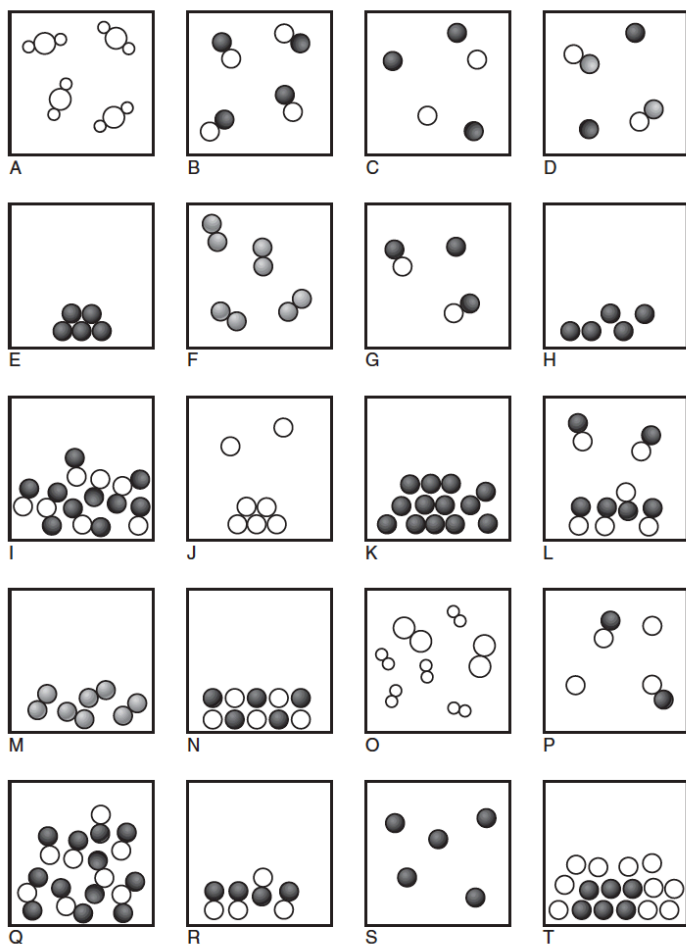


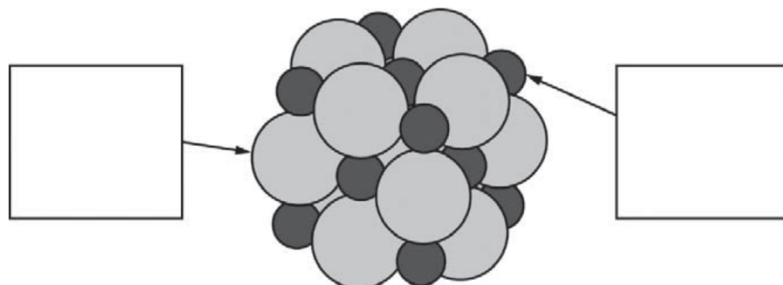
AP CHEMISTRY REVIEW  
PARTICULATE DIAGRAMS

1. Each container (A–T) shows a sample of substance(s) as viewed at the atomic level. Look at the containers and come up with some different ways to categorize the contents. For example, if you feel the contents of a subset of the containers could all be grouped, what would be the basis for the group?

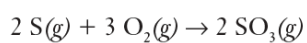


2016 AP Q1

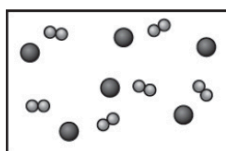
- (e) Below is a representation of a portion of a crystal of LiCl. Identify the ions in the representation by writing the appropriate formulas ( $\text{Li}^+$  or  $\text{Cl}^-$ ) in the boxes below.



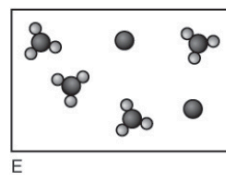
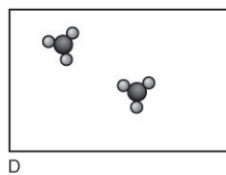
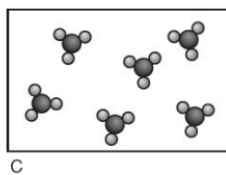
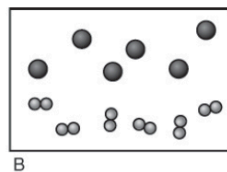
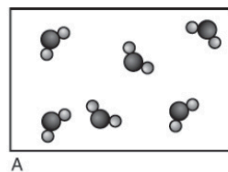
1. The equation for the reaction is:



