1. At equilibrium, the forward and reverse reaction rates are...

   ☐ equal

   ☐ both zero

   ☐ increasing

2. The symbol $\rightleftharpoons$ in an equation means the reaction is...

   ☐ irreversible

   ☐ explosive

   ☐ reversible

3. If $Q < K$, the reaction shifts...

   ☐ forward (toward products)

   ☐ backward (toward reactants)

   ☐ it is at equilibrium

4. For $A(aq) \rightleftharpoons B(aq)$, equilibrium $[B] = 6$ M and $[A] = 3$ M. Find K_c.

   _____

5. A large K (much greater than 1) means the equilibrium favours...

   ☐ products

   ☐ neither side

   ☐ reactants

6. For a net forward reaction with reactant coefficient 1, its equilibrium concentration is...

   ☐ just x

   ☐ initial plus x

   ☐ initial minus x

7. At equilibrium the reactant concentration reaches zero.

   ☐ True ☐ False

8. A concentration change alters the value of K.

   ☐ True ☐ False

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☐ True ☐ False

10. The common-ion effect changes the value of K_{sp}.

    ☐ True ☐ False

1. **equal**

   In a closed system at fixed conditions, equal opposing rates keep concentrations constant; equal concentrations are not required.

2. **reversible**

   A double arrow marks a reversible reaction.

3. **forward (toward products)**

   Too few products means it moves forward to make more.

4. **2**

   $K = 6/3 = 2$.

5. **products**

   Large K means product-favoured in the equilibrium expression; actual conversion also depends on initial composition and stoichiometry.

6. **initial minus x**

   Reactants are used up, so their amount is (initial $-x$).

7. **False**

   Both reactants and products remain present.

8. **False**

   Only temperature changes K; concentration and pressure only shift position.

9. **False**

   False. Adding a substance changes Q, and the system shifts until $Q = K$ again; only temperature changes K.

10. **False**

    At fixed temperature, K_{sp} is unchanged; the new ion concentrations must still satisfy it at saturation.

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