

AP Chemistry 2018-19 Summer Assignment

Welcome to AP Chemistry!

If you have chosen this course you should have a very strong background in chemistry from Honors Chemistry I. Advanced Placement Chemistry is a college level course covering topics including electrochemistry, equilibrium, kinetics and thermochemistry. Rather than memorizing how to do a particular type of problem, you must really understand the chemistry and be able to apply it to different situations. Because of the amount of material we must cover before the AP exams in May students must complete much of the work outside of class. Homework will include practice problems, sample AP questions and reading assignments from the textbook. But with hard work you will not only be successful in the AP Chemistry exam and course but also be prepared for college level coursework.

Like most AP classes, AP Chemistry comes with a summer assignment. You will need time to complete the different parts of this assignment, memorize some items and review content before school starts. So it is important to schedule your work during the summer.

To sign up for AP Chemistry Remind text:



Website for course and summer work videos/answers:

<http://chrylpierce.wordpress.com/>

The summer assignment document, answers, practice exam and videos explaining some of the content will be available under the AP Chemistry tab. Check the website during the summer for updates.

Contact Ms. Pierce

Email me at cheryl.pierce@polk-fl.net if you have questions about the assignment during the summer.

Summer Assignment Schedule

End of June Complete sections I-IV and check answers on AP Chem website

End of July Complete sections V-VIII and check answers on AP Chem website

August Work through Practice AP Multiple Choice & Free Response Questions

August 12 Bring for first day of class

1. Completed summer packet
2. Completed Practice AP Multiple Choice & Free Response Questions
3. Periodic Table/Equation Sheet

Materials

1-½ inch 3-ring binder
Divider tabs

scientific calculator
lab manual (provided)

AP Course Content

Prepare your binder before the first day of class with tabs for each of the following AP topics:

- Atomic Theory/Structure
- Chemical Bonding
- Intermolecular Attractions
- Reaction Types
- Stoichiometry
- Equilibrium (K_c/K_p)
- Thermodynamics
- Electrochemistry
- Equilibrium (K_a/K_b)
- Kinetics

2019 Summer Assignment Checklist

Check off each part of the assignment as you complete it and be sure to bring the appropriate items for collection the first day of school. Do not just complete the material in the summer assignment-**make sure that you know and understand the material for the quiz during the first class.**

Review the information and summer work timeline on pages 1-2.

Set up your notebook for AP Chemistry as described on page 2.

I. Chemical Bonding-Cations & Anions

Pages 5-7 Play the video “Learning Polyatomics” under the “AP Chemistry” tab at <http://chrylpierce.wordpress.com/>

Use the “Quizlet-Polyatomic Ions” link on the AP website to practice the names and formulas of the ions.

Complete the examples and questions.

II. Review of Chemical Bonding-Compound Formulas & Names

Page 8 Go over the examples of ionic and covalent compound nomenclature.

Pages 9-10 Complete the exercise.

III. Chemical Bonding-Rules for Naming Acids

Page 11 Read through the examples of acid naming rules.

Page 12 Complete the exercise.

IV. Solubility Rules

Page 13 Read through the solubility rules and answer the questions.

V. Applying Solubility Rules

Pages 14-15 Use the examples provided to complete the exercise on page 15.

Play the video “Applying Solubility Rules” on the website.

VI. Review of Reactions-Chemical Equations

- Page 16 Review the types of equations in the examples provided.
Play the video “Review of Reaction Types” on the website.
- Pages 17-18 Complete the exercise. Be sure to balance each equation.

VII. Review of Electron Configuration

- Pages 19-20 Review the examples of electron configuration and complete the exercises.
Watch the video “Review of Electron Configuration” on the website.

VIII. Electromagnetic Radiation

- Page 21 Watch the video on “Electromagnetic Radiation” on the website.
Review the variables and equations.
- Page 22 Complete the exercises and check answers.

Practice Multiple Choice & Free Response Questions

- Complete the AP Multiple Choice and Free Response practice questions.

Bring these items with you to class the first day of school:

1. Completed summer packet sections I-VIII to turn in.
2. Completed practice multiple choice & free response questions.

Quiz-First day of school on selected summer assignment topics.

Test-First week of school on summer assignment topics.

