3.1 Multiple-Choice

1) How many electrons are in the highest energy level of sulfur?
   A) 2
   B) 4
   C) 6
   D) 8

2) An atom of phosphorous has how many valence electrons?
   A) 4
   B) 5
   C) 6
   D) 8

3) The element Silicon has how many electrons in each of its energy levels?
   A) 2, 8, 4
   B) 2, 6, 4
   C) 3, 5, 7
   D) 2, 8, 6

4) An atom of chlorine has how many valence electrons?
   A) 2
   B) 4
   C) 6
   D) 7

5) Which of the following elements contains 6 valence electrons?
   A) Si
   B) P
   C) S
   D) Cl

6) Which of the following elements has a complete valence shell?
   A) Ne
   B) P
   C) Se
   D) O

7) How many electrons are in the second energy level for an atom of N?
   A) 5
   B) 6
   C) 4
   D) 8

8) How many electrons can be contained in the first energy level?
9) How many electrons can be contained in the second energy level?
A) 2  
B) 8  
C) 10  
D) 18

10) How many electrons are in the highest energy level of strontium?
A) 2  
B) 4  
C) 6  
D) 8
11) What is the total capacity of electrons in the third energy level?
A) 2
B) 8
C) 18
D) 32

12) How many valence electrons does arsenic have?
A) 1
B) 3
C) 5
D) 7

13) An ion is:
A) an atom or a group of atoms that carries an electrical charge
B) another term for an atom
C) a molecule such as sucrose
D) a substance formed by the combination of two elements

14) An ion with an atomic number of 34 and 36 electrons has a ________ charge.
A) -2
B) +34
C) -36
D) +2

15) Which of the following is the sulfate ion?
A) CO$_3^{2-}$
B) SO$_4^{2-}$
C) PO$_4^{3-}$
D) S$^2-$
16) Which of the following is the carbonate ion?
A) CO$_3^{2-}$
B) CO$_2$
C) CO$_3$
D) CO$_3^-$

17) Which of the following is one of the main cations in the body that maintains solution concentrations inside and outside the cell?
A) Fe$^{2+}$
B) Ba$^{2+}$
C) K$^+$
D) NH$_4^+$

18) Which of the following is the main anion in the body?
A) CO$_3^{2-}$
B) SO$_4^{2-}$
C) Cl$^-$
D) S$^{2-}$

19) In order to form an octet, an atom of selenium will:
A) lose 6 electrons
B) gain 6 electrons
C) lose 2 electrons
D) gain 2 electrons

20) Which of the following ions is not isoelectronic with the noble gas neon?
A) O$_2^-$
B) F$^-$
C) Al$^{3+}$
D) S$^{2-}$
21) What combination of these atoms or ions have complete valence shells? He, I-, Pb\(^{2+}\), Mg\(^{2+}\), H\(^{-}\), Tl\(^{+}\)

A) He, I-, Mg\(^{2+}\), H-
B) He, I-, Pb\(^{2+}\), Mg\(^{2+}\)
C) Pb\(^{2+}\), Mg\(^{2+}\), H\(^{-}\), Tl\(^{+}\)
D) He, Pb\(^{2+}\), H\(^{-}\), Tl\(^{+}\)

22) Which of the following is the symbol for the chlorite ion?

A) ClO\(_3\)^{-}
B) ClO\(_4\)^{-}
C) ClO^{-}
D) ClO\(_2\)^{-}

23) Which of the following elements will form ions with the same charge:

A) Chlorine and Iodine
B) Sodium and Sulfur
C) Iodine and Magnesium
D) Magnesium and Oxygen

24) How many protons and electrons are there in the iodide ion?

A) 53 protons, 52 electrons
B) 53 protons, 54 electrons
C) 53 protons, 55 electrons
D) 53 protons, 51 electrons

25) How many protons and electrons are there in the sulfide ion?

A) 16 protons, 17 electrons
B) 16 protons, 16 electrons
C) 16 protons, 18 electrons
D) 16 protons, 15 electrons
26) How many protons and electrons are there in the calcium ion?
A) 20 protons, 20 electrons
B) 20 protons, 22 electrons
C) 20 protons, 18 electrons
D) 20 protons, 19 electrons

27) What is the name and symbol of an ion that has 26 protons and 23 electrons?
A) Fe$^{+3}$
B) Fe$^{+2}$
C) Mn$^{+2}$
D) Mn$^{+3}$

28) Iron pyrite (fool's gold) is iron (II) sulfide. What is its formula?
A) FeS
B) FeCl$_2$
C) FeSO$_4$
D) Fe$_2$S$_3$

