

Name Key



rapp = mole
hmu = amu

Rittersburgers is a local restaurant that determines how many pieces they need to order because orders are placed by a "rapp" only. This is because the orders are such unusual numbers.

The following lists the ingredients placed in these boring hamburgers and the masses of each item in hamburger mass units (hmu).

<p>1</p> <p style="text-align: center;">Hb</p> <p style="text-align: center;">Hamburgerbun</p> <p style="text-align: center;">2.003</p>	<p>2</p> <p style="text-align: center;">Ch</p> <p style="text-align: center;">Cheese</p> <p style="text-align: center;">4.034</p>
<p>3</p> <p style="text-align: center;">Bst</p> <p style="text-align: center;">Bacon Strip</p> <p style="text-align: center;">7.618</p>	<p>4</p> <p style="text-align: center;">Hp</p> <p style="text-align: center;">Hamburgerpatty</p> <p style="text-align: center;">12.467</p>

1. What is the mass of one slice of cheese? INCLUDE UNITS!

4.034 hmu

2. What is the mass of a hamburger made from a top and bottom bun, two patties, and two slices of cheese? INCLUDE UNITS!

$$2(2.003) + 2(12.467) + 2(4.034) = 37.008 \text{ hmu}$$

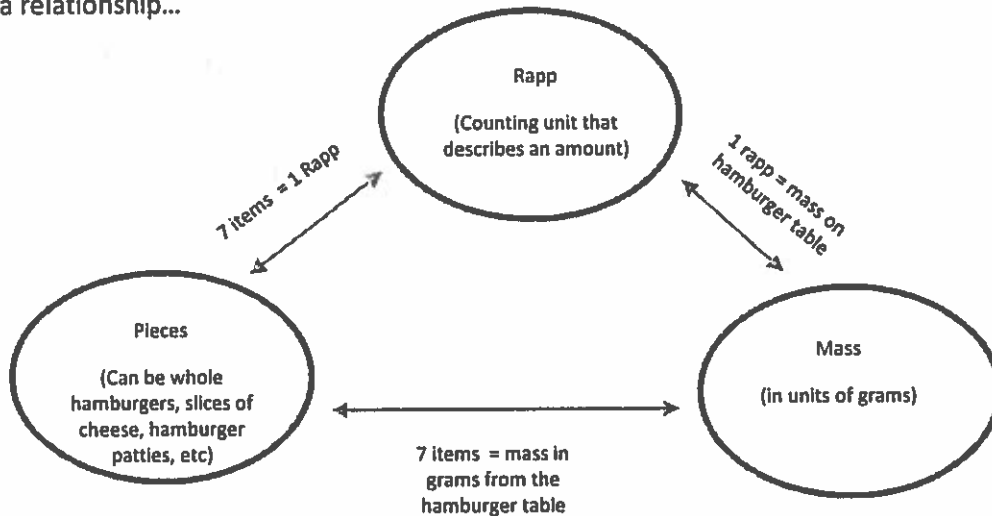
Now there is a really cool relationship that is already known about pieces, or even the total number of hamburgers made. It is the rapp. A rapp of anything is 7 items.

I can have a rapp of cheese, which is 7 pieces of cheese.

I can have a rapp of single hamburgers-which is seven hamburgers.

Rittersburgers chooses to package their items in rapps because the relationship with the mass on the periodic table of burgers is the same numerical number as the hmu, but instead in units of grams. This means that 7 buns has a mass of 2.003 grams instead of 2.003 hmu (because one bun is 2.003 hmu).

Let's make a relationship...



3. What is the mass of one rapp of cheese(7 slices of cheese)? INCLUDE UNITS!

4.034g

4. What is the mass of a rapp of hamburgers(seven hamburgers), with each a top and bottom bun, two hamburger patties, and two slices of cheese? INCLUDE UNITS!

37.008g

5. How are answers 1 and 3 similar? How are they different?

Same number, different units (hmu vs. g)

6. How are answers 2 and 4 similar? How are they different?

Same number, different units (hmu vs. g)

7. Ryan loves Rittersburger's "Double Down Cholesterol Attack". This specific hamburger has no buns, and contains two hamburger patties, two slices of cheese and an order of bacon (which has four strips).

4(7.618) 2(12.467) 2(4.034)

a. What is the mass of this burger?

63.474 hmu.

b. What is the mass of one rapp of this burger?

63.474 g

c. In one of these burgers, how many TOTAL pieces are present?

