Reactants, Products and Leftovers Clicker questions

by Trish Loeblein
http://phet.colorado.edu
(assuming complete reactions)

Reactants, Products, and Leftovers

Activity 1: **Introduction to Chemical reactions**
by Trish Loeblein http://phet.colorado.edu

Learning Goals:
Students will be able to:

- Relate the real-world example of making sandwiches to chemical reactions
- Describe what "limiting reactant" means using examples of sandwiches and chemicals at a particle level.
- Identify the limiting reactant in a chemical reaction
- Use your own words to explain the Law of Conservation of Particles means using examples of sandwiches and chemical reaction

1. Making a cheese sandwich can be represented by the chemical equation:

$2\ Bd + Ch \rightarrow Bd_2Ch$

What would you expect a sandwich to look like?

A B C D

2. Making a cheese sandwich can be represented by the chemical equation:

$Bd_2 + 2Ch \rightarrow 2BdCh$

What would you expect a sandwich to look like?

A B C D

3. Making a cheese sandwich can be represented by the chemical equation:

$2\ Bd + Ch \rightarrow Bd_2Ch$

What does the "2" on the *left* side of the chemical equation represent?

A. 2 pieces of bread stuck together 
B. 2 separate pieces of bread 
C. 2 loaves of bread 

4. Making a cheese sandwich can be represented by the chemical equation:

$Bd_2 + 2Ch \rightarrow 2BdCh$

What does the "2" on the *left* side of the chemical equation represent?

A. 2 pieces of bread stuck together 
B. 2 separate pieces of bread 
C. 2 loaves of bread 

5. A menu at the Chemistry Café shows a sandwich: BdM_2Ch

What would you expect a sandwich to have?

A. 2 pieces of bread, 2 pieces of meat, 1 piece of cheese

B. 1 piece of bread, 2 pieces of meat, 1 piece of cheese

C. 2 loaves of bread

6. A menu at the Chemistry Café describes a sandwich as 3 pieces of bread, one meat and 2 cheeses.

What would you expect a sandwich name to be?

A. Bd_2MCh_2

B. Bd_3M_2Ch

C. Bd_3MCh_2

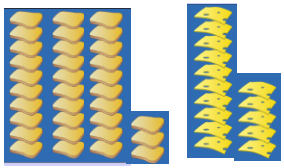
7. The Chemistry Café owner was out of bread. She went to the bakery next door and bought a loaf which had 33 slices. Then she sells 12 sandwiches, which need 2 pieces of bread each. How much bread did she have left?

A. 21

B. 9

C. None, she gave the leftovers to the birds

8. The Chemistry Café cook has a loaf which had 33 slices and a package of cheese that has 15 slices. He is making sandwiches that have 2 pieces of both bread and cheese. How many sandwiches can he make?



A.16

B.15

C.7

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Activity 2: **Limiting Reactants in Chemical reactions**

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(assuming complete reactions)

Learning Goals: Students will be able to:

- Predict the amounts of products and leftovers after reaction using the concept of limiting reactant
- Predict the initial amounts of reactants given the amount of products and leftovers using the concept of limiting reactant
- Translate from symbolic (chemical formula) to molecular (pictorial) representations of matter
- Explain how subscripts and coefficients are used to solve limiting reactant problems.

1. **A mixture of 4 moles of H_2 and 3 moles of O_2 reacts to make water. Identify: limiting reactant, excess reactant, and how much is unreacted.**

	Limiting reactant	Excess reactant
A.	H_2	1 mole H_2
B.	H_2	1 mole O_2
C.	O_2	1 mole H_2
D.	O_2	1 mole O_2

E. No reaction occurs since the equation does not balance with 4 mole H_2 and 3 mole O_2

2. **A mixture of 6 moles of H_2 and 2 moles of O_2 reacts to make water. How much water is made?**

A. 6 moles water

B. 2 moles water

C. 3 moles water

D. 4 moles water

E. No reaction occurs since the equation does not balance with 6 mole H_2 and 2 mole O_2

3. **A mixture of 2.5 moles of Na and 1.8 moles of Cl_2 reacts to make NaCl. Identify: limiting reactant, excess reactant, and how much is unreacted.**

	Limiting reactant	Excess reactant
A.	Na	0.7 mole Na
B.	Na	0.7 mole Cl_2
C.	Na	0.55 mole Cl_2
D.	Cl_2	0.7 mole Na
E.	Cl_2	1 mole Na

4. **A mixture of 2.5 moles of Na and 1.8 moles of Cl_2 reacts to make NaCl. How much sodium chloride is made?**

A. 2.5 moles NaCl

B. 1.8 moles NaCl

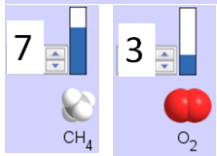
C. 0.7 moles NaCl

D. 0.55 moles NaCl

E. 1 mole Nacl

5. **The reaction for combustion of methane is**

$1\ CH_4 + 2\ O_2 \rightarrow 1\ CO_2 + 2\ H_2O$



Given the shown amounts for each reactant, predict the amounts of products and leftovers after complete reaction.

