Chemistry

Name Key
Period ___ Date ___/___/___

Moles, Molecules, & Molar Masses

Mole Calculations - Difficulty Level 1

1 mole = 6.02 x 10^{23} molecules = 22.4 L (@ STP)

1. Calculate the mass of 1.58 moles CH_4. [molar mass CH_4 = 16.00 g/mol]
   G: 1.58 moles CH_4
   D: ? g CH_4

   $$1.58 \text{ moles } CH_4 \times \frac{16 \text{ g}}{\text{mol}} = 25.28 \text{ g } CH_4$$

2. What volume will 7.29 moles of CO_2 gas occupy at STP?
   G: 7.29 moles CO_2
   D: ? L CO_2

   $$7.29 \text{ moles } CO_2 \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 163.29 \text{ L } CO_2$$

3. How many molecules are there in a 0.00583 mole sample of H_2O?
   G: 0.00583 moles H_2O
   D: ? molecules H_2O

   $$0.00583 \text{ moles } H_2O \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}} = .035 \times 10^{23} \text{ atoms}$$
   OR
   3.5×10^{21} atoms

4. What mass of CO_2 gas occupies a volume of 100. Liters at STP? [molar mass CO_2 = 44.01 g/mol]
   G: 100. Liters CO_2
   D: ? g CO_2

   $$100. \text{ Liters } CO_2 \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 196.47 \text{ g } CO_2$$

5. How many molecules are in a 35.0 gram sample of H_2O? [molar mass H_2O = 18.02 g/mol]
   G: 35.0 g H_2O
   D: ? molecules H_2O

   $$35.0 \text{ g } H_2O \times \frac{1 \text{ mol}}{18.02 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ atom}}{1 \text{ mol}} = 11.69 \times 10^{23}$$
   OR
   1.16×10^{24}

6. What volume will 5.25 x 10^{22} molecules of CH_4 occupy at STP?
   G: 5.25 x 10^{22} molecules CH_4
   D: ? L

   $$5.25 \times \cancel{1022}\ 10^{22} \text{ molecules } CH_4 \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ atom}} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 19.53 \times 10^{-1}$$
   OR
   1.95

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Mole Calculations - Difficulty Level 2

1 mole = 6.02 x 10^{23} molecules = 22.4 L (@ STP)

1. Calculate the mass of 2.19 moles CH_4. [molar mass CH_4 = 16.0 g/mol]
   G:
   D:

   $2.19\,mol \times \frac{16\ g}{1\ mol} =$ 35.04 g CH_4

2. What volume will 2.22 moles of CO_2 gas occupy at STP?
   G:
   D:

   $2.22\,mol \times \frac{22.4\ L}{1\ mol} =$ 49.72 L CO_2

3. How many molecules are there in a 0.127 mole sample of H_2O?
   G:
   D:

   $.127\,mol \times \frac{6.02 \times 10^{23}\ atom}{1\ mol} =$ $.76 \times 10^{23}$ atoms H_2O OR 7.6×10^{22}

4. What mass of CO_2 gas occupies a volume of 395 Liters at STP? [molar mass CO_2 = 44.0 g/mol]
   G:
   D:

   $395\,L \times \frac{1\ mol}{22.4\ L} \times \frac{44\ g}{1\ mol} =$ 775.89 g CO_2

5. How many molecules are in a 0.250 gram sample of H_2O? [molar mass H_2O = 18.0 g/mol]
   G:
   D:

   $.250\,g \times \frac{1\ mol}{18\ g} \times \frac{6.02 \times 10^{23}\ atom}{1\ mol} =$ $.083 \times 10^{23}$ OR 8.3×10^{21} atoms H_2O

6. What volume will 3.01 x 10^{22} molecules of CH_4 occupy at STP?
   G:
   D:

   $3.01 \times 10^{22}\ atoms \times \frac{1\ mol}{6.02 \times 10^{23}\ atoms} \times \frac{22.4\ L}{1\ mol} =$ 1.12 L CH_4