Empirical Formula Practice

Find the molecular formula for each…

1. 40.0% C; 6.71% H; 53.29% O — MM = 60

C: $\frac{40.0}{12.0} = \frac{3.33}{3.33} = 1$

H: $\frac{6.71}{1.0} = \frac{6.71}{3.33} = 2$

O: $\frac{53.29}{16.0} = \frac{3.33}{3.33} = 1$

Empirical Formula → Molecular formula

CH_2O $\xrightarrow{\times 2}$ $C_2H_4O_2$

30.0 g/mol $\xrightarrow{\times 2}$ 60.0 g/mol

C: 1(12.0) = 12.0
H: 2(1.0) = 2.0
O: 1(16.0) = 16.0
30.0

$\frac{60.0}{30.0} = 2$

2. 89.94% C; the rest is H — MM = 120.2

C: $\frac{89.94}{12.0} = \frac{7.495}{7.495} = 1 \xrightarrow{\times 3} 3$

H: $\frac{10.06}{1.0} = \frac{10.06}{7.495} = 1.34 \xrightarrow{\times 3} 4$

Empirical → Molecular

C_3H_4 $\xrightarrow{\times 3}$ C_9H_{12}

40.0 $\xrightarrow{\times 3}$ 120.2

$\frac{120.2}{40} = 3$

3. ~~53.34~~ 56.34% P; 43.66% O — MM = 219.90

P: $\frac{56.34}{31.0} = 1.81 = 1 \times 2 = 2$

O: $\frac{43.66}{16.0} = 2.72 = 1.5 \times 2 = 3$

Emp → Molec

P_2O_3 $\xrightarrow{\times 2}$ P_4O_6

110.0 $\xrightarrow{\times 2}$ 219.9

$\frac{219.9}{110.0} = 2$

4. 43.64% P; 56.36% O MM = 283.89

P: $\frac{43.64}{31.0} = 1.408 = 1 \xrightarrow{\times 2} 2$

O: $\frac{56.36}{16.0} = 3.5225 = 2.5 \xrightarrow{\times 2} 5$

EMP → MOLEC

$P_2O_5 \xrightarrow{\times 2} P_4O_{10}$

$142.0 \xrightarrow{\times 2} 283.89$

P: 2(31.0) = 62.0
O: 5(16.0) 80.0
142.0

5. 40.9% C; 4.58% H; 54.5% O MM = 176.13

C: $\frac{40.9}{12.0} = \frac{3.4083}{3.40625} = 1. \xrightarrow{\times 3} 3$

H: $\frac{4.58}{1.0} = \frac{4.58}{3.40625} = 1.34 \xrightarrow{\times 3} 4$

O: $\frac{54.5}{16.0} = \frac{3.40625}{3.40625} = 1 \xrightarrow{\times 3} 3$

EMP → MOLEC

$C_3H_4O_3 \xrightarrow{\times 2} C_6H_8O_6$

$88.0 \xrightarrow{\times 2} 176.13$

$\frac{176.13}{88.0} = 2$

6. 24.0% C; 3.0% H; 16.0% O; 57.0% F MM = 100

C: $\frac{24.0}{12.0} = 2.0$

H: $\frac{3.0}{1.0} = 3.0$

O: $\frac{16.0}{16.0} = 1.0$

F: $\frac{57.0}{19.0} = 3.0$

Empirical → Molecular

$C_2H_3OF_3 \xrightarrow{\times 1} C_2H_3OF_3$

$100.0\ g/mol \xrightarrow{\times 1} 100.0\ g/mol$

C: 2(12.0) = 24.0
H: 3(1.0) = 3.0
O: 1(16.0) = 16.0
F: 3(19.0) = 57.0
100.0