Chemistry 1410-2/1610-2 Quiz 3 November 2, 2012
D. H. Metcalf 12:00 p.m.

Instructions:

1. Mark the answer sheet with a **# 2** pencil.
2. **Write out** and **bubble in your UVa student ID** (9-digit number, from your UVa Photo ID) in the spaces provided on the right of the answer sheet. **Print your name** in the appropriate blank at the top. **Write your computing ID next to your name.**
3. **Write out and sign the honor pledge** in the box on the back of the answer sheet.
4. You have until **12:50 P.M.** to complete the quiz and turn in your answer sheet.
5. Useful information as well as a periodic table are provided below and on the reverse side of this front sheet. You may remove this front sheet for convenience.
6. Turn in only the answer sheet. You may keep the quiz booklet.
7. There are 15 (fifteen) questions; each counts 5 (five) points, for 75 possible points. Wrong answers count for 0 points.
8. If for any question, no answer listed is correct, please mark answer E.
9. The answers to this quiz will be sent to you by e-mail, but only after all the quizzes are graded.
10. Your grade will be posted on the Gradebook feature of the Collab site for your class. Also posted will be a spreadsheet that will list your scan sheet responses (but no grade). Should you suspect a scanning error, email me and I will check your scan sheet.

1A																	8A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3B	4B	5B	6B	7B	----------8B----------			1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr 223.0	88 Ra 226.0	89 Ac† 227.0	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 (269)	111 (272)	112 (277)	113	114 (285)	115	116 (289)	117	118 (293)

* Lanthanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.2	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
† Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Conversion Factors

Length

1 Å = 10^{-10} m

1 in = 2.54 cm *

Mass

1 kg = 2.205 lb

1 amu = 1.6605×10^{-24} g

Volume

1 L = 1 dm^3
= 0.266 gal

Pressure

1 Pa = 1 N · m^{-2}
= 1 kg · m^{-1} · s^{-2}

1 atm = 101,325 Pa
= 760 mm Hg *
= 760 torr *
= 14.70 lb · in^{-2}

Energy

1 J = 1 kg · m^2 · s^{-2}
= 1 V · C

Electric Charge

1 C = 1 A· s

Electric Potential

1 V = 1 kg · m^2 · s^{-3} · A^{-1}
= 1 J · C^{-1}

Force

1 N = 1 kg · m · s^{-2}

Temp

0 K = −273.15° C *

* These conversion factors and the unitary conversion factors are *exact*; the others have been rounded to the values given.

Constants

Avogadro	N	$= 6.022 \times 10^{23}$ mol^{-1}
Plank	h	$= 6.626 \times 10^{-34}$ J · s
Boltzmann	k	$= 1.381 \times 10^{-23}$ J · K^{-1}
Faraday	F	$= 96485$ C · mol^{-1}
Gas	R	$= 0.08206$ L · atm · K^{-1} · mol^{-1} $= 8.314$ J · K^{-1} · mol^{-1} $= 1.987$ cal · K^{-1} · mol^{-1}
Speed of Light	c	$= 2.998 \times 10^8$ m · s^{-1}

Electron Charge	e	$= 1.602 \times 10^{-19}$ C
Electron mass	m_e	$= 9.109 \times 10^{-28}$ g
Proton mass	m_p	$= 1.673 \times 10^{-24}$ g
Neutron mass	m_n	$= 1.675 \times 10^{-24}$ g
ΔH_{fusion} (H_2O)		$= 6.01$ kJ · mol^{-1}
ΔH_{vap} (H_2O)		$= 40.67$ kJ · mol^{-1}
Specific heat (ice)		$= 2.09$ J · g^{-1} · K^{-1}
Specific heat (water)		$= 4.18$ J · g^{-1} · K^{-1}
Specific heat (water vapor)		$= 1.84$ J · g^{-1} · K^{-1}

In answering questions involving Lewis Dot Structures – use the structure(s) with the preferred values of the formal charges.

1. Place the following in order of ***increasing magnitude*** of lattice energy.

   KF MgS RbI

   a. RbI < KF < MgS
   b. RbI < MgS < KF
   c. MgS < RbI < KF
   d. KF < RbI < MgS
   e. MgS < KF < MgI

2. Which of the following ions does ***not*** have the same number of electrons as argon?

   a. S^{2-}
   b. P^{3-}
   c. Ca^{2+}
   d. Br^{-}
   e. Sc^{3+}

3.. Which of the following molecules will have resonance structures? (Use only structures with preferred values of formal charges.)

   a. N_2
   b. IF_2^-
   c. NO_2^-
   d. None of these.
   e. Two of these.

