

AP CHEMISTRY SUMMER ASSIGNMENT

Instructions:

The purpose of this summer assignment is to help you remember one of the Chemistry I topics – **Nomenclatures**. All these problems are based on topics that you should have learned how to do in Chemistry I.

You can always work ahead of the schedule but remember that the goal of this assignment is to keep the material fresh in your brain for the fall by working little bits at a time.

Keep ALL your work so that you can submit it on Google Classroom on August 19th/20th during the first day of class.

Important Dates

August 5th, 2022: Write an introduction letter to your AP Chemistry Teacher

August 16th/August 17th (depend on A Day or B Day): Nomenclature Worksheets are due the first day of class & there will be a quiz on the elements on the first day.

- Quiz on the polyatomic ions on the second day of class.

Tasks Checklist:

- **Task 1:** Complete Nomenclature Worksheets (attached)
- **Task 2: Write an introduction letter to your AP Chemistry teacher. This must be completed by August 5th, 2022.**

Instructions: Please write a letter to me giving me some more information about yourself and why you chose to take AP Chem. Please address the following points but feel free to also include some other information if you would like!

- Why are you taking AP Chemistry? What goals do you have for this class next year (and your future)?
- What are your worries or fears when you think about this class and your school year next year?
- What was your greatest struggle in your previous chemistry class? How did you work through it?
- What are some other activities and interests that you have outside of class? (this can be through Gibbons or otherwise) - Tell me something interesting about yourself.

Expectations:

1. Students must be able to find charges and write formulas of common simple ions and various polyatomic ions on demand. Unlike Chemistry I, familiarity with the formulas of many more polyatomic ions will be expected from AP Chemistry students. Students are also expected to know the names and formulas of common acids and bases. Proficiency in recognizing transition metals, and proper use of Roman Numerals is also expected.
2. Students must have proficiency in using prefixes in the names of binary covalent compounds. They also need to memorize the formulas of the seven diatomic elements for use in writing chemical equations and be able to write formulas of some common covalent compounds.
3. The AP periodic table itself is different from the one supplied for the Chemistry I exam - The AP periodic table has no element names (only symbols and atomic masses), no period number info, no family names (other than identifying lanthanide and actinide series). Students are expected to correlate element names and properties from their prior knowledge, and hence you need to practice recognizing symbols of elements (particularly those of similar sounding elements) and their relative positions to explain periodic trends.
4. Common monoatomic/polyatomic ions—be able to match their names with their symbols, plus charge.
5. Naming molecules and compounds.
6. Sig figs & metric conversions

Significant Figure Rules

Here are the basic rules for what digits in a number are considered significant, and how to keep the proper sig figs in your answer after doing calculations—if you need more guidance here, YouTube videos are your friend.

1. Non-zero digits are always significant. Eg. **322**
2. Zeroes between non-zeroes are significant. Eg. **302**
3. Zeroes at the beginning of a number are not significant—they are placeholder zeroes. Eg. 0.032
4. Final zeroes at the end of a number are significant IF there is a decimal point. Eg. **320.** (320 zero is not)

Addition/subtraction rule: Round answer so it has the same number of digits after the decimal as there are in the number with the least sig figs after the decimal. Eg. $35.48 + 2.4 = 37.88$ 🚫 round to 37.9 (1 sig fig after)

Multiplication/division rules: Round answer so it has the same number of total sig figs as there are in the number with the least total sig figs. Eg. $4.82 \times 2.318 = 11.17276$ 🚫 round to 11.2 (3 total sig figs)

Stuff worth memorizing....

Solubility Rules - memorize the simple rules below

ALWAYS SOUBLE IF IN A COMPOUND	EXCEPT WITH
Alkali ions, NH_4^+ ,	No Exceptions
NO_3^- , $\text{C}_2\text{H}_3\text{O}_2^-$, ClO_4^- , ClO_3^-	No Exceptions
Cl^- , Br^- , I^-	Pb^{2+} , Ag^+
SO_4^{2-}	Pb^{2+} , Ag^+ , Hg_2^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+}

If a substance does not fit one of the four rules above, assume it is **INSOLUBLE** and should be written as a *molecule* (not ionized). This isn't perfect, but will cover most situations, unless you are given other information in the question to help you know soluble or not.

