Reactants, Products, and Leftovers

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	.7 mole Na
B.	Na	.7 mole Cl_2
C.	Na	.55 mole Cl_2
D.	Cl_2	.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

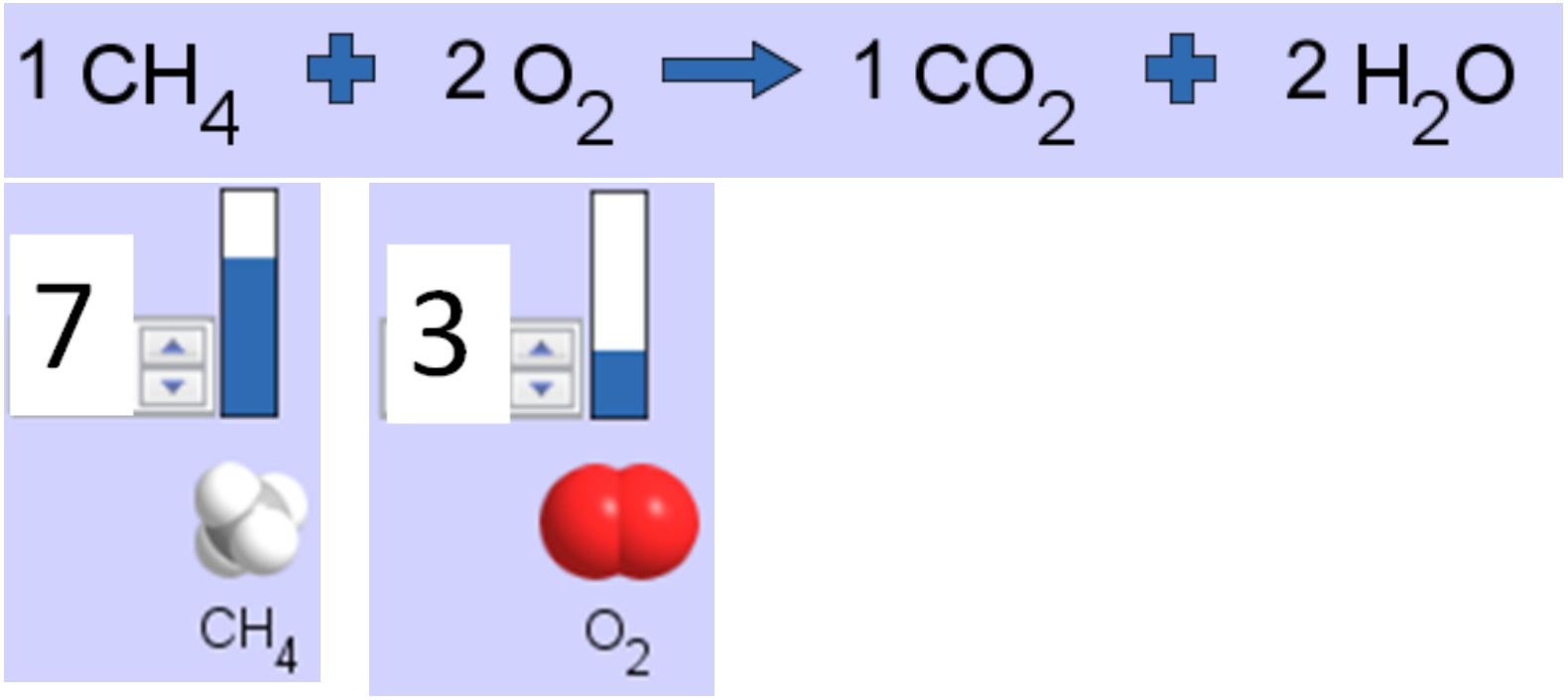
B. 1.8 moles NaCl

C. 0.7 moles NaCl

D. 0.55 moles NaCl

E. 1 mole Nacl

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

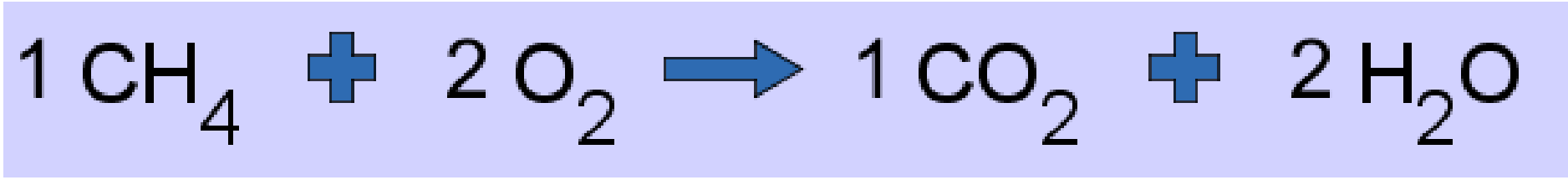


Given the shown amounts for each reactant, predict the amounts of products and leftovers after complete reaction.

