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.

   a) 0.50 M acetic acid and 0.25 M sodium acetate.
   b) 0.0120 M ethylaminium chloride and 0.0360 M ethylamine.
   c) 0.20 M sodium dihydrogen phosphate and 0.05 M potassium monohydrogen phosphate
   d) 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.
   a) Prepare a 0.100 M buffer at pH 5.0
   b) 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:  pyridine$H^+/pyridine$  $pK_a = 5.25$

     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  $pK_a = 10.3$
      trimethylamine$H^+/trimethylamine$  $pK_a = 9.81$

     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