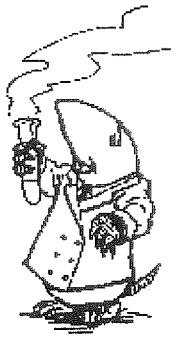
Chemistry 11 Full Name: Key Block:



PRACTICE MOLE TEST

*Show all work for full marks. Watch your sig. figs. and units!

1. Calculate the following: (1 mark each)

a	molar mass of H_3BO_3	$B = 1(10.8) = 10.8$ $O = 3(16.0) = 48.0$ $H = 3(1.0) = 3.0$ / 61.8 g/mol
b	molar mass of 3.75×10^6 g of a substance that contains 8.8×10^3 mol	$\text{molar mass} = \frac{g}{mol} = \frac{3.75 \times 10^6 g}{8.8 \times 10^3 mol}$ $= 430 g/mol$
c	mass of 7.23×10^{-2} mol HCN	$g = 7.23 \times 10^{-2} mol \times \frac{27.0 g}{1 mol}$ $= 1.95 g$
d	moles of F_2 gas in 335 mL (at STP)	$mol\ F_2 = 335 mL \times \frac{1 L}{1000 mL} \times \frac{1 mol}{22.4 L}$ $= 0.0150\ mol\ F_2$
e	What is the molar concentration of a 3.7×10^3 L solution containing 5.62×10^3 moles HSO_3?	$M = \frac{mol}{L} = \frac{5.62 \times 10^3 mol}{3.7 \times 10^3 L}$ $= 1.5 M$
f	How many moles of $MgBr_2$ are in 35.0 mL of a 0.025 *M* solution?	$mol = \frac{0.025 mol}{L} \times 0.0350 L$ $= 8.8 \times 10^{-4} mol$
g	What volume of 4.50 *M* $AgNO_3$ can be made from 1.3×10^4 moles $AgNO_3$?	$L = 1.3 \times 10^4 mol \times \frac{1 L}{4.50 mol}$ $= 2900 L$

2. Calculate the following: (2 marks each)

a	How many moles of NH_3 are present if you know there are 3.227×10^{40} molecules?	$mol = 3.227 \times 10^{40}\ molecules \times \frac{1\ mol}{6.02 \times 10^{23}\ molecules}$ $= 5.360 \times 10^{16}\ mol$
b	How many molecules are in 25 L of NO_2 gas? (at STP)	$molecules = 25\ L \times \frac{1\ mol}{22.4\ L} \times \frac{6.02 \times 10^{23}\ molecules}{1\ mol}$ $= 6.7 \times 10^{23}\ molecules$
c	Determine the percentage composition of $Ba(NO_3)_2$.	Ba : 1 (137.3) = 137.3/261.3 x 100% = 52.5% N : 2 (14.0) = 28.0/261.3 x 100% = 10.7% O : 6 (16.0) = 96.0/261.3 x 100% = 36.7% 261.3
d	How many grams of $(NH_4)_2S$ are in 100.0 mL of 3.5 *M* solution?	$\frac{3.5\ mol}{L} \times 0.1000\ L = 0.35\ mol$ $0.35\ mol \times \frac{68.1\ g}{1\ mol} = 24\ g$
e	Calculate the concentration of the solution made by dissolving 3.75 g Na_2SO_4 in 650 mL of solution.	$3.75\ g \times \frac{1\ mol}{142.1\ g} = 0.02639\ mol$ $M = \frac{0.02639}{0.650\ L} = 0.041\ M$

3. Calculate the following: (3 marks each)

a	How many total atoms are in 0.25 g of NH_4NO_3? N: 2(14.0) = 28.0 H: 4(1.0) = 4.0 O: 3(16.0) = 48.0	$0.25g \times \frac{1mol}{80.0g} \times \frac{6.02\times10^{23}\ molecules}{1mol}$ $= 1.88\times10^{21}\ molecules \times \frac{9\ atoms}{1\ molecule}$ $= 1.7\times10^{22}\ atoms$
b	What is the volume of 8.0×10^{55} atoms of titanium? (d=4.54 g/mL)	$8.0\times10^{55}\ atoms \times \frac{1mol}{6.02\times10^{23}\ atoms} \times \frac{47.9g}{1mol} \times \frac{1mL}{4.54g} \times \frac{1L}{1000mL}$ $= 1.4\times10^{30}L$
c	What is the density of CO_2 gas at STP?	$d = \frac{m}{V} = \frac{44.0g}{1mol} \times \frac{1mol}{22.4L}$ $= \frac{1.96g}{L}$

d	Determine the empirical formula for the compound with a percent composition: 35.0% N 5.0% H 60.0% O	N: $35.0\,g \times \frac{1\,mol}{14.0\,g} = 2.5\,mol/2.5\,mol = 1$ ×2 → 2 H: $5.0\,g \times \frac{1\,mol}{1.0\,g} = 5.0\,mol/2.5\,mol = 2$ → 4 O: $60.0\,g \times \frac{1\,mol}{16.0\,g} = 3.75\,mol/2.5\,mol = 1.5$ → 3 $N_2H_4O_3$
e	A gas has the percentage composition: 78.3% B and 21.7% H. It is known that the mass of 3.0 moles of the gas is 124.2 g. What is the molecular formula?	$78.3\,g \times \frac{1\,mol}{10.8\,g} = 7.25\,mol$ ÷ 7.25 mol = 1 $21.7\,g \times \frac{1\,mol}{1.0\,g} = 21.7\,mol$ = 3 BH_3 $\frac{\text{molecular mass}}{3.0\,mol} = 41.4\,g/mol$ Emp. mass = 13.8 g/mol $\frac{\text{molecular mass}}{\text{empirical mass}} = \frac{41.4}{13.8} = 3$ B_3H_9
f	What is the actual experimental procedure you would use to prepare 3.0L of 3.0 M NaCl?	$\frac{3.0\,mol}{L} \times 3.0\,L = 9.0\,mol$ $9.0\,mol \times \frac{58.5\,g}{1\,mol} = 526.5\,g$ Weigh out 526.5g dissolve in ~1.0L of water. once all salt is dissolved add water to a total final volume of 3.0L.