A **buffer** is a solution containing **equal** amounts of a **weak acid** and its conjugate **weak base.**

CH3COOH + H2O  CH3COO- + H3O+

A buffer is made by combining a weak acid and a salt containing its conjugate base (or a weak base and a salt containing its conjugate acid). The extra ion in the salt will be a spectator.

For example, the buffer above could be made by combining CH3COOH and NaCH3COO. The weak acid is CH3COOH, the weak base is CH3COO-, and Na+ is a spectator.

When **equal** concentrations of a weak acid and its conjugate weak base are added to water, the pH of the buffer will equal the pKa of the weak acid.

pH = pKa

Diluting a buffer has no effect on its pH.

A buffer prevents the addition of either an acid or a base from changing the pH of a solution to any great extent.

**Hint: use Le Chatelier’s Principle**

Station 1:

You are given two buffer solutions:

1 M NH3 mixed with 1 M NH4Cl

* 1. M NH3 mixed with 0.1 M NH4Cl

1. Write the chemical equation for the buffer formed. Which ion is the spectator?
2. Will the pH of the above buffers differ from each other? Explain.

Station 2:

State whether or not each of the following solutions will be buffers? Explain why or why not.

1. 0.10 M KCN mixed with 0.10 M HCN
2. 1.0 M HNO2 mixed with 1.0 M HF
3. 1.0 M NaOH mixed with 1.0 M HCl
4. 1.5 M NaHCO3 mixed with 1.2 M Na2CO3

Station 3:

1. What happens to the pH of a buffer if you add some NaOH to it?
2. What happens to the pH of a buffer if you add some HCl to it?

Use Le Chatelier’s Principle and the following buffer to explain your answers.

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Station 4:

You have a buffer made by mixing 0.10 mol of NH3 and 0.10 mol of NH4Cl in 1.0 L of water. Will this buffer be able to neutralize 0.15 mol of OH-? Explain.

Station 5:

1. How would you prepare a solution in which the pH is buffered close to a value of 7.2 (which weak acid would you choose)?
2. How would you prepare a solution in which the pH is buffered close to a value of 2.0 (which weak acid would you choose)?

\*show any calculations that you use to choose the acid