What is Le Chatelier's Principle?

Worksheet

When equilibrium is stressed (concentration/pressure/temperature change), the system shifts to consume or produce species, reducing the stress. This doesn't change Kc, but temporarily shifts the equilibrium position, eventually re-establishing constancy of concentrations.

Questions

1. For A 2B at equilibrium, you remove some B. Which way shifts?

A) left
B) right
C) no shift
D) random

2. For an exothermic reaction at equilibrium, temperature increases. Yield

A) increases
B) decreases
C) unchanged
D) becomes zero

3. Increasing pressure favors which side of N + 3H 2NH?

A) left
B) right
C) equally
D) neither

4. If you add a catalyst to an equilibrium system

A) shifts right
B) shifts left
C) no shift (Kc constant)
D) equilibrium vanishes

5. For N + 3H 2NH at equilibrium, you add more N. Which way does equilibrium shift?

6. For 2NO NO (colorless), pressure increases. What happens?

7. For N + 3H 2NH (exothermic), temperature increases. Shift?

8. Define: What is Le Chatelier's Principle?

9. Define: What stresses can shift equilibrium?

10. Define: If you add reactant, which way does equilibrium shift?

Answer Key

1. B) right - Removing product decreases [B] forward shift (right) to replace the removed B.

2. B) decreases - Exothermic reactions shift left (endothermic direction) when heated yield decreases.

3. B) right - Right side has 2 moles total (1 N, 0 is liquid-actually 2 NH only), left has 4 moles. Pressure favors fewer moles right.

4. C) no shift (Kc constant) - Catalyst speeds both directions equally no net shift. Kc unchanged; reaches equilibrium faster.

5. Adding N increases [N] (stress = too much reactant) System shifts right (forward) to consume N More NH forms until equilibrium re-established Result: [N] decreases, [NH] increases

6. n = 2 1 (moles decrease on right) Increasing pressure favors fewer moles Shift right (forward) More NO forms; color fades (colorless) System absorbs the pressure increase

7. Reaction is exothermic (releases heat) Higher temperature = added heat (stress) System shifts left (endothermic direction) to absorb heat Less NH at new equilibrium; efficiency decreases Trade-off: high temp speeds reaction, but lowers yield

8. When a system at equilibrium is disturbed, it shifts to counteract the disturbance and restore equilibrium.

9. Concentration changes (add/remove species), pressure changes, temperature changes, catalyst (doesn't shift).

10. Forward (to the right), consuming the added reactant and reducing the stress.