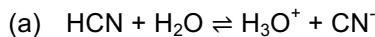


AP WORKSHEET 08CDEGHIJ: ANSWERS

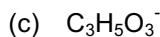
1.



Pair 1: HCN acid, CN^- base

Pair 2: H_3O^+ acid, H_2O base

(b) Lactic acid. It has a larger K_a , indicating that the degree of dissociation (formation of products) is greater.



2.

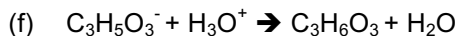
(a) 2.43

(b) 3.38

(c) 8.28

(d) 3.86

(e) 12.05



3. A 'good' buffer has the ability to absorb acid AND base, and so has significant (and similar) amounts of each buffer component. Since the pH of the buffer solution can be determined using the

Henderson-Hasselbalch equation, $\text{pH} = \text{pK}_a + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$, when $[\text{salt}] \approx [\text{acid}]$, then $\log \left(\frac{[\text{salt}]}{[\text{acid}]} \right) \approx 0$

and pH of the buffer $\approx \text{pK}_a$.

4. $[\text{salt}] > [\text{acid}]$. Considering the Henderson-Hasselbalch equation, $\text{pH} = \text{pKa} + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$, so when $[\text{salt}] > [\text{acid}]$, then $\log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$ is a positive number and therefore pH of the buffer $> \text{pKa}$.
5. $[\text{salt}] < [\text{acid}]$. Considering the Henderson-Hasselbalch equation, $\text{pH} = \text{pKa} + \log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$, so when $[\text{salt}] < [\text{acid}]$, then $\log \left(\frac{[\text{salt}]}{[\text{acid}]} \right)$ is a negative number and therefore pH of the buffer $< \text{pKa}$.

