

# How do I prepare a phosphate buffer solution with a specific pH?

I am a science fair student at Shaker Heights Middle School. I need to make a phosphate buffer solution for my experiment. I am testing the effects of growth hormones on green plant life, and the buffer is to be absorbed by a sponge to aid the hormones in working. I would appreciate any assistance that you can give me. The solution needs to be a .001 M phosphate buffer with a pH of 6.1.

B. Peterson 1/13/98

Recipes for preparing phosphate buffer solutions can be found in many texts and handbooks. For example, the CRC Handbook of Chemistry and Physics recommends preparing a pH 6.10 buffer by adding 6.8 mL of 0.1 M NaOH to 50 mL of 0.1 M  $\text{KH}_2\text{PO}_4$ . You can then dilute the buffer 1:100 for your needs.

Here is an abbreviated phosphate buffer table taken from Clark's *Determination of Hydrogen Ions*:

Clark and Lubs standard buffer solutions. Add the indicated number of mL of 0.2 M NaOH to 50 mL of 0.2 M  $\text{KH}_2\text{PO}_4$ , and dilute to 200 mL. Taken from *Determination of Hydrogen Ions*, William and Wilkins, Baltimore, 1928.

pH	mL NaOH	pH	mL NaOH
5.8	3.72	7.0	29.63
6.0	5.70	7.2	35.00
6.2	8.60	7.4	39.50
6.4	12.60	7.6	42.80
6.6	17.80	7.8	45.20
6.8	23.65	8.0	46.80

**Be sure you're using the correct phosphate.** There are several potassium phosphates which can NOT be used interchangeably in buffer solutions! You want  $\text{KH}_2\text{PO}_4$ .

Formula	Systematic name	Other names
$\text{KH}_2\text{PO}_4$	potassium dihydrogen phosphate	acid potassium phosphate monobasic potassium phosphate monopotassium phosphate potassium biphosphate
$\text{K}_2\text{HPO}_4$	potassium hydrogen phosphate	dipotassium phosphate dibasic potassium phosphate
$\text{K}_3\text{PO}_4$	potassium phosphate	tripotassium phosphate tribasic potassium phosphate

If you can't find such a recipe, follow this procedure:

1. **Use the Henderson-Hasselbalch equation** to compute the ratio of the base form to acid form at the desired pH. The Henderson-Hasselbalch equation is

# Phosphate Buffer Solution Preparation

**Ensheng Dong**



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