Year 12 Science: Equilibrium, acids, bases and pH

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Write the Kc expression for $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$.

2. What is the pH of 0.0050 mol L^{-1} HCl?

3. What is the pH of 0.10 mol L^{-1} KOH?

4. Find $[H_3O^+]$ in a solution of pH 9.20.

5. For $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$, which way does the equilibrium shift when the pressure is increased?

Exam-style question: making methanol

Methanol, a fuel and solvent, is made industrially from carbon monoxide and hydrogen: $CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$. The forward reaction is exothermic.

6. Write the Kc expression for this equilibrium.

7. In a test vessel at equilibrium, [CO] = 0.20, $[H_2]$ = 0.30 and $[CH_3OH]$ = 0.045 mol L^{-1}. Calculate Kc and say what it shows.

8. Explain why the process is run at high pressure.

9. Discuss how raising the temperature affects the amount of methanol at equilibrium, the value of Kc, and the rate.

10. Equipment is rinsed with 0.010 mol L^{-1} NaOH. Calculate its pH.

Fix the mistake

11. Correct this statement: "At equilibrium the concentrations of reactants and products are equal."

12. Correct this statement: "Adding more reactant increases Kc."

13. Correct this statement: "The pH of 0.020 mol L^{-1} NaOH is –log(0.020) = 1.70."

14. Correct this statement: "A weak acid is the same as a dilute acid."