I. Chemical Bonding-Cations & Anions

Common Ions with One Oxidation State (charge)			
Name	Formula	Name	Formula
lithium	Li ⁺¹	sodium	Na ⁺¹
potassium	K ⁺¹	magnesium	Mg ⁺²
calcium	Ca ⁺²	strontium	Sr ⁺²
barium	Ba ⁺²	silver	Ag ⁺¹
zinc	Zn ⁺²	aluminum	Al ⁺³
hydrogen	H ⁺¹ or H ⁻¹	nitride	N ⁻³
oxide	O ⁻²	sulfide	S ⁻²
fluoride	F ⁻¹	chloride	Cl ⁻¹
bromide	Br ⁻¹	iodide	I ⁻¹

Exercise: Locate the elements listed above on your periodic table and observe the trend. Remove the periodic table from the plastic protector and label the top of each column involved with the appropriate ion charge.

Common Ions with More Than One Oxidation State			
Name	Formula	Name	Formula
copper (I)	Cu ⁺¹	mercury (I)	Hg ₂ ⁺¹
copper (II)	Cu ⁺²	mercury (II)	Hg ⁺²
iron (II)	Fe ⁺²	chromium (I)	Cr ⁺¹
iron (III)	Fe ⁺³	chromium (III)	Cr ⁺³
manganese (II)	Mn ⁺²	cobalt (II)	Co ⁺²
manganese (III)	Mn ⁺³	cobalt (III)	Co ⁺³
tin (II)	Sn ⁺²	lead (II)	Pb ⁺²
tin (IV)	Sn ⁺⁴	lead (IV)	Pb ⁺⁴

Questions: Locate the elements listed above on your periodic table.

Is there a trend based on the oxidation states for each of the transition elements?

What does the Roman number indicate about the ion?

Why is it not necessary to give a Roman number when writing the name for silver and zinc ions?

Exercise: Write the charges above in the box on your periodic table for each of the transition elements listed on page 5.

Polyatomic Ions = a charged particle which has two or more atoms held together by covalent bonds.

Polyatomic Ions = charged particle with two or more atoms held together by covalent bonds

Name	Formula	Name	Formula
ammonium	NH_4^{+1}	acetate	$\text{C}_2\text{H}_3\text{O}_2^{-1}$
oxalate	$\text{C}_2\text{O}_4^{-2}$	peroxide	O_2^{-2}
hydroxide	OH^{-1}	permanganate	MnO_4^{-1}
selenate	SeO_4^{-2}	bromate	BrO_3^{-1}
iodate	IO_3^{-1}	silicate	SiO_3^{-2}
nitrate	NO_3^{-1}	cyanide	CN^{-1}
nitrite	NO_2^{-1}	thiocyanate	SCN^{-1}
phosphate	PO_4^{-3}	chromate	CrO_4^{-2}
phosphite	PO_3^{-3}	dichromate	$\text{Cr}_2\text{O}_7^{-2}$
carbonate	CO_3^{-2}	perchlorate	ClO_4^{-1}
bicarbonate	HCO_3^{-1}	chlorate	ClO_3^{-1}
sulfate	SO_4^{-2}	chlorite	ClO_2^{-1}
bisulfate	HSO_4^{-1}	hypochlorite	ClO^{-1}
sulfite	SO_3^{-2}		
bisulfite	HSO_3^{-1}		

Questions: What do the prefixes hypo-, per-, bi- and thio- mean in terms of polyatomic ion?

What is the significance of the suffixes –ate and –ite in terms of the formula of the ions?

Assignment: Students taking the AP Chemistry exam are given several reference sheets to use during the test. Monoatomic and polyatomic ions are **not** included on those reference sheets so students are required to memorize them. Use the Quizlet on the AP website to learn common polyatomic names and formulas. You may wish to make flashcards of the ions from the lists above-write the ion formula with charge on one side of the flashcard and the name of the ion on the other side of the card.

First day of class-have the ion names and formulas memorized (there will be a quiz).

II. Review of Chemical Bonding-Compound Formulas & Names

Use the examples below to complete the chart on the following page.