Polyatomic Ions - Memorize the shaded ions (and learn the pattern so you know their companions)

By learning the four shaded "-ate" ions below, **and** knowing that one less oxygen (same charge) turns the name to *-ite*, **and** two less oxygens (if possible) turns the name to *hypo-xxx-ite* **and** one more oxygen (if possible) turns the name to *hypo-xxx-ite* will make learning all eighteen ions in the chart below as easy as learning just four.

Seven Strong Acids

memorize them
(assume all other acids are weak)

HCl	hydrochloric acid
HBr	hydrobromic acid
HI	hydroiodic acid
HNO_3	nitric acid
H_2SO_4	sulfuric acid
HClO_3	chloric acid
HClO_4	perchloric acid

hypo- (2 less O)	-ite (1 less O)	-ate	per- (1 more O)
	nitrite NO_2^-	nitrate NO_3^-	
	sulfite SO_3^{2-}	sulfate SO_4^{2-}	
	phosphite PO_3^{3-}	phosphate PO_4^{3-}	
hypochlorite ClO^-	chlorite ClO_2^-	chlorate ClO_3^-	perchlorate ClO_4^-
hypobromite BrO^-	bromite BrO_2^-	bromate BrO_3^-	perbromate BrO_4^-
hypoiodite IO^-	iodite IO_2^-	iodate IO_3^-	periodate IO_4^-

and don't forget

ammonium NH_4^+

Odd Companions or No Companion

hydroxide OH^-	
cyanide CN^-	
acetate $\text{C}_2\text{H}_3\text{O}_2^-$	
carbonate CO_3^{2-}	bicarbonate HCO_3^-
permanganate MnO_4^- <i>purple color</i>	

No kidding.....

Practice your times tables.

Go to www.tablestest.com
or www.timestables.me.uk/
or some other times & division
practice site.

The multiple choice section of
the AP Exam and thus our class
exams does not allow
calculators, thus you must get
good at your times tables.

You will use a calculator on Free
Response (problem type)
questions.

Naming Acids - Learn the pattern, don't just memorize the names

Does the anion contain oxygen?

if NO
hydro-(anion root)-ic

HF	hydrofluoric
HCl	hydrochloric
HBr	hydrobromic
HI	hydroiodic
H_2S	hydrosulfuric
HCN	hydrocyanic

if YES
check the ending of the root

-ite
(anion root)-ous

nitrous	HNO_2	nitric	HNO_3
sulfurous	H_2SO_3	sulfuric	H_2SO_4
phosphorous	H_3PO_3	phosphoric	H_3PO_4
chlorous	HClO_2	chloric	HClO_3
bromous	HBrO_2	bromic	HBrO_3

carbonic H_2CO_3

acetic $\text{HC}_2\text{H}_3\text{O}_2$

Name: _____ Date: _____ Block: _____

Ionic Compounds Worksheet
AP Chemistry Summer Assignments

Part I

- | | |
|-----------------------------|---|
| 1.) Sodium Oxide _____ | 11.) Na ₂ S _____ |
| 2.) Calcium Oxide _____ | 12.) Be ₃ P ₂ _____ |
| 3.) Aluminum Chloride _____ | 13.) CaBr ₂ _____ |
| 4.) Potassium Sulfide _____ | 14.) Sr ₃ N ₂ _____ |
| 5.) Magnesium Bromide _____ | 15.) KF _____ |
| 6.) Strontium Nitride _____ | 16.) AlN _____ |
| 7.) Lithium Fluoride _____ | 17.) Al ₂ S ₃ _____ |
| 8.) Beryllium Bromide _____ | 18.) MgCl ₂ _____ |
| 9.) Sodium Phosphide _____ | 19.) BeO _____ |
| 10.) Calcium Nitride _____ | 20.) Rb ₃ P _____ |

Part II

- | | |
|-----------------------------------|---|
| 1.) Lead (II) Oxide _____ | 11.) Ni ₂ S ₃ _____ |
| 2.) Manganese (II) Oxide _____ | 12.) V ₃ P ₄ _____ |
| 3.) Tin (II) Chloride _____ | 13.) CoBr ₂ _____ |
| 4.) Iron (III) Oxide _____ | 14.) Cu ₃ N ₂ _____ |
| 5.) Mercury (II) Bromide _____ | 15.) SnS ₂ _____ |
| 6.) Copper (I) Oxide _____ | 16.) FeN _____ |
| 7.) Cobalt (III) Chloride _____ | 17.) Fe ₂ S ₃ _____ |
| 8.) Lead (IV) Oxide _____ | 18.) MnCl ₄ _____ |
| 9.) Chromium (III) Chloride _____ | 19.) SnO _____ |
| 10.) Chromium (II) Nitride _____ | 20.) Co ₂ S ₃ _____ |

Complex Ionic Compounds

Write the formula.

