

# 16-1 Apply

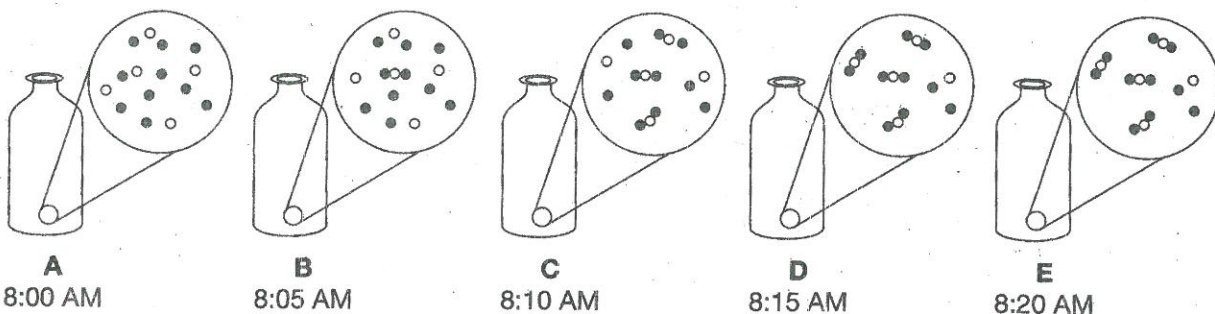
7 possible  $\geq 5$  (+3)

## Equilibrium in a Bottle

In the lab, Alejandro mixes two gases, A and B, inside a sealed bottle. He knows that A and B react with each other to form substance  $A_2B$ , and that  $A_2B$  decomposes to form A and B. This reversible reaction can be represented by the following balanced equation:  $2A + B \rightleftharpoons A_2B$

The pictures below show molecules of A, B, and  $A_2B$  per unit volume over a 20-minute period. After examining these pictures, answer the questions below on Alejandro's experiment.

• = A, ◦ = B, •• =  $A_2B$



1. In which of the pictures A-E is the system at equilibrium? How can you tell?

+ 2 Pictures D & E depict equilibrium. They both have the same number of reactants (2A & 1B) & same number of products (4  $A_2B$ ).

2. How many molecules of each substance per unit volume are present at equilibrium?

+ 3 4 molecules of  $A_2B$   
2 molecules of A  
1 molecule of B

3. Predict how many molecules of  $A_2B$  per unit volume Alejandro would measure at equilibrium if he had started with half as much of substances A and B.

This is to keep  $K_{eq}$  constant.

There should be only half the number of  $A_2B$  molecules (& half the number of A + B (although  $\frac{1}{2}$  molecule doesn't make sense))

4. How would the reaction have proceeded if Alejandro had started with only  $A_2B$  in the bottle?

+ 1 1  $A_2B$  molecule would decompose into A & B so that 2 molecules of A exist + 1 of B (since that's equilibrium).