Ionic Compounds

metal + nonmetal
or containing a polyatomic ion

total ions charges must equal 0

roman # = transition metal ion charge

potassium oxide

ions = K^{+1} O^{-2}

formula = K_2O

calcium nitrate

ions = Ca^{+2} NO_3^{-1}

formula = $Ca(NO_3)_2$

iron III hydroxide

ions = Fe^{+3} OH^{-1}

formula = $Fe(OH)_3$

BaBr₂

barium bromide

(NH₄)₂CO₃

ammonium carbonate

Cu₂O

copper (I) oxide

Covalent Compounds

nonmetal + nonmetal
or acid (HX)

prefixes in name indicate number of each element

sulfur trioxide

SO_3

phosphorus pentachloride

PCl_5

dinitrogen tetraoxide

N_2O_4

BCl₃

boron trichloride

SCl₆

sulfur hexachloride

OCl₂

oxygen dichloride

Exercise: Complete this section by giving the correct formula or name for each compound.

Write the formulas for the following:

- a. barium sulfate
- b. ammonium chloride
- c. chlorine monoxide
- d. silicon tetrachloride
- e. magnesium fluoride
- f. sodium oxide
- g. sodium peroxide
- h. copper (I) oxide
- i. zinc sulfide
- j. potassium carbonate
- k. manganese (II) phosphate

Name each of the following:

- a. CuSO_4
- b. PCl_3
- c. Li_3N
- d. BaSO_3
- e. N_2F_4
- f. KClO_4
- g. NaH
- h. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
- i. $\text{Ba}(\text{NO}_2)_2$
- j. Sr_3P_2
- k. $\text{Mg}(\text{OH})_2$

Write the formulas for the following:

- l. silicon tetrabromide

- m. lead (II) acetate

- n. sodium permanganate

- o. lithium oxalate

- p. potassium cyanide

- q. iron (III) hydroxide

- r. silicon dioxide

- s. nitrogen trifluoride

- t. chromium (III) oxide

- u. calcium chlorate

- v. sodium thiocyanate

- w. aluminum nitride

Name each of the following:

- l. Al_2S_3

- m. AgBr

- n. P_4O_{10}

- o. $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_4$

- p. CaI_2

- q. MnO_2

- r. Li_2O

- s. FeI_3

- t. Cu_3PO_4

- u. PCl_5

- v. NaCN

- w. IF_3

III. Chemical Bonding-Rules for Naming Acids

Acids are covalent compounds that ionize or form ions in water:



Acid names are linked to the anion formed when the acid reacts with water.

1. When the name of the anion (negative ion) ends in **-ide**, the acid name begins with the prefix hydro- and the stem of the anion has the suffix -ic. This is followed by the word acid.

Pattern: hydro _____ ic acid

Examples: $\text{HCl} = \text{hydro}$ chloric acid [$\text{Cl}^{-1} = \text{chloride}$]

$\text{HCN} = \text{hydro}$ cyanic acid [$\text{CN}^{-1} = \text{cyanide}$]

2. When the name of the anion ends in **-ite**, the acid name is the stem of the anion with the suffix -ous. This is followed by the word acid.

Pattern: _____ ous acid

Examples: $\text{HNO}_2 = \text{nitro}$ s acid [$\text{NO}_2^{-1} = \text{nitrite}$]

$\text{H}_2\text{SO}_3 = \text{sulfuro}$ s acid [$\text{SO}_3^{-2} = \text{sulfite}$]

3. When the name of the anion ends in **-ate**, the acid name is the stem of the anion with the suffix -ic. This is followed by the word acid.

Pattern: _____ ic acid

Examples: $\text{HNO}_3 = \text{nitri}$ c acid [$\text{NO}_3^{-1} = \text{nitrate}$]

$\text{H}_2\text{SO}_4 = \text{sulfuri}$ c acid [$\text{SO}_4^{-2} = \text{sulfate}$]

Acids Names & Formulas

Exercise: Complete the page using the rules on the previous page.

