

1. Calculate the freezing point depression of 100 g of alien snot when 8.4 g of salt NaHCO_3 is added. Pretend that the freezing point depression constant of alien snot is $1.5^\circ\text{C}\cdot\text{kg/mol}$. (In case you didn't know alien snot is very runny, not so viscous).

- 3.0°C
- 2.0°C
- 1.5°C
- 4.5°C

2. Determine the correct equilibrium expression for the reaction of hydrogen gas with nitrogen gas to produce ammonia.

- $K_p = \{P(\text{N}_2) P^2(\text{H}_2)\} / P^3(\text{NH}_3)$
- $K_p = P^3(\text{NH}_3) / \{P(\text{N}_2) P^2(\text{H}_2)\}$
- $K_c = [\text{NH}_3]^2 / \{[\text{N}_2][\text{H}_2]^3\}$
- $K_c = \{[\text{N}_2][\text{H}_2]^2\} / [\text{NH}_3]^3$

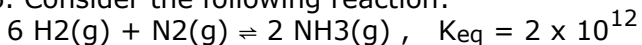
3. In the reaction below the partial pressures are $P_{\text{CO}_2} = 2 \text{ atm}$, $P_{\text{Cl}_2} = .20 \text{ atm}$, $P_{\text{CCl}_4} = 10 \text{ atm}$, $P_{\text{O}_2} = 0.5 \text{ atm}$. Determine the direction of the reaction and why. ($K_p = 6.4 \times 10^{-18}$)
 $\text{CO}_2(\text{g}) + 2 \text{ Cl}_2(\text{g}) \rightleftharpoons \text{CCl}_4(\text{g}) + \text{O}_2(\text{g})$

- Shift right, $Q < K$
- Shift left, $Q = K$
- Shift left, $Q < K$
- Shift right, $Q > K$
- Shift left, $Q > K$
- No shift, $K < Q$

4. Steel rusting is exothermic. It's mostly made of iron, which when reacted with oxygen will form iron oxide (Fe_2O_3). An increase in which of the following compounds will be seen when the temperature decreases?

- Fe
 - O_2
 - Fe_2O_3
- I
 - I and II
 - I, II and III
 - II
 - II and III
 - III
 - I and III

5. Consider the following reaction:



Which combination of concentrations of H_2 , N_2 , and NH_3 will lead to the most ammonia once equilibrium is reached? Assume 1 L of solvent.

- 0 M, 0 M, and 1 M
- 10 M, 10 M, and 1 M
- .1 M, .1 M, and 1 M

6. Complete the following table:

R	4 $\text{NH}_3(\text{g})$	+	3 $\text{O}_2(\text{g})$	\rightleftharpoons	2 $\text{N}_2(\text{g})$	+	6 $\text{H}_2\text{O}(\text{g})$
I	20		11		6		0
C							
E			5				

What is the value of K?

- a. 2
- b. 1.4
- c. 234.4
- d. 115.2

7. Which of the following values for ΔG will result in the largest positive value for K? (No calculations necessary)

- a. -1 kJ/mol
- b. -100 J/mol
- c. 100 J/mol
- d. 1 kJ/mol

8. Which of the following is a true statement?

- a. As temperature increases, the equilibrium of an exothermic reaction will shift right.
- b. As temperature increases, the equilibrium of an endothermic reaction will shift right.
- c. The equilibrium of any reaction is independent of temperature.
- d. When using the Van't Hoff equation, the sign of ΔH can be ignored