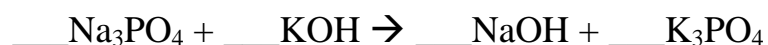


Unit 6 Review

1. How many atoms are in 0.711 moles of Helium?
2. What is the molar mass of Barium Fluoride?
3. What is the percent composition by mass of the elements in AgNO_3 ?
4. What is the empirical formula for a compound that is 57.14% C, 6.16% H, 9.52% N, and 27.18% O?
5. What is the molecular formula for a compound with an empirical formula of $\text{C}_4\text{H}_4\text{O}$ and a molar mass of 136 g/mol?
6. Balance the following equation:



7. What is the name for CdSO_4 ?
8. How many chlorate ions are in 3.62 moles of Calcium Chlorate?
9. How many molecules are in 4.60 moles of Sulfur Trioxide gas?
10. A 0.41g sample of a compound containing Carbon, Nitrogen, and Oxygen was burned. The sample contained 0.13g of Oxygen. What is the percentage of Oxygen in this compound?
11. What is the empirical formula for a compound that is 67.1% Zinc and 32.9% Oxygen?
12. What is the molecular formula for a compound with an empirical formula of C_2OH_4 and a molar mass of 88 g/mol?
13. What is the missing reactant when the following equation is balanced?



14. What is the chemical formula for Carbonic Acid?

15. How many moles are in 5.91×10^{27} atoms of Xenon?

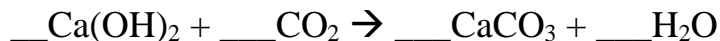
16. How many moles are in 6.19×10^{34} molecules of Diphosphorus Nonanitride?

17. What is the percent composition by mass of the elements in Aluminum Nitrate?

18. What is the empirical formula for a compound that is 44.82% Potassium, 18.39% Sulfur, and 36.79% Oxygen?

19. What is the molecular formula for a compound with an empirical formula of C_2H_8N and a molar mass of 46 g/mol?

20. What is the coefficient for Calcium Carbonate when the following equation is balanced?



21. What is the molar mass of Lithium Perchlorate?

Problem Solutions:

1. 4.28×10^{23} atoms

Moles \rightarrow atoms (single element)

$$0.711 \text{ moles} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mole}} = 4.28 \times 10^{23} \text{ atoms}$$

2. 175.324 g/mol

Barium Fluoride = BaF_2

$$\text{Molar mass} = 1(137.328) + 2(18.998) = 175.324 \text{ g/mol}$$

3. 63.5% Ag, 8.2% N, 28.3% O

$$\text{Molar mass} = 1(107.868) + 1(14.007) + 3(15.999) = 169.872 \text{ g/mol}$$

$$\% \text{ Ag} = \frac{107.868}{169.872} \times 100\% = 63.5\%$$

$$\% \text{ N} = \frac{14.007}{169.872} \times 100\% = 8.2\%$$

$$\% \text{ O} = \frac{3(15.999)}{169.872} \times 100\% = 28.3\%$$

4. $\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$

Step 1: Convert percent to grams	C = 57.14g	H = 6.16g	N = 9.52g	O = 27.18g
Step 2: Convert grams to moles	$C = \frac{57.14}{12.011}$ = 4.76 moles	$H = \frac{6.16}{1.008}$ = 6.11 moles	$N = \frac{9.52}{14.007}$ = 0.68 moles	$O = \frac{27.18}{15.999}$ = 1.70 moles
Step 3: Divide by the smallest number of moles to get the mole ratios	$C = \frac{4.76}{0.68}$ = 7	$H = \frac{6.11}{0.68}$ = 9	$N = \frac{0.68}{0.68}$ = 1	$O = \frac{1.70}{0.68}$ = 2.5
Step 4: Multiply subscripts (if necessary) to make whole numbers	7 x 2 = 14	9 x 2 = 18	1 x 2 = 2	2.5 x 2 = 5
Formula:	$\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$			

5. $C_8H_8O_2$

$$\text{Mass of Empirical Formula} = 4(12.011) + 4(1.008) + 1(15.999) = 68.075 \text{ g/mol}$$

$$\frac{136}{68.075} \approx 2 (C_4H_4O) = C_8H_8O_2$$

6. $\underline{1} Na_3PO_4 + \underline{3} KOH \rightarrow \underline{3} NaOH + \underline{1} K_3PO_4$

