BALANCING CHEMICAL EQUATIONS

Load the simulation *Balancing Chemical Equations*
http://phet.colorado.edu/en/simulation/balancing-chemical-equations

CRITICAL THINKING QUESTIONS

1. Explore the ***Balancing Chemical Equations*** simulation. Discuss with your group what you find.

   a) What are the different ways that the simulation indicates when an equation is balanced?

2. For each balanced reaction, indicate the total number of molecules in the table below.

Reaction	Total Number of Molecules	
	Reactant Side (Left)	Product Side (Right)
Make Ammonia		
Separate Water		
Combust Methane		

3. Is the number of total molecules on the left side of a balanced equation always equal to the number of total molecules on the right side of the equation? Explain your answer.

4. For each balanced reaction, indicate the total number of atoms in the table below.

Reaction	Total Number of Atoms	
	Reactant Side (Left)	Product Side (Right)
Make Ammonia		
Separate Water		
Combust Methane		

5. Is the number of total atoms on the left side of a balanced equation always equal to the number of total atoms on the right side of the equation?

6. What is the same on the left and right side of a balanced equation? Explain your answer.

7. As a group, play level 1 of the balancing equation game. Write down the strategies your group uses to balance chemical equations.

8. Start level 2 of the balancing equation game. Take turns in your group to balance the equations in the sim, using your strategies from Level 1, and adding new strategies as needed.

   Each person should be in charge of balancing at least one equation, asking for help from the group as needed. As a group, write down the equations as you solve them.

9. In the simulation, were you able to use noninteger numbers (like ½ or 0.43) for the coefficients in a balanced equation?   Why do you think this is?

   a) Which of the following are coefficients you could use in a balanced equation?
      □ ½   □ ¾   □ 1   □ 2   □ 6   □ 9

   b) If you were balancing an equation containing the O_2 molecule, which of the following would be correct representations of O_2 and its coefficient?
      □ ½O_2 □ O_2 □ $3O_2$ □ $6O_2$ □ $3O$ □ $5O_3$

10. What do you have to do to the coefficients of equation I below to get to equation II?
    i. $2 SnO_2 + 4 H_2 \rightarrow 2 Sn + 4 H_2O$
    ii. $SnO_2 + 2 H_2 \rightarrow Sn + 2 H_2O$
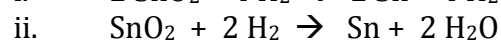
   a) Both equation I and II are balanced, but equation I is the correct way to write the balanced equation.

   b) Can you divide equation II by another factor and still have it be correct? Why or why not?

   c) In a complete sentence, write down a method you could use to determine if an equation is written in the correct way.

11. Start level 3 of the balancing equation game. Take turns and write down the equations as you solve them, along with any new strategies you needed for balancing.

CHALLENGE QUESTIONS: BALANCE THE EQUATIONS BELOW.

A. ___ $NaNO_3$ + ___ PbO → ___ $Pb(NO_3)_2$ + ___ Na_2O

B. ___ Ca_3P_2 + ___ H_2O → ___ $Ca(OH)_2$ + ___ PH_3

C. ___ Fe_2O_3 + ___ CO → ___ Fe + ___ CO_2

D. ___ NH_3 + ___ O_2 → ___ NO_2 + ___ H_2O

E. ___ FeS + ___ O_2 → ___ Fe_2O_3 + ___ SO_2

F. ___ $C_3H_6O_2$ + ___ O_2 → ___ CO_2 + ___ H_2O