1. Name the following acids:

a. HBr

b. H_3PO_4

c. HClO_4

d. $\text{HC}_2\text{H}_3\text{O}_2$

e. HI

f. HIO_3

g. HClO

h. $\text{H}_2\text{C}_2\text{O}_4$

2. Give the formula for the following acids:

a. hydrofluoric acid

b. bromic acid

c. chloric acid

d. carbonic acid

e. chlorous acid

f. phosphorous acid

g. selenic acid

IV. Solubility Rules (for aqueous solutions)

Ion	Solubility
NO_3^{-1} $\text{C}_2\text{H}_3\text{O}_2^{-1}$ ClO_4^{-1} ClO_3^{-1}	always soluble
alkali metals (Li^{+1} , Na^{+1} , K^{+1} , etc) NH_4^{+1}	always soluble
Cl^{-1} Br^{-1} I^{-1}	soluble except with Ag^{+1} , Pb^{+2} , Hg_2^{+2}
SO_4^{-2}	soluble except with Pb^{+2} , Hg_2^{+2} , Sr^{+2} , Ca^{+2} , Ba^{+2}
OH^{-1}	insoluble except with Ca^{+2} , Sr^{+2} , Ba^{+2}
PO_4^{-3} S^{-2} CO_3^{-2} SO_3^{-2}	insoluble except with alkali metals or NH_4^{+1}
Acids	soluble acids = HCl , HBr , HI , HNO_3 , HClO_4 , H_2SO_4 insoluble acids = all other acids

Questions: What is meant by the term solution?

What does it mean when we say a compound is soluble or insoluble?

What does the term “aqueous” mean?

Are the solubility rules different for compounds mixed with alcohol or other liquids?

What elements are included in the alkali metal group mentioned in solubility rules?

V. Applying Solubility Rules

Use the examples below to complete the chart on the following page.

Compound	Soluble or Insoluble?	Ions present in solution?
KCl potassium chloride	Soluble	K^{+1} and Cl^{-1}
Solubility Rule alkali metal K^{+1} is always soluble or Cl^{-1} (chloride ion) is soluble except with Ag^{+1} , Pb^{+2} , Hg_2^{+2}		

Compound	Soluble or Insoluble?	Ions present in solution?
$Cu(NO_3)_2$ copper II nitrate	Soluble	Cu^{+2} and NO_3^{-1}
Solubility Rule nitrate is always soluble (with any positive ion)		

Compound	Soluble or Insoluble?	Ions present in solution?
AgCl silver chloride	Insoluble	None Ag^{+1} and Cl^{-1} ions remain bonded together in a ionic crystal
Solubility Rule chloride ion is soluble <u>except with</u> Ag^{+1} , Pb^{+2} and Hg_2^{+2}		

Compound	Soluble or Insoluble?	Ions present in solution?
$Zn(OH)_2$ zinc hydroxide	Insoluble	None Zn^{+2} and OH^{-1} ions remain bonded together in an ionic crystal
Solubility Rule hydroxide ion is insoluble <u>except with</u> Ca^{+2} , Sr^{+2} , Ba^{+2}		

Exercise: For each compound below determine whether the compound is soluble or insoluble in water. Indicate which ions, if any, would be present in an aqueous solution.

Compound	Soluble or Insoluble?	Ions present in solution?
NaCN		
NH ₄ NO ₃		
CuSO ₄		
sulfurous acid		
FeI ₃		
KC ₂ H ₃ O ₂		
HNO ₃		
copper (I) chlorate		
Al ₂ S ₃		
lead (II) bromide		
(NH ₄) ₂ Cr ₂ O ₇		
Na ₃ N		
zinc sulfide		
BaSO ₃		
potassium chlorate		
NaH		
Mg(OH) ₂		
calcium iodide		
Cu ₃ (PO ₄) ₂		
K ₂ CO ₃		
ZnSiO ₃		

VI. Review of Reactions-Chemical Equations

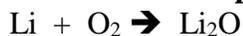
Diatomic Molecules: H₂ O₂ N₂ F₂ Cl₂ Br₂ I₂

Examples of five types of reactions (equations are unbalanced)-

1. Composition/Synthesis/Combination

example: lithium burns in oxygen gas

element + element → compound



check to see if the elements involved are diatomic then use charges of the ions to determine the formula of the compound

2. Decomposition

example: calcium oxide is heated

compound → element + element



heat applied to the compound triggers the decomposition of the compound

3. Single Replacement/Displacement

example: lithium reacts with sodium nitrate

element + compound → compound + element



the three ions in the reactants switch partners to form a new compound (LiNO₃) and a different free element (Na)

4. Double Replacement/Displacement

example: calcium oxide reacts with barium sulfate

compound + compound → compound + compound



the four ions in the reactants switch partners to form two new compounds as products

5. Combustion

example: hydrocarbon react with oxygen

hydrocarbon + oxygen → carbon dioxide + water



a hydrocarbon contains C, H and may contain O also

Exercise:

For each reaction below:

- identify the type of reaction
- predict and write the products
- balance the reaction.

