The Mole Review

****ALL ANSWERS MUST INCLUDE THE PROPER UNITS & SIG FIGS.****

SOLVE THE FOLLOWING MOLAR CONVERSION & MOLARITY PROBLEMS:
1. How many grams would $8.1 \times 10^{21}$ molecules of sucrose ($C_{12}H_{22}O_{11}$) weigh?
2. How many grams of AgNO$_3$ are required to make 25 mL of a 0.80$M$ solution?
3. How many moles are in 53.8 g of magnesium chloride?
4. What volume of 0.15$M$ SrSO$_4$ can be made from 23.1 grams?
5. Find the molarity of a 2.50 L solution containing 7 g of potassium fluoride.
6. How many units are in 0.845 moles of NaNO$_3$?
7. How many grams of aluminum chloride are required to make 0.50 L of a 1.0$M$ solution?
8. How many molecules are in 50.0 g of calcium sulfide?
9. Find the molarity of an 85 mL solution containing 2.6 g of ZnCl$_2$.
10. How many atoms are in a 2.0 kg ingot of gold? (Note mass units.)
11. Find the molarity of a 750 mL solution containing 20.0 g of lithium bromide.

SOLVE THE FOLLOWING PERCENTAGE COMPOSITION PROBLEMS:
12. Find the percentage composition of sucrose ($C_{12}H_{22}O_{11}$).
13. Find the percentage composition of a sample containing 1.29 g of carbon and 1.71 g of oxygen.
14. Find the mass percentage of water in sodium carbonate decahydrate.
15. How many grams of zinc are in a 37.2-gram sample of zinc nitrate?

SOLVE THE FOLLOWING EMPIRICAL & MOLECULAR FORMULA PROBLEMS:
16. Find the empirical formula of a compound that contains 75% carbon and 25% hydrogen.
17. Find the empirical formula of a compound that contains 9.03 g magnesium and 3.48 g of nitrogen.
18. The empirical formula of a compound is NO$_2$. Its molecular mass is 92 g/mol. What is its molecular formula?
19. Glucose has an empirical formula of CH$_2$O. Find its molecular formula if its molecular mass is 180.0 g/mol.
20. A compound is composed of 34.2% sodium, 17.7% carbon, and 47.6% oxygen. Find its empirical formula. If its molecular mass is 134 g/mol, find its molecular formula.
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ANSWER KEY  

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1. $4.6 \text{ g } C_{12}H_{22}O_{11}$  
2. $3.4 \text{ g } \text{AgNO}_3$  
3. $0.565 \text{ mol } \text{MgCl}_2$  
4. $0.84 \text{ L } \text{SrSO}_4$ solution  
5. $0.048 \text{M } \text{KF}$  
6. $5.09 \times 10^{23} \text{ units } \text{NaNO}_3$  
7. $67 \text{ g } \text{AlCl}_3$  
8. $4.17 \times 10^{23} \text{ molec. } \text{CaS}$  
9. $0.22 \text{M } \text{ZnCl}_2$  
10. $6.1 \times 10^{24} \text{ atoms } \text{Au}$  
11. $0.31 \text{M } \text{LiBr}$  
12. $42.098\% \text{ C}, 6.490\% \text{ H}, 51.411\% \text{ O}$  
13. $43\% \text{ C}, 57\% \text{ O}$  
14. $62.976\% \text{ H}_2\text{O}$  
15. $12.8 \text{ g } \text{zinc}$  
16. $\text{CH}_4$  
17. $\text{Mg}_3\text{N}_2$  
18. $\text{N}_2\text{O}_4$  
19. $\text{C}_6\text{H}_{12}\text{O}_6$  
20. empirical: $\text{NaCO}_2$ molecular: $\text{Na}_2\text{C}_2\text{O}_4$