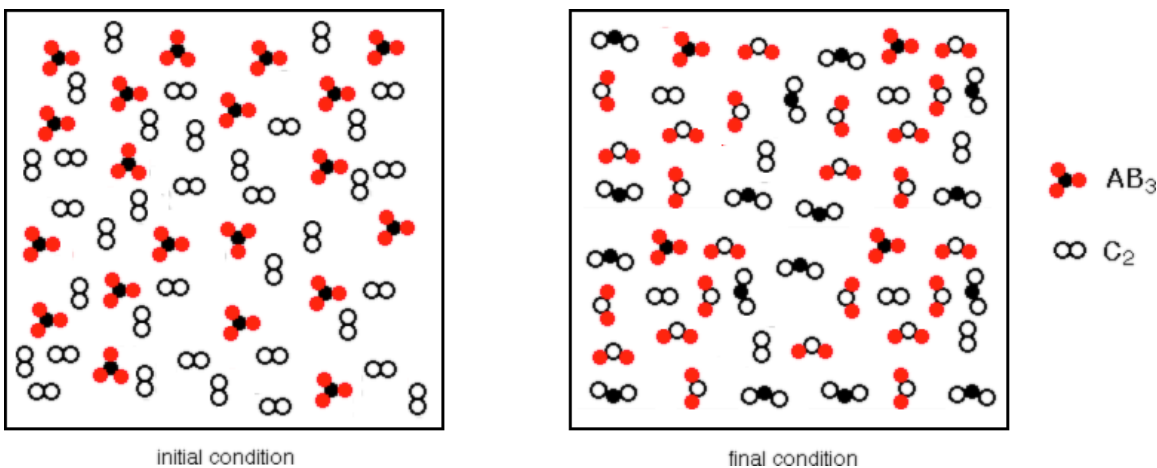
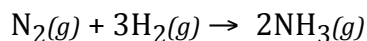


## Stoichiometry Problems

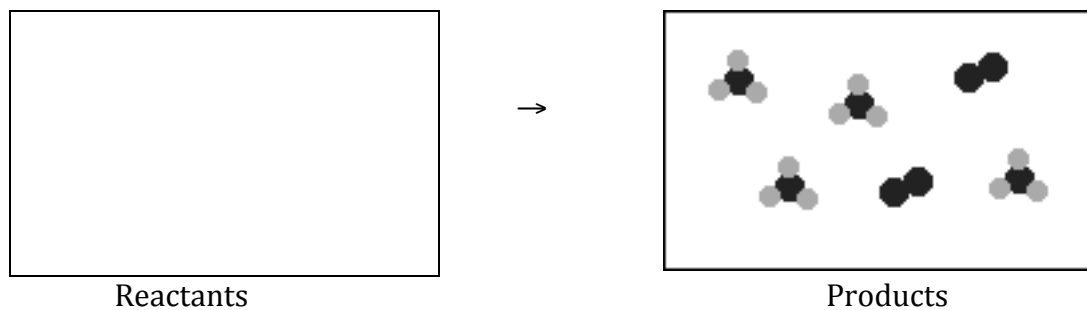
1. Consider the container label 'initial condition' as the reactants before any reaction has occurred, and the container labeled 'final condition' as the same container after the reaction has reached completion. Write a balanced chemical equation that best describes the reaction represented by the containers below?



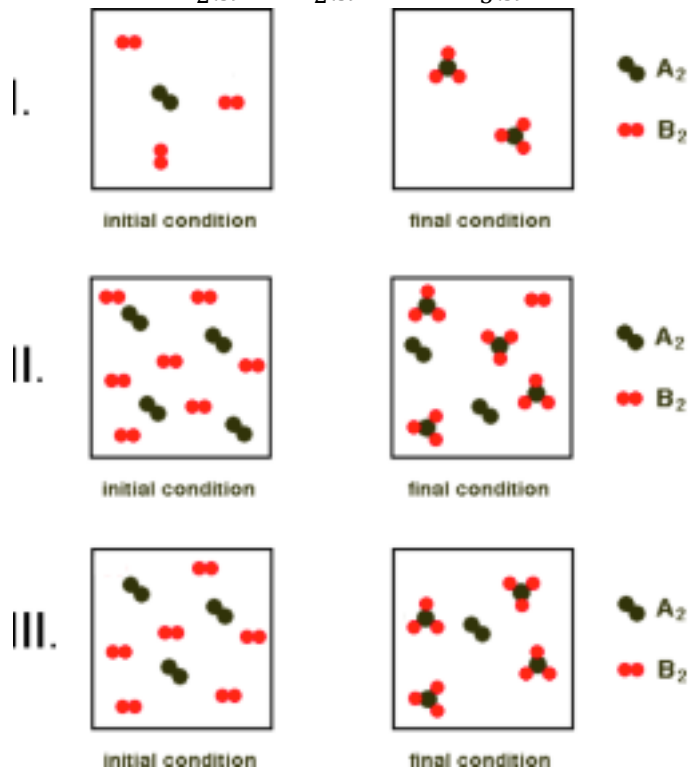
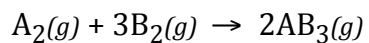
2. In the container below labeled Products are the contents after the reaction described by the chemical equation, (6)



has occurred. In the Reactants container, draw and label the contents before the reaction occurs.

