

Name:

Chapter 3 Review Quiz

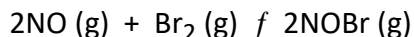
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ☐ 1. Which of the following is not included in an equilibrium expression?
- gas in a heterogeneous system
 - gas in a homogeneous system
 - liquid in a heterogeneous system
 - liquid in a homogeneous system
- ☐ 2. The equation for a chemical reaction is given below.
- $$2A(g) + 4B(l) \rightleftharpoons D(s) + 3E(aq)$$
- The equilibrium expression for this reaction is:
- $\frac{[D][E]}{[A][B]}$
 - $\frac{[D][E]^3}{[A]^2[B]^4}$
 - $\frac{[E]}{[A]}$
 - $\frac{[E]^3}{[A]^2}$
- ☐ 3. The equilibrium expression for a gaseous chemical reaction is given below.
- $$\frac{[HCl]^x \times [O_2]}{[Cl_2]^2 \times [H_2O]^2}$$
- Determine the value of x .
- 1
 - 2
 - 3
 - 4
- ☐ 4. In a chemical system, the reaction quotient is greater than the equilibrium constant. This indicates that:
- the forward reaction is favoured to reach equilibrium.
 - the reverse reaction is favoured to reach equilibrium.
 - the concentration of reactants is greater than the concentration of products.
 - the concentration of products is greater than the concentration of reactants.
- ☐ 5. The equilibrium constant for a chemical reaction at a specific temperature is 0.0013. This indicates that:
- the forward reaction is favoured to reach equilibrium.
 - the reverse reaction is favoured to reach equilibrium.
 - the concentration of reactants is greater than the concentration of products.
 - the concentration of products is greater than the concentration of reactants.
- ☐ 6. The units for concentrations of all species in the equilibrium expression must be in:

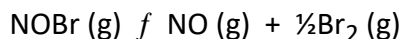
- a. ppm.
- b. g/L.
- c. kg/L.
- d. mol/L.

▼ 7. Given the reaction:



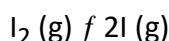
The equilibrium constant for this reaction at 1000 K is 1.32×10^{-2} .

Calculate the equilibrium constant for the following reaction:



- a. 75.8
- b. 8.70
- c. 0.115
- d. 1.32×10^{-2}

▼ 8. Calculate the equilibrium constant for the reaction:



Given that, at equilibrium at 1200°C, the $[\text{I}_2] = 3.00 \times 10^{-3} \text{ mol/L}$ and $[\text{I}] = 2.87 \times 10^{-3} \text{ mol/L}$

- a. 2.75×10^{-3}
- b. 0.957
- c. 1.04
- d. 362

▼ 9. $2\text{NO (g)} + \text{Cl}_2 \text{ (g)} \rightleftharpoons 2\text{NOCl (g)}$

Initially, 2 moles of NO and 2 moles of Cl_2 were added to a 2L reaction vessel.

At equilibrium, there was 0.96 mol/L NOCl present in the reaction vessel.

The temperature remained constant throughout the investigation.

What is the equilibrium constant for this reaction?

- a. 46
- b. 2.8×10^2
- c. 1.1×10^3
- d. 1.4×10^4

▼ 10. Which of the following can be used to measure equilibrium concentrations?

- a. Colorimeter and universal indicator
- b. Light meter and thermometer
- c. pH meter and colorimeter
- d. pH meter and thermometer

▼ 11. In colourimetry, the Beer–Lambert Law is used because there is:

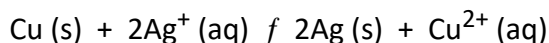
- a. a linear relationship between absorbance and concentration.
- b. a parabolic relationship between absorbance and concentration.
- c. an inverse relationship between absorbance and concentration.
- d. an inverse square relationship between absorbance and concentration.

▼ 12. $\text{Fe}^{3+} \text{ (aq)} + \text{SCN}^- \text{ (aq)} \rightleftharpoons \text{FeSCN}^{2+} \text{ (aq)}$

Blue light (470 nm) was used for the colourimetry experiment for the reaction above because:

- a. the iron(III) ion preferentially reflects this light.
- b. the iron(III) ion preferentially absorbs this light.
- c. the iron(III) thiocyanate ion preferentially reflects this light.
- d. the iron(III) thiocyanate ion preferentially absorbs this light.