- 1) barium sulfate _____
- 2) lead (II) acetate _____
- 3) nickel (II) hypochlorite _____
- 4) tin (IV) chlorate _____
- 5) manganese (IV) carbonate _____
- 6) copper (II) nitrite _____
- 7) iron (III) hydroxide _____
- 8) hydrogen cyanide _____
- 9) ammonium chloride _____
- 10) ammonium nitrate _____

Write the name.

- 11) $\text{Mg}(\text{ClO}_4)_2$ _____
- 12) LiClO_2 _____
- 13) CuOH _____
- 14) $\text{Cu}(\text{ClO}_3)_2$ _____
- 15) AgNO_3 _____
- 16) $\text{Al}(\text{ClO})_3$ _____
- 17) NaCN _____
- 18) $(\text{NH}_4)_2\text{C}_2\text{O}_4$ _____
- 19) CuCO_3 _____
- 20) Na_3PO_4 _____

Complex Ionic Compounds

Write the formula.

- 1) sodium hydroxide _____
- 2) ammonium chromate _____
- 3) hydrogen iodate _____
- 4) lead (IV) oxalate _____
- 5) nickel (II) iodite _____
- 6) copper (I) sulfate _____
- 7) cobalt (III) hypochlorite _____
- 8) lithium arsenate _____
- 9) dimercury dichromate _____
- 10) magnesium phosphate _____
- 11) dimercury bromate _____
- 12) zinc nitrate _____
- 13) manganese (IV) carbonate _____
- 14) potassium dichromate _____
- 15) iron (III) cyanide _____
- 16) lithium nitrite _____
- 17) beryllium bisulfite _____
- 18) barium hydroxide _____
- 19) ammonium permanganate _____
- 20) calcium cyanide _____
- 21) sodium bicarbonate _____
- 22) beryllium acetate _____

(continued on next page)

Write the name.