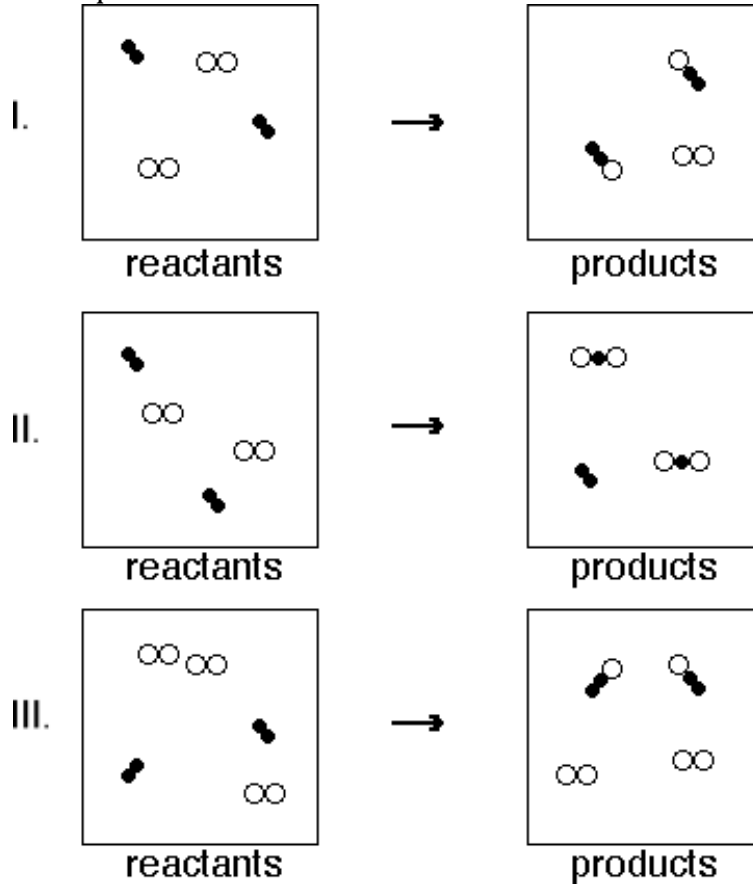


3. Which of the following changes can be described by the balanced chemical equation,



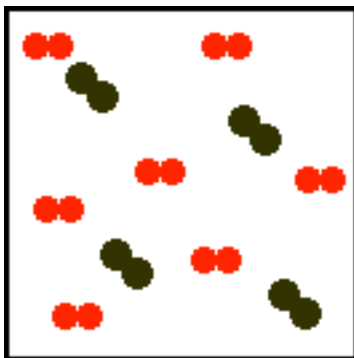
- A) I only  
 B) II only  
 C) I and III  
 D) II and III  
 E) I, II and III

4. Which of the following representations can be described using the same balanced chemical equation?

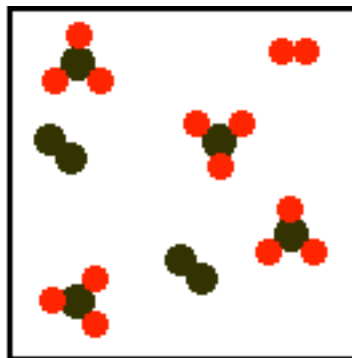


- A) I and II
- B) I and III
- C) II and III
- D) I, II and III
- E) I, II and III are each different

5. Which of the chemical equations best describes the reaction represented by the containers below? Consider the container label 'initial condition' as the reactants before any reaction has occurred, and the container labeled 'final condition' as the same container after the reaction has reached completion.



**initial condition**

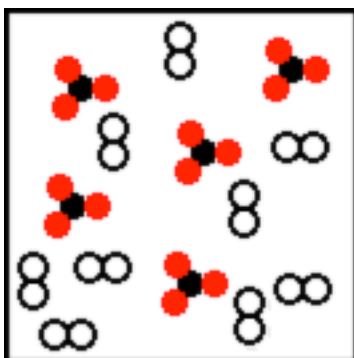


**final condition**

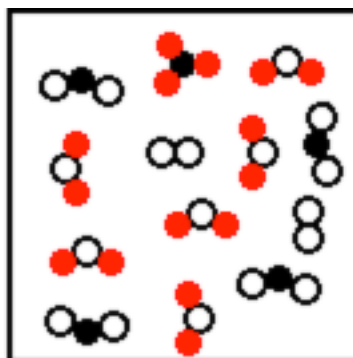


- A)  $4A_2(g) + 7B_2(g) \rightarrow 4AB_3(g)$   
 B)  $4A_2(g) + 7B_2(g) \rightarrow 4AB_3(g) + 1B_2(g) + 2A_2(g)$   
 C)  $A_2(g) + 3B_2(g) \rightarrow 2AB_3(g)$   
 D)  $4A_2(g) + 6B_2(g) \rightarrow 4AB_3(g)$   
 E)  $A_2(g) + B_2(g) \rightarrow AB_3(g)$

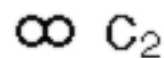
6. Consider the container label 'initial condition' as the reactants before any reaction has occurred, and the container labeled 'final condition' as the same container after the reaction has reached completion. Write a balanced chemical equation that best describes the reaction represented by the containers below?