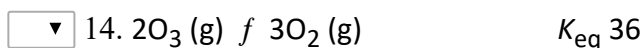
▼ 13.



The equilibrium constant for this reaction is 3.1×10^9 .

Measurements were taken and it was found that the concentration of Cu^{2+} was 0.88 mol/L and the concentration of Ag^+ was 0.050 mol/L. Which reaction will be favoured for the system to reach equilibrium?

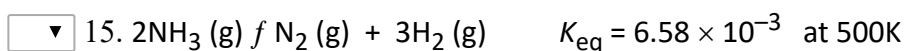
- The forward reaction will be favoured since $Q > K_{\text{eq}}$.
- The forward reaction will be favoured since $Q < K_{\text{eq}}$.
- The reverse reaction will be favoured since $Q > K_{\text{eq}}$.
- The reverse reaction will be favoured since $Q < K_{\text{eq}}$.



The equilibrium concentration of O_2 is 8.0×10^{-2} mol/L.

What is the concentration of ozone, O_3 ?

- 3.8×10^{-3} mol/L
- 4.7×10^{-2} mol/L
- 8.0×10^{-2} mol/L
- 1.2×10^{-1} mol/L



Initially, only ammonia was present in the reaction vessel. At equilibrium, the concentration of nitrogen was 0.00400 mol/L.

Calculate the concentration of ammonia present when the system reached equilibrium.

- 1.02×10^{-3} mol/L
- 1.05×10^{-3} mol/L
- 2.43×10^{-3} mol/L
- 4.93×10^{-2} mol/L

▼ 16. A chemical reaction has reached equilibrium. The investigation for this reaction is repeated at a higher temperature. What is the effect on the reaction of raising the temperature?

- The time for the reaction to reach equilibrium is less and the equilibrium constant remains the same.
- The time for the reaction to reach equilibrium is less and the equilibrium constant is smaller for an exothermic reaction.
- The time for the reaction to reach equilibrium is less and the equilibrium constant is smaller for an endothermic reaction.
- The time for the reaction to reach equilibrium is the same and the equilibrium constant remains the same.

▼ 17. In solubility equilibria:

- the precipitate is written on the right-hand side, the reaction quotient is called the ionic product and the equilibrium constant is called the solubility product.
- the precipitate is written on the right-hand side, the reaction quotient is called the solubility product and the equilibrium constant is called the ionic product.
- the precipitate is written on the left-hand side, the reaction quotient is called the ionic product and the equilibrium constant is called the solubility product.
- the precipitate is written on the left-hand side, the reaction quotient is called the solubility product and the equilibrium constant is called the ionic product.

▼ 18.

Name of acid	Formula of acid	K_a
Hydrocyanic acid	HCN	6.2×10^{-10}
Hydrofluoric acid	HF	6.6×10^{-4}

Hypochlorous acid	HClO	2.9×10^{-8}
Nitrous acid	HNO ₂	7.2×10^{-4}

Rank these acids in terms of increasing degree of ionisation.

- a. HCN < HClO < HF < HNO₂
- b. HClO < HCN < HF < HNO₂
- c. HNO₂ < HF < HClO < HCN
- d. HCN < HClO < HNO₂ < HF

▼ 19. Which statement about K_p is correct?

- a. K_p for gases is the same as K_c for solutions.
- b. K_p can be determined for both homogeneous systems and heterogeneous systems, which contain gases and solutions.
- c. K_p can be calculated if the mole fractions of all gaseous species in a gaseous reaction are known.
- d. K_p can be calculated if the partial pressures of all gaseous species in a gaseous reaction are known.

▼ 20. Ammonia gas is produced by the reaction of nitrogen gas and hydrogen gas.

At a particular temperature T , the system reaches equilibrium. The partial pressure of ammonia is found to be 0.0060 atm while nitrogen's is 0.094 atm. K_p for this reaction is 1.61.

What is the partial pressure for hydrogen?

- a. 0.34 atm
- b. 0.062 atm
- c. 0.040 atm
- d. 2.4×10^{-4} atm

