

This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

What is the pH of a solution containing 50 mL of 0.5 M HNO_3 and 150 mL of 0.1 M NaOH ?

1. 2.00
2. 1.30
3. 0.70
4. 7.00
5. 0.30

002 10.0 points

According to the Bronsted-Lowry definition, a base is

1. a substance that increases the anion formed by the autoionization of the solvent.
2. None of these
3. a substance that can donate an electron pair to the formation of a covalent bond.
4. a substance that can accept a proton from an acid.
5. a substance that increases the hydroxide ion concentration in water.

003 10.0 points

According to Lewis theory, an acid is

1. any compound that can donate an electron pair.
2. any compound that can accept a share of an electron pair.
3. any compound that can accept a proton.
4. any compound containing hydrogen.

5. any compound that can donate a proton.

004 10.0 points

Which of the following would be expected to act as a Lewis acid?

1. BF_3
2. OH^-
3. H_3O^+
4. NH_4^+
5. NH_3

005 10.0 points

Which acid has the strongest conjugate base?

1. HCl
2. HClO_2
3. HClO_4
4. HClO_3
5. HClO

006 10.0 points

You have a weak molecular base with $K_b = 6.6 \times 10^{-9}$. What is the pH of a 0.0500 M solution of this weak base?

1. pH = 9.26
2. pH = 3.63
3. pH = 7.12
4. None of these
5. pH = 4.74

007 10.0 points

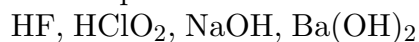
A solution of 0.2 M boric acid is prepared as an eye wash. What is the approximate pH of

this solution? For boric acid $K_a = 7.2 \times 10^{-10}$.

1. pH = 5
2. pH = 7
3. pH = 3
4. pH = 4
5. pH = 6

008 10.0 points

Of the four compounds



which are either strong acids or strong bases in water?

1. All are either strong acids or strong bases.
2. NaOH
3. None are strong acids nor strong bases.
4. HClO₂ and NaOH
5. NaOH and Ba(OH)₂

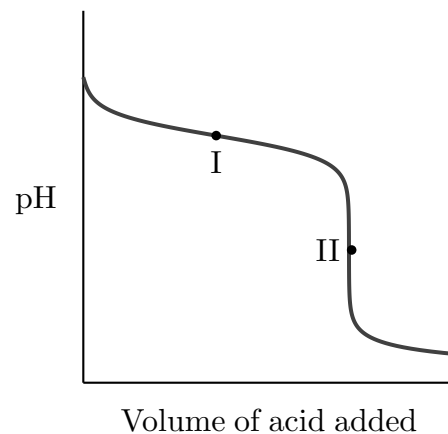
009 10.0 points

What is the pH of a solution containing 0.3 M NH₄Cl and 0.6 M NH₃? The pK_a of the ammonium ion is 9.25.

1. 9.55
2. 8.95
3. 12.25
4. 5.05
5. 4.45

010 10.0 points

Consider the titration curve of a weak base with a strong acid



The pOH at point I is equal to the ___ and the pH at point II is ___ pH 7.

1. pK_b of the base, less than
2. pH of the base, less than
3. pK_b of the base, equal to
4. pK_b of the base, greater than
5. pH of the base, greater than

011 10.0 points

Which equation represents K_{a2} for phosphoric acid?

1. $\text{HPO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{PO}_4^{3-}(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$
2. $\text{H}_2\text{PO}_4^-(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{HPO}_4^{2-}(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$
3. $\text{H}_3\text{PO}_4(\text{aq}) + 2\text{H}_2\text{O}(\ell) \rightarrow \text{HPO}_4^{2-}(\text{aq}) + 2\text{H}_3\text{O}^+(\text{aq})$
4. $\text{H}_3\text{PO}_4(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{PO}_4^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$
5. $\text{HPO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{PO}_4^-(\text{aq}) + \text{OH}^-(\text{aq})$

012 10.0 points

The pH of 0.010 M H₃PO₄(aq) is 2.24. Estimate the concentration of HPO₄²⁻ in the solution. For H₃PO₄, the values of K_{a1} , K_{a2} , and

K_{a3} are 7.6×10^{-3} , 6.2×10^{-8} , and 2.1×10^{-13} , respectively.

2. 7.5

1. 6.2×10^{-8} M

3. 9

2. 5.8×10^{-3} M

4. 9.3

3. 2.1×10^{-13} M

4. 0.010 M

5. 7.6×10^{-3} M

013 10.0 points

List the bases

CN^- , $(\text{C}_2\text{H}_5)_3\text{N}$, N_2H_4 , BrO^-
in order of decreasing strength, if

Base	$\text{p}K_{\text{b}}$	Acid	$\text{p}K_{\text{a}}$
$(\text{C}_2\text{H}_5)_3\text{N}$	2.99	HBrO	8.69
N_2H_4	5.77	HCN	9.31

1. CN^- , N_2H_4 , BrO^- , $(\text{C}_2\text{H}_5)_3\text{N}$

2. $(\text{C}_2\text{H}_5)_3\text{N}$, BrO^- , N_2H_4 , CN^-

3. N_2H_4 , BrO^- , CN^- , $(\text{C}_2\text{H}_5)_3\text{N}$

4. $(\text{C}_2\text{H}_5)_3\text{N}$, CN^- , BrO^- , N_2H_4

5. $(\text{C}_2\text{H}_5)_3\text{N}$, BrO^- , CN^- , N_2H_4

6. BrO^- , $(\text{C}_2\text{H}_5)_3\text{N}$, N_2H_4 , CN^-

7. None of these

8. CN^- , N_2H_4 , $(\text{C}_2\text{H}_5)_3\text{N}$, BrO^-

9. N_2H_4 , CN^- , BrO^- , $(\text{C}_2\text{H}_5)_3\text{N}$

014 10.0 points

What would be the pH of a solution prepared from 2 L of 0.05 M HClO and 1 L of 3.16 M NaClO? The K_{a} of chlorous acid is 3.16×10^{-8} .

1. 6