

The Periodic Table

<i>IA</i> H 1 1.01																	<i>VIIIA</i> He 2 4.00		
<i>IIA</i> Li 3 6.94	<i>IIA</i> Be 4 9.01											<i>IIIA</i> B 5 10.81	<i>IVA</i> C 6 12.01	<i>VA</i> N 7 14.01	<i>VIA</i> O 8 16.00	<i>VIIA</i> F 9 19.00	<i>VIIA</i> Ne 10 20.18		
Na 11 22.99	Mg 12 24.31			<i>IIIB</i>	<i>IVB</i>	<i>VB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>IB</i>	<i>IIB</i>	Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95
K 19 39.10	Ca 20 40.08	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80		
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.91	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29		
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)		
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 (263)	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)											

Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11

Solubility Guidelines:

Soluble Ionic Compounds	
1.	All sodium, potassium and ammonium salts are soluble.
2.	All nitrate, acetate, chlorate and perchlorate salts are soluble
3.	All chloride, bromide and iodide salts are soluble. Except those that contain: lead, silver or mercury(I) (Hg_2^{2+}).
4.	All fluoride salts are soluble. Except those that contain: magnesium, calcium, strontium, barium or lead.
5.	All sulfate salts are soluble. Except those that contain: calcium, silver, mercury(I), strontium, barium or lead.
Not Soluble Ionic Compounds	
1.	All hydroxide and oxide salts are not soluble. Except those that contain: sodium, potassium or barium.
2.	All sulfide salts are not soluble. Except those that contain: sodium, potassium ammonium or barium.
3.	All carbonate and phosphate salts are not soluble. Except those that contain: sodium, potassium or ammonium.

Some Information For Your Use:

Formula:

$$[H^+][OH^-] = 1 \times 10^{-14} \text{ at } 25^\circ C$$

$$[H^+] = [Acid]_{initial}$$

$$[H^+] = \{K_a[Acid]_{initial}\}^{\frac{1}{2}}$$

$$[H^+] = K_a\{[Acid]/[Base]\}$$

$$pH = -\log_{10}[H^+]$$

$$pH + pOH = 14 \text{ at } 25^\circ C$$

K_a Values For Some Weak Acids at $25^\circ C$:

HF	7.2×10^{-4}
HCN	4.0×10^{-10}
HNO ₂	4.5×10^{-4}
HClO	3.5×10^{-8}



Question 1 Are the following salts expected to be soluble or insoluble in water?

12 Points

1. FeF_3	Soluble	Insoluble	4. $\text{Ba}(\text{NO}_3)_2$	Soluble	Insoluble
2. Na_3PO_4	Soluble	Insoluble	5. FeCO_3	Soluble	Insoluble
3. NH_4OH	Soluble	Insoluble	6. BaS	Soluble	Insoluble

Question 2 Classify each of the following substances:

12 Points

1. HF	_____	A) Strong Acid
2. NaI	_____	B) Weak Acid
3. NH_3	_____	C) Strong Base
4. HCl	_____	D) Weak Base
5. NaOH	_____	E) Soluble Salt
6. $\text{Cr}_3(\text{PO}_4)_2$	_____	F) Insoluble Salt

Question 3 1. The formula for the conjugate base of HCN: _____

6 Points

2. The formula for the conjugate acid of CO_3^{2-} : _____

Question 4 The $[\text{H}^+]$ in an aqueous solution is found to be $5.43 \times 10^{-2} \text{M}$.

8 Points

1. The pH of this solution is: _____

2. The $[\text{OH}^-]$ of this solution is: _____

3. The pOH of this solution is: _____

4. The solution is (circle one) Basic Acidic Neutral

Question 5 What is the expected pH of an aqueous solution of 0.302M hydrocyanic acid (HCN) at 25°C ?

6 Points

pH: _____

Question 6 How would the pH of a 0.302M aqueous hydrochloric acid solution compare to the 0.302M aqueous HCN solution at the same temperature.
4 Points

1. $\text{pH HCl(aq)} > \text{pH HCN(aq)}$ _____
2. $\text{pH HCl(aq)} < \text{pH HCN(aq)}$ _____
3. $\text{pH HCl(aq)} = \text{pH HCN(aq)}$ _____

Question 7 Give the net ionic equation for the following reactions:
6 Points

1. $\text{NaOH(aq)} + \text{HNO}_2\text{(aq)}$ _____
2. $\text{NH}_3\text{(aq)} + \text{HCl(aq)}$ _____
3. $\text{HI(aq)} + \text{LiOH(aq)}$ _____

Question 8 A 1L buffer solution contains 0.112M KF and 0.396M HF. Calculate the expected pH of this solution?
6 Points

pH: _____

Question 9 The addition of 0.012 moles of HBr to the buffer described in question 8 would result in:
14 Points

- | | | | |
|---|-------------|----------|-----------|
| 1. pH | Increase | Decrease | No Change |
| 2. $[\text{H}_3\text{O}^+]$ | Increase | Decrease | No Change |
| 3. $[\text{OH}^-]$ | Increase | Decrease | No Change |
| 4. $[\text{F}^-]$ | Increase | Decrease | No Change |
| 5. $[\text{HF}]$ | Increase | Decrease | No Change |
| 6. $[\text{HF}]/[\text{F}^-]$ | Increase | Decrease | No Change |
| 7. The maximum amount of NaOH that this buffer could withstand? | _____ moles | | |

Question 10 The reaction $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ has a $K_c = 55.6$ and a $\Delta H^\circ = -10 \text{ kJ/mol}$ at 696K .
10 Points The production of $\text{HI}(\text{g})$ is favor by:

- | | | |
|--|------|-------|
| 1. Decreasing the temperature. | True | False |
| 2. Increasing the pressure by changing the volume. | True | False |
| 3. Decreasing the volume. | True | False |
| 4. Adding Br_2 | True | False |
| 5. Removing NOBr | True | False |

Question 11 An aqueous solution of **potassium hydroxide** is standardized by titration with a **0.369 M** solution of **hydrobromic acid**.
8 Points If **30.5 mL** of base are required to neutralize **13.4 mL** of the acid, what is the molarity of the **potassium hydroxide** solution?

_____M

Question 12 How many grams of solid **calcium hydroxide** are needed to exactly neutralize **27.6 mL** of a **1.68 M** **hydrochloric acid** solution? Assume that the volume remains constant.
8 Points

_____g