23) $\text{Zn}(\text{ClO}_2)_2$ _____

24) $\text{Mg}_3(\text{PO}_4)_2$ _____

25) ZnCr_2O_7 _____

26) CaCO_3 _____

27) KMnO_4 _____

28) H_2O_2 _____

29) $\text{AgC}_2\text{H}_3\text{O}_2$ _____

30) $\text{Cd}(\text{HSO}_4)_2$ _____

31) CuFO_3 _____

32) H_2SO_4 _____

33) $\text{Cr}_2(\text{SO}_3)_3$ _____

34) LiCN _____

35) Cu_3AsO_4 _____

36) NH_4OH _____

37) ZnSO_4 _____

38) Au_2CrO_4 _____

39) $\text{Sr}_3(\text{PO}_4)_2$ _____

40) AgMnO_4 _____

41) $\text{Co}(\text{HSO}_4)_2$ _____

42) $\text{HC}_2\text{H}_3\text{O}_2$ _____

Acids Worksheet

1. HNO_3 _____

2. $\text{HC}_2\text{H}_3\text{O}_2$ _____

3. H_3PO_4 _____

4. HCl _____

5. HClO _____

6. HFO_3 _____

7. HIO_2 _____

8. HBrO_4 _____

9. HI _____

10. sulfurous acid _____

11. carbonic acid _____

12. sulfuric acid _____

13. hydrobromic acid _____

14. hypobromous acid _____

15. perfluoric acid _____

16. hydrofluoric acid _____

17. nitrous acid _____

18. iodic acid _____

Molecular Compounds Worksheet

1. carbon monoxide _____

2. nitrogen dioxide _____

3. oxygen difluoride _____

4. carbon tetraiodide _____

5. dinitrogen trioxide _____

6. phosphorus trichloride _____

7. trisilicon tetranitride _____

8. dinitrogen monoxide _____

9. phosphorus pentachloride _____

10. carbon tetrachloride _____

11. ammonia _____

12. germanium disulfide _____

13. sulfur dichloride _____

14. PI_3 _____

15. CS_2 _____

16. PBr_3 _____

17. NO _____

18. H_2O _____

19. P_4O_{10} _____

20. SiO_2 _____

21. N_2O_5 _____

22. SO_3 _____

23. N_2O_4 _____

24. ICl_3 _____

25. PBr_5 _____

26. As_2O_5 _____

Mixed Compounds

- aluminum hypochlorite _____
- carbon tetrachloride _____
- calcium hydride _____
- sodium cyanide _____
- hypobromous acid _____
- copper (II) carbonate _____
- dinitrogen tetroxide _____
- zinc chloride _____
- magnesium phosphide _____
- zinc dichromate _____
- calcium carbonate _____
- potassium permanganate _____
- potassium oxide _____
- silver acetate _____
- cadmium bisulfate _____
- oxygen difluoride _____
- sulfuric acid _____
- chromium (III) sulfide _____
- lithium hydride _____
- copper (II) sulfide _____
- dinitrogen monoxide _____
- zinc oxide _____
- sodium hydroxide _____
- ammonium chromate _____
- hydroiodic acid _____
- BaS _____
- Al₂S₃ _____
- NO₂ _____
- HIO₃ _____
- Pb(C₂H₃O₂)₂ _____
- SiS₂ _____
- Ni(BrO)₂ _____
- HFO₄ _____
- SnBr₄ _____
- HCl _____
- MnO₂ _____
- Cu(NO₂)₂ _____
- SiO₂ _____
- HBr _____
- Fe(OH)₃ _____
- Mg(IO₄)₂ _____
- LiBrO₃ _____
- Cu₂O _____
- Cu₃N₂ _____
- CuOH _____
- Cu(ClO₃)₂ _____
- AgNO₃ _____
- H₂O _____

Common Ions List
AP Chemistry

Monatomic Ions → Main Group Elements

You must know the ionic charge of a main group element based upon its position on the periodic table.

Monatomic Ions → Stock System

Ion Name	Ion Formula		Ion Name	Ion Formula
Silver	Ag ⁺		Tin (II)	Sn ²⁺
Copper (I)	Cu ⁺		Tin (IV)	Sn ⁴⁺
Copper (II)	Cu ²⁺		Lead (II)	Pb ²⁺
Chromium (II)	Cr ²⁺		Lead (IV)	Pb ⁴⁺
Chromium (III)	Cr ³⁺		Manganese (II)	Mn ²⁺
Iron (II)	Fe ²⁺		Manganese (III)	Mn ³⁺
Iron (III)	Fe ³⁺		Nickel (II)	Ni ²⁺
Cobalt (II)	Co ²⁺		Nickel (IV)	Ni ⁴⁺
Cobalt (III)	Co ³⁺		Zinc	Zn ²⁺

Polyatomic Ions

Ion Name	Ion Formula		Ion Name	Ion Formula
Acetate	C ₂ H ₃ O ₂ ⁻ or CH ₃ COO ⁻		Hydronium ion	H ₃ O ⁺
Ammonium	NH ₄ ⁺		Hydroxide	OH ⁻
Carbonate	CO ₃ ²⁻		Hypochlorite	ClO ⁻
Chlorate	ClO ₃ ⁻		Nitrate	NO ₃ ⁻
Chlorite	ClO ₂ ⁻		Nitrite	NO ₂ ⁻
Chromate	CrO ₄ ²⁻		Oxalate	C ₂ O ₄ ²⁻
Cyanide	CN ⁻		Perchlorate	ClO ₄ ⁻
Dichromate	Cr ₂ O ₇ ²⁻		Permanganate	MnO ₄ ⁻
Dihydrogen phosphate	H ₂ PO ₄ ⁻		Peroxide	O ₂ ²⁻
Hydrogen carbonate (bicarbonate)	HCO ₃ ⁻		Phosphate	PO ₄ ³⁻
Hydrogen ion	H ⁺		Phosphite	PO ₃ ³⁻
Hydrogen phosphate	HPO ₄ ²⁻		Sulfate	SO ₄ ²⁻
Hydrogen sulfate	HSO ₄ ⁻		Sulfite	SO ₃ ²⁻
Hydrogen sulfite	HSO ₃ ⁻			