

### Question #70873, Chemistry / General Chemistry

Calculate the pH of a Tris-buffer. 435.96 mg of Tris and 3.0 mL of 1 M HCl are dissolved and diluted to 100 mL with water.

The mw of Tris = 121.1 g/mol and has a pKa = 8.3

#### Answer:

According to Henderson–Hasselbalch equation pH of buffer can be calculated as:

$$pH = pK_a + \log \frac{[A^-]}{[HA]}$$

[HA] – acidic form concentration

[A<sup>-</sup>] – conjugate base form concentration

Starting moles of Tris:

$$n(\text{Tris}) = \frac{0.43596 \text{ g}}{121.1 \frac{\text{g}}{\text{mol}}} = 0.0036 \text{ mol}$$

Starting moles of HCl:

$$n(\text{HCl}) = 1 \frac{\text{mol}}{\text{L}} \times 0.003 \text{ L} = 0.003 \text{ mol}$$

Normally, Tris is a base, reaction with HCl gives HTris – conjugate acid (n(HTris)=n(HCl)):

$$[\text{HA}] = \frac{0.003 \text{ mol}}{0.1 \text{ L}} = 0.03 \frac{\text{mol}}{\text{L}}$$

Remaining Tris represents base:

$$[A^-] = \frac{0.0036 \text{ mol} - 0.003 \text{ mol}}{0.1 \text{ L}} = 0.006 \frac{\text{mol}}{\text{L}}$$

Thus:

$$pH = 8.3 + \log \frac{0.006 \frac{\text{mol}}{\text{L}}}{0.03 \frac{\text{mol}}{\text{L}}} = 8.3 - 0.7 = \mathbf{7.6}$$

Answer provided by <https://www.AssignmentExpert.com>