Hint: when writing these reactions, ignore all of the information about heat, bubbling, or mixing details. These are excess words used to make complete sentences. Simply locate the chemical formulas or names in the description to find the reactants for the reaction.

Example: Solutions of silver nitrate and magnesium iodide are combined.



1. Ammonium sulfate reacts with barium nitrate.
2. Zinc metal is added to a solution of copper (II) chloride.
3. Propane gas (C_3H_8) is burned in excess oxygen.
4. Magnesium and nitrogen gas are heated together.
5. Chlorine gas is bubbled through a solution of sodium bromide.
6. Solutions of lead (II) nitrate and calcium iodide are mixed.

7. Sulfuric acid is combined with sodium hydroxide.

8. Isopropyl alcohol ($\text{C}_3\text{H}_7\text{OH}$) is burned in oxygen.

9. Iron metal shavings are added to hydrochloric acid.

10. Ammonium hydroxide solution is added to potassium sulfite.

Be sure all equations are balanced.

VII. Review of Electron Configuration

What is meant by the terms shell, subshell and orbital?

What is meant by the ground state of an electron?

1	1s			He
2	2s		2p	Ne
3	3s		3p	Ar
4	4s	3d	4p	Kr
5	5s	4d	5p	Xe
6	6s	5d	6p	Rn
7	7s	6d	7p	?

4f
5f

Electron configuration examples:



Elements with electrons in the f sublevel:



Exceptions: $\text{Cr} = [\text{Ar}]4s^13d^5$ $\text{Cu} = [\text{Ar}]4s^13d^{10}$

What do elements in the columns with Cr and Cu not have a filled s sublevel?

Exercise:

1. Give the electron configuration for the following atoms:

a. Mg

b. Rb

c. I

d. Mo

e. As

f. Ba

g. Ag

h. Sr

i. Pb

j. U

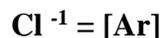
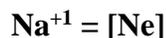
k. Tc

l. Kr

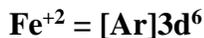
Electron configuration of ions:

Cations (+) = lose high energy level e⁻

Anions (-) = gain e⁻



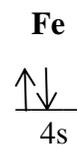
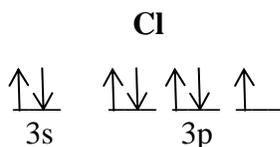
Transition metals (+) = lose s electrons first



2. Give the electron configuration for the following ions:



Electron dot diagram and orbital notation-show the highest energy level e⁻ only



3. Draw the orbital notation for the following elements:

a. I

b. Ca

c. Ag

d. As

e. Cu

f. Fr

4. Draw the electron dot diagram for:

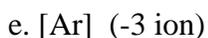
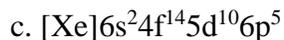
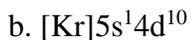
a. Mg