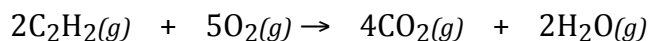
initial condition



final condition



7. Acetylene,  $C_2H_2$ , reacts with oxygen according to the reaction below;



- a) Calculate the maximum mass of carbon dioxide formed when 50.0 g of acetylene reacts with 140.0 g of oxygen. (13)
- b) Calculate the mass, in grams, of BOTH reactants after the reaction has reached completion. (4)
8. An anti-inflammatory steroid containing carbon, hydrogen and oxygen is used to reduce the pain associated with rheumatoid arthritis. The compound contains 69.6 % by weight carbon, 8.34% by weight hydrogen and the remaining is oxygen.
- a. Determine the empirical formula for this compound. (10 pt)
- b. The molar mass of this steroid is approximately 360 g/mol. What is the likely molecular formula? (4 pt)
9. Nitrogen gas can be prepared in the laboratory according to the chemical reaction;
- $$3CuO(s) + 2NH_3(g) \rightarrow N_2(g) + 3Cu(s) + 3H_2O(l)$$
- 14.75 grams of  $CuO$  are reacted with 4.75 grams of  $NH_3$ .
- a) Calculate the maximum amount of nitrogen gas, in grams, that can be produced in the reaction? (12)
- b) Calculate the mass, in grams, of the reactants after the reaction has reached completion. (4)

10. Calculate the volume, in milliliters, of 0.200 M  $\text{H}_3\text{PO}_4$  required to completely neutralize 25.0 mL of 0.500 M KOH.
- A) 20.8 mLs
  - B) 25.0 mLs
  - C) 50.0 mLs
  - D) 62.4 mLs
  - E) 75.0 mLs
11. An unknown compound with the formula  $\text{MSO}_4$  that has a mass of 5.00 g also contains  $2.03 \times 10^{22}$  formula units. M is
- A) Mg
  - B) Cr
  - C) Fe
  - D) Cu
  - E) Mo
12. When hexane,  $\text{C}_6\text{H}_{14}$ , is combusted in air, the products are carbon dioxide and water. Calculate the mass of hexane required to produce 100. grams of carbon dioxide.
- A) 195 g
  - B) 100. g
  - C) 51 g
  - D) 32 g
  - E) 18 g
13. Calculate the volume, in milliliters, of 0.600 M  $\text{Ca}(\text{OH})_2$  required to completely neutralize 25.0 mL of 0.500 M  $\text{HClO}_4$ .
- A) 5.2 mLs
  - B) 7.8 mLs
  - C) 10.4 mLs
  - D) 20.8 mLs
  - E) 30.0 mLs
14. A chloride of the metal titanium reacts with water to produce the oxide of titanium and hydrogen chloride gas. When a 0.500 g sample of the chloride of titanium, is reacted with water, 0.384 g of hydrogen chloride is formed. What is the formula for the chloride of titanium?
- A)  $\text{TiCl}$
  - B)  $\text{TiCl}_2$
  - C)  $\text{TiCl}_3$
  - D)  $\text{TiCl}_4$
  - E)  $\text{TiCl}_5$

15. Which of the following cannot be an empirical formula for a compound?

- A)  $P_4O_{10}$
- B)  $AlCl_3$
- C)  $N_2O_3$
- D)  $NaCl$
- E)  $CO_2$

16. A compound containing only carbon and hydrogen is 80.0% by weight carbon. The empirical formula for the compound is;

- A) CH
- B)  $CH_2$
- C)  $C_2H_3$
- D)  $CH_3$
- E)  $C_2H_5$

17. Samples of which of the following substances contain  $O_2$  molecules?

- I. air
- II.  $N_2O_4$
- III.  $FeO_2$
- IV.  $H_2CO_3$

- A) I only
- B) IV only
- C) II and III only
- D) I, II and III only
- E) I, II, III and IV.

18. A 2.31 gram sample of an oxide of iron is heated in a stream of  $H_2$  gas and produces 0.720 grams of  $H_2O$ . The empirical formula of the oxide is,

- A) FeO
- B)  $Fe_2O$
- C)  $FeO_2$
- D)  $Fe_2O_3$
- E)  $Fe_3O_4$