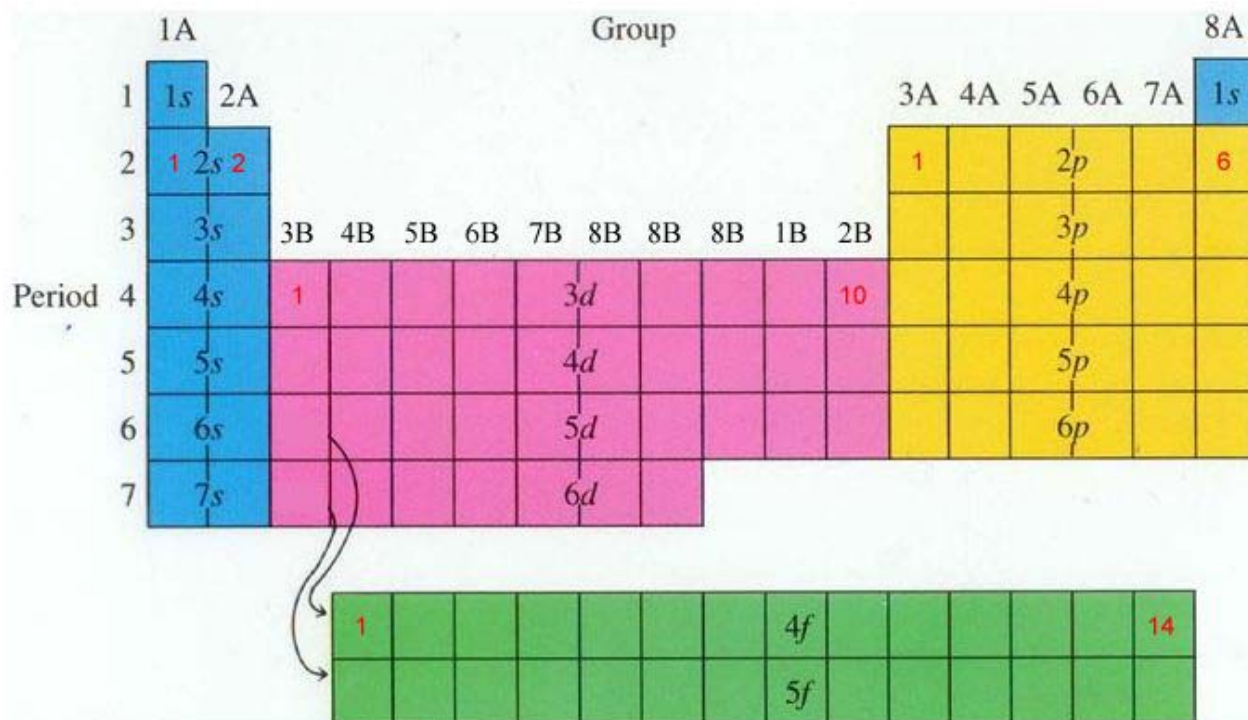


# The Periodic Table

											<i>VIIIA</i>							
<i>IA</i> <b>H</b> 1 1.01																<i>VIIIA</i> <b>He</b> 2 4.00		
<i>IIA</i>												<i>IIIA</i>	<i>IVA</i>	<i>V/A</i>	<i>VIA</i>	<i>VIIA</i>		
<b>Li</b> 3 6.94	<b>Be</b> 4 9.01											<b>B</b> 5 10.81	<b>C</b> 6 12.01	<b>N</b> 7 14.01	<b>O</b> 8 16.00	<b>F</b> 9 19.00	<b>Ne</b> 10 20.18	
<b>Na</b> 11 22.99	<b>Mg</b> 12 24.31											<b>Al</b> 13 26.98	<b>Si</b> 14 28.09	<b>P</b> 15 30.97	<b>S</b> 16 32.07	<b>Cl</b> 17 35.45	<b>Ar</b> 18 39.95	
		<i>IIIB</i>	<i>IVB</i>	<i>VB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>VIB</i>	<i>IB</i>	<i>IIB</i>							
<b>K</b> 19 39.10	<b>Ca</b> 20 40.08	<b>Sc</b> 21 44.96	<b>Ti</b> 22 47.88	<b>V</b> 23 50.94	<b>Cr</b> 24 52.00	<b>Mn</b> 25 54.94	<b>Fe</b> 26 55.85	<b>Co</b> 27 58.93	<b>Ni</b> 28 58.69	<b>Cu</b> 29 63.55	<b>Zn</b> 30 65.39	<b>Ga</b> 31 69.72	<b>Ge</b> 32 72.61	<b>As</b> 33 74.92	<b>Se</b> 34 78.96	<b>Br</b> 35 79.90	<b>Kr</b> 36 83.80	
<b>Rb</b> 37 85.47	<b>Sr</b> 38 87.62	<b>Y</b> 39 88.91	<b>Zr</b> 40 91.22	<b>Nb</b> 41 92.91	<b>Mo</b> 42 95.94	<b>Tc</b> 43 (97.9)	<b>Ru</b> 44 101.07	<b>Rh</b> 45 102.91	<b>Pd</b> 46 106.42	<b>Ag</b> 47 107.87	<b>Cd</b> 48 112.41	<b>In</b> 49 114.82	<b>Sn</b> 50 118.71	<b>Sb</b> 51 121.76	<b>Te</b> 52 127.60	<b>I</b> 53 126.90	<b>Xe</b> 54 131.29	
<b>Cs</b> 55 132.91	<b>Ba</b> 56 137.33	<b>La</b> 57 138.91	<b>Hf</b> 72 178.49	<b>Ta</b> 73 180.95	<b>W</b> 74 183.85	<b>Re</b> 75 186.21	<b>Os</b> 76 190.2	<b>Ir</b> 77 192.22	<b>Pt</b> 78 195.08	<b>Au</b> 79 197.97	<b>Hg</b> 80 200.59	<b>Tl</b> 81 204.38	<b>Pb</b> 82 207.2	<b>Bi</b> 83 208.98	<b>Po</b> 84 (209)	<b>At</b> 85 (210)	<b>Rn</b> 86 (222)	
<b>Fr</b> 87 223.02	<b>Ra</b> 88 226.03	<b>Ac</b> 89 227.03	<b>Rf</b> 104 (261)	<b>Db</b> 105 (262)	<b>Sg</b> 106 263)	<b>Bh</b> 107 (262)	<b>Hs</b> 108 (265)	<b>Mt</b> 109 (266)	<b>Ds</b> 110 (271)	<b>Rg</b> 111 (272)	<b>Uub</b> 112 (285)	<b>Uut</b> 113 (284)	<b>Uuq</b> 114 (289)	<b>Uup</b> 115 (288)				

