Practice quiz 4. My spring break gift to the class.

(Questions below are exactly the same in concept and structure to the real quiz 4 on Thursday. The numbers and compounds have been change to satisfy those interested in academic integrity.) If you get the calculations on your first pass at this, you are good. Expect to say, "oops, I forgot to do that, a bunch."

Question 1: Identifying a buffer

Which of the following mixtures will be a buffer when dissolved in a liter of water?
1. 0.2 mol $Ba(OH)_2$ and 0.3 mol $HClO_2$
2. 0.2 mol KNO_3 and 0.2 mol $HClO_3$
3. 0.4 mol NH_4Cl and 0.4 mol NaOH
4. 0.2 mol HClO3 and 0.1 mol LiOH
5. 0.4 mol HCOOH and 0.2 mol NaOH **correct**

Question 2. Ranking acid/base strength from K values.
Which of the following is the WEAKEST acid?

1. Acid 1 ($pK_a = 5.2$)
2. Acid 2 ($pK_a = 1.9$)
3. Acid 3 ($pK_a = 7.3$)
4. Acid 4 ($pK_a = 9.6$) **correct**

Question 3. Your first of many pH approximation questions to come

Estimate the pH of 10^{-9} M NaOH (aq).
1. 7.01 **correct**
2. 7.5
3. 6.99
4. 9
5. 5

Question 4. The dreaded buffer neutralization problem. An easy version.
A solution is initially 0.0500 M in CH_3COOH and 0.0300 M in $NaCH_3COO$. $K_a = 1 \times 10^{-5}$. What is the pH after the addition of 0.0050 mol of $HClO_3$ to 1.00 L of this solution?
Assume no volume change.

1. 2.2×10^{-5}
2. 4.66 **correct**
3. 4.77
4. 4.74

Question 5. Equilibrium expressions for polyprotic acids.

Which equation represents K_{a2} for carbonic acid?
1. $H_2CO3 \rightarrow H^+ + HCO_3^-$
2. $H_2CO3 \rightarrow 2H^+ + CO_3^{=}$
3. $HCO_3^- \rightarrow H^+ + CO_3^{=}$ **correct**
4. $CO_3^{=} \rightarrow H^+ + HCO_3^-$

Question 6. Features of a titration curve.

The pKa of a monoprotic weak acid or base can be identified on a titration curve:
(hint, draw the titration curve of a weak acid or base titrated with strong acid or base and label the important parts):

1. From the pH of the weak acid or base when $V_{titrated}$ = equivalence point
2. From the pH of the weak acid or base when $V_{titrated}$ = endpoint
3. From the pH of the weak acid or base when $V_{titrated}$ = 0 ml
4. From the pH of the weak acid or base when $V_{titrated}$ = half the $V_{titrated}$ of the equivalence point **correct**
5. From the pH of the weak acid or base when $V_{titrated}$ = half the $V_{titrated}$ of the equivalence point plus two-thirds the square root of egg shells (a response to prove that the right answer isn't always the longest one.).

Question 7. Strong acid/base titration

Calculate the pOH of the solution resulting from the addition of 50.0 mL of 0.200 M $HClO_3$ to 10.0 mL of 0.20 M LiOH.

1. 0.1333
2. 0.87
3. 13.13 **correct**
4. 7

Question 8. Weak acid or base titrated with strong acid or base.

What would be the OH- if 0.020 moles of solid LiOH were added to 100 mL of 0.200 M $HClO_2$ solution? Assume the volume of the solution does not change when the solid is added. The Ka = 1×10^{-5}.

1. 1.4×10^{-5} **correct**
2. 4.8
3. 7.1×10^{-10}
4. 9.2