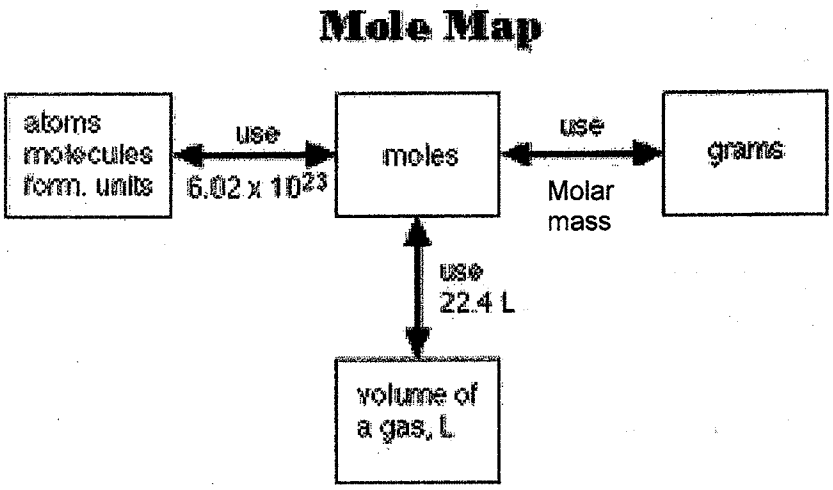
Name: KEY Hour: _____ Date:_____

Mole-Mass & Mole-Volume WS

(obj. 1c,f,g,h)



Conversion Factors:

(these factors describe what one mole of a substance can be equal to, these form the "bridges" of our dimensional analysis).

1 mole = 6.02 x 10^{23} atoms, molecules or formula units

1 mole of a substance = atomic mass in grams

1 mole of any gass = 22.4 litersat STP*

*STP = standard temperature and pressure

Particle Conversion: Changing between units of Moles and atoms, molecules or formula units (Obj.1c)

1. How many Mg atoms are in 3.24 moles of Mg?

$$3.24 \text{ moles} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = \boxed{1.95 \times 10^{24} \text{ atoms}}$$

2. 2.68 x 10^{24} atoms of Cu equal how many moles?

$$2.68 \times 10^{24} \text{ atoms} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} = \boxed{4.45 \text{ moles}}$$

3. How many moles are 1.505 x 10^{23} Na atoms?

$$1.505 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} = \boxed{0.2499 \text{ moles}}$$

Mass Conversions: Converting between Grams and Moles (Obj.1f)

4. How much would 5.00 moles of carbon weigh?

$$5.00 \text{ moles C} \times \frac{12 \text{ g}}{1 \text{ mole of C}} = \boxed{60 \text{ g}}$$

5. How many moles are in 4.86 x 10^4 g of $CaSO_4$?

$$4.86 \times 10^4 \text{ g} \times \frac{1 \text{ mole } CaSO_4}{136 \text{ g}} = \boxed{357 \text{ moles}}$$

6. How many grams are 9.213 moles of CH_3OH?

$9.213 \text{ moles} \times \frac{32 \text{ g}}{1 \text{ mole } CH_3OH} = 294 \text{ g}$

7. How many moles are in 12.4 g of P_4O_5?

$12.4 \text{ g } P_4O_5 \times \frac{1 \text{ mole}}{284 \text{ g } P_4O_5} = 0.0608 \text{ mole}$

8. What would be the mass of 0.64 moles of Cr_2O_3?

$0.64 \text{ moles} \times \frac{152 \text{ g } Cr_2O_3}{1 \text{ mole}} = 97 \text{ g } Cr_2O_3$

Volume Conversions: Converting between Volume and Moles (Obj. 1g)

9. What volume will 5 moles of O_2 gas occupy at STP?

$5 \text{ moles } O_2 \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 112 \text{ L}$

10. A container holds 7.5 liters of CO_2 gas at STP, how many moles of gas is this?

$7.5 \text{ L} \times \frac{1 \text{ mole}}{22.4 \text{ L}} = 0.33 \text{ mole}$

11. H_2 gas at STP occupies 57L of space, how many moles of ~~CH_4~~ H_2 gas are present?

$57 \text{ L} \times \frac{1 \text{ mole}}{22.4 \text{ L}} = 2.5 \text{ mole}$

12. What volume will 0.77 moles of Neon gas occupy at STP?

$0.77 \text{ moles} \times \frac{22.4 \text{ L}}{1 \text{ mole}} = 17 \text{ L}$

13. How many moles of H_2 are present in 3.2 ~~moles~~ liters at STP?

$3.2 \text{ L} \times \frac{1 \text{ mole}}{22.4 \text{ L}} = 0.14 \text{ mole}$

Mixed Mole Problems (some may require more than one step) (Obj. 1c, f, g)

14. How much would 8.452×10^{23} atoms of Ne weigh? (atoms → moles → grams)

$8.452 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} \times \frac{20 \text{ g of Ne}}{1 \text{ mole}} = 28 \text{ g Ne}$

15. How many atoms are in 45.6 grams of sulfur? (grams → moles → atoms)

$45.6 \text{ g} \times \frac{1 \text{ mole}}{32 \text{ g S}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = 8.58 \times 10^{23} \text{ atoms}$

16. How many moles are in 68 grams of copper (II) hydroxide, $Cu(OH)_2$? (g → moles)

$68 \text{ g} \times \frac{1 \text{ mole}}{98 \text{ g } Cu(OH)_2} = 0.69 \text{ mole}$

17. What is the mass of 8.944×10^{18} iron atoms? (atoms → moles → grams)

$8.944 \times 10^{18} \text{ atoms} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} \times \frac{56 \text{ g of Fe}}{1 \text{ mole}} = 8.3 \times 10^{-4} \text{ g Fe}$

18. How many grams does 3.3 moles of potassium sulfide, K_2S, weigh? (moles → grams)

$3.3 \text{ moles} \times \frac{110 \text{ g of } K_2S}{1 \text{ mole}} = 363 \text{ g}$