# G12 Chemistry: Class 12 Homework

1. Write the formula of the conjugate base of each molecule or ion: **[4 marks]**

   a) HCl _____

   b) $HCO_3^-$ _____

   c) $H_2SO_4$ _____

   d) $N_2H_5^+$ _____

2. Write the formula of the conjugate acid of each molecule or ion: **[4 marks]**

   a) $NO_3^-$ _____

   b) $OH^-$ _____

   c) $H_2O$ _____

   d) $HCO_3^-$ _____

3. Determine the conjugate acid-base pairs in each reaction. **[4 marks]**

   a) $HS^-(aq) + H_2O(l) \rightleftharpoons H_2S(aq) + OH^-(aq)$

   b) $O^{2-}(aq) + H_2O(l) \rightarrow 2OH^-(aq)$

   c) $H_2S(aq) + NH_3(aq) \rightleftharpoons NH_4^+(aq) + HS^-(aq)$

   d) $H_2SO_4(aq) + H_2O(l) \rightarrow H_3O^+(aq) + HSO_4^-(aq)$

4. Calculate the concentration of hydronium ions in each solution.

    a) 30.0 mL of 4.50 mol/L HBr(aq) diluted to 100.0 mL **[2 marks]**

    b) 17.9 mL of 0.175 mol/L $HNO_3$(aq) added to 35.4 mL of 0.0160 mol/L $Ca(OH)_2$(aq) **[3 marks]**

5. $[H_3O^+]$ is $1.7x10^{-14}$ M in a solution of calcium hydroxide. What is the molar concentration of the $Ca(OH)_2$(aq)? **[3 marks]**

6. $[H_3O^+]$ of a sample of milk is found to be $3.98 \times 10^{-7}$ mol/L. Is the milk acidic, neutral, or basic? Calculate the pH and $[OH^-]$ of the sample. **[3 marks]**

7. Butanoic acid gives rancid butter its distinctive odour. Calculate the pH of a $1.0 \times 10^{-2}$ M solution of butanoic acid ($K_a = 1.51 \times 10^{-5}$). **[4 marks]**

8. HOCl, is used as a bleach and a germ-killer. A chemist finds that 0.027% of HOCl acid molecules are dissociated in a 0.40 M solution of the acid. What is the value of $K_a$ for the acid? **[4 marks]**

9. Morphine, $C_{17}H_{19}NO_3$ is a naturally occurring base that is used to control pain. A $4.5 \times 10^{-3}$ M solution has a pH of 9.93. Calculate $K_b$ for morphine. **[5 marks]**

10. Methylamine, $CH_3NH_2$ is a fishy-smelling gas at room temperature. It is used to manufacture several prescription drugs, including methamphetamine. Calculate $[OH^-]$ and pOH of a 0.25M aqueous solution of methylamine. **[4 marks]**