29) What is the correct name for BaF$_2$?
A) barium fluoride
B) barium phosphide
C) barium (II) fluoride
D) barium fluorine
Answer: A
Diff: 2
Section: 3-3

30) Which of the following formulas is correct for a cobalt (III) compound?
A) CoCl
B) CoCl$_3$
C) Co$_2$O$_5$
D) CoI$_2$
31) The correct name for Cr₂O₃ is:
A) chromium (III) oxide 
B) chromium (II) oxide 
C) chromium oxide 
D) copper oxide 

32) The reaction of calcium and sulfur produces:
A) Ca₂S 
B) CaS₂ 
C) CaS 
D) Ca₂S₃ 

33) The reaction of magnesium and nitrogen produces:
A) Mg₂N₃ 
B) Mg₃N₂ 
C) MgN 
D) Mg₃N 

34) Which one of the compounds below is covalent?
A) LiF 
B) NaF 
C) HF 
D) RbF 

35) Which compound contains only covalent bonds?
A) FeCl₂ 
B) Ca₃(PO₄)₂ 
C) HC₂H₃O₂ 
D) NaCl
36) The total number of valence electrons in a molecule of SOF₂ is:
A) 26
B) 24
C) 18
D) 20

37) A double bond involves the sharing of ________ electron(s) between the atoms.
A) 1
B) 2
C) 4
D) 6

38) What is the correct name for a molecule of SO₃?
A) Sulfur trioxide
B) Sulfur (III) oxide
C) Sulfite
D) Disulfur trioxide

39) What is the correct name for Cl₂O₇?
A) Chloric acid
B) Chlorine oxide
C) Dichloride oxide
D) Dichlorine heptoxide

40) Which one of the compounds below is most likely to be ionic?
A) CH₄
B) SrBr₂
C) NO₂
D) CBr₄
41) What is the correct formula for dichlorine monoxide?
A) ClO
B) ClO₂
C) Cl₂O
D) Cl₂O₄

42) How many single bonds does an atom of carbon normally make in a covalent molecule if there are no double or triple bonds?
A) 1
B) 2
C) 3
D) 4

44) A thimble of water contains $4.0 \times 10^{21}$ molecules. The number of moles of H₂O is:
A) $2.4 \times 10^5$
B) $6.6 \times 10^{-3}$
C) $6.6 \times 10^{-23}$
D) $2.4 \times 10^{23}$

45) What is the mass of 3.61 moles of Ca?
A) 0.090 g
B) 144 g
C) 40.0 g
D) 150 g
46) Which quantity contains the most moles?
A) 10 g CH₄
B) 10 g CO₂
C) 10 g SiO₂
D) 10 g SO₂

47) The approximate bond angles between the atoms in a molecule with a trigonal planar electron pair geometry are:
A) 90°
B) 120°
C) 180°
D) 109.5°

48) The approximate bond angles between the atoms in a molecule with a tetrahedral electron pair geometry are:
A) 90°
B) 120°
C) 180°
D) 109.5°

49) What is the molecular geometry of a CO₂ molecule?
A) Trigonal planar
B) Tetrahedral
C) Linear
D) Bent
51) Given the electronegativities below, which of the following covalent single bonds is the most polar?

<table>
<thead>
<tr>
<th>Element</th>
<th>H</th>
<th>C</th>
<th>N</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronegativity</td>
<td>2.1</td>
<td>2.5</td>
<td>3.0</td>
<td>3.5</td>
</tr>
</tbody>
</table>

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

52) Which atom is the most electronegative?
A) Li  
B) Cs  
C) P  
D) Cl  

53) A bond where the electrons are shared unequally is called a(n):
A) polar covalent  
B) coordinate covalent  
C) purely (nonpolar) covalent  
D) ionic  

54) A bond where the electrons are shared equally is called a(n):
A) polar covalent  
B) coordinate covalent  
C) nonpolar covalent  
D) ionic
Practice Problems

1. Calculate the masses in grams of the following quantities:
   A) 2.00 moles of P₄
   B) 125 moles of N₂
   C) 75.0 millimoles of S₈

2. Calculate the number of particles in the following quantities:
   A) 2.00 moles of O₂
   B) 125 moles of H₂O
   C) 75.0 millimoles of C₆H₆

3) Calculate the number of O atoms in each of the following compounds.
   A) 2.00 moles of H₂O₂
   B) 5.00 moles of CuSO₄
   C) 6.00 moles of CuCl₂.2H₂O
   D) 8.00 moles of C₆H₁₂O₆

4) Calculate the molar masses of the following compounds.
   A) CH₃(CH₂)₃CH₃
   B) (CH₃)₂NH
   C) Cu(CH₃COO)₂
   D) CuSO₄.5H₂O