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

Which K_a value(s) would you use when calculating the pH of a system involving Li_2HPO_4 and Li_3PO_4?

1. K_{a2}, K_{a3}

2. K_{a1}

3. K_{a2}

4. K_{a3}

5. K_{a1}, K_{a2}

002 10.0 points

One difference between a Lewis base and an Arrhenius base is

1. a Lewis base is a proton acceptor and an Arrhenius base produces hydroxide ions in solution.

2. a Lewis base is an electron pair acceptor and an Arrhenius base is a proton acceptor.

3. a Lewis base is an electron pair donor and an Arrhenius base is a proton acceptor.

4. a Lewis base is an electron pair acceptor and an Arrhenius base is a proton donor.

5. a Lewis base is an electron pair donor and an Arrhenius base produces hydroxide ions in solution.

003 10.0 points

Which of the acids

I. $HBrO_3$ II. $GaCl_3$ III. HSO_4^-

IV. AlF_3

are classified as Lewis acids but are not Bronsted-Lowry acids?

1. I and II

2. II and IV

3. None of these

4. II and III

5. I and IV

004 10.0 points

Listed in order of increasing acid strength, which pair is incorrect?

1. $HNO_3 < HNO_2$

2. $H_3AsO_4 < H_3PO_4$

3. $HF < HCl$

4. $H_3As < H_2Se$

5. $HClO < HClO_2$

005 10.0 points

Which one of the following pairs of acids and their conjugate bases is INCORRECTLY matched?

1. $H_2O : OH^-$

2. $H_3O^+ : H_2O$

3. $HClO : ClO^-$

4. $NH_4^+ : NH_2^-$

5. $HF : F^-$

006 10.0 points

A 0.0001 M solution of HCl has a pH of

1. 11.

2. 10.

3. 3.

4. 4.

007 10.0 points

Arrange the acids
I) phosphorous acid (H_3PO_3), $pK_{a1} = 2.00$;
II) hydrogen selenate ion ($HSeO_4^-$), $pK_a = 1.92$;
III) phosphoric acid (H_3PO_4), $pK_a = 2.12$;
IV) selenous acid (H_2SeO_3), $pK_a = 2.46$;
in *increasing* order of strengths.

1. Cannot be determined

2. II, I, III, IV

3. None of these

4. III, I, IV, II

5. II, IV, I, III

6. IV, I, III, II

7. II, III, IV, I

8. IV, III, I, II

9. I, IV, III, II

10. II, III, I, IV

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008 10.0 points

Which of
I) HCl II) HF III) LiOH
IV) $HClO_2$ V) HNO_3
are strong acids or strong bases in water?

1. All of the compounds

2. I, III, and V only

3. I, II, IV, and V only

4. I, III, IV, and V only

5. I, II, III, and V only

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009 10.0 points

Assume that five weak acids, identified only by numbers (1, 2, 3, 4 and 5), have the following ionization constants.

Acid	Ionization Constant K_a value
1	1.0×10^{-3}
2	3.0×10^{-5}
3	2.6×10^{-7}
4	4.0×10^{-9}
5	7.3×10^{-11}

The anion of which acid is the weakest base?

1. 3

2. 5

3. 2

4. 4

5. 1

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010 10.0 points

What is the pH of 2×10^{-9} M $Ba(OH)_2$?

1. 8.40

2. 8.70

3. 7.02

4. 5.60

5. 5.30

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011 10.0 points

For a solution labeled "0.10 M H_2SO_4(aq),"

1. $[HSO_4^-]$ is greater than 0.10 M.

2. the pH is less than 1.0.

3. $[SO_4^{2-}] = 0.10$ M.

4. the pH equals 1.0.

5. the pH is greater than 1.0.

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012 10.0 points

Estimate the pH of 0.10 M Na_2HPO_4(aq) given $pK_{a1} = 2.12$, $pK_{a2} = 7.21$, and $pK_{a3} = 12.68$ for phosphoric acid.

1. 4.67

2. 7.40

3. 9.94

4. 2.12

5. 12.68

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013 10.0 points

Consider the titration of equal volumes of 0.1 M HCl and 0.1 M $HC_2H_3O_2$ with 0.1 M NaOH. Which of the following would be the same for both titrations?

1. the volume of NaOH added to reach the equivalence point

2. the pH at the halfway point

3. the pH at the equivalence point

4. the initial pH

5. Two of the other answers are correct.

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014 10.0 points

What would be the pH of a solution of hypobromous acid (HOBr) prepared by dissolving 9.7 grams of the acid in 20 mL of pure water (H_2O)? The Ka of hypobromous acid is 2×10^{-9}

1. 13

2. 1

3. 10

4. 4

5. 6