7. Cadmium (II) Sulfate

8. 4.36×10^{24} Chlorate ions

Moles \rightarrow Formula Units \rightarrow ions

Calcium Chlorate = $Ca(ClO_3)_2$

$$\begin{aligned} 3.62 \text{ moles} \times \frac{6.02 \times 10^{23} \text{ formula units}}{1 \text{ mole}} \times \frac{2 \text{ chlorate ions}}{1 \text{ formula unit}} \\ = 4.36 \times 10^{24} \text{ ions} \end{aligned}$$

9. 2.77×10^{24} molecules

Moles \rightarrow molecules

$$4.60 \text{ moles} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}} = 2.77 \times 10^{24} \text{ molecules}$$

10.32% O

$$\% O = \frac{0.13}{0.41} \times 100\% = 32\%$$

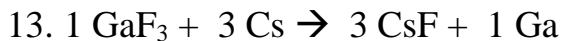
11. ZnO₂

Step 1: Convert percent to grams	Zn = 67.1g	O = 32.9g
Step 2: Convert grams to moles	$Zn = \frac{67.1}{65.38}$ $= 1.03 \text{ moles}$	$O = \frac{32.9}{15.999}$ $= 2.06 \text{ moles}$
Step 3: Divide by the smallest number of moles to get the mole ratios	$Zn = \frac{1.03}{1.03}$ $= 1$	$O = \frac{2.06}{1.03}$ $= 2$
Step 4: Multiply subscripts (if necessary) to make whole numbers	N/A	N/A
Formula:	ZnO ₂	

12. C₄O₂H₈

$$\text{Mass of Empirical Formula} = 2(12.011) + 1(15.999) + 4(1.008) = 44.053 \text{ g/mol}$$

$$\frac{88}{44.053} \approx 2 \text{ (C}_2\text{OH}_4\text{)} = \text{C}_4\text{O}_2\text{H}_8$$



Missing part is 3 CsF

14. H₂CO₃

15. 9820 moles

Atoms (single element) → moles

$$5.91 \times 10^{27} \text{ atoms} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ atoms}} = 9820 \text{ moles}$$

16.1.03 x 10¹¹ moles

Molecules → moles

$$6.19 \times 10^{34} \text{ molecules} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecules}} = 1.03 \times 10^{11} \text{ moles}$$

17.12.7% Al, 19.7% N, 67.6% O

Aluminum Nitrate = Al(NO₃)₃

Molar mass = 1(26.982) + 3(14.007) + 9(15.999) = 212.994 g/mol

$$\% \text{ Al} = \frac{26.982}{212.994} \times 100\% = 12.7\%$$

$$\% \text{ N} = \frac{3(14.007)}{212.994} \times 100\% = 19.7\%$$

$$\% \text{ O} = \frac{9(15.999)}{212.994} \times 100\% = 67.6\%$$

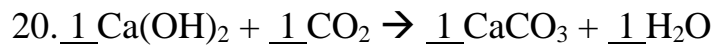
18.K₂SO₄

Step 1: Convert percent to grams	K = 44.82g	S = 18.39g	O = 36.79g
Step 2: Convert grams to moles	$K = \frac{44.82}{39.098}$ = 1.146 moles	$S = \frac{18.39}{32.066}$ = 0.574 moles	$O = \frac{36.79}{15.999}$ = 2.300 moles
Step 3: Divide by the smallest number of moles to get the mole ratios	$K = \frac{1.146}{0.574}$ = 2	$S = \frac{0.574}{0.574}$ = 1	$O = \frac{2.300}{0.574}$ = 4
Step 4: Multiply subscripts (if necessary) to make whole numbers	N/A	N/A	N/A
Formula:	K ₂ SO ₄		

19. C_2H_8N

$$\text{Mass of Empirical Formula} = 2(12.011) + 8(1.008) + 1(14.007) = 46.093 \text{ g/mol}$$

$$\frac{46}{46.093} \approx 1 \text{ (C}_2\text{OH}_4\text{)} = C_2H_8N$$



Coefficient for Calcium Carbonate ($CaCO_3$) is 1

21. 106.390 g/mol

Lithium Perchlorate = $LiClO_4$

$$\text{Molar mass} = 1(6.941) + 1(35.453) + 4(15.999) = 106.390 \text{ g/mol}$$