1. If your evaporating dish were wet when you measured the sodium carbonate, how would your percent yield be affected? Explain.

If evaporating dish were wet when measuring out the sodium carbonate, the mass of the sodium carbonate would be inflated, leading to artificially high theoretical yield. This would make the percent yield lower than its actual value

1. If your mixture were not completely dried for your final mass measurement, how would your percent yield be affected? Explain.

If mixture were not completely dried for final mass measurement, the actual yield will be artificially high leading high percent yield.

1. Why is it unlikely to get 100% yield in any reaction?

Because human error, experimental error, and instrumental error are unavoidable

1. Which has a higher mass percent of sodium, sodium chloride or sodium carbonate? Show calculations to support your answer.

Molar Mass of sodium chloride: 22.99 + 35.45 = 58.44g/mol

Molar Mass of sodium carbonate: 22.99(2) + 12.01 + 16.00(3) = 105.99g/mol

% sodium in NaCl $=\frac{22.99}{58.44}×100\%=39.34\%$

% sodium in Na2CO3$=\frac{22.99\left(2\right)}{105.99} ×100\%=43.38\%$

1. In a similar experiment a student produced 4.500 g NaCl.

$$Na\_{2}CO\_{3}+2HCl\rightarrow 2NaCl+H\_{2}O+CO\_{2}$$

* 1. How many moles of HCl reacted?

$$4.500g NaCl ×\frac{1molNaCl}{58.44gNaCl}×\frac{2molHCl}{2molNaCl}=0.07700molHCl $$

* 1. How many liters of CO2 were produced at STP?

$$4.500g NaCl ×\frac{1molNaCl}{58.44gNaCl}×\frac{1molCO\_{2}}{2molNaCl}×\frac{22.4L CO\_{2}}{1molCO\_{2}}=0.8624L CO\_{2}$$

* 1. How many molecules of H2O were produced?

$$4.500g NaCl ×\frac{1molNaCl}{58.44gNaCl}×\frac{1molH\_{2}O}{2molNaCl}×\frac{6.022×10^{23}molecules H\_{2}O}{1molH\_{2}O}=2.319 ×10^{22}molecules H\_{2}O$$

* 1. How many grams of Na2CO3 did she start with if her percent yield was 95.8%?

$$\%yield=\frac{4.500g}{theoretical}×100\%=95.8\%$$

$$theoretical=4.500÷95.8\%=4.697g$$

$$4.697gNaCl×\frac{1molNaCl}{58.44gNaCl}×\frac{1molNa\_{2}CO\_{3}}{2molNaCl} ×\frac{105.99gNa\_{2}CO\_{3}}{1molNa\_{2}CO\_{3}}=4.260g Na\_{2}CO\_{3}$$

$$ $$

* 1. How many sodium ions were in her initial sample of Na2CO3?

$$4.697gNaCl×\frac{1molNaCl}{58.44gNaCl}×\frac{1molNa\_{2}CO\_{3}}{2molNaCl}×\frac{6.022×10^{23}molecule Na\_{2}CO\_{3}}{1 mol Na\_{2}CO\_{3}}×\frac{2 Na ions}{1 molecule of Na\_{2}CO\_{3}}=4.840×10^{22}Na ions$$

1. Write a balanced equation for the reaction between aluminum carbonate and hydrochloric acid. (Note: this reaction is similar to the one carried out in your experiment.)

$$Al\_{2}\left(CO\_{3}\right)\_{3}+6HCl\rightarrow 2AlCl\_{3}+3H\_{2}O+3CO\_{2}$$