Class 11 Chemistry · Chapter 6: Equilibrium

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

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1. 0.1 M aqueous solutions of HCl, NH_4Cl, NaCl and CH_3COONa at 298 K, in increasing order of pH, are [1]

(a) HCl < NH_4Cl < NaCl < CH_3COONa (b) NH_4Cl < HCl < NaCl < CH_3COONa

(c) HCl < NaCl < NH_4Cl < CH_3COONa (d) CH_3COONa < NaCl < NH_4Cl < HCl

2. With concentrations in mol L^{-1}, the unit of Kc for $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is [1]

(a) mol L^{-1} (b) L mol^{-1}

(c) L^2 mol^{-2} (d) none; Kc has no unit

3. For which equilibrium is Kp equal to Kc at every temperature? [1]

(a) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ (b) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(c) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ (d) $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

4. A sparingly soluble salt dissolves as $MX_2(s) \rightleftharpoons M^{2+}(aq) + 2X^-(aq)$. In its saturated solution at 298 K, $[X^-] = 2.0 \times 10^{-4}$ mol L^{-1}. The Ksp of MX_2 is [1]

(a) 4.0×10^{-12} (b) 3.2×10^{-11}

(c) 2.0×10^{-8} (d) 8.0×10^{-12}

5. A cook at a hill station, where the atmospheric pressure is about 0.70 bar, heats water in an open pan. The water boils [1]

(a) at exactly 100 °C, as pure water always does (b) above 100 °C, because the air at the hill station is colder

(c) below 100 °C, because the pressure over it is less than 1.013 bar (d) only when its vapour pressure reaches 1.013 bar

6. Kc for a reaction is measured twice at the same temperature, starting from different initial concentrations, and once more at a higher temperature. Which of the three values will differ, and why? [2]

7. Explain why the pH of a dilute acetic acid solution rises when solid sodium acetate is dissolved in it. [2]

8. A student writes: “At chemical equilibrium the forward and reverse reactions stop.” Correct the statement, and name one experiment from the chapter that shows the student is wrong. [2]

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9. In the two-cylinder activity on dynamic equilibrium, coloured water is transferred from cylinder 1 to cylinder 2 with one glass tube and back with another. (a) Why do the levels in the two cylinders become constant? (b) What shows that the process is dynamic? (c) What happens if the two tubes have different diameters? [3]

10. In the Haber process, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$; $\Delta H = -92.38$ kJ mol^{-1}. Explain why the plant (a) works at a high pressure of about 200 atm, (b) does not work at a low temperature although low temperature favours the yield, and (c) uses an iron catalyst. [3]

11. A saturated solution of CaF_2 in pure water at 298 K is found to have $[Ca^{2+}] = 1.10 \times 10^{-3}$ mol L^{-1}. (a) Calculate Ksp of CaF_2. (b) Taking Ksp = 5.3×10^{-9}, what concentration of F^-, supplied by NaF, would lower the solubility of CaF_2 to 1.0×10^{-6} mol L^{-1}? (c) Explain the fall in solubility. ($1.10^3 = 1.331$; $\sqrt{53} = 7.28$) [3]

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