

Exercise 9.1a

Mole Ratios in Stoichiometry - Answers

Name: _____

Date: _____ Per: _____

DIRECTIONS: Answer each set of questions in the space provided.

Balance the following equations

- 1 FeCl₃(aq) + 3 KOH(aq) → 1 Fe(OH)₃(s) + 3 KCl(aq)
- 1 Pb(C₂H₃O₂)₂(aq) + 2 KI(aq) → 1 PbI₂(s) + 2 KC₂H₃O₂(aq)
- 1 P₄O₁₀(s) + 6 H₂O(l) → 4 H₃PO₄(aq)
- 1 Li₂O(s) + 1 H₂O(l) → 2 LiOH(aq)

Find the mole ratio of:

- KO₂ to KOH in $4\text{KO}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{KOH}(\text{aq}) + 3\text{O}_2(\text{g})$ $\frac{4 \text{ mol KO}_2}{4 \text{ mol KOH}}$ (4:4 or 1:1 is also ok)
- BaCl₂ to NaCl in $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$ $\frac{1 \text{ mol BaCl}_2}{2 \text{ mol NaCl}}$ (1:2 is also ok)
- H₂O₂ to O₂ in $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ $\frac{2 \text{ mol H}_2\text{O}_2}{1 \text{ mol O}_2}$ (2:1 is also ok)

Given the following unbalanced equations:

- 1 MnO₂(s) + 1 C(s) → 1 Mn(s) + 1 CO₂(g)

What is the mole ratio of MnO₂ to CO₂?

1 mol MnO₂ : 1 mol CO₂

- 2 Sb(s) + 3 Cl₂(g) → 2 SbCl₃(s)

What is the mole ratio of Sb to Cl₂?

2 mol Sb : 3 mol Cl₂

- 1 CH₄(g) + 1 H₂O(g) → 1 CO(g) + 3 H₂(g)

How many moles of H₂ would be produced from:

- 2 moles of CH₄? 6 mol

$$\frac{2 \text{ mol CH}_4}{1 \text{ mol CH}_4} \left| \frac{3 \text{ mol H}_2}{1 \text{ mol CH}_4} \right. = 6 \text{ mol H}_2$$

- 3 moles of CH₄? 9 mol

$$\frac{3 \text{ mol CH}_4}{1 \text{ mol CH}_4} \left| \frac{3 \text{ mol H}_2}{1 \text{ mol CH}_4} \right. = 9 \text{ mol H}_2$$

- 4 moles of H₂O? 12 mol

$$\frac{4 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \left| \frac{3 \text{ mol H}_2}{1 \text{ mol H}_2\text{O}} \right. = 12 \text{ mol H}_2$$

- 0.50 moles of H₂O? 1.5 mol

$$\frac{0.50 \text{ mol H}_2\text{O}}{1 \text{ mol H}_2\text{O}} \left| \frac{3 \text{ mol H}_2}{1 \text{ mol H}_2\text{O}} \right. = 1.5 \text{ mol H}_2$$

- 1 Zn(s) + 2 CrCl₃(aq) → 2 CrCl₂(aq) + 1 ZnCl₂(aq)

How many moles of CrCl₂ would be produced from:

- 2 moles of Zn? 4 mol

$$\frac{2 \text{ mol Zn}}{1 \text{ mol Zn}} \left| \frac{2 \text{ mol CrCl}_2}{1 \text{ mol Zn}} \right. = 4 \text{ mol CrCl}_2$$

- 4 moles of CrCl₃? 4 mol

$$\frac{4 \text{ mol CrCl}_3}{2 \text{ mol CrCl}_3} \left| \frac{2 \text{ mol CrCl}_2}{1 \text{ mol CrCl}_3} \right. = 4 \text{ mol CrCl}_2$$

- 3 moles of Zn? 6 mol

$$\frac{3 \text{ mol Zn}}{1 \text{ mol Zn}} \left| \frac{2 \text{ mol CrCl}_2}{1 \text{ mol Zn}} \right. = 6 \text{ mol CrCl}_2$$

- 2.5 moles of CrCl₃? 2.5 mol

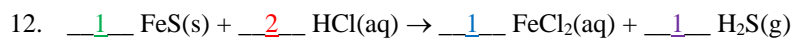
$$\frac{2.5 \text{ mol CrCl}_3}{2 \text{ mol CrCl}_3} \left| \frac{2 \text{ mol CrCl}_2}{1 \text{ mol CrCl}_3} \right. = 2.5 \text{ mol CrCl}_2$$

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- a. How many moles of HCl are required to react with 1.5 moles of FeS? 3 mol HCl

$$\frac{1.5 \text{ mol FeS}}{1 \text{ mol FeS}} \times \frac{2 \text{ mol HCl}}{1 \text{ mol FeS}} = 3 \text{ mol HCl}$$

- b. How many moles of FeS are required to react with 3 moles of HCl? 2 mol FeS (only 1 SF)

$$\frac{3 \text{ mol HCl}}{2 \text{ mol HCl}} \times \frac{1 \text{ mol FeS}}{1 \text{ mol FeS}} = 1.5 \text{ mol FeS}$$

- c. How many moles of HCl are required to produce 1.5 moles of FeCl₂? 3 mol HCl

$$\frac{1.5 \text{ mol FeCl}_2}{1 \text{ mol FeCl}_2} \times \frac{2 \text{ mol HCl}}{1 \text{ mol FeCl}_2} = 3 \text{ mol HCl}$$

- d. How many moles of HCl are required to produce 0.5 moles of H₂S? 1 mol HCl

$$\frac{0.5 \text{ mol H}_2\text{S}}{1 \text{ mol H}_2\text{S}} \times \frac{2 \text{ mol HCl}}{1 \text{ mol H}_2\text{S}} = 1 \text{ mol HCl}$$

- e. How many moles of FeS are required to produce 3 moles of H₂S? 3 mol FeS

$$\frac{3 \text{ mol H}_2\text{S}}{1 \text{ mol H}_2\text{S}} \times \frac{1 \text{ mol FeS}}{1 \text{ mol H}_2\text{S}} = 3 \text{ mol FeS}$$