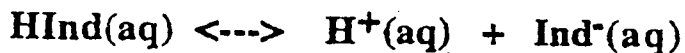


Hydrolysis / Chemical Indicators: Practice Problems.

1. Which of the following substances is a salt that produces a basic aqueous solution?
- a. KBr
 - b. NH₃
 - c. NH₄Cl
 - d. Na₃PO₄

2. An indicator, HInd, is found to establish the following equilibrium:



When the indicator was added to solutions of various pH values, the following data were collected:

pH	2	4	6	8	10	12
colour	yellow	yellow	yellow	yellow	green	blue

At pH 10,

- a. $[\text{H}^+] = K_a$
 - b. $[\text{H}^+] = \text{pH}$
 - c. $[\text{H}^+] = [\text{Ind}^-]$
 - d. $[\text{H}^+] = [\text{HInd}]$
3. Which of the following will have the greatest $[\text{H}_3\text{O}^+]$?
- a. 0.10 M NaF
 - b. 0.10 M NaIO₃
 - c. 0.10 M Na₂SO₃
 - d. 0.10 M NaCH₃COO

4. A solution of unknown pH is tested with various indicators resulting in the following data:

Indicator	Colour
methyl violet	blue
bromcresol green	blue
methyl red	yellow
bromthymol blue	yellow
phenolphthalein	colourless

From the above data, the pH of the solution is approximately

- a. 1.6
b. 5.4
c. 6.0
d. 8.2
5. Consider the following data:

Indicator	Color of Acid form	Color of Base form	K_a value
'A'	red	yellow	1.0×10^{-3}
'B'	yellow	blue	1.0×10^{-9}

- At a pH of 7.0, the predominant color of
- a. indicator 'A' and indicator 'B' will both be yellow.
b. indicator 'A' will be red and indicator 'B' will be yellow.
c. indicator 'A' will be yellow and indicator 'B' will be blue.
d. indicator 'A' will be orange and indicator 'B' will be green.
6. The approximate K_a value for the indicator thymolphthalein is
- a. 1×10^{-10}
b. 1×10^{-4}
c. 4
d. 10

7. The value of K_b for HSO_3^- is ⁻¹³
- (a) ~~6.7×10^{-13}~~ 6.7×10^{-10}
- b. 6.2×10^{-8}
- c. 1.6×10^{-7}
- d. 1.7×10^{-2}

8. Two indicators were added to separate samples of a solution, giving the following results:

Indicator	Colour
Chlorophenol red	Red
Thymol blue	Yellow

The pH of the solution is approximately

- a. 3
- b. 5
- (c) 7
- d. 10
9. Find the pOH and pH of the following solutions.
- a. 0.50 M KCN $\text{pOH} = 2.50$ $\text{pH} = 11.50$
- b. 1.0 M Na_2CO_3 $\text{pOH} = 1.87$ $\text{pH} = 12.13$
- c. 0.05 M $\text{NaC}_6\text{H}_5\text{COO}$ (sodium benzoate) $\text{pOH} = 5.56$ $\text{pH} = 8.44$
- d. 0.2 M AlCl_3 $\text{pOH} = 11.22$ $\text{pH} = 2.78$
10. When a 0.1 M solution of NH_3 is titrated against a 0.1 M solution of HCl , the endpoint is reached at pH 5.1. Which indicator would be best to use in the titration of NH_3 with HCl ?
methyl red or bromocresol green
11. Calculate the $[\text{OH}^-]$ midway through the colour change (or transition point) for the indicator indigo carmine.
 $[\text{OH}^-] = 0.016 \text{ M} = 0.02 \text{ M}$
12. When the amphiprotic anion, HPO_4^{2-} , is added to water, does it act as an acid or as a base? Support your answer with calculations.
 $K_a = 2.2 \times 10^{-13}$
 $K_b = \frac{1.0 \times 10^{-14}}{6.2 \times 10^{-8}} = 1.6 \times 10^{-7}$ \therefore basic
13. A 0.60 M base solution, $\text{NaX}(\text{aq})$ is found to have a $[\text{OH}^-]$ of 0.12 M. Determine the K_b for the base.
 $K_b = \frac{[\text{HX}][\text{OH}^-]}{[\text{X}^-]} = \frac{(0.12)(0.12)}{(0.60 - 0.12)} = 3.0 \times 10^{-2}$
14. Discuss, in terms of hydrolysis, the use of sodium acetate to produce the vinegar flavour on some potato chips.

