many grams of CuSO₄ are necessary to create 250mL of a 0.1M solution?

$$\text{mol} = M \times V_L$$

$$= (0.1M)(0.250L)$$

$$= 0.025 \text{ mol}$$

$$0.025 \text{ mol CuSO}_4 \times \frac{159.603}{1 \text{ mol CuSO}_4}$$

$$\boxed{= 3.99g}$$

What would the molarity of a solution be if I added enough water to 10.25 grams of CaCl₂ to make the volume of solution 350mL?

$$10.25g \text{ CaCl}_2 \times \frac{1 \text{ mol}}{110.986g \text{ CaCl}_2} = 0.0924$$

$$M = \frac{0.0924 \text{ mol}}{0.350L}$$

$$\boxed{= 0.264M}$$

What would be the new molarity if I add 100mL of water to 50mL of a 1.25M solution?

$$M_c V_c = M_d V_d \quad M_d = \frac{(1.25M)(0.050L)}{0.150L}$$

$$\boxed{= 0.417M}$$

How much water needs to be added to 100mL of 0.5M in order to create a 0.325M solution?

$$M_c V_c = M_d V_d \quad \text{water} = V_d - V_c$$

$$V_d = \frac{(0.100L)(0.5M)}{0.325M} = 0.154L$$

$$= 0.154L - 0.100L$$

$$\boxed{= 0.054L}$$

Calculate the empirical formula of a compound that contains 43.64% phosphorus and 56.36% oxygen.

$$43.64g \text{ P} \times \frac{1 \text{ mol}}{30.973g} = 1.408969 \text{ mol P}$$

$$56.36g \text{ O}_x \times \frac{1 \text{ mol}}{15.999g \text{ O}_x} = 3.52263 \text{ mol O}_x$$

$$\boxed{\text{P}} \frac{1.40000 \text{ mol P}}{1.40000 \text{ mol P}} = 1.0000$$

$$\boxed{\text{O}_x} \frac{3.52200 \text{ mol O}_x}{1.40000 \text{ mol P}} = 2.5000$$

$$\boxed{\text{P}} 1.000 \times 2 = 2.0$$

$$\boxed{\text{O}_x} 2.5 \times 2 = 5.0$$



Find the empirical formula for a molecule that is 41% Carbon, 4.6% Hydrogen, and 54.4% Oxygen. 41g C; 4.6g H; 54.4g O_x

$$41\text{g C} \times \frac{1\text{ mol}}{12.011\text{ g}} = 3.41351\text{ mol C}$$

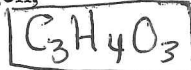
$$4.6\text{g H} \times \frac{1\text{ mol}}{1.0079\text{ g}} = 4.56802\text{ mol H}$$

$$54.4\text{g O}_x \times \frac{1\text{ mol}}{16.999\text{ g}} = 3.400127\text{ mol O}_x$$

$$\boxed{\text{C}} \frac{3.41\dots\text{ mol C}}{3.400\dots\text{ mol O}} = 1.004 \times 3 = 3$$

$$\boxed{\text{H}} \frac{4.56\dots\text{ mol H}}{3.400\dots\text{ mol O}} = 1.34 \times 3 = 4$$

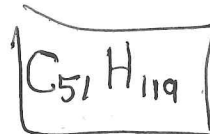
$$\boxed{\text{O}_x} \frac{3.40\dots\text{ mol O}}{3.40\dots\text{ mol O}} = 1.0 \times 3 = 3$$



Determine the true formula for a molecule that has an empirical formula of C₃H₇ and a molar mass of 740.15g/mol.

$$\rightarrow 43.0823$$

$$\frac{\text{T.F.} = \text{M.T.F.}}{\text{M.E.F.}} = \frac{740.15\text{ g/mol}}{43.0823\text{ g/mol}} = 17$$



What is the true formula of a molecule that has a molar mass of 936.73g/mol and an empirical formula of C₃H₆N₇O?

$$\rightarrow 156.1216\text{ g/mol}$$

$$\frac{\text{T.F.} = \text{M.T.F.}}{\text{M.E.F.}} = \frac{936.73}{156.1216} = 6.$$