5. **What are the amounts after the reaction?**
Initial:
7 CH_4 and 3 O_2

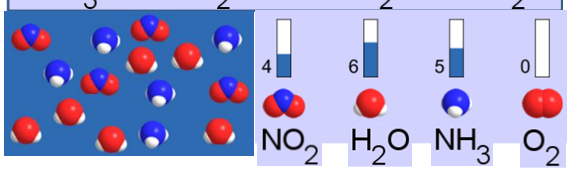
$1\ CH_4 + 2\ O_2 \rightarrow 1\ CO_2 + 2\ H_2O$

After:

A. 6	1	1	2
B. 1	6	1	2
C. 1	0	6	12
D. 4	0	4	8

6. **Given the shown amounts for the products and leftovers after a complete reaction, predict the initial reactants.**

$4\ NH_3 + 7\ O_2 \rightarrow 4\ NO_2 + 6\ H_2O$



6. **What are the amounts before the reaction?**

After:

5 NH_3 0 O_2 4 NO_2 6 H_2O

$4\ NH_3 + 7\ O_2 \rightarrow 4\ NO_2 + 6\ H_2O$

Before:

A. 4 7

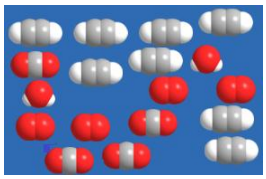
B. 9 7

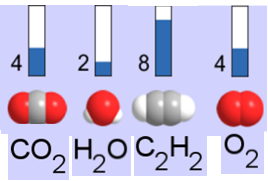
C. 10 7

D. 4 0

7. **Given the shown amounts for the products and leftovers after a complete reaction, predict the initial reactants.**

$2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O$





7. **What are the amounts before the reaction?**

After:

8 C_2H_2 4 O_2 4 CO_2 2 H_2O

$2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O$

Before:

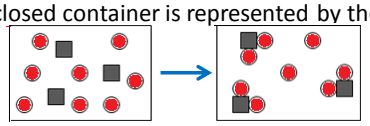
A. 2 10

B. 12 10

C. 10 9

D. 8 4

8. A mixture of S atoms (■) and O_2 molecules (●●) in a closed container is represented by the diagrams:



Which equation best describes this reaction?

A. $3X + 8Y \rightarrow X_3Y_8$

B. $X_3 + Y_8 \rightarrow 3XY_2 + 2Y$

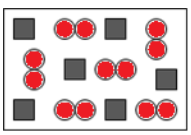
C. $X + 2Y \rightarrow XY_2$

D. $3X + 8Y \rightarrow 3XY_2 + 2Y$

E. $X_3 + Y_8 \rightarrow 3XY_2 + Y_2$

From Lancaster/Perkins activity

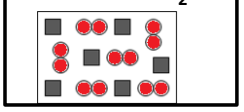
9. **An initial mixture of sulfur(■) and oxygen(●●)is represented:**



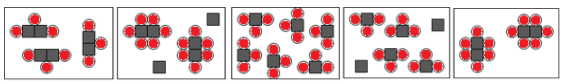
Using this equation: $2S + 3O_2 \rightarrow 2SO_3$, what would the results look like?

From Lancaster/Perkins activity

9 **Before: S ■ O_2●●**

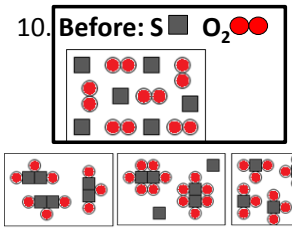


$2S + 3O_2 \rightarrow 2SO_3$



A B C D E

From Lancaster/Perkins activity

10. 

$2S + 3O_2 \rightarrow 2SO_3$

Which is the limiting reactant?

A. Sulfur
B. Oxygen
C. Neither they are both completely used

From Lancaster/Perkins activity