

# Chemistry 225 Semester 04-2016

## Homework for Submission #4

Answer the following question and submit it for as instructed. Only answers showing full working can attract full marks. Express numerical answers to the correct number of significant figures. If any answer shows evidence of copying the whole exercise will attract zero marks. Construct your answers carefully before submitting them on separate sheets of lined paper.

- 1) The hydrazinium ion ( $\text{N}_2\text{H}_5^+$ ) is a weak Brønsted-Lowry acid in water.
  - a) Write the equation for the acid dissociation of this ion in water. Label the conjugate base of this acid in the equation.
  - b) The  $\text{pK}_a$  of this ion is 8.23 at  $25^\circ\text{C}$ .
    - i) Calculate the  $\text{K}_a$  value of the acid.
    - ii) Calculate the pH of a solution which is made up by dissolving 0.015 mol of hydrazinium nitrate,  $\text{N}_2\text{H}_5^+\text{NO}_3^-$ , (sometimes used as a rocket fuel) in water to make  $2.50 \text{ dm}^3$  of solution. (NB. The nitrate ion has no appreciable acidic or basic properties and need not be considered.)
- 2) The hypochlorite ion ( $\text{ClO}^-$ ) is a weak base in water. The base dissociation constant for this ion in water is  $3.58 \times 10^{-7}$  at  $25^\circ\text{C}$ .
  - a) Write the equation for the base dissociation of this ion in water. Label the conjugate acid of this base in the equation.
  - b) Household bleach is a solution of sodium hypochlorite in water, typically 2.5%. This means that  $100 \text{ cm}^3$  of solution contains 2.5 g of sodium hypochlorite,  $\text{Na}^+\text{ClO}^-$ .
    - i) Calculate the molarity of 2.50% sodium hypochlorite solution. (RAM of Na=22.99, Cl=35.45, O=16.00.)
    - ii) Calculate the pH of 2.50% sodium hypochlorite solution (bleach) at  $25^\circ\text{C}$ . (NB. The sodium ion has no appreciable acidic or basic properties and need not be considered.)