Quiz 1

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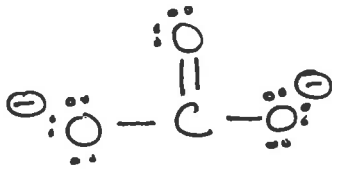
Educational Goal
Career Goal undecided

1. Please draw the Lewis structure for the polyatomic ion $CO_3^{2-}$. Please show all formal charges.



What is the electron pair geometry about the central C? trigonal planar

What are the bond angles about the central C? 120°

What is the hybridization of the central carbon? $sp^2$

2. Acetic acid is a weak acid.

a. Complete the following reaction:

$CH_3CO_2H + H_2O \leftrightarrows$ $H_3O^{\oplus}$ + $CH_3CO_2^{\ominus}$

b. The Ka for acetic acid is $1.8 \times 10^{-5}$. What is the concentration of $H_3O^+$ in 1 M acetic acid?

let $[H_3O^{\oplus}] = x = [CH_3CO_2^{\ominus}]$

$$K_a = \frac{[H_3O^{\oplus}][CH_3CO_2^{\ominus}]}{[CH_3CO_2H]} = \frac{x \cdot x}{1-x} = x^2 = 1.8 \times 10^{-5}$$

assume $1 - x \approx 1$

$x = \sqrt{1.8 \times 10^{-5}}$

$x = 0.00424$

FW = 58.5 g/mol

3. How many grams of NaCl are produced from the reaction of 20.0 g of $Na_2CO_3$ and 20.0 mL of 12.1 M HCl?

FW = 106 g/mol

0.0200 L

$$2HCl_{(aq)} + Na_2CO_{3\,(s)} \rightarrow 2\,NaCl_{(aq)} + H_2O_{(l)}$$

limiting reagent produces less product

$$0.0200\,L\,HCl \times \frac{12.1\ moles}{L} \times \frac{2\,NaCl}{2\,HCl} \times \frac{58.5\,g}{mol} = 14.0\,g\ NaCl$$

$$20.0\,g\,Na_2CO_3 \times \frac{mol}{106\,g} \times \frac{2\,NaCl}{1\,Na_2CO_3} \times \frac{58.5\,g}{mol} = 22.1\,g\ NaCl$$