b. Se

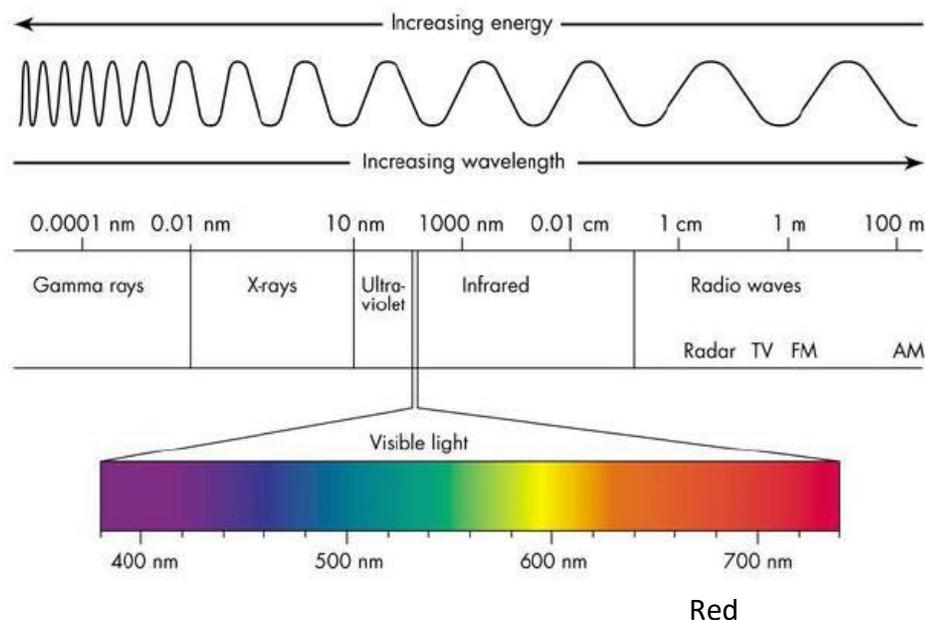
d. Sr

e. Co

5. Identify the element that has the following electron configurations:



VIII. Electromagnetic Radiation



The electromagnetic spectrum is made up of packets of energy called photons that travel in waves. The more compact the wave the higher the energy (more energy would be transmitted every second so higher energy). Gamma rays have more compact waves so they are higher energy than TV/radio waves.

Use the Atomic Structure section of the AP Chemistry Equations and Constants sheets (Appendix B) to fill in the blanks below:

Variables

λ = _____ unit = m, nm, angstroms
(distance from the top of one wave to the top of the next wave)

E = _____ of the photon unit = KJ or J

ν = _____ unit = waves/second or /s or s^{-1}
(how many times the wave passes a point per second)

Constants

c = _____ speed of light
(distance light or the other forms of energy travel per second)

h = _____ Planck's constant

Equations

$$c = \lambda \nu \quad E = h \nu$$

Conversions (for wavelength)

$$1 \text{ m} = 1 \times 10^6 \text{ nm} \quad 1 \text{ m} = 1 \times 10^9 \text{ nm} \quad 1 \text{ m} = 1 \times 10^{10} \text{ \AA}$$

Example: Calculate the frequency of energy with a wavelength of $2.2 \times 10^{-7} \text{ m}$.

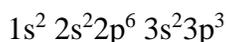
Exercise:

1. A laser used to weld detached retinas produces radiation with a frequency of $4.69 \times 10^{14} \text{ s}^{-1}$. What is the wavelength of this radiation? $\lambda = c/\nu$
2. The yellow light given off by a sodium vapor lamp used for public lighting has a wavelength of 589 nm. What is the frequency of this radiation? (convert wavelength from nm to m)
3. Using the frequency calculated in #2, calculate the smallest increment of energy (E) that an object can absorb from yellow light whose wavelength is 589 nm.
4. What is the energy, in Joules, of radiation that has a frequency of $9.00 \times 10^{11} \text{ s}^{-1}$?
5. Yellow light has a wavelength of 0.583 nm. Calculate the energy, in Joules, of this radiation.
6. What is the wavelength of radiation, in Angstroms, whose frequency is $8.34 \times 10^{14} \text{ s}^{-1}$.

Practice Multiple Choice & Free Response Questions

I. Multiple Choice-

Directions-Eliminate choices as you work each question and use your Honors Chemistry notebook if needed for background information.



1. Atoms of an element, X, have the electronic configuration shown above. The compound most likely formed with magnesium, Mg, is:

- (A) MgX (B) Mg₂X (C) MgX₂ (D) MgX₃ (E) Mg₃X₂

2. Which of the following represents the ground state electron configuration for the Mn³⁺ ion?

- (A) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁴ (B) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁵ 4s²
(C) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d² 4s² (D) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁸ 4s²
(E) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d³ 4s¹

Use the following answers for questions 3-5.

- (A) F (B) S (C) Mg (D) Ar (E) Mn

3. Forms monatomic ions with 2⁻ charge in solutions

4. Forms a compound having the formula KXO₄

5. Forms oxides that are common air pollutants and that yield acidic solution in water.

Use these answers for questions 6-9.

