The Periodic Table

IA												IIIA	IVA	VA	VIA	VIIA	VIIIA
H 1 1.01	IIA																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	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	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

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

Question 1 (10 Points) Consider the following endothermic equilibrium reaction:

$COBr_2(g) \Leftrightarrow CO(g) + Br_2(g)$

The production of $CO(g)$ is favored by – ***Circle the correct answer***

1. True False **Increasing** the temperature.
2. True False **Decreasing** the pressure.
3. True False **Decreasing** the volume.
4. True False **Removing** $COBr_2$.
5. True False **Removing** Br_2.

Question 2 (4 Points)

1. Write a **net ionic equation** to show that hydrofluoric acid, **behaves** as an **acid** in **water**.
   $HF(aq) + H_2O(l) \Leftrightarrow$ _____ + _____
2. Write a **net ionic equation** to show that isoquinoline, **behaves** as a **base** in **water**.
   $C_9H_7N + H_2O(l) \Leftrightarrow$ _____ + _____

Question 3 (4 Points) Assign each substance given on the **left** with a category given on the **right**.

HF	_____	**1.** Strong Acid
LiOH	_____	**2.** Weak Acid
$(C_2H_5)_2NH$	_____	**3.** Strong Base
HNO_2	_____	**4.** Weak Base

Question 4 (4 Points) Consider the amino acids listed below:

Lysine, $K_a = 1.0\times10^{-9}$ @ 25^0C — **Histidine**, $K_a = 7.9\times10^{-7}$ @ 25^0C

Tyrosine, $K_a = 1.6\times10^{-10}$ @ 25^0C — **Cysteine**, $K_a = 5.0\times10^{-9}$ @ 25^0C

1. The **strongest** of the four acids is: _____
2. The acid with the **largest pK_a** value is: _____

Question 5 (8 Points) The **pH** of an aqueous solution was found to be **12.00**.

1. The pOH of this solution is: _____
2. The hydronium concentration is: _____
3. The hydroxide concentration is: _____
4. This solution is: _____
   (a buffer, acidic, neutral, basic)

Question 6
12 Points

1. In the following net ionic equation, identify each species as either a Bronsted-Lowry **acid** or a Bronsted-Lowry **base**.
   $CH_3COO^- + HSO_3^- \Leftrightarrow CH_3COOH(aq) + SO_3^{2-}$

   – Circle the appropriate answer

CH_3COO^-	B-L Acid	B-L Base
HSO_3^-	B-L Acid	B-L Base
CH_3COOH	B-L Acid	B-L Base
SO_3^{2-}	B-L Acid	B-L Base

2. The formula for the conjugate _____ of CH_3COO^- is: _____
3. The formula for the conjugate _____ of HSO_3^- is: _____

Question 7
8 Points

Are the following aqueous solutions, **buffer solutions?**

– Circle the appropriate answer

1. 0.40M NH_4Cl and 0.30M NH_3	Yes	No
2. 0.30M HF and 0.10M NaF	Yes	No
3. 0.40M HI and 0.40M NaI	Yes	No

Which buffer would absorb the greatest quantity of H_3O^+? 1 2 3

Question 8
4 Points

A buffer solution made from **HClO** and **KClO** has a **pH** of **7.15**. If **pKa** for HClO is **7.46**, this implies that:

– Circle the appropriate answer

1. $[ClO^-]/[HClO] = 1$
2. $[ClO^-]/[HClO] > 1$
3. $[ClO^-]/[HClO] < 1$

Question 9
4 Points

A buffer solution is **0.476** M in **CH_3COOH** and **0.379** M in **CH_3COONa**. If Ka for CH_3COOH is **1.8×10^{-5}**, what is the pH of this buffer solution?
[Show Work]

Ph = ☐

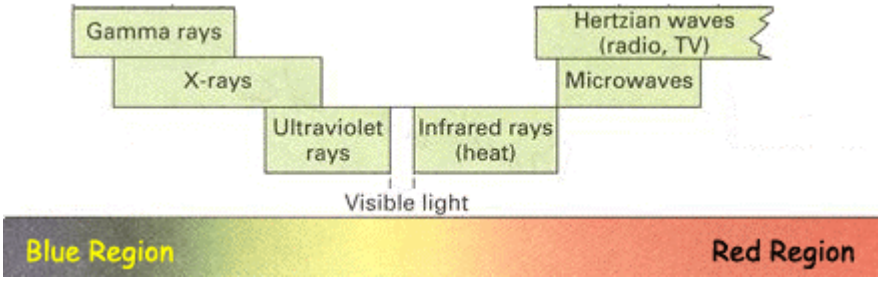
Question 10
8 Points

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

- Circle the appropriate answer

1.	**pH**	Increase	Decrease	Remain the same
2.	**[OH^-]**	Increase	Decrease	Remain the same
3.	**[HCN]**	Increase	Decrease	Remain the same
4.	**[CN^-]**	Increase	Decrease	Remain the same

Question 11
6 Points



a. Rank the following (1-3) forms of electromagnetic radiation in order of **increasing energy**: 1= Lowest Energy 3 = Highest Energy

Visible: _____ Radio wave: _____ Gamma ray: _____

b. Rank the following (1-3) forms of electromagnetic radiation in order of **increasing wavelength**: 1= Shortest Wavelength 3 = Longest Wavelength

Infrared: _____ Radio wave: _____ Visible: _____

Question 12
10 Points

Write a **balanced nuclear equation** for the following:

1. The nuclide $^{222}_{86}$**Rn** undergoes **alpha** emission. _____
2. The nuclide $^{18}_{7}$**N** undergoes **beta** decay. _____
3. The nuclide $^{129}_{55}$**Cs** decays by **electron capture**. _____
4. The nuclide $^{25}_{13}$**Al** undergoes **positron emission**. _____

Which of the above represents the decay of an isotope with too many neutrons. _____.

Question 13
3 Points

Iodine-131 **(half-life, 8.04 days)** is used as a treatment for thyroid cancer. How many milligrams of an **80.1** milligram sample of iodine-131 will remain after **40.2** days? **[Show Work]**

Miligrams of Iodine-131 remaining: ☐

Question 14
4 Points

According to the following reaction, how many **moles** of **potassium hydroxide** are necessary to form 0.668 moles **potassium carbonate**?

carbon dioxide (g) + potassium hydroxide (aq) ➔ potassium carbonate (aq) + water (l)

[Show Work]

Moles of potassium hydroxide: ☐

Question 15
6 Points

An aqueous solution of **hydrobromic acid** is standardized by titration with a **0.0768 M** solution of **barium hydroxide**. If **39.2** mL of base are required to neutralize **25.3** mL of the acid, what is the **molarity** of the **hydrobromic** acid solution?

Molarity of hydrobromic acid: ☐

Question 16
5 Points

According to the following reaction, how many **moles** of **ammonium nitrite** are needed to form **30.3** grams of **water**?

ammonium nitrite (aq) ➔ nitrogen (g) + water (l)

Moles of ammonium nitrite: ☐

Exam III Score ☐