5. **What are the amounts after the reaction?**

Initial:

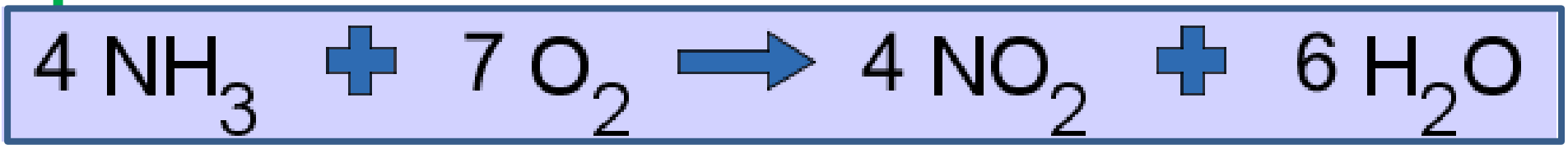
7 CH_4 and 3 O_2

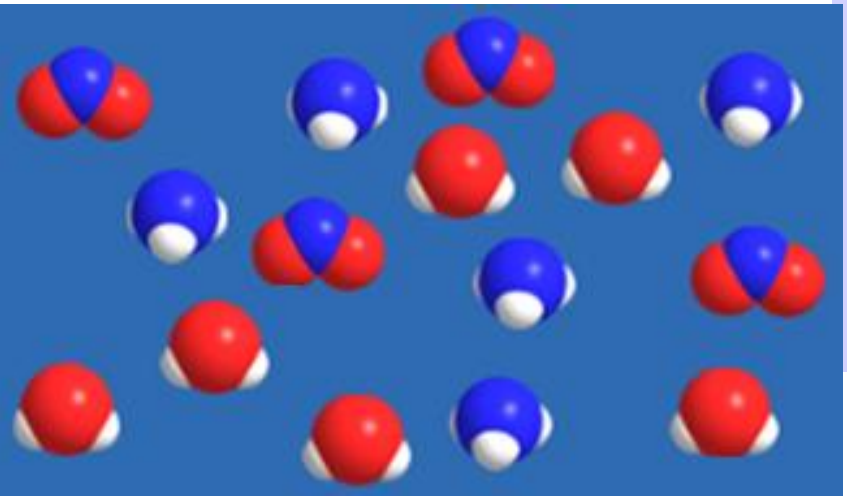


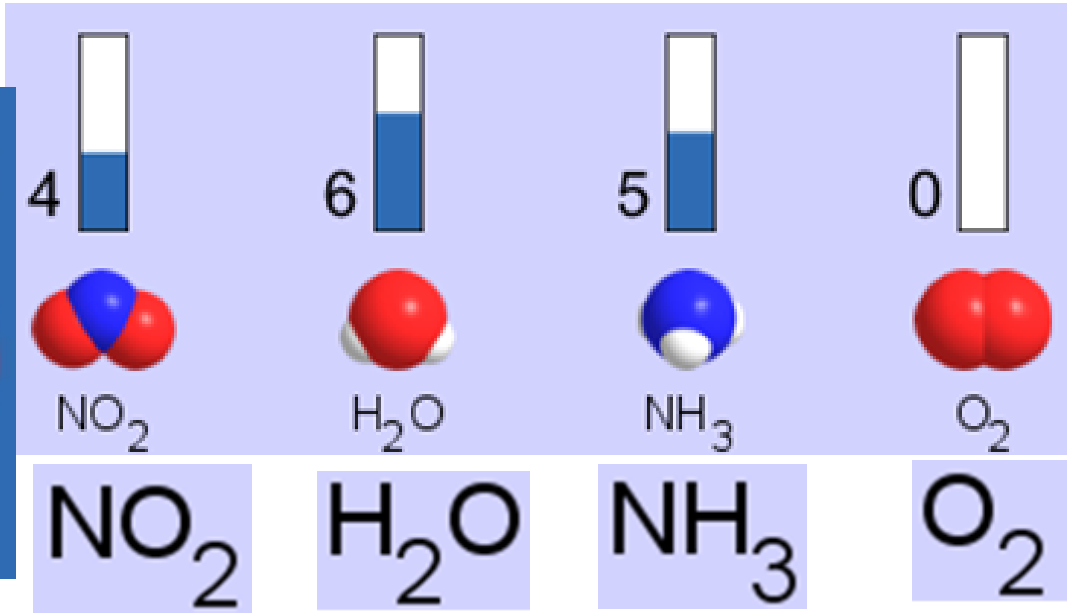
After:

