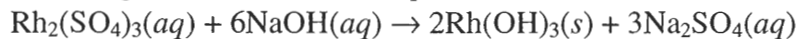


SHOW ALL WORK TO RECEIVE CREDIT.

Atomic masses: H 1.008, C 12.01, Rh 102.9, S 32.07, O 16.00, Na 22.99, K 39.01, Cr 52.00,

1. (6 Pts) One step in the isolation of pure rhodium metal (Rh) is the precipitation of rhodium(III) hydroxide from a solution containing rhodium(III) sulfate according to the following balanced chemical equation:



1.70g ?g
 If 1.70 g of rhodium(III) sulfate reacts with excess sodium hydroxide, what mass of rhodium(III) hydroxide may be produced?

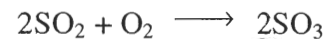
$$\frac{1.70 \text{ g Rh}_2(\text{SO}_4)_3}{494.0 \text{ g Rh}_2(\text{SO}_4)_3} \times \frac{2 \text{ mol Rh}(\text{OH})_3}{1 \text{ mol Rh}_2(\text{SO}_4)_3} \times \frac{153.93 \text{ g Rh}(\text{OH})_3}{1 \text{ mol Rh}(\text{OH})_3} = 1.06 \text{ g Rh}(\text{OH})_3$$

2. (6 Pts) How many grams of potassium are present in 16.4 g of K₂Cr₂O₇?

$$\frac{16.4 \text{ g K}_2\text{Cr}_2\text{O}_7}{294.2 \text{ g K}_2\text{Cr}_2\text{O}_7} \times 78.20 \text{ g K} = 4.36 \text{ g K}$$

* either make a ratio as above or work as a %

3. (7 Pts) Sulfur trioxide, SO₃, is made from the oxidation of SO₂, and the reaction is represented by the equation



23g ?g
 If a 23-g sample of SO₂ gives 18 g of SO₃. Determine the percent yield of SO₃ is.

$$\frac{23 \text{ g SO}_2}{64.06 \text{ g SO}_2} \times \frac{2 \text{ mol SO}_3}{2 \text{ mol SO}_2} \times \frac{80.06 \text{ g SO}_3}{1 \text{ mol SO}_3} = 28.7 \text{ g SO}_3 \text{ (theoretical yield)}$$

Now: $\frac{\text{actual}}{\text{theor}} \times 100 = \%$ $\frac{18 \text{ g}}{28.7 \text{ g}} \times 100 = 63\% \text{ yld}$

4. (6 Pts) A particular compound contains, by mass, 41.4% carbon, 3.47% hydrogen, and 55.1% oxygen. Determine the empirical formula of this compound.

Assume 100g:

$$\begin{aligned} \text{C: } & \frac{41.4 \text{ g}}{12.01 \text{ g/mol}} = 3.45 \div 3.44 = 1 \\ \text{H: } & \frac{3.47 \text{ g}}{1.01 \text{ g/mol}} = 3.44 \div 3.44 = 1 \\ \text{O: } & \frac{55.1 \text{ g}}{16.00 \text{ g/mol}} = 3.44 \div 3.44 = 1 \end{aligned}$$

CHO

SHOW ALL WORK TO RECEIVE CREDIT.

Atomic masses: H 1.008, C 12.01, O 16.00, F 19.00, S 32.07, Na 22.99, K 39.01, Cr 52.00, Rh 102.9

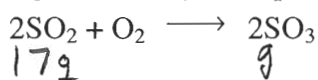
1. (6 Pts) A particular compound contains, by mass, 25.5% carbon, 40.4% fluorine, and 34.1% oxygen. Determine the empirical formula of this compound.

Assume: 100g

| | | | | | | | |
|----|----------------------------|---|--------|--------|--------|---|-----|
| C: | $\frac{25.5g}{12.01g/mol}$ | = | 2.12 | \div | 2.12 | = | 1 |
| F: | $\frac{40.4g}{19.00g/mol}$ | = | 2.13 | \div | 2.12 | = | 1 |
| O: | $\frac{34.1g}{16.00g/mol}$ | = | 2.13 | \div | 2.12 | = | 1 |

CFO

2. (7 Pts) Sulfur trioxide, SO₃, is made from the oxidation of SO₂, and the reaction is represented by the equation

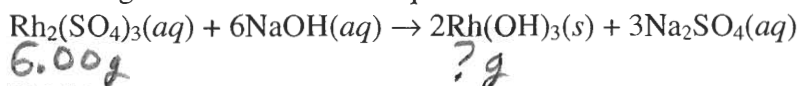


A 17-g sample of SO₂ gives 18 g of SO₃. The percent yield of SO₃ is ____.

| | | | | | | |
|--------------------------|--|---------------------|--|----------------------|---|---------|
| $\frac{17g}{64.06g/mol}$ | | $\frac{2mol}{2mol}$ | | $\frac{80.06g}{mol}$ | = | $21.2g$ |
| SO_2 | | SO_2 | | SO_3 | | SO_3 |

$\% \text{ yield} = \frac{\text{Actual}}{\text{theo.}} \times 100 = \frac{18}{21.2} \times 100 = \mathbf{85\%}$

3. (6 Pts) One step in the isolation of pure rhodium metal (Rh) is the precipitation of rhodium(III) hydroxide from a solution containing rhodium(III) sulfate according to the following balanced chemical equation:



If 6.00 g of rhodium(III) sulfate reacts with excess sodium hydroxide, what mass of rhodium(III) hydroxide may be produced?

| | | | | | | |
|----------------------------|--|---------------------|--|-----------------------|---|------------|
| $\frac{6.00g}{494.0g/mol}$ | | $\frac{1mol}{2mol}$ | | $\frac{153.93g}{mol}$ | = | $3.74g$ |
| $Rh_2(SO_4)_3$ | | $Rh_2(SO_4)_3$ | | $Rh(OH)_3$ | | $Rh(OH)_3$ |

4. (6 Pts) How many grams of potassium are present in 17.7 g of K₂Cr₂O₇?

| | | | | |
|----------------------------|--|-----------------------------|---|---------|
| $\frac{17.7g}{294.2g/mol}$ | | $\frac{78.20g}{294.2g/mol}$ | = | $4.70g$ |
| $K_2Cr_2O_7$ | | $K_2Cr_2O_7$ | | K |