

Name KEKPeriod Date / /

Molecules & Compounds

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ molecules} = 22.4 \text{ L (@ STP)}$$

1. Calculate the mass of 1.58 moles CH_4 .

$$\frac{1.58 \text{ moles } \text{CH}_4}{1} \times \frac{16.043 \text{ g } \text{CH}_4}{1 \text{ mole } \text{CH}_4} = 25.3 \text{ g } \text{CH}_4$$

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

$$\frac{7.29 \text{ mol } \text{CO}_2}{1} \times \frac{22.4 \text{ L } \text{CO}_2}{1 \text{ mol } \text{CO}_2} = 163 \text{ L } \text{CO}_2$$

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

$$\frac{0.00583 \text{ mol } \text{H}_2\text{O}}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{H}_2\text{O}}{1 \text{ mol } \text{H}_2\text{O}} = 3.51 \times 10^{21} \text{ molecules } \text{H}_2\text{O}$$

4. What mass of CO_2 gas occupies a volume of 100. Liters at STP?

$$\frac{100. \text{ L } \text{CO}_2}{1} \times \frac{1 \text{ mol } \text{CO}_2}{22.4 \text{ L } \text{CO}_2} \times \frac{44.0098 \text{ g } \text{CO}_2}{1 \text{ mol } \text{CO}_2} = 196 \text{ g } \text{CO}_2$$

5. How many molecules are in a 35.0 gram sample of H_2O ?

$$\frac{35.0 \text{ g } \text{H}_2\text{O}}{1} \times \frac{1 \text{ mol } \text{H}_2\text{O}}{18.0153 \text{ g } \text{H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{H}_2\text{O}}{1 \text{ mol } \text{H}_2\text{O}} = 1.17 \times 10^{24} \text{ molecules } \text{H}_2\text{O}$$

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

$$\frac{5.25 \times 10^{22} \text{ molecules } \text{CH}_4}{1} \times \frac{1 \text{ mol } \text{CH}_4}{6.02 \times 10^{23} \text{ molecules } \text{CH}_4} \times \frac{22.4 \text{ L } \text{CH}_4}{1 \text{ mol } \text{CH}_4} = 1.95 \text{ L } \text{CH}_4$$

7. Calculate the mass of 2.19 moles CH_4 .

$$\frac{2.19 \text{ mol } \text{CH}_4}{1} \times \frac{16.043 \text{ g } \text{CH}_4}{1 \text{ mol } \text{CH}_4} = 35.1 \text{ g } \text{CH}_4$$

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

$$\frac{2.22 \text{ mol } \text{CO}_2}{1} \times \frac{22.4 \text{ L } \text{CO}_2}{1 \text{ mol } \text{CO}_2} = 49.7 \text{ L } \text{CO}_2$$

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

$$\frac{0.127 \text{ mol } \text{H}_2\text{O}}{1} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{H}_2\text{O}}{1 \text{ mol } \text{H}_2\text{O}} = 7.65 \times 10^{22} \text{ molecules } \text{H}_2\text{O}$$

10. What mass of CO₂ gas occupies a volume of 395 Liters at STP?

$$\frac{395 \text{ L CO}_2}{1} \times \frac{1 \text{ mol CO}_2}{22.4 \text{ L CO}_2} \times \frac{44.0098 \text{ g CO}_2}{1 \text{ mol CO}_2} = \boxed{776 \text{ g CO}_2}$$

11. How many molecules are in a 0.250 gram sample of H₂O?

$$\frac{0.250 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0153 \text{ g H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{8.35 \times 10^{21} \text{ molecules H}_2\text{O}}$$

12. What volume will 3.01×10^{22} molecules of CH₄ occupy at STP?

$$\frac{3.01 \times 10^{22} \text{ molecules CH}_4}{1} \times \frac{1 \text{ mol CH}_4}{6.02 \times 10^{23} \text{ molecules CH}_4} \times \frac{22.4 \text{ L CH}_4}{1 \text{ mol CH}_4} = \boxed{1.12 \text{ L CH}_4}$$

13. Calculate the mass of 7.23 moles CH₄.

$$\frac{7.23 \text{ mol CH}_4}{1} \times \frac{16.043 \text{ g CH}_4}{1 \text{ mol CH}_4} = \boxed{116 \text{ g CH}_4}$$

14. What volume will 9.35 moles of CO₂ gas occupy at STP?

$$\frac{9.35 \text{ mol CO}_2}{1} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = \boxed{209 \text{ L CO}_2}$$

15. How many molecules are there in a 0.0752 mole sample of H₂O?

$$\frac{0.0752 \text{ mol H}_2\text{O}}{1} \times \frac{6.02 \times 10^{23} \text{ molecules H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{4.53 \times 10^{22} \text{ molecules H}_2\text{O}}$$

16. What mass of CO₂ gas occupies a volume of 10.8 Liters at STP?

$$\frac{10.8 \text{ L CO}_2}{1} \times \frac{1 \text{ mol CO}_2}{22.4 \text{ L CO}_2} \times \frac{44.0098 \text{ g CO}_2}{1 \text{ mol CO}_2} = \boxed{21.2 \text{ g CO}_2}$$

17. How many molecules are in a 1.44 gram sample of H₂O?

$$\frac{1.44 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0153 \text{ g H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ molecules H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{4.81 \times 10^{22} \text{ molecules H}_2\text{O}}$$

18. What volume will 1.21×10^{24} molecules of CH₄ occupy at STP?

$$\frac{1.21 \times 10^{24} \text{ molecules CH}_4}{1} \times \frac{1 \text{ mol CH}_4}{6.02 \times 10^{23} \text{ molecules CH}_4} \times \frac{22.4 \text{ L CH}_4}{1 \text{ mol CH}_4} = \boxed{45.0 \text{ L CH}_4}$$