CHM 1001 General Chemistry

Assignment 2

- 20 multiple-choice questions + 5 short answer questions.
- There is only one correct answer for each multiple-choice question.
- Please write your answers in the Assignment Answers Template, which is uploaded with the assignment.
- Upload your answer into Blackboard before the deadline, only word and pdf format are allowed. If you use other formats, you will not get any scores.
- No late submission is allowed.

Deadline: 23:59 pm, October 9th(UTC+8)

Part 1: Multiple-choice questions

1) In which set of elements would all members be expected to have very similar chemical properties?
A) O, S, Se
B) N, O, F
C) Na, Mg, K
D) S, Se, Si
E) Ne, Na, Mg

2) The effective nuclear charge of an atom is primarily affected by _____.
A) inner electrons
B) outer electrons
C) nuclear charge
D) electron distribution
E) orbital radial probability

3) Atomic radius generally increases as we move _____.
A) down a group and from right to left across a period
B) up a group and from left to right across a period
C) down a group and from left to right across a period
D) up a group and from right to left across a period
E) down a group; the period position has no effect

4) Which of the following is an isoelectronic series?

A) B^{5-}, Si^{4-}, As^{3-}, Te^{2-}

B) F^-, Cl^-, Br^-, I^-

C) S, Cl, Ar, K

D) Si^{2-}, P^{2-}, S^{2-}, Cl^{2-}

E) O^{2-}, F^-, Ne, Na^+

5) Of the choices below, which gives the order for first ionization energies?
A) Kr > Se > Br > Ga > Ge
B) Kr > Br > Se > Ge > Ga
C) Ga > Br > Ge > Kr > Se
D) Ga > Ge > Se > Br > Kr
E) Br > Se > Ga > Kr > Ge

6) The ion with the smallest diameter is _____.

A) Br^-

B) Cl^-

C) I^-

D) F^-

E) O^{2-}

7) Of the following elements, _____ has the most negative electron affinity.
A) S
B) Cl
C) Se
D) Br
E) I

8) Which one of the following is a metalloid?
A) Ge
B) S
C) Br
D) Pb
E) C

9) The reaction of alkali metals with oxygen produce _____.
A) oxides
B) peroxides
C) superoxides
D) all of the above
E) none of the above

10) In nature, the noble gases exist as
A) monatomic gaseous atoms
B) the gaseous fluorides
C) solids in rocks and in minerals
D) alkali metal salts
E) the sulfides

11) Which of the following does not have eight valence electrons?

A) Ca^+

B) Rb^+

C) Xe

D) Br^-

E) All of the above have eight valence electrons.

12) Using the Born-Haber cycle, the $\Delta H_f°$ of KBr is equal to _____.

A) $\Delta H_f°[K\ (g)] + \Delta H_f°[Br\ (g)] + I_l(K) + E(Br) + \Delta H_{lattice}$

B) $\Delta H_f°[K\ (g)] - \Delta H_f°[Br\ (g)] - I_l(K) - E(Br) - \Delta H_{lattice}$

C) $\Delta H_f°[K\ (g)] - \Delta H_f°[Br\ (g)] + I_l(K) - E(Br) + \Delta H_{lattice}$

D) $\Delta H_f°[K\ (g)] + \Delta H_f°[Br\ (g)] - I_l - E(Br) + \Delta H_{lattice}$

E) $\Delta H_f°[K\ (g)] + \Delta H_f°[Br\ (g)] + I_l(K) + E(Br) - \Delta H_{lattice}$

13) Of the atoms below, _____ is the most electronegative.

A) Si

B) Cl

C) Rb

D) Ca

E) S

14) The Lewis structure of N_2H_2 shows _____.

A) a nitrogen-nitrogen triple bond

B) a nitrogen-nitrogen single bond

C) each nitrogen has one nonbonding electron pair

D) each nitrogen has two nonbonding electron pairs

E) each hydrogen has one nonbonding electron pair

15) In the Lewis symbol for a sulfur atom, there are _____ paired and _____ unpaired electrons.

A) 2, 2

B) 4, 2

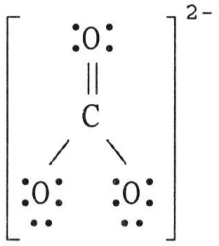
C) 2, 4

D) 0, 6

E) 5, 1

16) The Lewis structure of the COH_3^{2-} ion is _____.

A)



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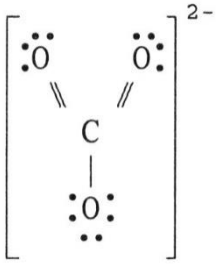

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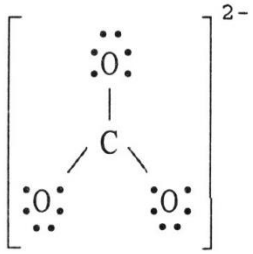
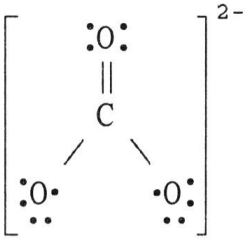
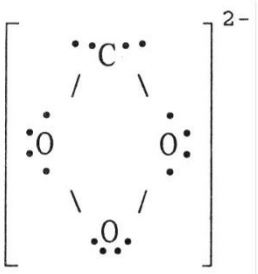


D)



E)



17) Resonance structures differ by _____.
A) number and placement of electrons
B) number of electrons only
C) placement of atoms only
D) number of atoms only
E) placement of electrons only

18) The oxidation number of phosphorus in PF_3 is _____.

A) -2
B) +1
C) +3
D) +2
E) -3

19) A valid Lewis structure of _____ cannot be drawn without violating the octet rule.

A) NF_3

B) IF_3

C) PF_3

D) SbF_3

E) SO_4^{2-}

20) Given that the average bond energies for C-H and C-Br bonds are 413 and 276 kJ/mol, respectively, the heat of atomization of bromoform ($CHBr_3$) is _____ kJ/mol.
A) 1241
B) 689
C) -689
D) 1378
E) -1378

Part 2: Short answer questions

1. What is the molecular geometry of formaldehyde? What are the bond angles (approximation)?

2. Draw the molecular orbital diagram of carbon monoxide, make assumptions if necessary.
   Assume small 2s-2p interaction.

3. Draw all the reasonable resonance structures of $S_2O_3^{2-}$

4. (1) Predict the chemical formula of the ionic compound formed between the following pairs of elements: (a) Al and F; (b) K and O; (c) Ca and S.

   (2) Arrange the ionic compounds formed in (a), (b), (c) in Q(1) in the order of increasing lattice energy.

5. Draw just one reasonable Lewis structure for each of the following:

(a) NI_3
(b) SF_5^-
(c) BrO_3^-
(d) SO_3^{2-}