The Periodic Table

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
H 1 1.01																	He 2 4.00
Li 3 6.94	Be 4 9.01											B 5 10.81	C 6 12.01	N 7 14.01	O 8 16.00	F 9 19.00	Ne 10 20.18
Na 11 22.99	Mg 12 24.31											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)	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:

$$pH = pKa + \log_{10} \frac{[Base]}{[Acid]}$$

$25^0C = 298K$

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

SID | | | | | | | | | Last _____ First _____

Question 1 (6 Points)

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

$H_2S(aq) + H_2O(l)$ _____ _____ + _____

(= or ⇔)

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

$NaOH(aq)$ _____ _____ + _____

(= or ⇔)

Question 2 (8 Points)

a. HNO_3 _____

b. $HCOOH$ _____

c. C_5H_5N _____

d. NH_4^+ _____

1. Strong Acid

2. Weak Acid

3. Strong Base

4. Weak Base

Question 3 (4 Points)

An aqueous solution has a **hydroxide ion** concentration of **1.0×10^{-2}** M.

a) What is the **hydronium ion** concentration in this solution? _____ M

b) Is this solution **acidic**, **basic** or **neutral**? _____

Question 4 (6 Points)

An aqueous solution has a **pOH** of **6**

a) What is the **pH** of this solution? _____

b) What is the **hydronium ion** concentration in this solution? _____ M

c) What is the **hydroxide ion** concentration in this solution? _____ M

Question 5 (6 Points)

Arrange the following solutions in order of **increasing acidity**:
1 = **least acidic** ; 3 = **most acidic**

a) Solution with a **pH = 11** _____

b) Solution with a **hydroxide ion** concentration = **1×10^{-11}** M _____

c) Solution with a **hydronium ion** concentration = **1×10^{-9}** M _____

Question 6 (6 Points)

The **hydronium** concentration in an aqueous solution is **3.51×10^{-2}** M.

a. The **hydroxide** ion concentration is: _____ M

b. The **pH** of this solution is: _____

c. The **pOH** is: _____

Question 7
6 Points

a) For following net ionic equation:
$HClO(aq) + H_2O(l) \Leftrightarrow ClO^- + H_3O^+$
– Circle the appropriate answer – B-L = Bronsted Lowry

H_2O	B-L Acid	B-L Base
ClO^-	B-L Acid	B-L Base

b) The formula for the conjugate _____ of **H_3O^+** is: _____

c) The formula for the conjugate _____ of **ClO^-** is: _____

Question 8
4 Points

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

Addition of **which of the following** would **increase the capacity of the buffer** for added **H_3O^+**?

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

Question 9
4 Points

Which of the following aqueous solutions are buffer solutions ?

- ☐ 0.14M HF + 0.17M KF
- ☐ 0.34M $Ba(ClO_4)_2$ + 0.25M BaI_2
- ☐ 0.19M $Ca(OH)_2$ + 0.21M $CaCl_2$
- ☐ 0.34M NH_4NO_3 + 0.34M NH_3
- ☐ 0.25M HCl + 0.17M KCl

Question 10
6 Points

A buffer solution is made that is **0.472M** in **H_2CO_3** and **0.472M** in **$NaHCO_3$**.

a) **Ka** for **H_2CO_3** is **$4.2x10^{-7}$**, what is the pH of the buffer solution? _____

b) Write the **net ionic equation** for the reaction that occurs when **0.129** mol **NaOH** is added to 1.00 L of the buffer solution.

_____ + _____ = _____ + _____

Question 11
6 Points

A buffer solution is **0.440M** in **HCN** and **0.324M** in **NaCN**. If **Ka** for **HCN** is **$4.0x10^{-10}$**, what is the pH of this buffer solution?
Must show work

pH = _____

Question 12
6 Points

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

Choose from the following choices:

Increase significantly	**Increase**	**Increase slightly**
Decrease significantly	**Decrease**	**Decrease slightly**

a) **pOH** _____

b) **[HCN]** _____

Question 13
6 Points

The isotope $^{60}_{27}$**Co** is but one of many isotopes whose **Neutron/Proton ratio** is **too large**.

a) The **only** form of **radioactive decay** available to $^{60}_{27}Co$ is: _____

b) The **balanced nuclear equation** for this decay: $^{60}_{27}Co$ = _____ + _____

Question 14
6 Points

Write a balanced nuclear equation for the following:

a) $^{214}_{82}$**Pb** undergoing beta decay: _____ = _____

b) $^{28}_{15}$**P** undergoing positron emission: _____ = _____

c) $^{41}_{20}$**Ca** undergoing electron capture: _____ = _____

Question 15
6 Points

How many **moles** of **water** will be formed upon the complete reaction of **27.3 grams** of **sulfuric acid** with excess **zinc(II) hydroxide**?

sulfuric acid (aq) + zinc(II) hydroxide (s) = zinc(II) sulfate (aq) + water (l)

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

_____ **mol**

Question 16 **8 Points**	An aqueous solution of **barium hydroxide** is standardized by titration with a **0.140 M** solution of **hydrochloric acid**. If **26.8 mL** of **base** are required to neutralize **19.4 mL** of the acid, what is the **molarity** of the **barium hydroxide** solution? **For full credit you must show work and include a balanced chemical equation.** **M**
Question 17 **6 Points**	What volume of a **0.142 M** solution of **aluminum bromide** contains the same number of moles of **aluminum bromide** as there are in **43.2 mL** of a **0.124 M** solution of **aluminum bromide**? **Must show work** **L**

Exam III Score