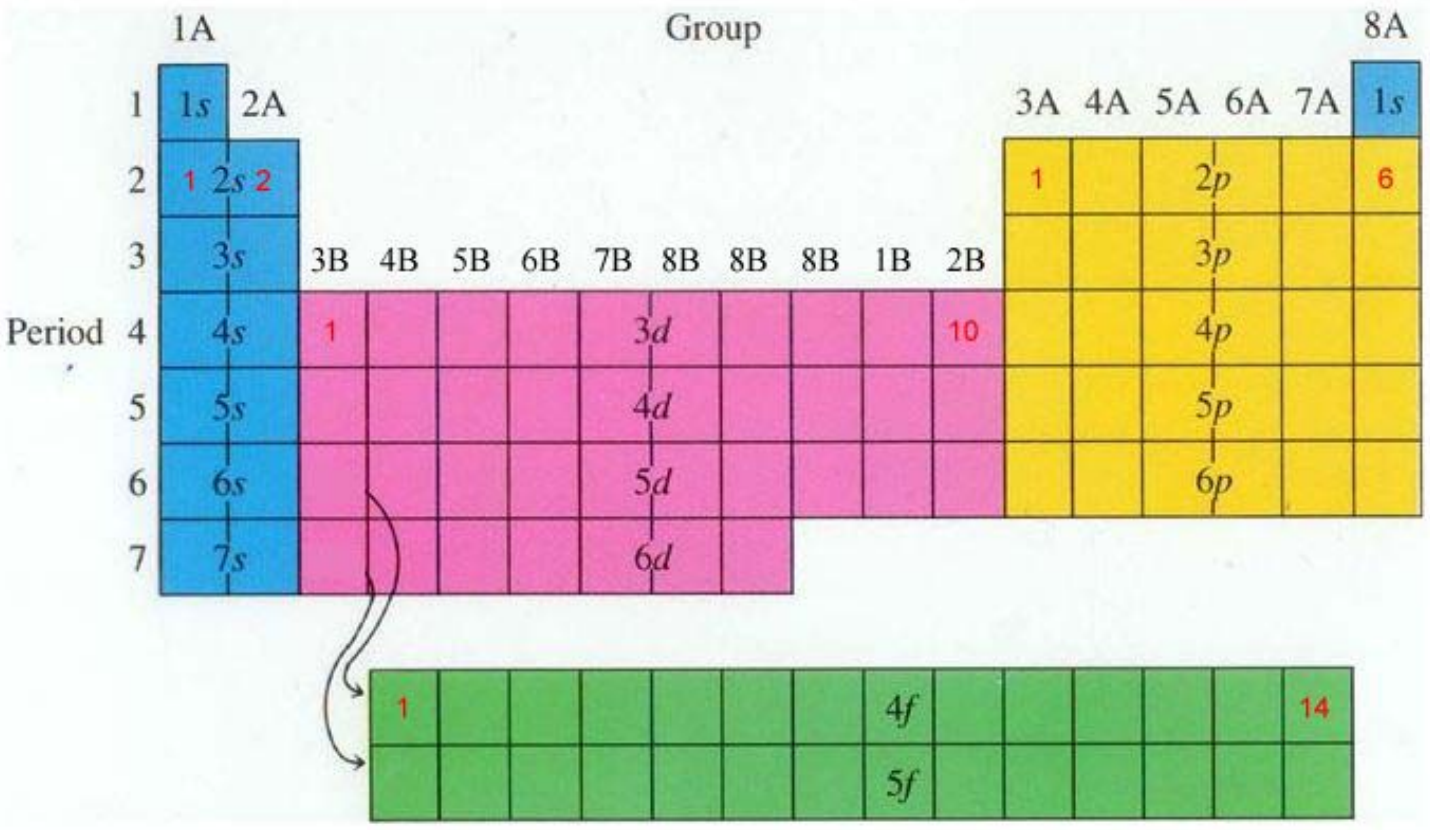
The Periodic Table

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

==========

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

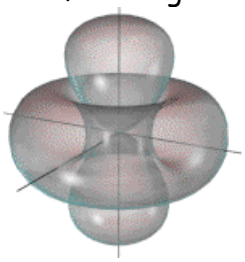
Average Multiple Bond Energies (kJ per mole)

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 (6 Points)

Label the following orbital's as either: s, p, d, f, g?