- (A) 1s² 2s² 2p⁵ 3s² 3p⁵ (B) 1s² 2s² 2p⁶ 3s² 3p⁶ (C) 1s² 2s² 2p⁶ 2d¹⁰ 3s² 3p⁶
(D) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁵ (E) 1s² 2s² 2p⁶ 3s² 3p⁶ 3d³ 4s²

6. An impossible electronic configuration

7. The ground-state configuration for the atoms of a transition element

8. The ground-state configuration of a negative ion of a halogen

9. The ground-state configuration of a common ion of an alkaline earth element

10. . . . C₁₀H₁₂O₄S(s) + . . . O₂(g) ---> . . . CO₂(g) + . . . SO₂(g) + . . . H₂O(g)

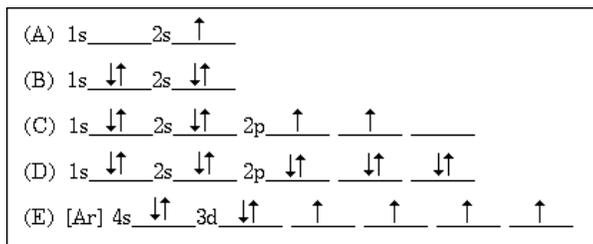
When the equation above is balanced and all coefficients are reduced to their lowest whole-number terms, the coefficient for O₂(g) is?

- (A) 6 (B) 7 (C) 12 (D) 14 (E) 28

11. $\dots \text{Li}_3\text{N}(\text{s}) + \dots \text{H}_2\text{O}(\text{l}) \rightarrow \dots \text{Li}^+(\text{aq}) + \dots \text{OH}^-(\text{aq}) + \dots \text{NH}_3(\text{g})$
 When the equation above is balanced and all coefficients reduced to lowest whole number terms, the coefficient for $\text{OH}^-(\text{aq})$ is:

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 6

Questions 12-14 refer to atoms for which the occupied atomic orbitals shown below:



12. Represents an atom that is chemically unreactive

13. Represents an atom that has four valence electrons.

14. Represents an atom of a transition metal.

15. Which is the most likely electron configuration for a sodium ion?

- (A) $1s^2 2s^2 2p^5$ (B) $1s^2 2s^2 2p^6$ (C) $1s^2 2s^2 2p^6 3s^1$
 (D) $1s^2 2s^2 2p^6 3s^2$ (E) $1s^2 2s^2 2p^5 3s^1$

16. Which of the following pairs of ions are isoelectric (have the same number of electrons)?

- (A) Kr^{-1} , Br^{+1} (B) F^{-1} , Na^{+1} (C) Sc , Ti^{-1}
 (D) Be^{+2} , Ne (E) Cs , Ba^{+2}

17. Which of the following has the same number of electrons as I^{-1} ?

- (A) Sr^{+2} (B) Rb^{+1} (C) Cs^{-1} (D) Ba^{+2} (E) Br^{-1}

II. Free Response Questions-

Directions-Answer the free response questions below. If asked to explain your reasoning in no more than 1-2 sentences and use specific details in your answer.

1.

	# of Valence e ⁻
Element A	4
Element B	1
Element C	7
Element D	8

The table above shows the number of valence electrons for atoms of four elements from the third period (row) of the periodic table. The elements are represented with letters A-D.

Use the information in the table to answer the following questions.

- Which element is most metallic in character? Explain your reasoning.
 - Identify element C. Explain your reasoning.
 - Write the complete electron configuration for an atom of element C.
 - What is the expected oxidation state (charge) for the most common ion of element B?
 - What is the chemical symbol for element B?
 - A neutral atom of which of the four elements is most unreactive? Explain your reasoning.
2. Suppose a stable element with atomic number 119, symbol Q, has been discovered.
- Write the ground-state electron configuration for Q.
 - Would Q be a metal or a nonmetal? Explain in terms of electron configuration.
 - On the basis of the periodic trends, would Q have the largest atomic radius in its group or would it have the smallest? Explain in terms of electron structure.
 - What would be the most common oxidation number for element Q.

3. For each reaction described below:

- (i) write the complete, balanced equation in the box.
- (ii) answer the question related to the equation from part (i).

(a) Magnesium metal is burned in nitrogen gas.

(ii) What type of bond is present in the product?

(b) Magnesium metal is immersed in silver nitrate solution.

(ii) What is the oxidation number (charge) of the magnesium before the reaction? What is the oxidation number of the magnesium after the reaction?

(c) A solution of sodium sulfate is added to a solution of barium nitrate.

(ii) Identify the precipitate (the insoluble product) that forms in the reaction.