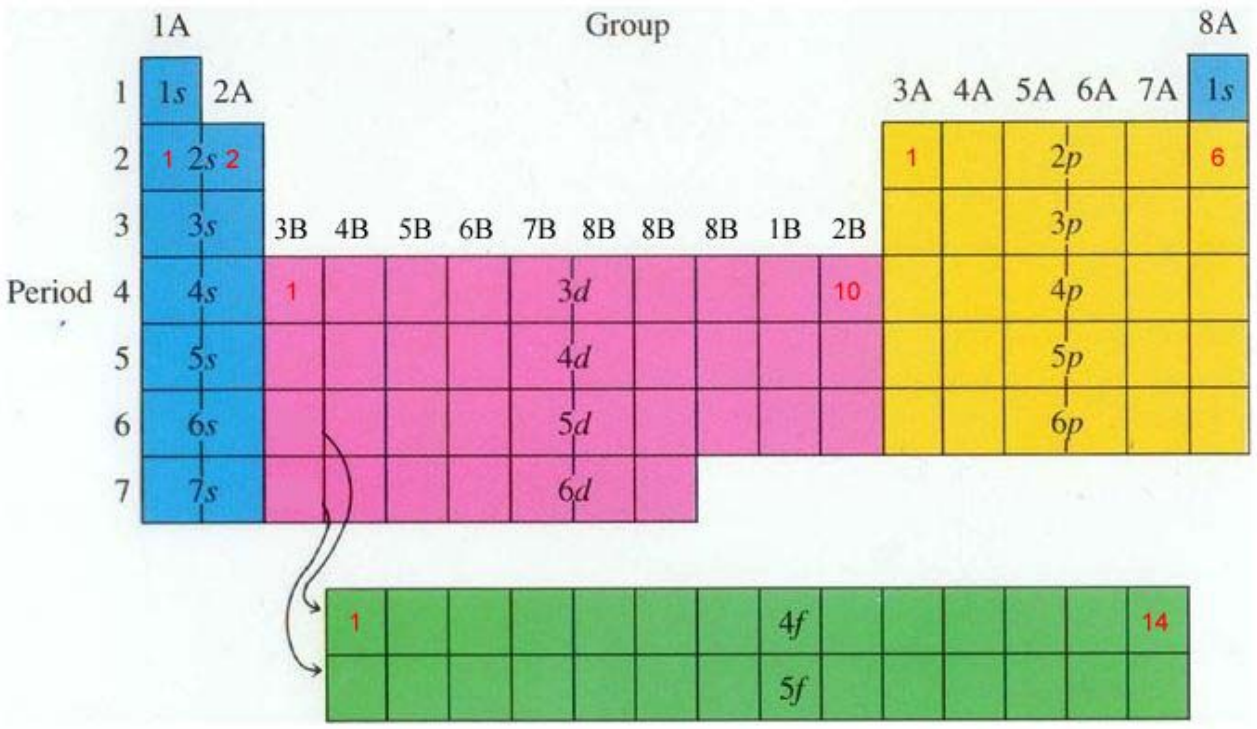
The Periodic Table

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



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 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

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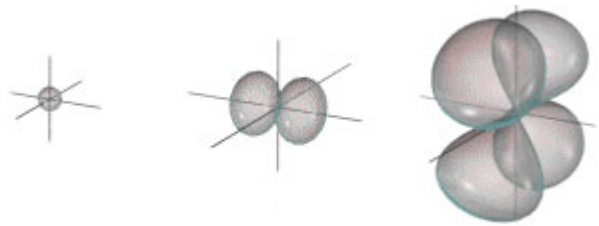
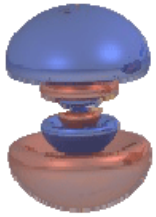
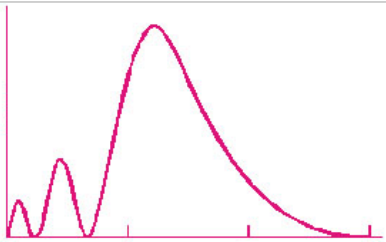
Average Single Bond Energies (kJ per mole)

	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 Energies (kJ per mole)

