

Name \_\_\_\_\_

Date \_\_\_\_\_

# End of Chapter 18 test

*This test and its sample answers have been written by the authors. IB may award marks differently.*

- 1 If a reaction has a smaller equilibrium constant, the reaction
  - A is more exothermic
  - B has a lower concentration of products at equilibrium
  - C has a faster reaction rate
  - D has a catalyst.
  
- 2 Looking at the following reactions, in which reaction does the position of equilibrium remain unaffected by a change in pressure?
  - A  $2\text{O}_3(\text{g}) \rightleftharpoons 3\text{O}_2(\text{g})$
  - B  $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$
  - C  $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{HCl}(\text{g})$
  - D  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
  
- 3 The volume of the vessel containing the mixture of gases for the Haber process is increased. This is the reaction:
 
$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$
 When this reaction reaches the new equilibrium, which of the following will occur?
  - A The amount of  $\text{N}_2(\text{g})$  will have increased.
  - B The amount of  $\text{NH}_3(\text{g})$  will have increased.
  - C The amount of  $\text{H}_2(\text{g})$  will remain unchanged.
  - D The amount of  $\text{H}_2(\text{g})$  will have decreased.
  
- 4 Iodine can react with iodide ions to produce triiodide ions. This reaction is reversible:
 
$$\text{I}_2(\text{aq}) + \text{I}^-(\text{aq}) \rightleftharpoons \text{I}_3^-(\text{aq})$$
 When more iodine is added to the reaction, and it re-establishes equilibrium, what will happen to the equilibrium constant?
  - A It will increase, and there will be a greater concentration of  $\text{I}_3^-(\text{aq})$ .
  - B It will increase, and there will be a greater concentration of  $\text{I}^-(\text{aq})$ .
  - C It will decrease, and there will be a greater concentration of  $\text{I}^-(\text{aq})$ .
  - D It will stay the same.

- 5 The reaction for the Haber process is as follows:



When the temperature of the reaction mixture is increased, what happens to the equilibrium constant?

- A Impossible to say without knowing if the pressure or volume of the mixture has changed.
  - B The equilibrium constant will remain the same.
  - C The equilibrium constant will increase.
  - D The equilibrium constant will decrease.
- 6 Iron, Fe, is a catalyst for the reaction of the Haber process. If this is added to the reaction, what will happen to the equilibrium constant?
- A It will increase.
  - B It will decrease.
  - C It will stay the same.
  - D Without knowing the concentrations of the reactants and products, it is impossible to calculate.
- 7 A catalyst is used in the Haber process to make ammonia. What is the purpose of the catalyst?
- A Decrease the equilibrium constant.
  - B Increase the equilibrium constant.
  - C Decrease the rate of reaction.
  - D Increase the rate of reaction.
- 8 Consider the following reaction:
- $$2[\text{CrO}_4]^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightleftharpoons [\text{Cr}_2\text{O}_7]^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l})$$
- $[\text{CrO}_4]^{2-}(\text{aq})$  is yellow and  $[\text{Cr}_2\text{O}_7]^{2-}(\text{aq})$  is orange. What happens to the equilibrium constant when  $\text{OH}^-(\text{aq})$  is added to this reaction mixture?
- A increases
  - B stays the same
  - C decreases
  - D Impossible to say, as it is not one of compounds in the reaction.

END OF TEST