What is a Buffer Solution?

Worksheet

Buffer = weak acid (HA) + conjugate base (A). pH = pKa + log([A]/[HA]). Buffers resist pH change.

Questions

1. Buffer main purpose?

A) conduct electricity
B) resist pH change
C) increase solubility
D) speed up reaction

2. Best buffer pH range?

A) pKa 1
B) pKa 5
C) any pH
D) pKa only

3. Add small amount of HCl to buffer ?

A) H + A HA
B) pH drops drastically
C) buffer destroyed
D) no change

4. Buffer with [HA] = 10 [A], pKa = 5. pH = ?

A) 4
B) 5
C) 6
D) undefined

5. An acetate buffer contains 0.1 M CHCOOH and 0.1 M CHCOO. Ka = 1.8 10. Find pH.

6. Same buffer. Add 0.01 M HCl. What happens to [A]?

7. Phosphate buffer at pH 7.4 (biologically important). If pKa = 7.21, find [HPO]/[HPO].

8. Define: What is a buffer?

9. Define: Buffer components?

10. Define: Henderson-Hasselbalch equation?

Answer Key

1. B) resist pH change - Buffers are designed to resist pH change when acid/base is added.
2. A) pKa 1 - Buffers work best within 1 of pKa (sufficient both species present).
3. A) H + A HA - Conjugate base absorbs H pH resists large change.
4. A) 4 - pH = 5 + log(0.1) = 5 1 = 4.
5. pH = pKa + log([A]/[HA]) pKa = log(1.8 10) = 4.74 log(0.1/0.1) = log(1) = 0 pH = 4.74 + 0 = 4.74
6. H + A HA (OH from HCl consumed) [A] decreases slightly; [HA] increases slightly Buffer capacity resists large pH change
7. pH = pKa + log([A]/[HA]) 7.4 = 7.21 + log(ratio) log(ratio) = 0.19, ratio = 10^0.19 1.55 [HPO]/[HPO] 1.55
8. A solution of weak acid + conjugate base (or weak base + conjugate acid) that resists pH change.
9. Weak acid (HA) and its conjugate base (A), usually in 1:1 or 10:1 ratio.
10. pH = pKa + log([A]/[HA]). Used to calculate buffer pH.