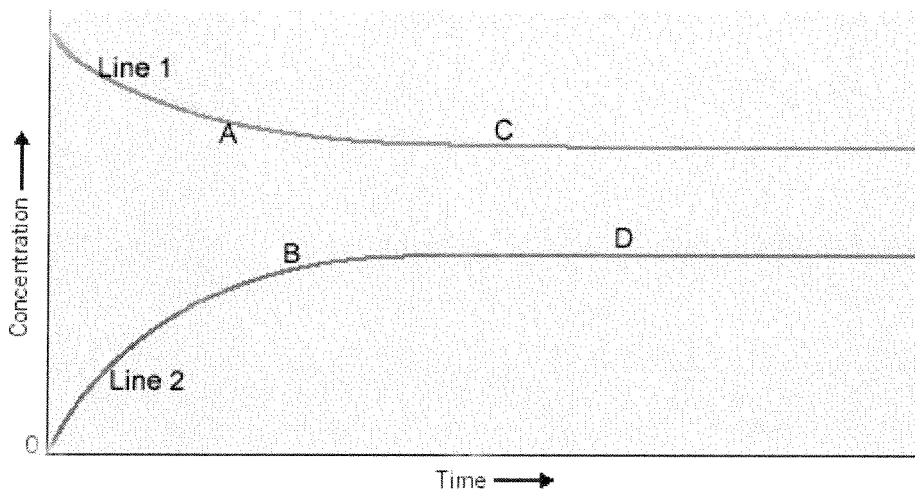


Nov 3

14.4: Predict the effects on the equilibrium position of changing concentrations or temperature)

Q23

Consider the following graph of concentration as a function of time for a reaction of the form



Which of the following correctly describes the numbered lines and lettered points on the graph? Select all that apply.

Line 1 represents R and Line 2 P.

At point B, Q is greater than K_c .

At point C the rate of the forward reaction is greater than the rate of the reverse reaction.

At point D, the rate of the forward and reverse reactions are the same.

At point C, equilibrium has been attained.

At point A, Q is less than K_c .

Q14

Examine the data shown below.



$$K_c = 1.78 \times 10^{-3} \quad \text{at } 800^\circ\text{C}$$

$$K_c = 4.68 \times 10^{-2} \quad \text{at } 1000^\circ\text{C}$$

$$K_c = 5.68 \quad \text{at } 1500^\circ\text{C}$$

↓ increase K with increase T

Based on this data, what is known about this reaction? Select all that apply.

The reaction is endothermic.

More product is formed at higher temperatures.

K_p for the reaction would increase with increasing temperature.

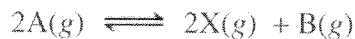
If the reaction temperature were raised to 2000°C the reaction will shift to the left.

K_p is equal to K_c at all temperatures.

(14.5: Solve quantitative equilibrium problems)

Q101

Consider the following reaction and data.



$$K_c = 1.2 \times 10^{-8}$$

If the initial mixture has the composition: $[\text{A}] = 0.200 \text{ M}$, what is the concentration of X when the system comes to equilibrium?

	$2\text{A} \rightleftharpoons 2\text{X} + \text{B}$	
λ	0.2M	— —
e	-2x	+2x +x
e	0.2-2x	(2x) x

$$K = \frac{[\text{B}][\text{X}]^2}{[\text{A}]^2} = 1.2 \times 10^{-8}$$

$$\frac{(x)(2x)^2}{(0.2-2x)^2} = 1.2 \times 10^{-8}$$

$$\frac{4x^3}{(0.2)^2} \approx 1.2 \times 10^{-8}$$

$$x = \cancel{8.84 \times 10^{-4} \text{ M}}$$

$$2x = [\text{X}]$$

$$[\text{X}] = \cancel{1.68 \times 10^{-3}}$$

$$4.93 \times 10^{-4} \text{ M} = x$$

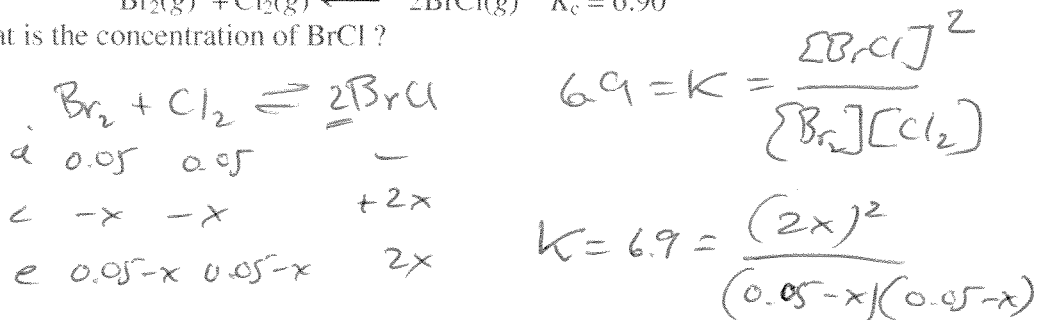
$$9.86 \times 10^{-4}$$

Q18

In the following reaction, initially the concentration of bromine and chlorine were both 0.0500 M.



At equilibrium what is the concentration of BrCl?



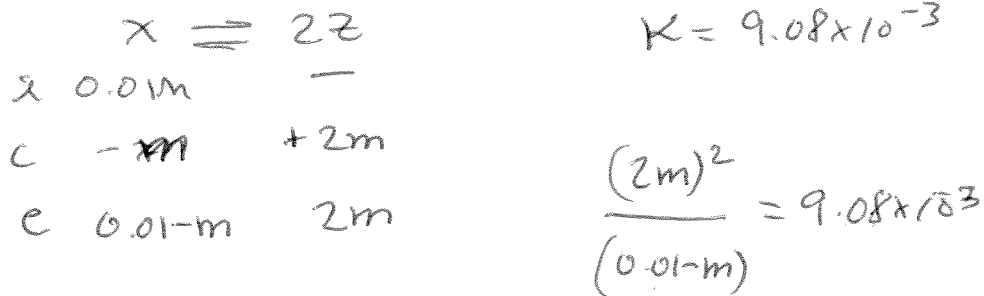
$$\sqrt{6.9} = \frac{2x}{(0.05-x)} = 2.63 \quad x = 0.0283$$

$$[\text{BrCl}] = 2x = \underline{\underline{0.057M}}$$

For the reaction given below



the initial reaction mixture contained only $[\text{X}] = 0.0100 \text{ M}$. If the equilibrium constant for the reaction is 9.08×10^{-3} , what is the equilibrium concentration of Z?



quadratic

$$4m^2 = 9.08 \times 10^{-5} - 9.08 \times 10^{-3}m$$

$$m = 0.003762$$

$$[\text{X}] = 0.01 - 0.003762$$

$$[\text{Z}] = 2 \times 0.003762 = 7.5 \times 10^{-3}$$

Q88

For the reaction given below



a reaction mixture consists of: $[A] = 0.500 \text{ M}$, $[B] = 0.250 \text{ M}$, $[C] = 0.0755 \text{ M}$, and $[D] = 0.150 \text{ M}$.

In the equilibrium constant for the reaction is 1.9×10^{-1} , which way will the reaction shift to attain equilibrium?

$$\underline{1.9 \times 10^{-1} = K}$$

$$Q = \frac{[D][C]}{[A][B]} = \frac{(0.0755)(0.15)}{(0.5)(0.25)} = \frac{\cancel{9.06}}{9.06 \times 10^{-2}}$$

$$Q < K$$