Dr. Zellmer | Chemistry 1210 | All sections
Time: 7 PM Sun. | Autumn Semester 2022 | November 6, 2022
40 min | Quiz IX

Name _____ Rec. TA/time _____

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

1. (5 pts) Draw the Lewis structure of the bromate ion, BrO_3^- 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.)**

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2. (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.)**

3. (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.)**

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4. (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?

5. (5 pts) Draw the resonance structures for the nitrite ion, NO_2^-. These indicate,

A. An electron pair in the molecule alternates back and forth between the two nitrogen-oxygen bonds so that the two different bonds seem to exchange positions.

B. The two bonds in the nitrite ion are of equal length and the electron distribution in the two nitrogen-oxygen bonds is identical with an electron pair being shared by all three atoms to give a bond order of 1.5.

C. The electron distribution in the two nitrogen-oxygen bonds differs, as do their bond lengths.

D. The molecule revolves around an axis through the nitrogen atom between the two oxygen atoms so the two different nitrogen-oxygen bonds seem to exchange positions.

E. The nitrite ion exists as two different molecules which simultaneously exist.

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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.)**

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7. (3 pts) Which of the following does **NOT** conform to the Lewis "octet" (noble gas) rule?

1) NO_2^- 2) PF_5 3) HCN 4) BCl_3 5) CO

8. (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

9. (3 pts) Which of the following bonds is most likely to be the **shortest**?

a) C = C b) C = N c) O = O d) C - C e) C ≡ C

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10. (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

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11. (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.**)

12. (4 pts) Which of the following species is **<u>trigonal</u> <u>pyramidal</u>**?

1) SO_3^{2-} 2) NO_2^- 3) CO_3^{2-} 4) BCl_3 5) NF_3

13. (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

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USEFUL INFORMATION

1 amu = 1.66×10^{-24} g

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

1 Å = 10^{-10} m

electron charge, e = 1.602×10^{-19} C 1 D = 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)

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