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

Average Single Bond Lengths (Picometers)

	H	C	N	O	F	Si	P	S	Cl	Br	I
H	74	110	98	94	92	145	138	132	127	142	161
C		154	147	143	141	194	187	181	176	191	210
N			140	136	134	187	180	174	169	184	203
O				132	130	183	176	170	165	180	199
F					128	181	174	168	163	178	197
Si						234	227	221	216	231	250
P							220	214	209	224	243
S								208	203	218	237
Cl									200	213	232
Br										228	247
I											266

Average Single Bond Energies (kJ per mole)

	H	C	N	O	F	Si	P	S	Cl	Br	I
H	436	414	389	464	569	293	318	339	431	368	297
C		347	293	351	439	289	264	259	330	276	238
N			159	201	272		209		201	243	
O				138	184	368	351		205		201
F					159	540	490	285	255	197	
Si						176	213	226	360	289	
P							213	230	331	272	213
S								213	251	213	
Cl									243	218	209
Br										192	180
I											151

Average Multiple Bond Lengths (Picometers)

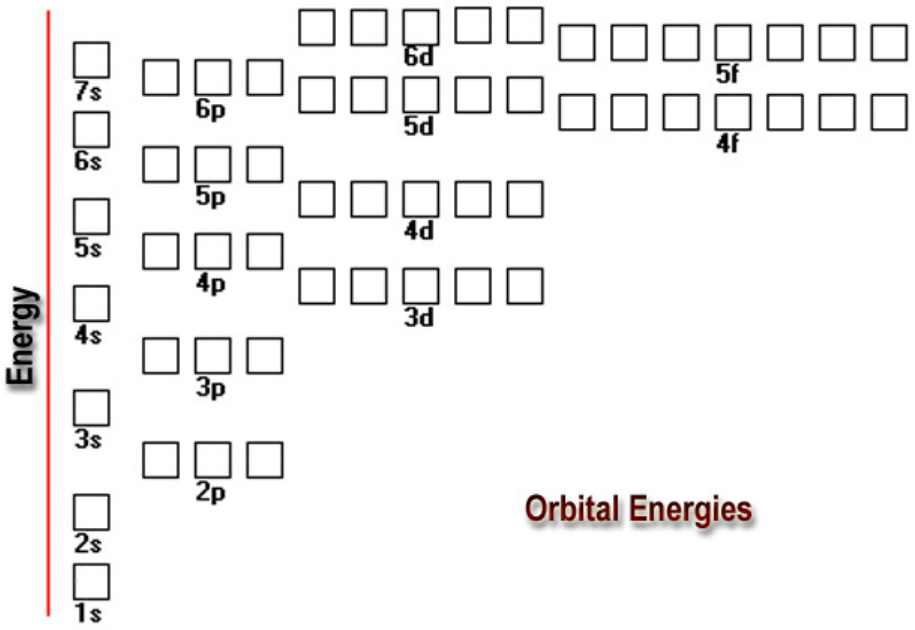
C = C	134	C ≡ C	121
C = N	127	C ≡ N	115
C = O	122	C ≡ O	113
N = O	115	N ≡ O	108

1 pm = 1×10^{-12} m

Average Multiple Bond Energies (kJ per mole)

N = N	418	C = C	611
N ≡ N	946	C ≡ C	837
N = O	590	C = O	803
C ≡ N	891	C = O	745
O = O	498	C ≡ O	1075

In CO_2 Only



Some Useful And Not So Useful Information:

1 kJ = 1000 J

$N = 6.023 \times 10^{23}\ mol^{-1}$

$c = 2.998 \times 10^{8}\ m.s^{-1}$

$h = 6.626 \times 10^{-34}\ J.s.$

Orbital Energies ns, (n-1)d, (n-2)f, np

SID _____ Last _____ First _____

Question 1 (4 Points) Give the **complete** electronic configuration for the following:

1. S _____ 2. Br _____

Question 2 (8 Points) Give the **noble gas** electronic configuration for the following:

1. Rb _____ 2. Cu _____
3. Pr _____ 4. Fe^{2+} _____

Question 3 (6 Points) List the **Period 4** elements that are **diamagnetic**: _____

