Name:
Date:

Mole Unit Review

Complete the following questions on a separate sheet of paper. Ensure all work is shown!

1. Calculate the molar mass of each of the following:

   a. H_2O
   b. NH_3
   c. $AgNO_3$
   d. $Sn(C_2O_4)_2$
   e. $Al_2(SO_4)_3$
   f. CH_3COOH

2. Calculate the mass of the following:

   a. 4.50 mol of NH_4Cl
   b. 3.25 mol of PCl_3
   c. 0.00355 mol of Na_2HPO_4
   d. 0.0125 mol of XeF_4

3. Calculate the number of moles in the following:

   a. 225 g of $(NH_4)_2SO_4$
   b. 55.2 mg of Cl_2
   c. 2955 kg of Ag
   d. 0.0845 g of $KMnO_4$

4. Calculate the molar mass of each of the substances mentioned in the following:

   a. A 0.250 mol sample of methane has a mass of 4.00 g.

   b. A 0.00248 mol sample of cholesterol has a mass of 0.947 g.

5. Calculate the number of moles contained in each of the following:

   a. 7.50×10^{21} molecules of HNO_3
   b. 425 mg of $Ca(OH)_2$
   c. 10.6 L of $SO_{2(g)}$ at STP
   d. 0.950 kg of NaOH

6. Calculate the volume of the following gases at STP:

   a. 0.235 mol of $B_2H_{6(g)}$
   b. 2.55×10^3 mol of $C_2H_{6(g)}$

7. Calculate the mass of each of the following:

   a. 0.125 mol of CO_2
   b. 5.48 mol of $FeCl_3$

8. Calculate the mass of 1 mol of each of the following:

   a. $Na_2B_4O_7 \cdot 10H_2O$
   b. $Cu_3(OH)_2(CO_3)_2$

9. An unknown gas sample contains only one of the compounds SO_3, CH_4, NF_3, or C_2H_2. If 1 molecule of the gas has a mass of 4.32×10^{-23} g, which type of molecule is contained in the sample?

10. How many atoms are contained in 1 molecule of each of the following?

    a. CH_3CO_2H
    b. NH_4Cl
    c. $(CH_3)_2CO$

11. How many atoms are contained in the following?

    a. 5 molecules of $C_6H_2Cl_4$
    b. 10 molecules of $Co(ClO_4)_2 \cdot 6H_2O$

12. Find the mass in grams of each of the following:

    a. 2×10^6 CO molecules   c.   175 N atoms

    b.   1 KOH molecule   d.   1.25 L of $NH_{3(g)}$ at STP

13. How many atoms are contained in each of the following?

    a.   12 g of H_2O_2 c.   5.0 g of NaCl   e. 6.5×10^{-6} g of Kr

    b.   40.0 g of K   d.   125 g of CH_3Cl

14. What volume at STP is occupied by each of the following?

    a.   16.5 g of $AsH_{3(g)}$ b. 5.65×10^{22} molecules of $POF_{3(g)}$

15. How many atoms of N are there in 30.0 g of NH_4NO_3?

16. Calculate the percentage composition of the following:

    a. C_2H_6 b. $FeCl_3$ c. $CaCO_3$

17. Find the empirical formula for the following compounds:

    a.   15.9% B, 84.1% F   c.   46.2% C, 7.69% H, 46.2% O

    b.   70.0% Fe, 30.0% O   d.   50.5% C, 5.26% H, 44.2% N

18. A gas has the empirical formula CH_2. If 0.850 L of the gas at STP has a mass of 1.59 g, what is the molecular formula?

19. A compound has an empirical formula C_5H_{11}. If 0.0275 mol of the compound has a mass of 3.91 g, what is the molecular formula of the compound?

20. 0.0600 mol of a gas containing carbon and oxygen has a mass of 1.68 g. If the gas is 42.9% C, what is the empirical and molecular formula of the gas?

21. Calculate the molar concentration of the following solutions:

    a.   0.26 mol of HCl in 1.0 L of solution

    b.   2.8 mol of HNO_3 in 4.0 L of solution

    c.   25.0 g of NaCl in 250.0 mL of solution

22. How many moles of $AlCl_3$ are contained in 350.0 mL of 0.250 M $AlCl_3$?

23. What volume of 2.8×10^{-2} M NaF contains 0.15 g of NaF?

24. How many grams of $CaCl_2$ are contained in 225 mL of 0.0350 M $CaCl_2$ solution?