Consider a mixture of sulfur atoms and dioxygen molecules in a closed container below:




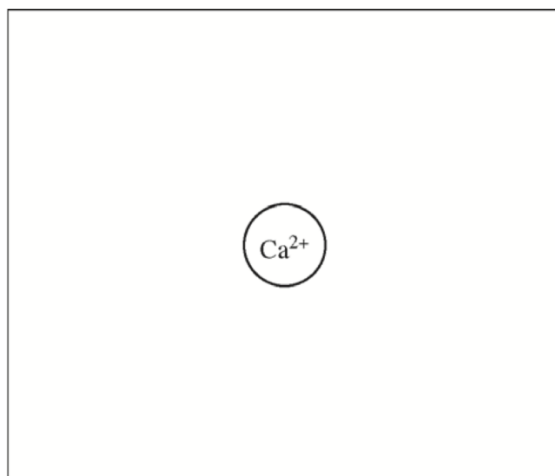
For each of the following explain why the representation is correct or incorrect.



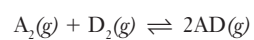
2015 Q4

- (c) In the box below, complete a particle representation diagram that includes four water molecules with proper orientation around the  $\text{Ca}^{2+}$  ion.

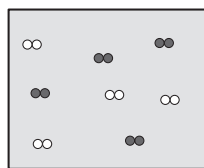
Represent water molecules as .



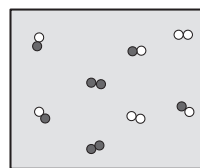
1. Below are 1.0 L containers for the initial and equilibrium condition for the reaction,



Calculate the magnitude of the equilibrium constant for the reaction.

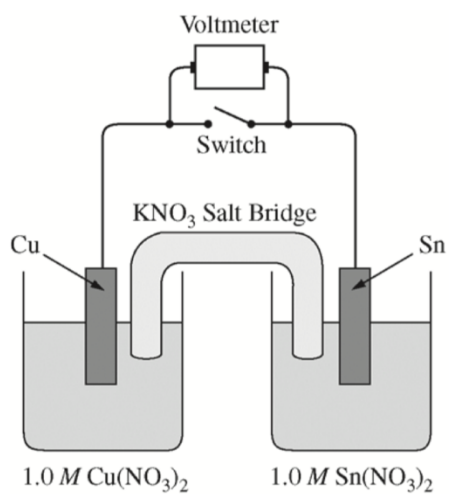


**Container Before  
Reaction Started**



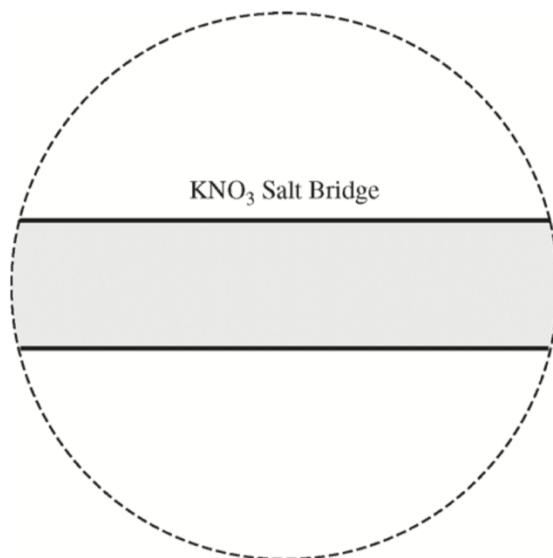
**Container After Reaction  
Achieves Equilibrium**

2014 Q3



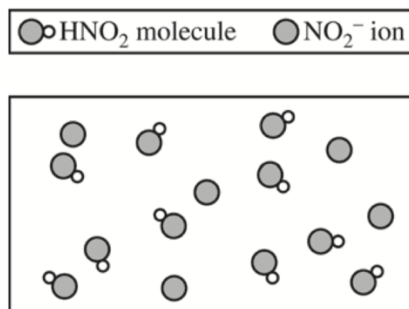
3. A student is given a standard galvanic cell, represented above, that has a Cu electrode and a Sn electrode. As current flows through the cell, the student determines that the Cu electrode increases in mass and the Sn electrode decreases in mass.