<b>Ce</b> 58 140.12	<b>Pr</b> 59 140.91	<b>Nd</b> 60 144.24	<b>Pm</b> 61 (145)	<b>Sm</b> 62 150.36	<b>Eu</b> 63 152.97	<b>Gd</b> 64 157.25	<b>Tb</b> 65 158.93	<b>Dy</b> 66 162.50	<b>Ho</b> 67 164.93	<b>Er</b> 68 167.26	<b>Tm</b> 69 168.93	<b>Yb</b> 70 173.04	<b>Lu</b> 71 174.97
<b>Th</b> 90 232.04	<b>Pa</b> 91 231.04	<b>U</b> 92 238.03	<b>Np</b> 93 237.05	<b>Pu</b> 94 (240)	<b>Am</b> 95 243.06	<b>Cm</b> 96 (247)	<b>Bk</b> 97 (248)	<b>Cf</b> 98 (251)	<b>Es</b> 99 252.08	<b>Fm</b> 100 257.10	<b>Md</b> 101 (257)	<b>No</b> 102 259.10	<b>Lr</b> 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

$$1 \text{ pm} = 1 \times 10^{-12} \text{ m}$$

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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	<i>In CO<sub>2</sub> Only</i>
C ≡ N	891	C = O	745	
O = O	498	C ≡ O	1075	

SID 

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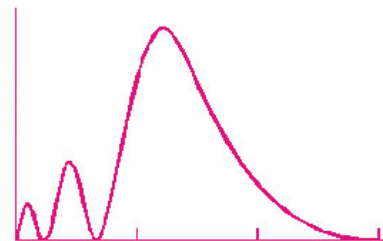
Last \_\_\_\_\_ First \_\_\_\_\_

Question 1  
4 Points

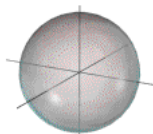


a) The orbital depicted on the left is what type of orbital? \_\_\_\_\_

b) Based on its Radial Distribution depicted on the right you can label this orbital as? \_\_\_\_\_



Question 2  
4 Points



(a)



(b)

a) Which of the orbitals depicted has the **highest n** value? \_\_\_\_\_

b) Which of the orbitals depicted has the **greatest force of attraction**? \_\_\_\_\_

Question 3  
8 Points

Write the **complete electron configuration** for the following

a) P: \_\_\_\_\_

c) Al<sup>3+</sup>: \_\_\_\_\_

b) Sc: \_\_\_\_\_

d) S<sup>2-</sup>: \_\_\_\_\_

Question 4  
6 Points

Using **Noble Gas** notation write the electron configuration for

a) Xe: \_\_\_\_\_

c) Zn<sup>2+</sup>: \_\_\_\_\_

b) Cu: \_\_\_\_\_

Question 5  
3 Points

The element with electronic configuration, [Ar]4s<sup>2</sup>3d<sup>10</sup>4p<sup>5</sup>, has \_\_\_\_\_ **valence electrons**.