4. Draw the Lewis structure for the nitrate ion. The structure of nitrate ion as it exists ***in nature*** has:

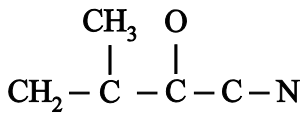
   a. One double and two single NO bonds, and thus one short and two long NO bonds.
   b. Two double and one single NO bonds, and thus one long and two short NO bonds.
   c. Three equivalent NO single bonds.
   d. Three equivalent NO bonds, with a bond length somewhat shorter than that for a NO single bond.
   e. Three equivalent NO bonds, with a bond length somewhat longer than that for a NO single bond.

5. Using Lewis structures and formal charge, predict which of the following ions is the most stable.

   OCN^- ONC^- NOC^-

   a. OCN^-
   b. ONC^-
   c. NOC^-
   d. None of these molecules is stable.
   e. All of these are equally stable.

6. Complete the Lewis structure for the molecule:



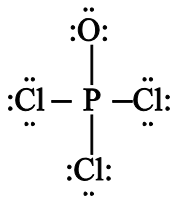
   The molecule has ___ single bonds, ___ double bonds, ___ triple bonds, and ___ non-bonding electron pairs.

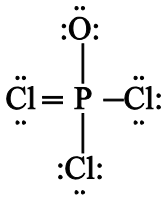
   a. 9, 1, 1, 2
   b. 8, 2, 1, 3
   c. 8, 1, 2, 4
   d. 9, 2, 1, 2
   e. None of the above.

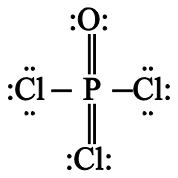
7. As indicated by its Lewis structure, which of the following would probably not exist as a stable molecule?

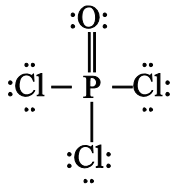
   a. CH_3OH
   b. CH_2O
   c. CH_3O
   d. C_2H_2
   e. All are stable, or more than one of these is not stable.

8. The best Lewis Dot structure for the compound $POCl_3$ (where the O and Cl's are attached to the central P) is:

   a. 

   b. 

   c. 

   d. 

   e. None of these

9. The azide ion, $\mathbf{N_3^-}$, is isoelectronic with (has the same electronic structure as) which of the following?

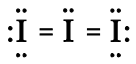
a. CO_2
b. I_3^-
c. O_3
d. None of these.
e. More than one of these.

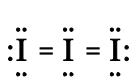
10. Arrange the following in order of **increasing** CO bond length.

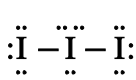
CO_2 CO_3^{2-} CO

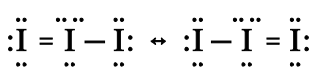
a. $CO_2 < CO_3^{2-} < CO$
b. $CO < CO_3^{2-} < CO_2$
c. $CO < CO_2 < CO_3^{2-}$
d. $CO_3^{2-} < CO_2 < CO$
e. $CO_3^{2-} < CO < CO_2$

11. The correct Lewis dot structure for the I_3^- anion is

a. 

b. 

c. 

d. 

e. None of these, or more than one of these.

12. In which of the following compounds is the interaction between the central atom and bromine have the greatest ionic character?

a. LiBr
b. KBr
c. $SeBr_2$
d. $AsBr_2$
e. $CaBr_2$

13. In which of the following is the bond polarity incorrect?

a. $^{\delta+}H-F^{\delta-}$
b. $^{\delta+}I-Cl^{\delta-}$
c. $^{\delta-}C-O^{\delta+}$
d. $^{\delta-}S-Si^{\delta+}$
e. $^{\delta+}P-Cl^{\delta-}$

14. What is the correct order of the following bonds in terms of ***decreasing*** polarity? (Most polar to least polar.)

a. N–Cl > P–Cl > As–Cl
b. P–Cl > N–Cl > As–Cl
c. As–Cl > N–Cl > P–Cl
d. P–Cl > As–Cl > N–Cl
e. As–Cl > P–Cl > N–Cl

15. From the given bond strength data, estimate ΔE for the following reaction.

$$PCl_3(g) + Cl_2(g) \rightarrow PCl_5(g)$$

Bond	Bond Strength (kJ/mol)
Cl–Cl	243
P–Cl	331

a. –243 kJ/mol

b. –419 kJ/mol

c. –662 kJ/mol

d. –67 kJ/mol

e. –905 kJ/mol

Pledge: On my honor, I have neither given nor received aid on this exam.

Make sure that your UVa Student ID is bubbled in correctly, and that you have pledged your scan sheet in the box on the back of the sheet.