(c) In the expanded view of the center portion of the salt bridge shown in the diagram below, draw and label a particle view of what occurs in the salt bridge as the cell begins to operate. Omit solvent molecules and use arrows to show the movement of particles.

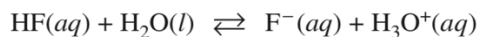


2017 Q3

- (e) A new buffer is made using  $\text{HNO}_2(aq)$  as one of the ingredients. A particulate representation of a small representative portion of the buffer solution is shown below. (Cations and water molecules are not shown.) Is the pH of the buffer represented in the diagram greater than, less than, or equal to 3.40? Justify your answer.



2018 Q5



5. The ionization of  $\text{HF}(aq)$  in water is represented by the equation above. In a  $0.0350\text{ M}$   $\text{HF}(aq)$  solution, the percent ionization of HF is 13.0 percent.
- (a) Two particulate representations of the ionization of HF molecules in the  $0.0350\text{ M}$   $\text{HF}(aq)$  solution are shown below in Figure 1 and Figure 2. Water molecules are not shown. Explain why the representation of the ionization of HF molecules in water in Figure 1 is more accurate than the representation in Figure 2. (The key below identifies the particles in the representations.)

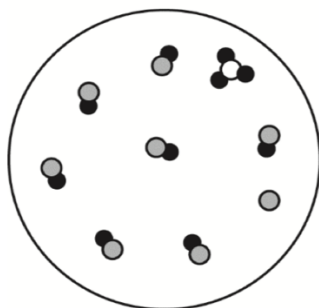
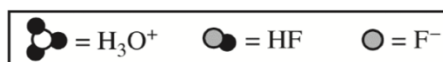


Figure 1

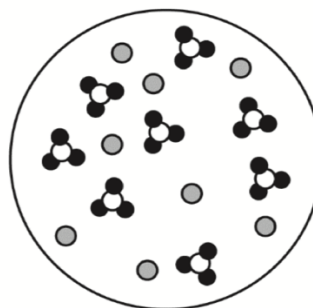
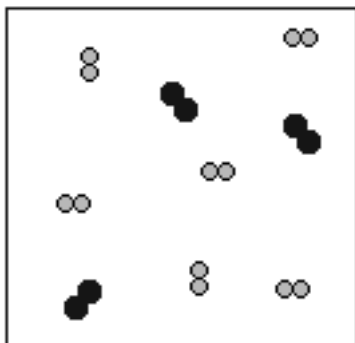


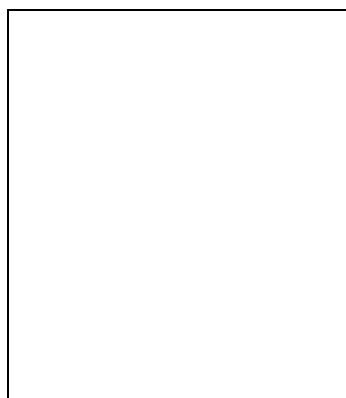
Figure 2

OTHER POSSIBILITIES:

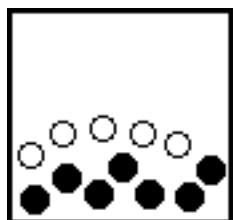
1. Describe the contents of the container below. Be sure to discuss the contents in terms of elements or compounds; pure substances or mixtures (homogeneous/heterogeneous); and the phase. Clearly label the contents so your discussion can be accurately interpreted.



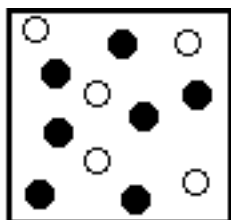
- b. The sample in part a) is cooled to the point that the contents of the container are in the liquid phase only. Use the empty container below to draw what you believe the contents of the container will appear. Clearly describe the nature of your drawing so as to address the composition of the contents. Again be sure you clearly label the contents.



