

Answer Questions 1-26 on your scantron. Only one answer for each question (2 pt ea).

3.1 Electron Arrangement

- The number of electrons in the valence shell of a neutral atom of boron is  
A) 2. B) 3. C) 5. D) 8. E) 10.
- Which of the following elements has the correct electron-dot structure?  
A) Na: B) :Ca: C)  $\cdot\overset{\cdot}{\underset{\cdot}{\text{C}}}\cdot$  D)  $\overset{\cdot}{\underset{\cdot}{\text{C}}}:\overset{\cdot}{\underset{\cdot}{\text{C}}}:$  E) :O:
- The electrons that occupy the highest energy orbitals in a ground state atom are called:  
a) a complete octet  
b) valence electrons  
c) the d orbital electrons  
d) the s electrons  
e) None of the above are correct
- In the periodic table the number assigned to each period corresponds to the  
a) number of valence electrons  
b) the highest occupied principle energy level (shell)  $n$   
c) the total number of electrons in the s and p orbitals = group numbers  
d) the atomic weights of the elements  
e) properties of the elements
- Which of the following is a statement of the rule of eight (octet rule)?  
a) bond with eight other electrons.  
b) a stable configuration of eight valence electrons.  
c) form eight variations of molecules.  
d) follow the Eight Rules of Bonding.  
e) four bonding pair of electrons.

3.2 Ion formation

- Which of the following is NOT a metal?  
a) Al b) Bi c) Br d) Mn e) Pb
- An ion with an atomic number of 34 and 36 electrons has a \_\_\_\_\_ charge.  
A) -2 B) +34 C) -36 D) +2
- Which of the following ion IS NOT isoelectronic with the noble gas neon? (10 electrons)  
A)  $\text{O}^{2-}$  (8) B)  $\text{F}^-$  (9) C)  $\text{Al}^{+3}$  (13) D)  $\text{S}^{2-}$  (16) ← like Argon
- Which of the following statements about ions is INCORRECT?  
T A) Cations are positive ions and anions are negative ions.  
T B) Cations are formed when an atom loses electrons.  
T C) Anions are formed when an atom gains electrons.  
F D) Cations are formed when an atom gains protons.
- In ionic compounds, ~~metals~~ nonmetals gain electrons to form negatively charged anions.  
A) metals, anions B) nonmetals, cations C) metals, polyatomic ions D) nonmetals, anions E) metals, cations

11. An ionic compound
- A) has a net positive charge.
  - B) has a net negative charge.
  - C) contains only cations.
  - D) contains only anions.
  - E) has a net charge of zero.

### 3.3 Ionic Compounds – formulas and names

12. What is the correct general formula for a salt made from a Group IIA metal (X) and a Group VIA nonmetal (Y)?

A)  $X_2Y_2$     B)  $X_2Y$     C)  $XY_2$     D)  $XY$  ~~20 pt~~

13. Which of the following is TRUE regarding the writing of formulas for compounds?

A) The sum of all positive and negative charges will be zero.  
 B) The positive portion or cation is named and written first.  
 C) If present, metals are named and written first  
D) Superscripts are used  
E) All of the above

14. What is the correct formula for iron (III) sulfide?

A)  $Fe_2S_2$     B)  $Fe_2S$     C)  $FeS$     D)  $FeS_2$     E)  $Fe_2S_3$

15. The name of  $Cr_2(SO_4)_3$  is

A) chromium (III) sulfate.  
 B) dichromium trisulfate.  
 C) dichromium sulfate.  
 D) dichromium trisulfide.  
 E) chromium sulfate.

16. The correct formula for a compound formed from the elements Zn and Cl is

A)  $Zn_2Cl$     B)  $ZnCl_2$     C)  $ZnCl$     D)  $ZnCl_3$     E)  $Zn_2Cl_3$ .

17. Which one of the following compounds contains an ion with a  $2+$  charge?

A)  $KCl$     B)  $NaOH$     C)  $FeCl_3$     D)  $CuCl$     E)  $MgCl_2$

(16 pt) Complete the following table for the names and formulas of ionic and covalent compounds.