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.







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** 

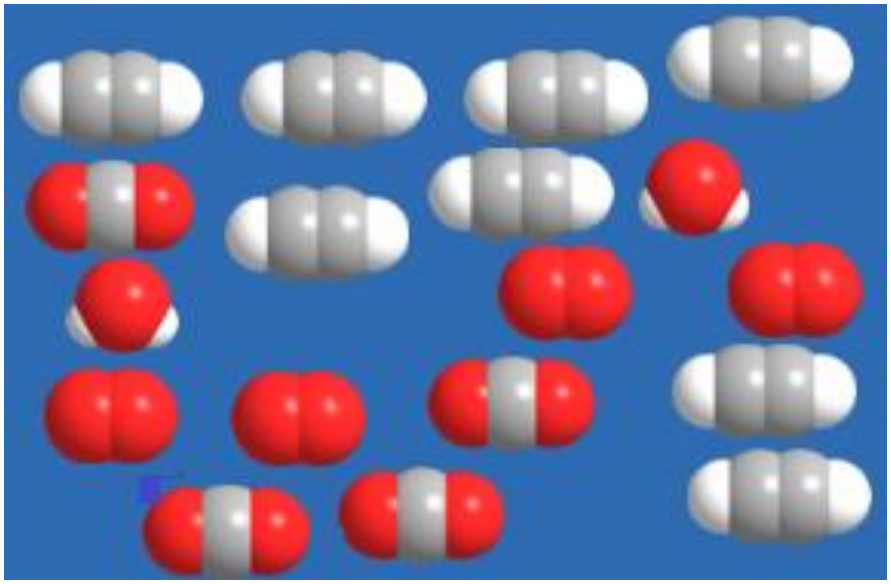
B. 9  **7** 

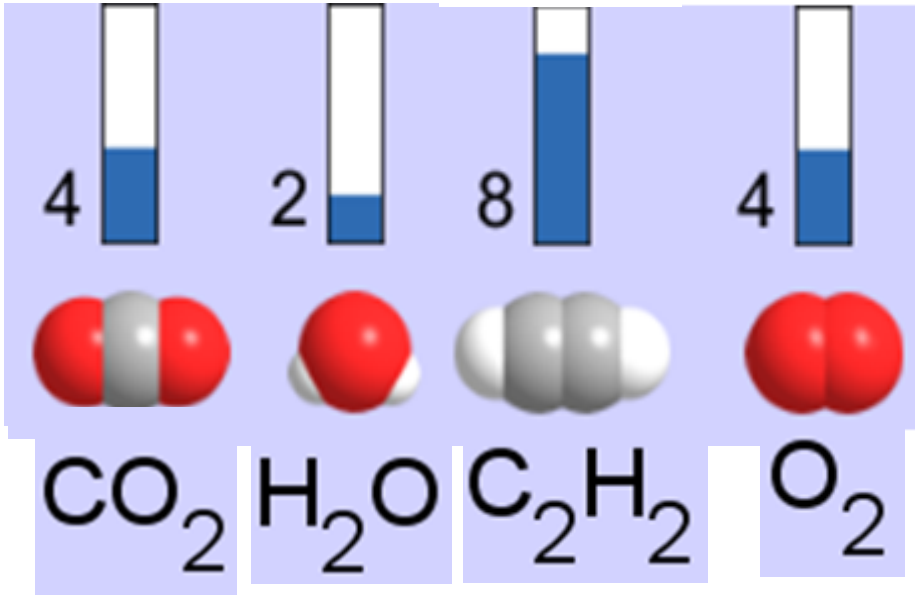
C. 10  **7** 

D. 4  **0** 

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

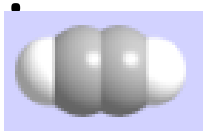
$$2\,C_2H_2 + 5\,O_2 \rightarrow 4\,CO_2 + 2\,H_2O$$





