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)									

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

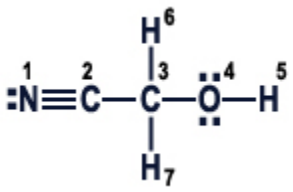
Solubility Guidelines:

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.

$q = m \times C \times \Delta T$ $\Delta H^0_{rxn} = \Sigma \Delta H^0_f(\text{Products}) - \Sigma \Delta H^0_f(\text{Reactants})$

Question 1
10 Points

1. The atoms that form a sigma bond by the overlap of an **sp** and an **sp** hybrid orbitals?



_____

2. The bonding between **N1** and ***C2*** is best described as:

   a) A triple bond
   b) A double bond and a sigma bond
   c) 2 pi bonds and 1 sigma bond
   d) 3 pi bond
   e) 2 sigma bonds and a pi bond
   f) covalent bonding

3. The bonding between **H6** and ***C3*** is best described as being the overlap of the _____ orbital on ***C3*** with the _____ orbital on **H6**

Question 2
12 Points

Classify each of the following salts as being either soluble (S) or non-soluble (NS) in water?

a) Silver(I) hydroxide _____
b) Na_2SO_4 _____
c) Ammonium sulfide _____
d) $FeCO_3$ _____

Question 3
8 Points

Indicate whether a precipitate is expected when each of the following pairs of aqueous solutions are mixed. If a precipitate forms, give the formula for the precipitate.

1. $Pb(NO_3)_2$ and KCl — Y or N _____
2. Iron(II) nitrate and sodium carbonate — Y or N _____
3. $CuCl_2$ and NH_4SO_4 — Y or N _____

Question 4
6 Points

In the laboratory you dilute **2.50** mL of a concentrated **3.00** M **nitric acid** solution to a total volume of **150** mL. What is the concentration of the dilute solution ?

Question 5
12 Points

1. Consider the reaction when aqueous solutions of **calcium nitrate** and **potassium sulfate** are combined. The net ionic equation for this reaction is:

_____

2. Write a net ionic equation for the reaction that occurs when aqueous solutions of **sodium hydroxide** and **nitrous acid** (HNO_2) are combined.

_____

3. Write a net ionic equation for the reaction that occurs when aqueous solutions of **ammonium carbonate** and **hydrobromic acid** are combined.

_____

Question 6
8 Points

A sample of ethylene glycol with a mass of 57.0g at 8^0C is placed into a perfectly insulated container together with 79.0g of glass at 34^0C. Calculate the final temperature of the sample when thermal equilibrium is reached?
Heat capacities: Glass = 0.84 J/g^oC Ethylene glycol = 2.14 J/g^0C

Question 7
8 Points

Given the following thermodynamic data:

$\Delta H^0_f N_2O_5(s)$ = 11.0 kJ/mol $\Delta H^0_f H_2O(l)$ = -285.8 kJ/mol
$\Delta H^0_f H_2O(g)$ = -241.8 kJ/mol $\Delta H^0_f HNO_3(aq)$ = -207.4 kJ/mol

Determine the enthalpy change associated with the following reaction:

$$N_2O_5(s) + H_2O(l) = 2\ HNO_3(aq)$$

Question 8
8 Points

14.0g of LiF are dissolved in 155.0g of water in a calorimeter the following data was collected:

Initial Temperature: $41.1^{0}C$

Final Temperature: $58.5^{0}C$

Heat capacity of the solution = 4.184 $J/g^{0}C$ Calorimeter constant = 63.9 $J/^{0}C$

What is the heat of solution for this compound in J/mol?

Question 9
8 Points

Increasing the temperature of a sample of gas in a contained causes the pressure to increase. What two factors contribute to this increase in pressure?

1. _____
2. _____

Question 10
8 Points

How many grams of solid **potassium hydroxide** are needed to exactly neutralize **28.2** mL of a **1.18 M hydrochloric acid** solution ? Assume that the volume remains constant.

Question 11
12 Points

For the following reaction, **63.6** grams of **KOH** are allowed to react with **34.4** grams of H_3PO_4.

$$3KOH\ (aq) + H_3PO_4\ (aq) = K_3PO_4\ (aq) + 3H_2O\ (l)$$

1. What is the maximum amount (in moles) of **potassium phosphate** that can be formed?
2. What is the **FORMULA** for the limiting reagent?
3. What amount (in moles) of the excess reagent remains after the reaction is complete?

Ans: **1.** _____ **2.**_____ **3.**_____