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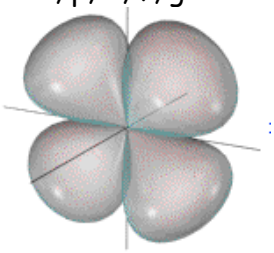


_____

_____

Question 2 (6 Points)

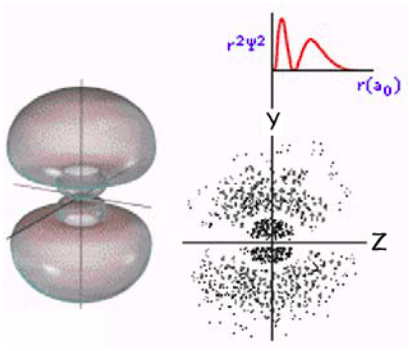
The orbital depicted on the left is:

a. What **type** of orbital? _____

b. Its **n** value is? _____

c. Its **specific** designation is? _____

(x, y, z, xy, xz, yz, x^2-y^2, z^2)



Question 3 (8 Points)

Give the **complete** electronic configuration for the following:

a. **S** _____

b. **F^-** _____

c. **Mg^{2+}** _____

d. **Mn** _____

Question 4 (8 Points)

Give the **noble gas** configuration for the following

a. **Kr** _____

b. **Cu** _____

c. **Fe^{2+}** _____

d. **Br^-** _____

Question 5 (2 Points)

The element with the electronic configuration **$[Xe]6s^25d^{10}4f^{14}6p^3$** has ____ **valence** electrons.

Question 6 (3 Points)

Give the symbol for the **diamagnetic** element(s) in **period 4?** _____

Question 7 (5 Points)

Using only the periodic table given with this exam rank the following elements **from 1 to 5** in order of **increasing ionization** (**1** being the **smallest** ionization energy and **5** the **largest** ionization energy:

__ Al __ Ca __ P __ Rb __ Ga

Question 8
3 Points

Using only the periodic table given with this exam **arrange** the following elements in order of **increasing electron affinity**: **oxygen, fluorine, sulfur**

_____ _____ _____
Smallest **Largest**

Question 9
12 Points

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

N_2

XeF_2

Cl_2CO

O_3^-

Question 10
8 Points

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

CH_3COCH_3

CH_3COONH_2

Question 11
9 Points
(6 Points)

Draw all **reasonable** resonance structure for **O_3**.

(3 Points)

Circle the best answer:
Average bond energy table is on the front page of this exam.
The ***O*** to ***O*** bond **energy** in **$kJ.mol^{-1}$** is expected to be:

o = 498 o < 138 o = 138

o > 498 o > 138

Question 12
6 Points

Using **average bond energies** (given on the front of this exam), **estimate** the **enthalpy change** for the following reaction:

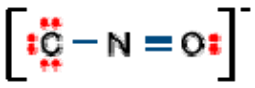
$$CH_4(g) + 2\ O_2(g) = CO_2(g) + 2\ H_2O(g)$$

Show Work

_____ **kJ.mol^{-1}**

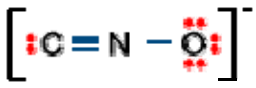
Question 13
8 Points

Assign formal charges to the elements in each of the Lewis structures below.



A

C: _____
N: _____
O: _____



B

C: _____
N: _____
O: _____

The **best** Lewis structure for **CNO** – is: _____

Question 14
6 Points

What is the **electron-pair geometry** for **N** in **NH_3**? _____ …

There are ___ **lone pair(s)** around the central atom, so the **molecular geometry** of **NH_3** is

_____.

Question 15
6 Points

What is the **electron-pair geometry** for **I** in **IF_3** _____ … There are

___ **lone pair(s)** around the central atom, so the **molecular geometry** of **IF_3** is

_____.

Question 16
4 Points

The planet **Whelanus** – far, far away in the galaxy – is somewhat like earth. Same order of elements, same order of filling orbitals, except that Hund's rule is different. Instead of 2 electrons per orbital there are **3**. This makes for a very different looking periodic table. On Whelanus give the symbols for the first 2 noble gases! _____ _____

Do Not Write Below This

Exam II Score	