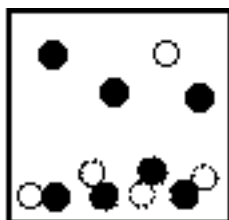
2. Given the containers below



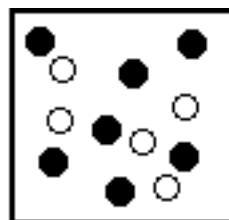
A



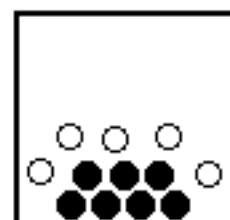
B



C



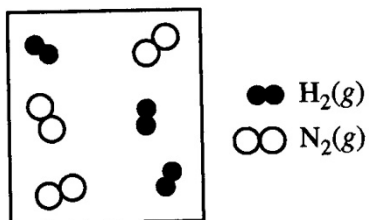
D



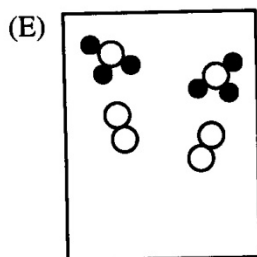
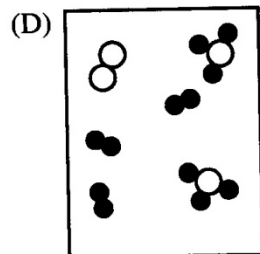
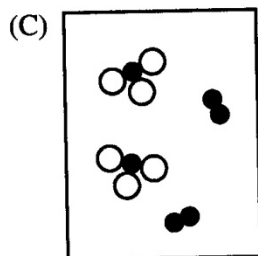
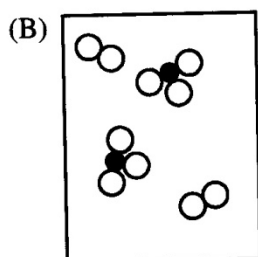
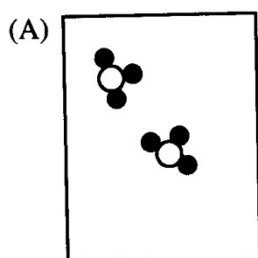
E

Question	Answer:
<p>i) Indicate the letter of one container representing a heterogeneous mixture of elements. Indicate the phase(s) present.</p>	
<p>ii) Indicate the letters of TWO containers depicting a phase change. Indicate the phase of each substance initially and finally. Be sure you label each substance with its phase change.</p>	
<p>iii) Indicate the letters of TWO containers depicting a chemical change. Write a balanced chemical equation that describes the reaction. Include the correct phase for each substance in your balanced equation.</p>	

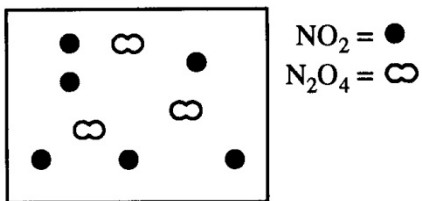
**MULTIPLE CHOICE**



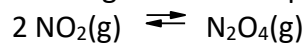
1. The diagram above represents  $\text{H}_2(g)$  and  $\text{N}_2(g)$  in a closed container. Which of the following diagrams would represent the results if the reaction shown below were to proceed as far as possible?
- $$\text{N}_2(g) + 3 \text{H}_2(g) \rightarrow 2 \text{NH}_3(g)$$







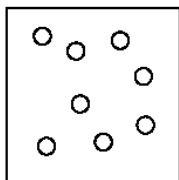
2. The diagram above represents a mixture of  $\text{NO}_2(\text{g})$  and  $\text{N}_2\text{O}_4(\text{g})$  in a 1.0 L container at a given temperature. The two gases are in equilibrium according to the equation



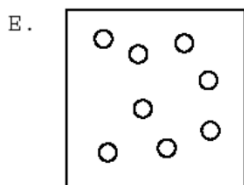
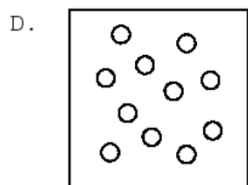
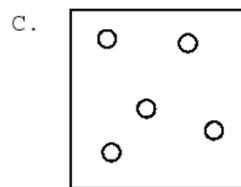
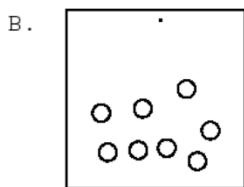
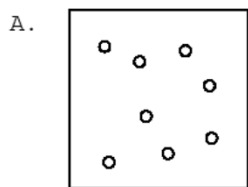
Which of the following must be true about the value of the equilibrium constant for the reaction at this temperature?

- (A)  $K = 0$
- (B)  $0 < K < 1$
- (C)  $K = 1$
- (D)  $K > 1$

3. The following diagram represents a gas sample.



Which of the following could represent the same gas at a lower temperature?



4. Which of the images below best represents an ionic compound like NaCl dissolved in water?

