Name KEY
Period ___ Date ___/___/___

Molecules & Compounds

1 mole = 6.02 x 10^{23} rep. particles = 22.4 L (@ STP) = molar mass

1. Calculate the mass of 1.58 moles CH_4. [molar mass CH_4 = 16.0 g/mol]

$$\frac{1.58 \text{ moles } CH_4}{1} \times \frac{16.0 \text{ g } CH_4}{1 \text{ mol } CH_4} = 25.3 \text{ g } CH_4$$

2. What volume will 7.29 moles of CO_2 gas occupy at STP?

$$\frac{7.29 \text{ mol } CO_2}{1} \times \frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = 163 \text{ L } CO_2$$

3. How many molecules are there in a 0.00583 mole sample of H_2O?

$$\frac{.00583 \text{ mol } H_2O}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} = 3.51 \times 10^{21} \text{ molecules } H_2O$$

4. What mass of CO_2 gas occupies a volume of 100. Liters at STP? [molar mass CO_2 = 44.0 g/mol]

$$\frac{100 \text{ L } CO_2}{1} \times \frac{1 \text{ mol } CO_2}{22.4 \text{ L } CO_2} \times \frac{44 \text{ g } CO_2}{1 \text{ mol } CO_2} = 196 \text{ g } CO_2$$

5. How many molecules are in a 35.0 gram sample of H_2O? [molar mass H_2O = 18.0 g/mol]

$$\frac{35.0 \text{ g } H_2O}{1} \times \frac{1 \text{ mol } H_2O}{18 \text{ g } H_2O} \times \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} = 1.17 \times 10^{24} \text{ molecules } H_2O$$

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

$$\frac{5.25 \times 10^{22} \text{ molecules } CH_4}{1} \times \frac{1 \text{ mol } CH_4}{6.02 \times 10^{23} \text{ molecules } CH_4} \times \frac{22.4 \text{ L } CH_4}{1 \text{ mol } CH_4} = 1.95 \text{ L}$$

7. Calculate the mass of 2.19 moles CH_4. [molar mass CH_4 = 16.0 g/mol]

$$\frac{2.19 \text{ mol } CH_4}{1} \times \frac{16.0 \text{ g } CH_4}{1 \text{ mol } CH_4} = 35.0 \text{ g } CH_4$$

8. What volume will 2.22 moles of CO_2 gas occupy at STP?

$$\frac{2.22 \text{ mol } CO_2}{1} \times \frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2} = 49.7 \text{ L } CO_2$$

9. How many molecules are there in a 0.127 mole sample of H_2O?

$$\frac{.127 \text{ mol } H_2O}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } H_2O}{1 \text{ mol } H_2O} = 7.65 \times 10^{22} \text{ molecules } H_2O$$

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

$$\frac{395\ L\ CO_2}{1} \times \frac{1\ mol\ CO_2}{22.4\ L\ CO_2} \times \frac{44.0\ g\ CO_2}{1\ mol\ CO_2} = 776\ g\ CO_2$$

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

$$\frac{.250\ g\ H_2O}{1} \times \frac{1\ mol\ H_2O}{18.0\ g\ H_2O} \times \frac{6.02\times10^{23}\ molecules\ H_2O}{1\ mol\ H_2O} = 8.36\times10^{21}\ molecules\ H_2O$$

12. What volume will 3.01×10^{22} molecules of CH_4 occupy at STP?

$$\frac{3.01\times10^{22}\ molecules\ CH_4}{1} \times \frac{1\ mol\ CH_4}{6.02\times10^{23}\ molecules\ CH_4} \times \frac{22.4\ L}{1\ mol\ CH_4} = 1.12\ L$$

13. Calculate the mass of 7.23 moles CH_4. [molar mass CH_4 = 16.0 g/mol]

$$\frac{7.23\ mole\ CH_4}{1} \times \frac{16.0\ g\ CH_4}{1\ mol\ CH_4} = 116\ g\ CH_4$$

14. What volume will 9.35 moles of CO_2 gas occupy at STP?

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

15. How many molecules are there in a 0.0752 mole sample of H_2O?

$$\frac{.0752\ mol\ H_2O}{1} \times \frac{6.02\times10^{23}\ molecules\ H_2O}{1\ mol\ H_2O} = 4.53\times10^{22}\ molecules\ H_2O$$

16. What mass of CO_2 gas occupies a volume of 10.8 Liters at STP? [molar mass CO_2 = 44.0 g/mol]

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

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

$$\frac{1.44\ g\ H_2O}{1} \times \frac{1\ mol\ H_2O}{18\ g\ H_2O} \times \frac{6.02\times10^{23}\ molecules\ H_2O}{1\ mol\ H_2O} = 4.82\times10^{22}\ molecules\ H_2O$$

18. What volume will 1.21×10^{24} molecules of CH_4 occupy at STP?

$$\frac{1.21\times10^{24}\ molecules\ CH_4}{1} \times \frac{1\ mol\ CH_4}{6.02\times10^{23}\ molecules\ CH_4} \times \frac{22.4\ L\ CH_4}{1\ mol\ CH_4} = 45.0\ L\ CH_4$$