Question 4 (5 Points) Arrange the following elements in order of **ionization energy**, by ranking then from 1 (**greatest**) to 5 (**smallest**)

P ☐ Ga ☐ S ☐
Ca ☐ Cs ☐

Question 5 (5 Points) Arrange the following elements in order of **electronegativity**, by ranking then from 1 (**least**) to 5 (**greatest**)

K ☐ Ga ☐ C ☐
Al ☐ Rb ☐

Question 6 (10 Points) Draw the **best** Lewis Dot structure for the following

O_2

ClO_4^-

BF_3

XeF_2

CO_2

Question 7
6 Points

The following questions all relate to NO_2^-

1. The molecule has **two** resonance structure. Draw them.

(4 Points)

(2 Points)

2. The N to O **bond length** in pm is best described as: (**Circle the best choice**)

a) = 136 b) > 136 c) = 115 d) >115 e) <115

Question 8
4 Points

The **formal charge** on the carbon and nitrogen atoms in CN^- are:

C: _____ N: _____

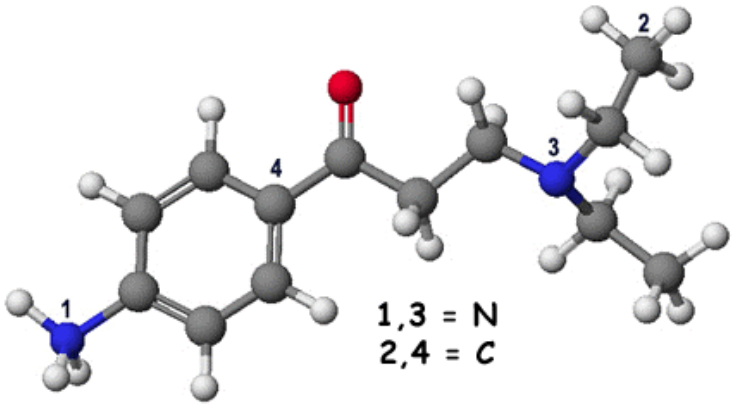
Question 9
6 Points

Methane when combusted produces carbon dioxide and water according to:

$$2\ CO(g) + O_2(g) = 2\ CO_2(g)$$

Estimate the amount of **energy** produced upon the combustion of **1 mole** of CO?

Question 10
4 Points

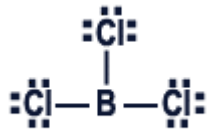
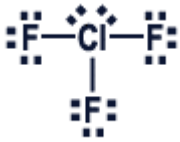
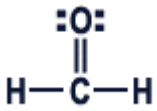


What is the **bond angle** about the **numbered** atoms?

1. _____
2. _____
3. _____
4. _____

Question 11
34 Points

The following questions refer to the molecules depicted below.

A	B	C	D
			
E	**F**	**G**	**H**
			

1. List the **structure(s)** whose only bond angle is **~180^0** _____
2. List the **structures(s)** whose **epg** is/are **trigonal planar**: _____
3. Give the **electron pair geometry** (**epg**) for:

   B: _____ C: _____

   F: _____ G: _____
4. Give the **molecular geometry** for:

   B: _____ C: _____

   E: _____ G: _____
5. Label the following molecules as either **polar (P)** or **non polar (NP)**

   A: ___ B: ___ C: ___ D: ___ F: ___

Question 12
4 Points

A hypothetical molecule has the formula **AB_3C_2**, where **A** is the **central atom** and **B** and **C** are elements belonging to the **same group**. The molecule has a **trigonal bipyramid electon pair geometry** and is **polar**. What could you infer about the **atomic weight** of C versus that of B?

(1 Point) _____

In three sentences or less justify your reasoning.

(3 Points) _____

_____

_____

Question 13
4 Points

The order (**most soluble to least soluble**) of **solubility in water** for the following molecules is:

$NH_3 > CO_2 > O_2$

(2 Points) What would you anticipate the order to be (**most soluble to least soluble**) in carbon tetrachloride, CCl_4

(2 Points) In two sentences or less, justify your choice.

Do Not Write Below This Line

Exam II Score		