Question 6  
3 Points

How many **diamagnetic elements** would you expect in **period 6**? \_\_\_\_\_

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 energy** (1 being the **smallest** ionization energy and **5 the largest** ionization energy).

\_\_\_\_\_ B    \_\_\_\_\_ Ca    \_\_\_\_\_ N    \_\_\_\_\_ Rb    \_\_\_\_\_ Ga

Question 8  
3 Points

Li, Na and K belong to group **IA** and as we know like to lose an electron. However if one of these **were to gain an electron** which one would it most likely be? \_\_\_\_\_

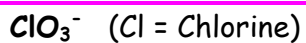
Question 9  
2 Points

The Lewis diagram on the **right** represents the **valence electron configuration** of a **main-group element**. If this element is in **period 4**, its **valence electron configuration** is? \_\_\_\_\_



Question 10  
12 Points

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



Question 11  
8 Points

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



Question 12  
8 Points

Draw all **reasonable** resonance structures for NO<sub>2</sub>F

Circle the best answer:

*Average bond lengths is given on the back of the Periodic Table accompanying this exam.*

The N to O bond length in pm is expected to be:

1. = 136pm

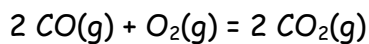
2. < 115pm

3. = 115pm

4. > 115pm

Question 13  
4 Points

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



Show Work

$$\Delta H^\circ_{\text{Reaction}} = \boxed{\phantom{00000}} \text{ kJ}$$

Question 14  
6 Points

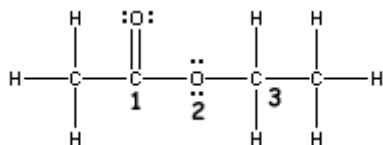
Draw Lewis Structures for  $\text{PO}_4^{3-}$  in which

- The **Octet Rule** is **satisfied** on **all the atoms**.
- The central **Phosphorus** atom has a **formal charge of zero**.

- a) **Octet Rule satisfied on all the atoms.**      b) **Phosphorus a formal charge of zero**

c) What is the **formal charge** on the **oxygen atoms** in a): \_\_\_\_\_

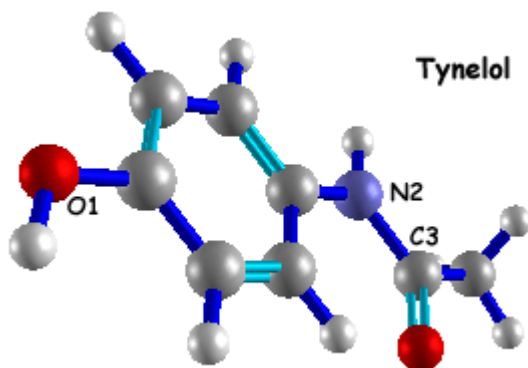
Question 15  
4 Points



a) The **predicted bond angle** about **1** is: \_\_\_\_\_

b) The **predicted bond angle** about **2** is: \_\_\_\_\_

Question 16  
6 Points



What is the **predicted bond angle** about the atoms indicated on Tylenol:

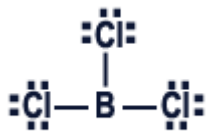





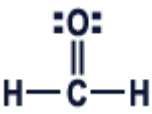
a) **Oxygen 1:** \_\_\_\_\_

b) **Nitrogen 2:** \_\_\_\_\_

c) **Carbon 3:** \_\_\_\_\_

Question 17  
14 Points

The following questions refer to the **Lewis Structures** for the molecules depicted below.

 <p style="text-align: center;">A</p>	 <p style="text-align: center;">B</p>	 <p style="text-align: center;">C</p>	<p style="text-align: center;">H—C≡N:</p> <p style="text-align: center;">D</p>
 <p style="text-align: center;">E</p>	 <p style="text-align: center;">F</p>	 <p style="text-align: center;">G</p>	 <p style="text-align: center;">H</p>

- List the **structure(s)** whose only bond angle is  $\sim 180^\circ$  \_\_\_\_\_
- List the **structures(s)** whose **epg** is/are **trigonal planar**: \_\_\_\_\_
- Give the **electron pair geometry (epg)** for:
 

B: _____	C: _____
F: _____	
- Give the **molecular geometry** for:
 

C: _____	E: _____
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*Do Not Write Below This*

Exam II Score