

Chemistry 116 General Chemistry
Practice Problems for Buffers

Acid	pK _a	Base	pK _b
phosphoric	2.12	triethylamine	2.99
pyruvic	2.49	ethylamine	3.19
lactic	3.86	dimethylamine	3.27
benzoic	4.19	methylamine	3.44
acetic	4.75	trimethylamine	4.19
carbonic	6.37	ammonia	4.75
dihydrogen phosphate	7.21	TRIS	5.92
hydrogen carbonate	10.3	pyridine	8.75
hydrogen phosphate	12.7	aniline	9.37

- 1) Calculate the pH of each of the mixed solutions (buffers) containing a weak acid (or base) and the salt of its conjugate.
- 0.50 M acetic acid and 0.25 M sodium acetate.
 - 0.0120 M ethylammonium chloride and 0.0360 M ethylamine.
 - 0.20 M sodium dihydrogen phosphate and 0.05 M potassium monohydrogen phosphate
 - 0.10 M TRIS·HCl and 0.60 M TRIS.
- 2) Select a conjugate acid/base pair to use for each of these buffer solutions and give the concentrations of the base and acid in the buffer.
- Prepare a 0.100 M buffer at pH 5.0
 - Prepare a 0.100 M buffer at pH 10.0

Answers

- 1) a) 4.4 b) 11.3 c) 6.6 d) 8.9

- 2) a) Two good choices for the buffer: acetic acid/acetate pK_a = 4.75
or: pyridineH⁺/pyridine pK_a = 5.25

for acetic acid, %base = 64%; %acid = 36%; [base] = 0.064 M; [acid] = 0.036 M
for pyridine, %base = 36%; %acid = 64%; [base] = 0.036 M; [acid] = 0.064 M

- b) Two good choices here too: hydrogen carbonate/carbonate pK_a = 10.3
trimethylamineH⁺/trimethylamine pK_a = 9.81

for carbonate, %base = 33%; %acid = 67%; [base] = 0.033 M; [acid] = 0.067 M
for trimethylamine, %base = 61%; %acid = 39%; [base] = 0.061 M; [acid] = 0.039 M