7. What are the amounts before the reaction?

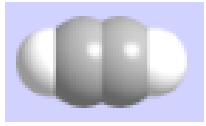
After:

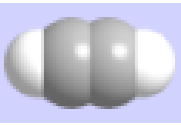


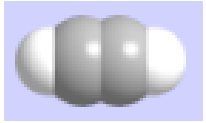

8 C_2H_2 **4 O_2** **4 CO_2** **2 H_2O**

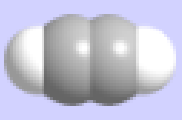
$$2\,C_2H_2 + 5\,O_2 \rightarrow 4\,CO_2 + 2\,H_2O$$

Before:

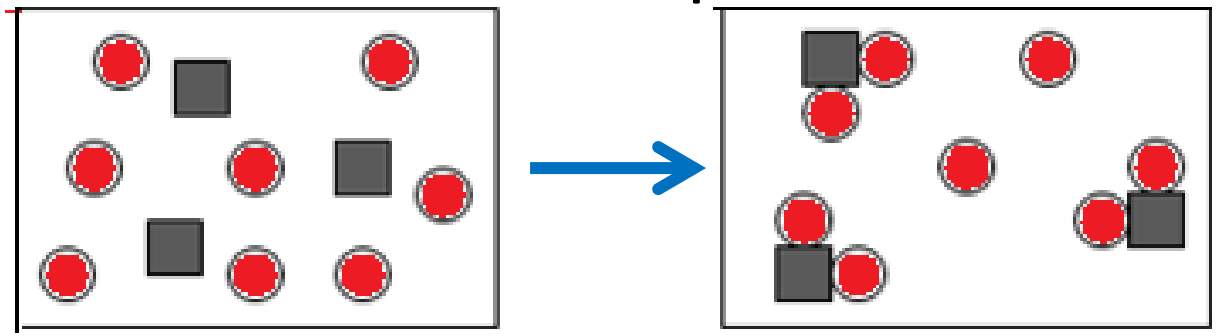
A. 2  **10** 

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

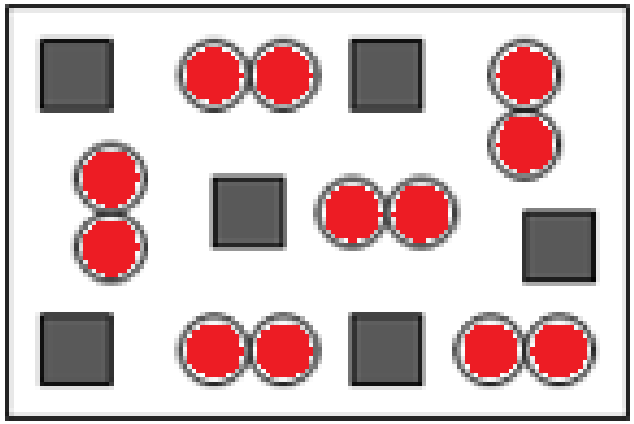
C. $X + 2Y \rightarrow XY_2$

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

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

From Lancaster/Perkins activity

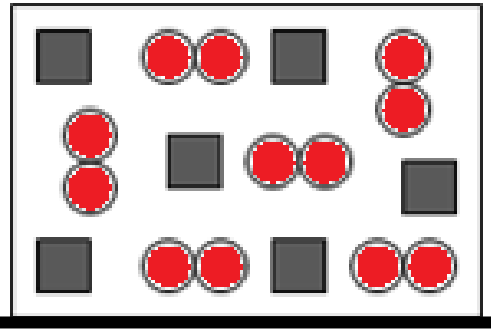
9. **An initial mixture of sulfur(■) and oxygen(●●)is represented:**



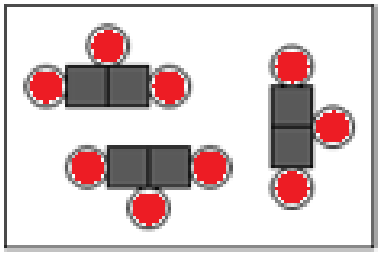
Using this equation: $2S + 3O_2 \rightarrow 2SO_3$, what would the results look like?

