Dr. Zellmer | Chemistry 1250 | T, R
Time: 7 PM Sun. | Spring Semester 2022 | February 27, 2022
40 min | Quiz VI

Name _____ Rec. TA/time _____

Show **ALL** your work or **EXPLAIN** to receive full credit.

1. (5 pts) Show the relationship between lattice energy (LE), charge and distance between the charges and use it to explain which compound in each pair should have the greater LE.

   a) show the equation for lattice energy, LE.

   b) $FeBr_3$ or $FeBr_2$

   c) CaO or MgO

2. (3 pts) The dipole moment of ClF(g) is 0.88 D. The bond length is 1.63 Å. (**Show work and explain!**) What magnitude of the effective charge (i.e. the partial charge), in units of *e*, on the Cl and F atoms leads to this dipole moment?

3. (5 pts) Draw the Lewis structure of the selenite ion, SeO_3^{2-}, conforming to the Lewis octet (noble gas) rule, **and** put the formal charges on each atom. **(Must show work or explain what you are doing and show and account for all valence electrons and formal charges.)**

4. (5 pts) Draw the Lewis structure of the selenite ion, SeO_3^{2-}, conforming to the Formal Charge rules, **and** put the formal charges on each atom. **(Must show work or explain what you are doing and show and account for all valence electrons and formal charges.)**

5. (5 pts) Draw the Lewis structure for ICl_2^-. How many lone pair(s) of electrons are there in the valence shell of the central atom?

6. (8 pts) Draw the all the possible resonance structures of the cyanate ion, NCO^-, conforming to the Lewis octet rule **and** put the **formal charges** on each atom. **Also**, **indicate** which would likely be the **dominate structure**. **(Must show work or explain what you are doing and show and account for all valence electrons and formal charges. Also, explain your reasoning for your choice of the dominate structure.)**

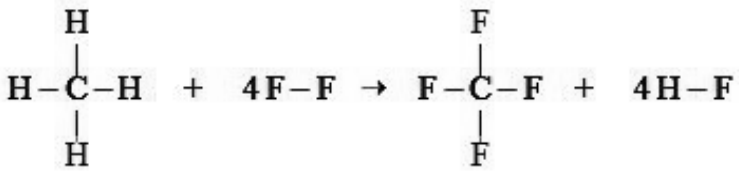
7. (3 pts) Of the possible bonds between nitrogen atoms (single, double, and triple), this of the following are ture? Multiple answers possible.

a) a triple bond is longer than a single bond
b) a double bond is stronger than a triple bond
c) a single bond is stronger than a triple bond
d) a double bond is longer than a triple bond
e) a single bond is stronger than a double bond
f) a triple bond is stronger than a double bond

8. (4 pts) Use the given bond enthalpy data to estimate the ΔH° (kJ) for the following gas phase reaction

C - H = 413 kJ, H - F = 567 kJ, F - F = 155 kJ, C - F = 485 kJ

$$CH_4\,(g) + 4\,F_2\,(g) \rightarrow CF_4\,(g) + 4\,HF\,(g)$$



9. (6 pts) Consider the following molecules and list their **molecular shapes** (NOT the electron domain geometries), **bond angles** and whether they are **polar or nonpolar**. (**Provide the Lewis structure and a short explanation for your choices.**)

AsH_3

AlF_3

H_2S

SiH_2F_2

10. (6 pts) Draw the Lewis structure of IF_4^+. What is its electron-domain geometry? What is its molecular geometry? What are the bond angles? (**Show work or explain.**)

11. (6 pts) Consider the following molecules and select those that are **<u>non</u>**polar.

1) PBr_3 2) BH_3 3) H_2S 4) CH_2Cl_2 5) CS_2

a) 1, 2 b) 1, 3 c) 2, 4 d) 2, 5 e) 2, 4, 5

USEFUL INFORMATION

1 amu = 1.661×10^{-24} g

Avogadro's number, N_A, = 6.02×10^{23} particles/mole

1 A = 10^{-10} m

electron charge, e = 1.602×10^{-19} C 1D = 3.34×10^{-30} C•m $\mu = Q \bullet r$

	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1.008 **H** 1																	4.003 **He** 2
2	6.941 **Li** 3	9.012 **Be** 4											10.811 **B** 5	12.011 **C** 6	14.007 **N** 7	15.999 **O** 8	18.998 **F** 9	20.179 **Ne** 10
3	22.990 **Na** 11	24.305 **Mg** 12											26.98 **Al** 13	28.09 **Si** 14	30.974 **P** 15	32.06 **S** 16	35.453 **Cl** 17	39.948 **Ar** 18
4	39.098 **K** 19	40.08 **Ca** 20	44.96 **Sc** 21	47.88 **Ti** 22	50.94 **V** 23	52.00 **Cr** 24	54.94 **Mn** 25	55.85 **Fe** 26	58.93 **Co** 27	58.69 **Ni** 28	63.546 **Cu** 29	65.38 **Zn** 30	69.72 **Ga** 31	72.59 **Ge** 32	74.92 **As** 33	78.96 **Se** 34	79.904 **Br** 35	83.80 **Kr** 36
5	85.47 **Rb** 37	87.62 **Sr** 38	88.91 **Y** 39	91.22 **Zr** 40	92.91 **Nb** 41	95.94 **Mo** 42	98 **Tc** 43	101.07 **Ru** 44	102.91 **Rh** 45	106.42 **Pd** 46	107.87 **Ag** 47	112.41 **Cd** 48	114.82 **In** 49	118.69 **Sn** 50	121.75 **Sb** 51	127.60 **Te** 52	126.90 **I** 53	131.39 **Xe** 54
6	132.91 **Cs** 55	137.33 **Ba** 56	138.91 **La** 57	178.39 **Hf** 72	180.95 **Ta** 73	183.85 **W** 74	186.21 **Re** 75	190.23 **Os** 76	192.22 **Ir** 77	195.08 **Pt** 78	196.97 **Au** 79	200.59 **Hg** 80	204.38 **Tl** 81	207.2 **Pb** 82	208.98 **Bi** 83	209 **Po** 84	210 **At** 85	222 **Rn** 86
7	223 **Fr** 87	226.03 **Ra** 88	227.03 **Ac** 89	261 **Rf** 104	262 **Ha** 105	263 **Sg** 106	262 **Ns** 107	265 **Hs** 108	266 **Mt** 109	269 110	272 111	277 112						

Lanthanide Series	140.12 **Ce** 58	140.91 **Pr** 59	144.24 **Nd** 60	145 **Pm** 61	150.36 **Sm** 62	151.96 **Eu** 63	157.25 **Gd** 64	158.93 **Tb** 65	162.50 **Dy** 66	164.93 **Ho** 67	167.26 **Er** 68	168.93 **Tm** 69	173.04 **Yb** 70	173.04 **Lu** 71
Actinide Series	232.04 **Th** 90	231.04 **Pa** 91	238.03 **U** 92	237.05 **Np** 93	**Pu** 94	**Am** 95	**Cm** 96	**Bk** 97	**Cf** 98	**Es** 99	**Fm** 100	**Md** 101	**No** 102	**Lr** 103

A PERIODIC CHART OF THE ELEMENTS
(Based on ^{12}C)