

Name: Key

Blk: _____ Date: 9

Chemistry 11
EMPIRICAL FORMULA PROBLEMS

Find the EMPIRICAL FORMULA for the following compounds:

- a) 77.7% Fe, 22.3% O = FeO
- b) 70.0% Fe, 30.0% O = Fe₂O₃
- c) 72.4% Fe, 27.6% O = Fe₃O₄
- d) 91.2% P, 8.82% H = PH₃
- e) 46.3% Li, 53.7% O = Li₂O
- f) 26.6% K, 35.4% Cr, 38.0% O = K₂Cr₂O₇
- g) 21.8% Mg, 27.9% P, 50.3% O = Mg₂P₂O₇
- h) 3.66% H, 37.8% P, 58.4% O = H₃PO₃
- i) 46.2% C, 7.69% H, 46.2% O = C₄H₈O₃
- j) 50.5% C, 5.26% H, 44.2% N = C₄H₅N₃

DETERMINING EMPIRICAL FORMULAS

Name Key

What is the empirical formula (lowest whole number ratio) of the compounds below?

1. 75% carbon, 25% hydrogen

$$75.0 \text{ g C} \times \frac{1 \text{ mol C}}{12.0 \text{ g C}} = 6.25 \text{ mol C} \div 6.25 = 1 \text{ mol C}$$

$$25.0 \text{ g H} \times \frac{1 \text{ mol H}}{1.0 \text{ g H}} = 25.0 \text{ mol H} \div 6.25 = 4 \text{ mol H}$$



2. 52.7% potassium, 47.3% chlorine

$$52.7 \text{ g K} \times \frac{1 \text{ mol K}}{39.1 \text{ g K}} = 1.35 \text{ mol K} \div 1.33 = 1 \text{ mol K}$$

$$47.3 \text{ g Cl} \times \frac{1 \text{ mol Cl}}{35.5 \text{ g Cl}} = 1.33 \text{ mol Cl} \div 1.33 = 1 \text{ mol Cl}$$

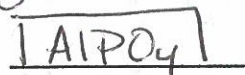


3. 22.1% aluminum, 25.4% phosphorus, 52.5% oxygen

$$22.1 \text{ g Al} \times \frac{1 \text{ mol Al}}{27.0 \text{ g Al}} = 0.819 \text{ mol Al} \div 0.819 = 1 \text{ mol Al}$$

$$25.4 \text{ g P} \times \frac{1 \text{ mol P}}{31.0 \text{ g P}} = 0.819 \text{ mol P} \div 0.819 = 1 \text{ mol P}$$

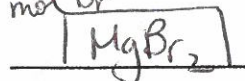
$$52.5 \text{ g O} \times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = 3.28 \text{ mol O} \div 0.819 = 4 \text{ mol O}$$



4. 13% magnesium, 87% bromine

$$13.0 \text{ g Mg} \times \frac{1 \text{ mol Mg}}{24.3 \text{ g Mg}} = 0.535 \text{ mol Mg} \div 0.535 = 1 \text{ mol Mg}$$

$$87.0 \text{ g Br} \times \frac{1 \text{ mol Br}}{79.9 \text{ g Br}} = 1.09 \text{ mol Br} \div 0.535 = 2 \text{ mol Br}$$

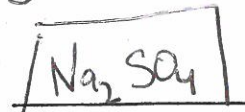


5. 32.4% sodium, 22.5% sulfur, 45.1% oxygen

$$32.4 \text{ g Na} \times \frac{1 \text{ mol Na}}{23.0 \text{ g Na}} = 1.41 \text{ mol Na} \div 0.7009 = 2 \text{ mol Na}$$

$$22.5 \text{ g S} \times \frac{1 \text{ mol S}}{32.1 \text{ g S}} = 0.7009 \text{ mol S} \div 0.7009 = 1 \text{ mol S}$$

$$45.1 \text{ g O} \times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = 2.819 \text{ mol O} \div 0.7009 = 4 \text{ mol O}$$



6. 25.3% copper, 12.9% sulfur, 25.7% oxygen, 36.1% water

$$25.3 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.5 \text{ g Cu}} = 0.398 \text{ mol Cu} \div 0.398 = 1 \text{ mol Cu}$$

$$12.9 \text{ g S} \times \frac{1 \text{ mol S}}{32.1 \text{ g S}} = 0.402 \text{ mol S} \div 0.398 = 1 \text{ mol S}$$

$$25.7 \text{ g O} \times \frac{1 \text{ mol O}}{16.0 \text{ g O}} = 1.606 \text{ mol O} \div 0.398 = 4 \text{ mol O}$$

$$36.1 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} = 2.00 \text{ mol H}_2\text{O} \div 0.398 = 5 \text{ mol H}_2\text{O}$$