From Lancaster/Perkins activity

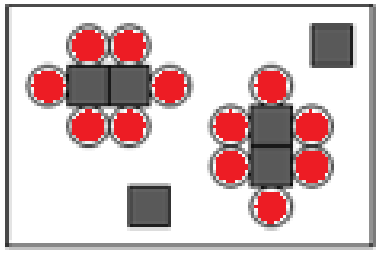
9 Before: S ■ O_2 ●●



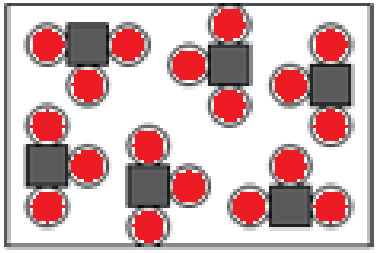
$$2S + 3O_2 \rightarrow 2SO_3$$



A



B



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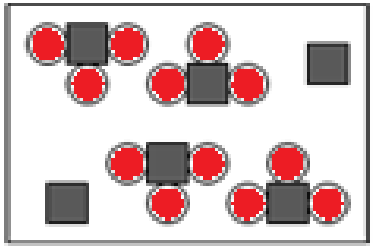

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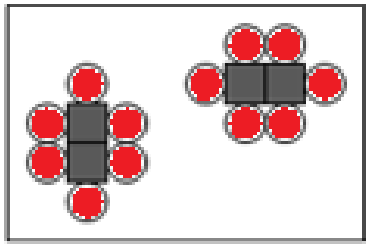
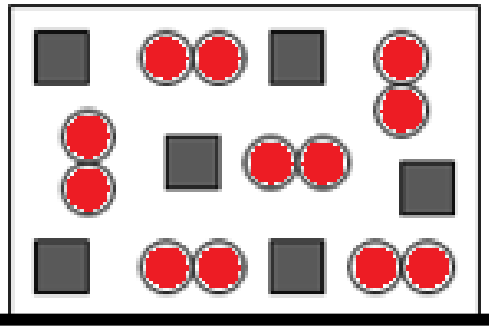


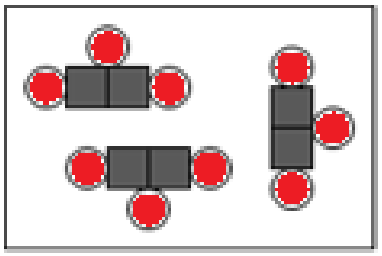
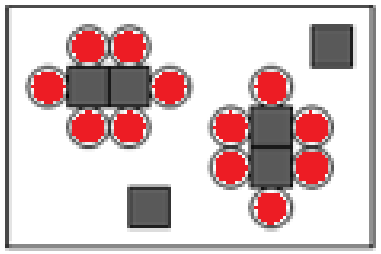
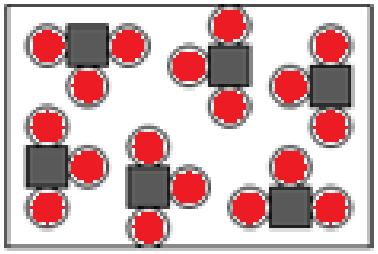
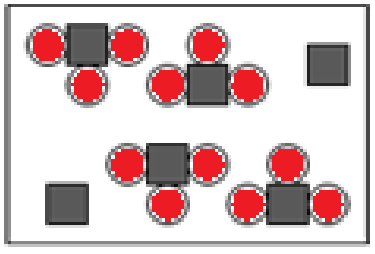
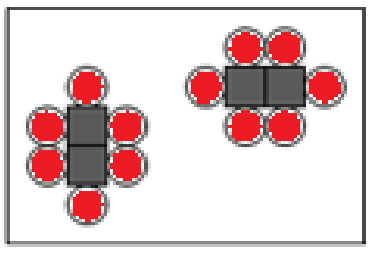
E

From Lancaster/Perkins activity

10. Before: S ■ O_2 ●●



$2S + 3O_2 \rightarrow 2SO_3$

Which is the limiting reactant?

A. Sulfur

B. Oxygen

C. Neither they are both completely used

From Lancaster/Perkins activity