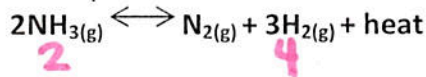


Key

PRACTICE: LECHATELIERS PRINCIPLE

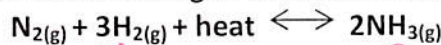
- Rules:
1. If a substance (or heat) is **ADDED** shift **AWAY** from that substance (or heat)
 2. If a substance (or heat) is **TAKEN** shift **TOWARDS** that substance (or heat)
 3. If pressure is added, there is less volume/room for moles. Shift towards side with less moles.
 4. If pressure is relieved, there is more room. Shift towards the side with more moles.
 5. Catalysts speed up the forward **AND** reverse reaction. Therefore equilibrium is unchanged.
 6. At equilibrium **RATES** are equal. Not amount!

1. Circle which **direction** the equilibrium will shift towards to relieve the stress and cite the rule used:



				Rule #
a. Ammonia is added	left	right	no effect	1
b. Nitrogen is added	left	right	no effect	1
c. Hydrogen is added	left	right	no effect	1
d. Heat is added	left	right	no effect	2
e. Ammonia is removed	left	right	no effect	2
f. Nitrogen is removed	left	right	no effect	2
g. Hydrogen is removed	left	right	no effect	2
h. Heat is removed	left	right	no effect	2
i. Pressure is increased	left	right	no effect	3
j. Pressure is decreased	left	right	no effect	4
k. A catalyst is added	left	right	no effect	5

2. Circle what will happen to the **Nitrogen** to relieve the stress:



a. Ammonia is removed →	increase	decrease	remain the same
b. Heat is added →	increase	decrease	remain the same
c. Pressure is increased →	increase	decrease	remain the same
d. Heat is removed ←	increase	decrease	remain the same
e. Ammonia is added ←	increase	decrease	remain the same
f. Hydrogen is removed ←	increase	decrease	remain the same
g. A catalyst is used	increase	decrease	remain the same
h. Pressure is decreased ←	increase	decrease	remain the same
i. Hydrogen is added →	increase	decrease	remain the same

3. List four changes you could make to the system in order to produce more phosphorous pentachloride:

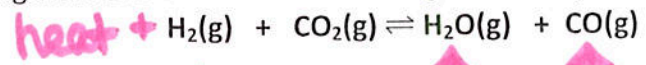


add $\text{Cl}_{2(g)}$ _____
add $\text{PCl}_{3(g)}$ _____

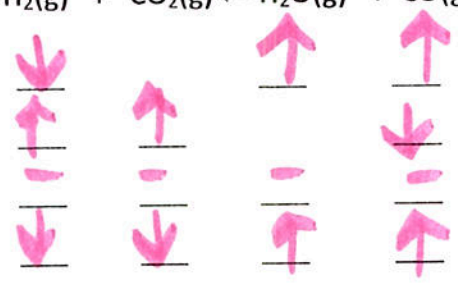
↑ heat/temp _____
remove $\text{PCl}_{5(g)}$ _____
↑ pressure

endothermic, heat on reactants side

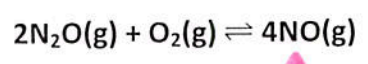
4. Indicate how each of the following changes affects the amount of each gas in the system below, for which $\Delta H_{\text{reaction}} = +9.9 \text{ kcal}$.



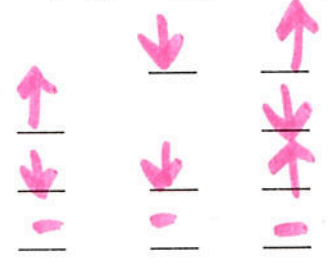
- a) addition of CO_2 →
- b) addition of H_2O ←
- c) addition of a catalyst →
- d) increase in temperature →



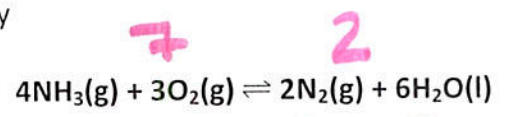
5. How will the amount of chemicals at equilibrium be affected by each of the following:



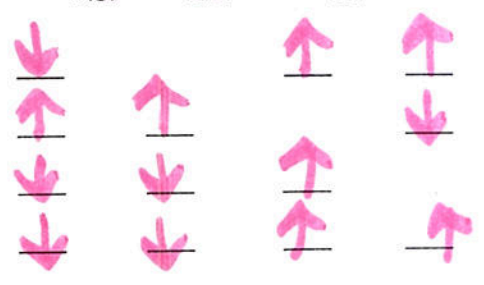
- a) adding N_2O →
- b) removing O_2 ←
- c) increasing the volume of the container →
- d) adding a catalyst **no effect**



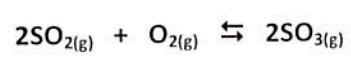
6. How will the concentration of each chemical be affected by



- a) adding O_2 to the system →
- b) adding N_2 to the system ←
- c) removing H_2O from the system →
- d) decreasing the volume of the container
↑ pressure, →



7. Match the change to the equilibrium system below with the letter of the appropriate response. Each letter can be used once, more than once, or not at all.



- a 1) O_2 is added to the reaction
- a 2) SO_3 is removed from the reaction
- b 3) SO_3 is added to the reaction
- a 4) The pressure is increased

- a) The equilibrium shifts to the right
- b) The equilibrium shifts to the left
- c) there is no change in the equilibrium