COMPOUND FORMULA	ION FORMULA	ION FORMULA	COMPOUND NAME
$NH_4 HCO_3$	$NH_4^+$	$HCO_3^-$	Ammonium hydrogen carbonate
$CuS$	$Cu^{2+}$	$S^{2-}$	copper(II) sulfide
$Fe I_2$	$Fe^{2+}$	$I^-$	iron(II) iodide
$NaF$	$Na^+$	$F^-$	Sodium fluoride
$Ni_3(PO_4)_2$	$Ni^{2+}$	$PO_4^{3-}$	Nickel(II) phosphate
$CaCO_3$	$Ca^{2+}$	$CO_3^{2-}$	calcium carbonate

30 pt

Mark your scantron to match the ion with the description on the right that describes its function in humans.

	SYMBOL	DESCRIPTION
18.	Na <sup>+</sup> C	A) Found in the protein hemoglobin which is responsible for oxygen transport and is obtained in red meat.
19.	Mg <sup>2+</sup> D	B) Maintains ion concentration in cells, induces heartbeat and is obtained in bananas. K <sup>+</sup>
20.	Fe <sup>2+</sup> A	C) Regulates fluids outside cells and is obtained in seafood.
21.	HCO <sub>3</sub> <sup>-</sup> CD	D) Found inside of cells, involved in nerve impulse transmission and is obtained in leafy vegetables. Ca <sup>2+</sup> Mg <sup>2+</sup>
22.	HPO <sub>4</sub> <sup>2-</sup> AB	E) Found outside cells and is involved in muscle contraction and the formation of bones and is obtained in leafy vegetables. Ca <sup>2+</sup>
		AB) Controls the acid base balance <u>in cells</u> and is obtained in dairy.
		BC) Found in gastric juice and outside of cells. It is obtained from seafood. Cl <sup>-</sup>
		CD) Controls acid base balance <u>in blood</u> and is supplied to the body by breathing. HCO <sub>3</sub> <sup>-</sup>

### 3.4 Covalent Bonding – formulas and names

23. Which of the following compound(s) is (are) covalent? Mark all that apply on your scantron.

- A) NaCl    B) H<sub>2</sub>O    C) Mg(OH)<sub>2</sub>    D) PCl<sub>3</sub>    E) Cl<sub>2</sub>

24. Using the electronegativities from the table, determine which of the following covalent single bonds is the most polar? 2.5-2.1    3.0-2.5    3.5-3.0

- A) C-H    B) N-C    C) O-N    D) O-C 2.5-2.5

25. Which of the following has the dipole arrow correctly oriented for the following bonds?

- A) C-C  $\leftarrow \oplus \text{NH}$     B) N-H  $\leftarrow \oplus$     C) Cl-O  $\leftarrow \oplus$     D) N-O  $\leftarrow \oplus$

26. Double and triple bonds form because

- A) the atoms involved have high electronegativities.  
 B) single covalent bonds do not give all of the atoms in the molecule eight valence electrons.  
 C) one of the atoms in the molecule has more than 8 valence electrons.  
 D) the ions involved have charges larger than one.  
 E) there is at least one hydrogen atom involved in the bond.

(8 pt) Fill in the following table with the correct formula or name of the following covalent compounds

NAME	FORMULA
Carbon monoxide	CO
phosphorus trichloride	PCl <sub>3</sub>
Dinitrogen trioxide	N <sub>2</sub> O <sub>3</sub>
ammonia	NH <sub>3</sub>

3.6-3.7 Molecular Shapes

Draw the Lewis structure and fill in the table for the compound  $\text{Cl}_2\text{NOH}$  where N is the central atom.

(2 pt) How many valence electrons are there?

$$2 \times 7 + 5 + 6 + 1 = 26$$

Draw the Lewis structure of this compound then fill in the blanks in the table.

<u>Lewis structure (6 pt)</u>	<u>Electron group name at (4pt)</u>	<u>Bond angle (4 pt)</u>	<u>Molecular shape name (4 pt)</u>	<u>Is this a Polar or Non-polar molecule? (2 pt)</u>
	<p>The Nitrogen atom: tetrahedral</p> <p>The Oxygen atom: tetrahedral</p>	<p>N: 109</p> <p>O: 109</p>	<p>The Carbon atom: trig. pyr.</p> <p>The Oxygen atom: bent</p>	<p>Polar</p>

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