Adv. Chem. Ratios

WS#6

#1-5

QUESTION #1

What percentage of methane (CH_4) is carbon?

What we know:
Mass of CH_4 = 16.05 g
Mass of C = 12.01

$$\%C = \frac{12.01\,\frac{g}{mol}}{16.05\,\frac{g}{mol}} = 74.8\%$$

QUESTION #2

What percentage of water is hydrogen?

What we know:
Mass of H_2O = 18.02 g
Mass of H = 1.01

$$\%H = \frac{2(1.01)\frac{g}{mol}}{18.02\frac{g}{mol}} = 11.2\%$$

QUESTION #3

What is the empirical formula of a compound which is 30.4% Nitrogen and 69.6% Oxygen?

30.4% → 30.4 g N

69.6% → 69.6 g O

USE THE RHYME
1. % to mass
2. Mass to Mole
3. Divide by small
4. Multiply till whole

$$30.4\ g\ N\ x\ \frac{1\ mol\ N}{14.02\ g\ N} = \frac{2.168\ mol\ N}{2.168} = 1$$

$$69.6\ g\ O\ x\ \frac{1\ mol\ O}{16.00\ g\ O} = \frac{4.35\ mol\ O}{2.168} = 2$$

Empirical Formula: NO_2

QUESTION #4

What is the empirical formula of a compound which is 57% Carbon and 43% Hydrogen?

57% → 57 g C

43% → 43 g H

USE THE RHYME
1. % to mass
2. Mass to Mole
3. Divide by small
4. Multiply till whole

$$57\ g\ C\ x\ \frac{1\ mol\ C}{12.01\ g\ C} = \frac{4.746\ mol\ C}{4.746}$$ = 1

$$43\ g\ H\ x\ \frac{1\ mol\ H}{1.01\ g\ H} = \frac{42.57\ mol\ H}{4.746}$$ = 8.97 = 9

Empirical Formula

CH_9

QUESTION #5

What is the molecular formula of a compound which is 80% Carbon and 20% Hydrogen, with a molar mass of 30 g/mol?

80% → 80 g C

20% → 20 g H

$$80\ g\ C\ x\ \frac{1\ mol\ C}{12.01\ g\ C} = \frac{6.661\ mol\ C}{6.661}$$ = 1

$$20\ g\ H\ x\ \frac{1\ mol\ H}{1.01\ g\ H} = \frac{19.802\ mol\ H}{6.661}$$ = 2.97 = 3

USE THE RHYME
1. % to mass
2. Mass to Mole
3. Divide by small
4. Multiply till whole

Empirical: CH_3
Mass = 15.04 g/mol

QUESTION #5

What is the molecular formula of a compound which is 80% Carbon and 20% Hydrogen, with a molar mass of 30 g/mol?

USE THE RHYME
1. % to mass
2. Mass to Mole
3. Divide by small
4. Multiply till whole

Empirical: CH_3

Mass = 15.04 g/mol

$$Factor: \frac{Molar\ Mass}{Empirical\ Mass} = \frac{30\,\frac{g}{mol}}{15.04\,\frac{g}{mol}} = 1.995 > 2$$

$(CH_3) \times 2 = C_2H_6$