South Pasadena • AP Chemistry

Name Key
Period ___ Date ___/___/___

3 • Molecules & Compounds

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: 2.19 moles CH_4
D: ? g

$$2.19 \text{ mol } CH_4 \left| \frac{16.0 \text{ g } CH_4}{1 \text{ mol } CH_4} \right. = 35.04 = \boxed{35.0 \text{ g } CH_4}$$

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

$$2.22 \text{ mol } CO_2 \left| \frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} \right. = 49.728 = \boxed{49.7 \text{ L } CO_2}$$

3. How many molecules are there in a 0.127 mole sample of H_2O?
G: .127 mol H_2O
D: ? molecules

$$.127 \text{ mol } H_2O \left| \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole } H_2O} \right. = 7.6454 \times 10^{22} = \boxed{7.65 \times 10^{22} \text{ molecules } H_2O}$$

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

$$395 \text{ L } CO_2 \left| \frac{1 \text{ mole } CO_2}{22.4 \text{ L } CO_2} \right| \frac{44.0 \text{ g } CO_2}{1 \text{ mol } CO_2} = 775.89 = \boxed{776 \text{ g } CO_2}$$

5. How many molecules are in a 0.250 gram sample of H_2O? [molar mass H_2O = 18.0 g/mol]
G: .250 g H_2O
D: ? molecules

$$.250 \text{ g } H_2O \left| \frac{1 \text{ mol } H_2O}{18.0 \text{ g } H_2O} \right| \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol } H_2O} = 8.3611 \times 10^{21} = \boxed{8.36 \times 10^{21} \text{ molecules}}$$

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

$$3.01 \times 10^{22} \text{ molec.} \left| \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molec.}} \right| \frac{22.4 \text{ L } CH_4}{1 \text{ mol } CH_4} = \boxed{1.12 \text{ L } CH_4}$$

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Name Key
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3 • Molecules & Compounds

Mole Calculations - Difficulty Level 3

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

1. Calculate the mass of 7.23 moles CH_4. [molar mass CH_4 = 16.0 g/mol]
G: 7.23 mol CH_4
D: ? g CH_4

$$7.23 \text{ mol } CH_4 \times \frac{16.0 \text{ g } CH_4}{1 \text{ mol } CH_4} = 115.68 = \boxed{116 \text{ g } CH_4}$$

2. What volume will 9.35 moles of CO_2 gas occupy at STP?
G: 9.35 mol CO_2
D: ? L CO_2

$$9.35 \text{ mol } CO_2 \times \frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = 209.44 = \boxed{209 \text{ L } CO_2}$$

3. How many molecules are there in a 0.0752 mole sample of H_2O?
G: .0752 mol H_2O
D: ? molecules H_2O

$$.0752 \text{ mol } H_2O \times \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} = \boxed{4.53 \times 10^{22} \text{ molecules } H_2O}$$

4. What mass of CO_2 gas occupies a volume of 10.8 Liters at STP? [molar mass CO_2 = 44.0 g/mol]
G: 10.8 L CO_2
D: ? g CO_2

$$10.8 \text{ L } CO_2 \times \frac{1 \text{ mol } CO_2}{22.4 \text{ L } CO_2} \times \frac{44.0 \text{ g } CO_2}{1 \text{ mol } CO_2} = \boxed{21.2 \text{ g } CO_2}$$

5. How many molecules are in a 1.44 gram sample of H_2O? [molar mass H_2O = 18.0 g/mol]
G: 1.44 g H_2O
D: ? molecules H_2O

$$1.44 \text{ g } H_2O \times \frac{1 \text{ mol } H_2O}{18.0 \text{ g } H_2O} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol } H_2O} = \boxed{4.82 \times 10^{22} \text{ molecules } H_2O}$$

6. What volume will 1.21 x 10^{24} molecules of CH_4 occupy at STP?
G: 1.21×10^{24} molecules CH_4
D: ? L CH_4

$$1.21 \times 10^{24} \text{ molecules } CH_4 \times \frac{1 \text{ mol } CH_4}{6.02 \times 10^{23} \text{ molecules } CH_4} \times \frac{22.4 \text{ L } CH_4}{1 \text{ mol } CH_4} = \boxed{45.0 \text{ L } CH_4}$$