

The Periodic Table

<i>IA</i> H 1 1.01																	<i>VIIIA</i> He 2 4.00	
<i>IIA</i> Li 3 6.94	Be 4 9.01											<i>IIIA</i> B 5 10.81	<i>IVA</i> C 6 12.01	<i>V A</i> N 7 14.01	<i>VIA</i> O 8 16.00	<i>VIIA</i> F 9 19.00	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>VII B</i>	<i>VIII B</i>	<i>VIII B</i>	<i>IB</i>	<i>IIB</i>	<i>IIIA</i> Al 13 26.98	<i>IVA</i> Si 14 28.09	<i>V A</i> P 15 30.97	<i>VIA</i> S 16 32.07	<i>VIIA</i> 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)	Ds 110 (271)	Rg 111 (272)	Uub 112 (285)	Uut 113 (284)	Uuq 114 (289)	Uup 115 (288)				
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					

Some Useful Formulae and Constants:

$$\text{pH} = \text{pK}_a + \log_{10} \frac{[\text{Base}]}{[\text{Acid}]}$$

$$25^\circ\text{C} = 298\text{K}$$

$$K_w = 1 \times 10^{-14} \text{ @ } 25^\circ\text{C}$$

$$R = 0.08205 \text{ L}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$$

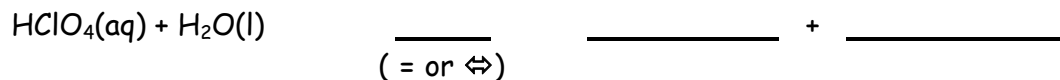
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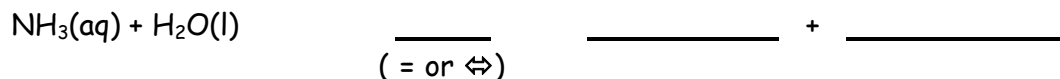
Last _____ First _____

Question 1
6 Points

a. Write a **net ionic equation** to show that **perchloric acid**, behaves as an acid in water.



b. Write a **net ionic equation** to show how **ammonia** behaves as a base in water.



Question 2
8 Points

- | | | |
|-----------------------------------|-------|----------------|
| a. HNO_2 | _____ | 1. Strong Acid |
| b. $\text{C}_9\text{H}_7\text{N}$ | _____ | 2. Weak Acid |
| c. CH_3COOH | _____ | 3. Strong Base |
| d. $\text{Ba}(\text{OH})_2$ | _____ | 4. Weak Base |

Question 3
6 Points

Circle the appropriate answers

	Acid	K_a
A	Acetic	1.8×10^{-5}
B	Histidine	7.9×10^{-7}
C	Carbonic	4.2×10^{-7}

- a. The acid with the **smallest $[\text{H}_3\text{O}^+]$** in a **0.10 M** aqueous solution is: **A** **B** **C**
- b. The acid with the **smallest pKa**: **A** **B** **C**
- c. The acid with the **smallest pOH** in a **0.10 M** aqueous solution is: **A** **B** **C**

Question 4
4 Points

A student determines that the value of **pKa** for **HCN** = **9.29**.

What is the value of **Ka**? _____

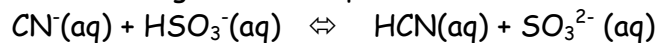
Question 5
9 Points

The **hydroxide** concentration in an aqueous solution is **3.5×10^{-2} M**.

- a. The **hydronium** ion concentration is: _____ M
- b. The **pH** of this solution is: _____
- c. The **pOH** is: _____

Question 6
6 Points

1. For following net ionic equation:



- **Circle the appropriate answer** - **B-L = Bronsted Lowry**

SO_3^{2-} B-L Acid B-L Base

HSO_3^- B-L Acid B-L Base

2. The formula for the conjugate _____ of **CN^-** is: _____

3. The formula for the conjugate _____ of **HSO_3^-** is: _____

Question 7 A buffer solution that is **0.436M** in **HCN** and **0.436M** in **KCN** has a pH of **9.40**.
6 Points

Addition of **which of the following** would **increase the capacity of the buffer** for added **OH⁻**?

- KCN
- HCN
- both HCN and KCN
- pure water
- none of these choices

Question 8 Which of the following aqueous solutions are buffer solutions ?
5 Points

- 0.24 M HI + 0.18 M NaI
- 0.10 M CH₃COOH + 0.18 M CH₃COOK
- 0.27 M NH₄Br + 0.31 M NH₃
- 0.34 M NH₄NO₃ + 0.39 M NaNO₃
- 0.10 M HCl + 0.21 M NaF

Question 9 A buffer solution is made that is **0.434M** in **HF** and **0.434M** in **KF**
6 Points

1. If **K_a** for **HF** is **7.2x10⁻⁴**, what is the pH of the buffer solution? _____
2. Write the net ionic equation for the reaction that occurs when **0.129 mol HCl** is added to **1.00 L** of the buffer solution.

_____ + _____ = _____ + _____

Question 10 A buffer solution is **0.414M** in **H₂CO₃** and **0.324M** in **KHCO₃**. If **K_a** for **H₂CO₃** is **4.2x10⁻⁷**, what is the pH of this buffer solution?
5 Points
Must show work

pH =

Question 11 A small amount of **strong base** is added to a **buffer** made from **HCN** and **NaCN**. What changes if any will occur to the following.
8 Points

Choose from the following choices:

Increase significantly
Decrease significantly

Increase
Decrease

Increase slightly
Decrease slightly

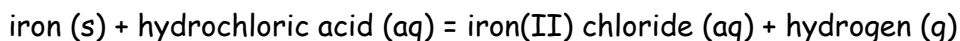
1. pH _____
2. $[\text{OH}^-]$ _____
3. $[\text{HCN}]$ _____
4. $[\text{CN}^-]$ _____

Question 12 When the nuclide ^{218}Po decays to ^{214}Pb , what kind of decay does ^{218}Po undergo?
6 Points
_____. The instability of ^{218}Po is probably due to the fact that it has too many _____.

Question 13 Write a balanced nuclear equation for the following:
6 Points

- $^{59}_{26}\text{Fe}$ undergoing beta decay: _____ = _____
- $^{25}_{13}\text{Al}$ undergoing positron emission: _____ = _____
- $^{41}_{20}\text{Ca}$ undergoing electron capture: _____ = _____

Question 14 What **volume** of **hydrogen gas** is produced when **1.33** mol of **iron** reacts completely according to the following reaction at **25°C** and **1 atm**?
6 Points



For full credit you must show work and include a balanced chemical equation.

Question 15

8 Points

An aqueous solution of **hydrochloric acid** is standardized by titration with a **0.453 M** solution of **barium hydroxide**.

If **29.4 mL** of base are required to neutralize **15.6 mL** of the acid, what is the **molarity** of the **hydrochloric acid** solution?

For full credit you must show work and include a balanced chemical equation.

Question 16

5 Points

How many **grams** of **iron(II) bromide** are there in **43.5 mL** of an aqueous solution that has a concentration of **0.166 M** ?

Must show work

M

grams

Exam III Score