N = N	418	C = C	611	
N ≡ N	946	C ≡ C	837	
N = O	590	C = O	803	*In CO_2 Only*
C ≡ N	891	C = O	745	
O = O	498	C ≡ O	1075	

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

Question 1 3 Points	Each of the orbitals depicted has the **lowest** value of **n** possible **for its type**. Which one has the **highest n** value?  a b c
Question 2 4 Points	 a) The orbital depicted on the left is what type of orbital? _____ b) Based on its Radial Distribution depicted on the right you can label this orbital as? _____ 
Question 3 4 Points	I am an **orbital** belong to a family whose $\mathbf{m_l}$ values are **-2, -1, 0, +1,+2** therefore I am a(n) _____ type orbital. I have a grand total of **5 nodes**, therefore my principal quantum number (**n**) is _____ . Apart from me there are a **total** of ___ **other** orbital's that have this same principal quantum number. **Combined** we can accommodate a **total** of _____ **electrons**.
Question 4 6 Points	Give the **complete** electronic configuration for the following: a. **P** _____ b. **Al^{3+}** _____
Question 5 4 Points	How many **unpaired electrons** are in the **Fe** atom? _____ Therefore **Fe** is **parmagnetic** or **diamagnetic**? _____
Question 6 6 Points	Give the **noble gas** configuration for the following a. **Kr** _____ c. **Cu** _____ b. **Ni^{2+}** _____
Question 7 4 Points	Using only the periodic table **arrange** the following elements in order of **increasing atomic radius**: **Na^+, F^-, O^{2-}, Mg^{2+}** _____ _____ _____ _____ *smallest* *largest*

Question 8 (6 Points)

a) Using only the periodic table **arrange** the following elements in order of **increasing atomic size**: **S, Ca, F, Mg**

_____ _____ _____ _____

smallest *largest*

b) Which one has the greatest Electron Affinity: _____

c) Which one has the smallest first ionization energy: _____

Question 9 (3 Points)

Using only the periodic table **arrange** the following elements in order of **decreasing ionization energy**: **bromine, potassium, gallium**

_____ _____ _____

largest *smallest*

Question 10 (12 Points)

Draw the **best** Lewis Dot structure for the following

ClO_2^- (Cl=Chlorine)

HFCO

BF_3

XeF_2

Question 11 (4 Points)

Draw the **best** Lewis Dot structure for **the following molecules** on the rough work paper provided and then **classify each as either a free radical** (**yes**) or **not** (**no**)

a) **NO_2** _____

b) **ClO_2^-** _____ (Cl = chlorine)

c) **BrO_2** _____

d) **ClO_2** _____

Question 12 (6 Points)

Draw the **best** Lewis Dot structure for the following organic molecules

CH_3COCH_3

C_2H_2

Question 13
8 Points
(6 Points)

Draw all **reasonable** resonance structure for NO_3^-.

(2 Points)

Circle the best answer:
Average bond length table is on the front page of this exam.
The **N** to **O** bond **length** in **pm** is expected to be:

1. = 136 **2.** > 115 **3.** = 115 **4.** > 136

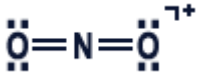
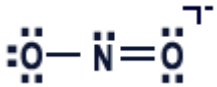
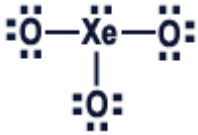
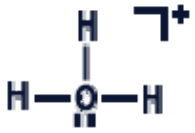
Question 14
4 Points

Using the ***Average bond energy table on the front page of this exam***, **estimate** the **enthalpy change** associated with the following reaction.

$$N_2(g) + 3\ H_2(g) \longrightarrow 2\ NH_3(g)$$

_____ kJ

Question 15
18 Points

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

1. List the **structure(s)** whose **only** bond angle is **180^0** _____

2. Give the **electron pair geometry** (**epg**) for:

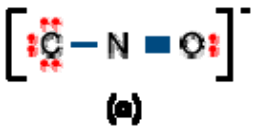
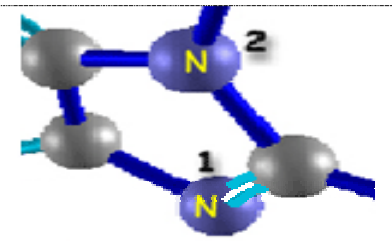
   A: _____ C: _____

   B: _____ E: _____

3. Give the **molecular geometry** for:

   D: _____ F: _____

   G: _____ B: _____

Question 16 6 Points	A resonance structure of **CNO^-** is given below:  (a) Give the formal charge on: **C** _____ **N** _____ **O** _____
Question 17 6 Points	 What is the **predicted bond angle** about the following atoms? a) **Nitrogen 1** _____ b) **Nitrogen 2** _____

Do Not Write Below This

Exam II Score