



Chemistry

Name: _____

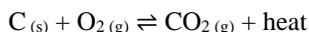
Section _____

LE CHÂTELIER

Date: _____

Directions (1-9): For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the 2011 Edition Reference Tables for Physical Setting/Chemistry.

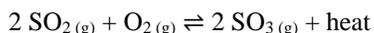
- 1 Consider the following equation:



Which stress on the system will increase the concentration of $\text{CO}_{2(g)}$?

- (1) increasing the temperature of the reaction
- (2) increasing the concentration of $\text{O}_{2(g)}$
- (3) decreasing the pressure on the reaction
- (4) decreasing the amount of $\text{C}_{(s)}$

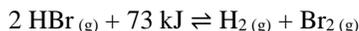
- 2 Consider the following equation:



The concentration of $\text{SO}_{3(g)}$ will be increased by

- (1) decreasing the concentration of $\text{SO}_{2(g)}$
- (2) decreasing the concentration of $\text{O}_{2(g)}$
- (3) increasing the pressure
- (4) increasing the temperature

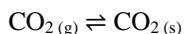
- 3 Consider the following equilibrium at constant pressure:



When the temperature is increased, the equilibrium is shifted to the

- (1) right, and the concentration of $\text{HBr}_{(g)}$ will decrease
- (2) right, and the concentration of $\text{HBr}_{(g)}$ will increase
- (3) left, and the concentration of $\text{HBr}_{(g)}$ will decrease
- (4) left, and the concentration of $\text{HBr}_{(g)}$ will increase

- 4 Consider the following change of phase:



As $\text{CO}_{2(g)}$ changes to $\text{CO}_{2(s)}$, the entropy of the system

- (1) decreases
- (2) increases
- (3) remains the same
- (4) depends on the enthalpy

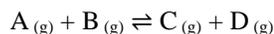
- 5 Which reaction system tends to become less random as reactants form products?

- (1) $\text{C}_{(s)} + \text{O}_{2(g)} \rightarrow \text{CO}_{2(g)}$
- (2) $\text{S}_{(s)} + \text{O}_{2(g)} \rightarrow \text{SO}_{2(g)}$
- (3) $\text{I}_{2(s)} + \text{Cl}_{2(g)} \rightarrow 2 \text{ICl}_{(g)}$
- (4) $2 \text{Mg}_{(s)} + \text{O}_{2(g)} \rightarrow 2 \text{MgO}_{(s)}$

- 6 In which reaction will the equilibrium shift to the left when pressure on the system is increased?

- (1) $\text{C}_{(s)} + \text{O}_{2(g)} \rightleftharpoons \text{CO}_{2(g)}$
- (2) $\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$
- (3) $2 \text{Mg}_{(s)} + \text{O}_{2(g)} \rightleftharpoons 2 \text{MgO}_{(s)}$
- (4) $2 \text{H}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2 \text{H}_2\text{O}_{(g)}$

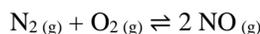
- 7 Consider the following equation:



Which relationship indicates that the reaction has reached equilibrium?

- (1) The [A] equals the [B].
- (2) The [C] equals the [D].
- (3) The [A], [B], [C], and [D] are constant.
- (4) The [A], [B], [C], and [D] are equal.

- 8 Consider the following equilibrium at constant pressure:



If the temperature remains constant and the pressure increases, the number of moles of $\text{NO}_{(g)}$ will

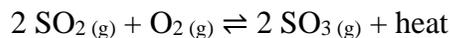
- (1) increase
- (2) decrease
- (3) remain the same
- (4) equal the number of moles of $\text{O}_{2(g)}$

- 9 Which two fundamental tendencies favor a chemical reaction occurring spontaneously?

- (1) higher energy and less randomness
- (2) higher energy and greater randomness
- (3) lower energy and less randomness
- (4) lower energy and greater randomness

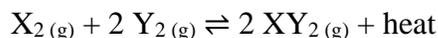
Answer the following questions completely. Remember to avoid the use of pronouns.

- 10 Explain why the addition of $\text{SO}_2(\text{g})$ to the following system will cause the rate of the forward reaction to increase.



Adding more $\text{SO}_2(\text{g})$ increases the number of effective collisions which increases the reaction speed.

- 11 Consider the following equation:

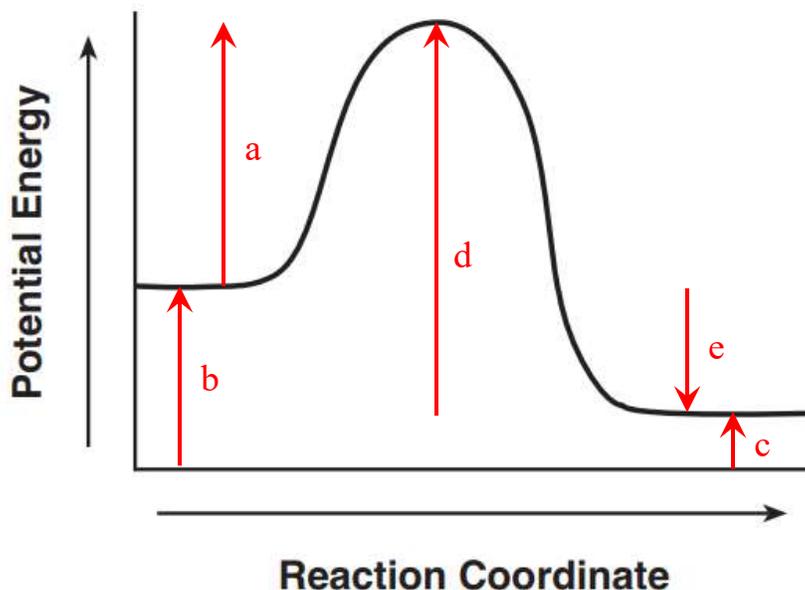


What are *two* changes that could cause the reaction to shift to the left?

Decreasing the temperature will shift an exothermic reaction to the right.

Increasing pressure will shift this reaction to the right. ($\uparrow[\text{X}_2]$, $\uparrow[\text{Y}_2]$, or $\downarrow[\text{XY}_2]$ will also work.)

- 12 A potential energy diagram is shown below. For each of the measures of energy described in parts a-e, draw an arrow on the diagram. Label each arrow with the correct corresponding letter. Then answer question f.



- a activation energy for the forward reaction
b potential energy of the reactants
c potential energy of the products
d activation energy for the reverse reaction
e heat of reaction
f Is the reaction endothermic or exothermic? Explain your answer.

This reaction is exothermic because the products have less energy than the reactants. (ΔH is $-$.)