8 pieces/burger

(2 patties + 2 cheese + 4 bacon)

d. In a rapp of these burgers, how many TOTAL pieces are present?

rapp = 7 things so $8 \times 7 = 56$ pieces

8. Nate orders 2 rapps of a single hamburger (one patty and 2 buns). How many hamburgers does he order? *14 hamburgers (14 burgers, 28 buns)*

9. Nate orders 2 rapps of a single hamburger as mentioned in the previous problem. What is the mass of this order in grams?

patty = 12.467
bun = 2.003

$12.467 + 2(2.003) = 16.473 \times 14 = 230.62 \text{ g}$

10. If Nate orders 2 rapps of these burgers, how many pieces in TOTAL does he order? (think about the total number of pieces that come in this particular unit (each hamburger)).

$14 + 28 = 42$ pieces

11. How many buns does he end up with?

28 buns

12. Taking Ryan's "Double Down Cholesterol Attack", please determine the % composition of the burger. Total mass = 63.474g

patty = $(12.467)2 = 24.934 \text{ g}$ bacon = $(7.618)4 = 30.472$
cheese = $(4.034)2 = 8.068 \text{ g}$

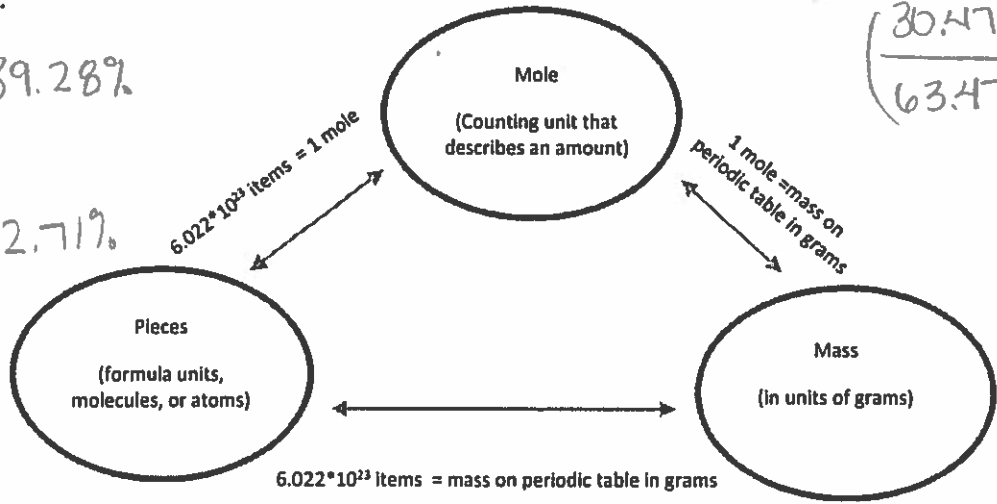
patty	39.28%
cheese	12.71%
bacon	48.01%

This relationship is the same as that of the mole. A mole of items is 6.02×10^{23} items. This many items is also equivalent to the mass on the periodic table. A mole is simply a counting unit. It connects a mass with a total number of things (either formula units (ionic compounds), molecules (covalent compounds) or atoms).

$\frac{24.934}{63.474} \times 100 = 39.28\%$

$\frac{8.068}{63.474} \times 100 = 12.71\%$

$\left(\frac{30.472}{63.474}\right) \times 100 = 48.01\%$



Keep in mind that a compound is simply several atoms held together. For example, CaCl_2 has one calcium and two chlorine atoms. This means for everyone one CaCl_2 formula unit, there is one Calcium

and two chloride ions. PLEASE NOTE THAT THIS IS OK, because when you break up things like a hamburger you will get multiple parts (just like in the hamburger).

For 10 CaCl_2 formula units, there will be ten Calcium atoms and twenty Chloride ions.

13. What is the mass of one NaCl formula unit?

$$58.44 \text{ amu}$$

14. What is the mass of one mole NaCl?

$$22.99 + 35.45 = 58.44 \text{ g}$$

15. How are the answers of 13 and 14 similar? How are they different?

Same number, different units

16. If there are 30 grams of NaCl, how many moles are present?

$$\frac{30\text{g}}{58.44\text{g}} = 0.51 \text{ mole} \quad \text{or} \quad \frac{x}{30\text{g}} = \frac{1\text{mol}}{58.44\text{g}}$$

17. Using either the moles or mass in #16, please determine how many formula units are present.

$$\frac{0.51 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ formula units} = 3.09 \times 10^{23} \text{ formula units}$$

18. Please determine how many ATOMS are present in 30 grams of NaCl (keep in mind that for every one formula unit, there are TWO atoms present.)

$$2(3.09 \times 10^{23}) = 6.18 \times 10^{23} \text{ atoms}$$