Mole Review

Chemistry L.H.S.

1. Calculate the number of moles in each of the following.
   a) 125 mL of hydrogen gas at STP
   b) 1.26×10^{24} molecules of carbon dioxide
   c) 12.6 g water
   d) 12.6 g sodium chloride

2. Calculate the mass of each of the following.
   a) 1.95×10^{22} molecules of sucrose, $C_{12}H_{22}O_{11}$
   b) 2.50 L of propane, C_3H_8, at STP
   c) 0.780 mol $Ca(CN)_2$

3. Determine the number of atoms in each of the following.
   a) 1 molecule of $C_{17}H_{19}NO_3$
   b) 2.85 mol of Ag
   c) 0.875 L of carbon dioxide at STP
   d) 12.9 g of $CaCO_3$
   e) 12.9 g of $Fe(NO_3)_3$

4. Determine the volume of the following gases at STP.
   a) 12.5 g of carbon dioxide
   b) 2.15 mol of propane
   c) 6.88×10^{20} atoms of helium
   d) 125 g of sulfur trioxide

5. What volume of 0.125 M $CaCl_2$ can be made from 15.0 g?

6. What is the molarity of 325 g of $NaHCO_3$ dissolved in 2500.0 mL of solution?

7. What volume of 14.0 M nitric acid would be required to make 750.0 mL of 0.100 M nitric acid?

8. What is the molarity of a solution that contains 36.1 g of $MgCl_2$ in 895 mL of solution.

9. You need to prepare 2.50 L of a 0.125 M solution of hydrochloric acid, but the only solution available is 12.0 M. What volume of the 12.0 M solution must be diluted?

10. What mass of sodium sulfate is required to prepare 750.0 mL of a 0.275 M solution?

11. 225.0 mL of 0.500 M nitric acid is added to 100.0 mL of 2.00 M nitric acid. What is the molarity of the mixture?

12. Two solutions are mixed together. The first solution is 250.0 mL of 0.450 M hydrochloric acid. The second solution consists of 600.0 mL of 2.800 M hydrochloric acid. What is the concentration of the solution that is obtained when the two are mixed together?

13. Determine the percentage composition of each element in gallium nitrate.

14. The density of a gaseous compound is 1.964 g/L at STP. Calculate the molar mass of this gas.

15. Determine the empirical formula of the compound with the following percentage composition: 32.00% carbon, 42.66% oxygen, 18.67% nitrogen & 6.67% hydrogen

16. Determine the empirical formula of the compound with the following percentage composition: 27.59% carbon, 1.15% hydrogen, 16.09% nitrogen & 55.17% oxygen

17. An organic compound contains 37.5% carbon, 58.3% oxygen and 4.20% hydrogen. The substance has a molar mass of 192.10 g/mol. Determine the molecular formula of this compound.

18. Determine the molecular formula of methyl butanoate, a compound that smells like apples. Its percent composition is 58.8% carbon, 9.8% hydrogen and 31.4% oxygen. In the gaseous state, 782 mL has a mass of 3.56 g.