Periodic Table of the Elements

1A (1)												3A (13)	4A (14)	5A (15)	6A (16)	7A (17)	8A (18)
1 H 1.0079	2A (2)																2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797
11 Na 22.9898	12 Mg 24.3050	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	8	8B (9)	10	1B (11)	2B (12)	13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.39
55 Cs 132.9054	56 Ba 137.327	57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.9665	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)									

58 Ce 140.115	59 Pr 140.9076	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9253	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Msci 18 0340

18:01, general, multiple choice, > 1 min, fixed.

001

What is $[OH^-]$ in a 0.0050 M HCl solution?

1. 5.0×10^{-3} M

2. 1.0 M

3. 1.0×10^{-7} M

4. 6.6×10^{-5} M

5. 2.0×10^{-12} M **correct**

Explanation:

$[OH^-] = 0.0050$ M

Since HCl is a strong acid, it completely dissociates and H^+ is 0.0050 M.

$$HCl \rightleftharpoons H^+ + Cl^-$$

$$K_w = [H^+][OH^-] = 1 \times 10^{-14}$$

$$[OH^-] = \frac{K_w}{[H^+]} = \frac{1 \times 10^{-14}}{0.0050} = 2 \times 10^{-12} \text{ M}$$

Msci 18 0401

18:01, general, multiple choice, > 1 min, fixed.

002

Hydroxylamine is a weak molecular base with $K_b = 6.6 \times 10^{-9}$.

What is the pH of a 0.0500 M solution of hydroxylamine?

1. pH = 3.63

2. pH = 4.74

3. pH = 7.12

4. pH = 9.26 **correct**

5. pH = 10.37

6. pH = 9.48

7. pH = 8.93

Explanation:

Hydroxylamine is a weak base, so use the equation to calculate weak base $[OH^-]$ concentration (note that this is the approximate equation. Why? Because K_b is very small and the concentration is reasonable) :

$$[OH^-] = \sqrt{K_b C_b} = \sqrt{(6.6 \times 10^{-9})(0.0500)} = 1.82 \times 10^{-5}$$

After finding $[OH^-]$, you can find pH using either method below:

A)

$$pOH = -\log\left(1.82 \times 10^{-5}\right) = 4.74$$

$$pH = 14 - 4.74 = 9.26$$

or B)

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{1.0 \times 10^{-14}}{1.82 \times 10^{-5}} = 5.52 \times 10^{-10}$$

$$pH = -\log\left(5.52 \times 10^{-10}\right) = 9.26$$

Acid Strength 10 36b

18:01, basic, multiple choice, > 1 min, wording-variable.

003

Which acid is weaker?

1. HBrO **correct**

2. $HBrO_3$

3. They have the same strength.

Explanation:

$HBrO_3$ is stronger; there are more O atoms attached to the central atom in $HBrO_3$, making the H — O bond in $HBrO_3$ more polar (and thus more easily broken) than in HBrO.

Msci 10 0318

11:04, general, multiple choice, > 1 min, fixed.

004

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

1. OH^-

2. NH_3

3. H_3O^+

4. NH_4^+

5. BF_3 **correct**

Explanation:
A Lewis acid will have an electron poor region and be able to accept an electron pair. In BF_3 the boron atom is sharing only 6 electrons and therefore would be able to accept an electron pair.

ChemPrin3e T10 05
18:99, basic, multiple choice, < 1 min, fixed.
005
What is the conjugate base of ammonia?

1. NH_2OH

2. NH_2^- **correct**

3. NH_4^+

4. NH_3

5. OH^-

Explanation:

Msci 18 0716
18:08, general, multiple choice, > 1 min, fixed.
006
All components are present in 0.10 M concentrations.

I) HCN and NaCN
II) NH_3 and NH_4Cl
III) HNO_3 and NH_4NO_3
IV) $HClO_3$ and $NaClO_3$

Which will give buffer solutions?

1. I, III and IV only

2. I and II only **correct**

3. II, III and IV only

4. III and IV only

5. I and III only

Explanation:
Buffers are formed in one of two ways, by combining a weak acid and its conjugate base or by combining a weak base and its conjugate acid.

HNO_3 and $HClO_3$ are both strong acids and cannot be used to make effective buffer solutions.

HCN is a weak acid and NaCN is the salt of its conjugate base, CN^-. NH_3 is a weak base and NH_4Cl is the salt of its conjugate acid, NH_4^+. Therefore 1 and 2 can be used to make effective buffer solutions.

Msci 46 0014
19:01, general, multiple choice, > 1 min, fixed.
007
What is the molar solubility of CaF_2? ($K_{sp} = 3.9 \times 10^{-11}$.)

1. 6.2×10^{-6}

2. 3.4×10^{-4}

3. 2.1×10^{-4} **correct**

4. 3.9×10^{-11}

5. 4.4×10^{-6}

Explanation:

$$CaF_2 \rightleftharpoons Ca^{2+} + 2\,F^-$$

$$\begin{aligned} K_{sp} &= [Ca^{2+}]\,[F^-]^2 \\ 3.9 \times 10^{-11} &= (x)\,(2x)^2 \\ &= 4\,x^3 \\ x &= 2.1 \times 10^{-4} \end{aligned}$$

ChemPrin3e T11 04

18:08, basic, multiple choice, < 1 min, fixed.

008

What is the pH of an aqueous solution that is 0.10 M HCOOH ($K_a = 1.8 \times 10^{-4}$) and 0.10 M $NaHCO_2$?

1. 10.26

2. 3.74 **correct**

3. 5.74

4. 2.38

5. 5.62

Explanation: