# Day 6.1 Warm-Up

1. Relatively slow rates of chemical reaction are associated with which of the following?

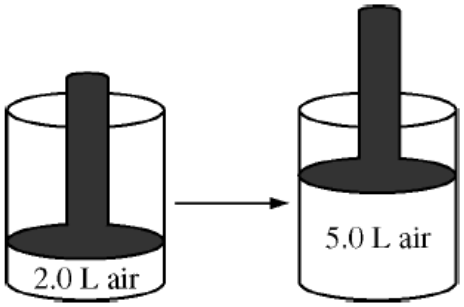
   (A) The presence of a catalyst
   (B) High temperature
   (C) High concentration of reactants
   (D) Strong bonds in reactant molecules
   (E) Low activation energy

2. Which of the following lists the substances $F_2$, HCl, and HF in order of increasing boiling point?

   (A) HF < HCl < $F_2$
   (B) HF < $F_2$ < HCl
   (C) HCl < $F_2$ < HF
   (D) HCl < HF < $F_2$
   (E) $F_2$ < HCl < HF

3. At 298 K and 1 atm, bromine is a liquid with a high vapor pressure, whereas chlorine is a gas. This provides evidence that, under these conditions, the

   (A) forces among $Br_2$ molecules are greater than those among $Cl_2$ molecules
   (B) forces among $Br_2$ molecules are weaker than the Br-Br bond
   (C) forces among $Cl_2$ molecules are stronger than the Cl-Cl bond
   (D) Br-Br bond is stronger than the Cl-Cl bond
   (E) Br-Br bond is weaker than the Cl-Cl bond




4. The volume of a sample of air in a cylinder with a movable piston is 2.0 L at a pressure $P_1$, as shown in the diagram above. The volume is increased to 5.0 L as the temperature is held constant. The pressure of the air in the cylinder is now $P_2$. What effect do the volume and pressure changes have on the average kinetic energy of the molecules in the sample?

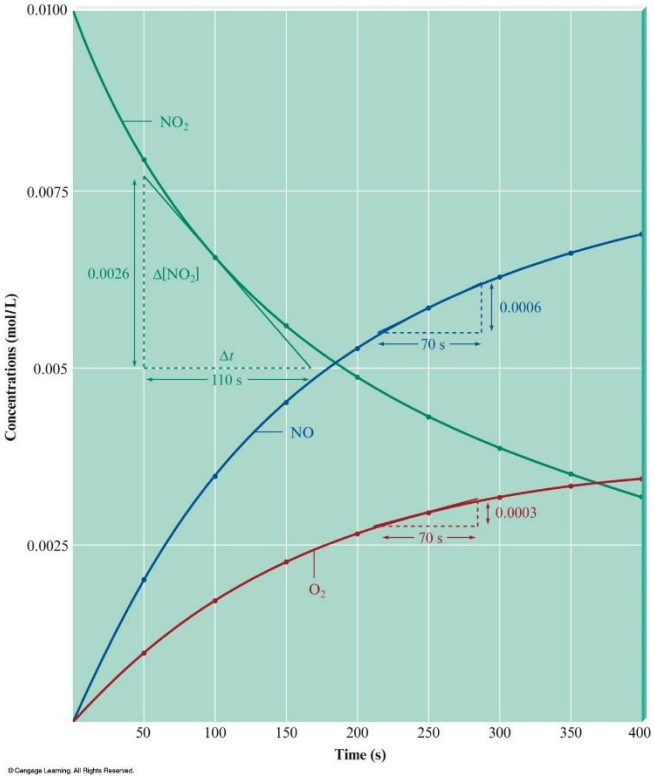
   (A) The average kinetic energy increases.
   (B) The average kinetic energy decreases.
   (C) The average kinetic energy stays the same.
   (D) It cannot be determined how the kinetic energy is affected without knowing $P_1$ and $P_2$.

## Instantaneous Rate

Calculate the instantaneous rate for the reactant at 100 s.

Calculate the instantaneous rate of formation of NO at 250 s.

Calculate the instantaneous rate of formation of $O_2$ at 250 s.




## Relative Rates (Stoichiometric Relationship)

Write the relative rates of change in concentration of the reactants and products of each reaction below.

a) $2\ NO_2(g) \rightarrow O_2(g) + 2\ NO(g)$

b) $4\ PH_3(g) \rightarrow P_4(g) + 6\ H_2(g)$

c) $2\ NOCl(g) \rightarrow 2\ NO(g) + Cl_2(g)$