

AP Chemistry Summer Assignment (2026-27)

Welcome to AP Chemistry! I am so glad you decided to take the class. ☺ AP chemistry builds on prior knowledge, so it is important to have a solid foundation. With that in mind, I have selected your summer assignment to include basics from first-year chemistry that we will build upon. For the reading assignments, you choose how much time you need to spend on the material to have mastery.

In first-year chemistry, we used the online textbook, Atoms First. You can access the textbook by clicking the link below.

Flowers, P., Neth, E., Robinson, W., Theopold, K., & Langley, R. (2019) *Chemistry: Atoms First 2e*. OpenStax. <https://openstax.org/books/chemistry-atoms-first-2e/pages/1-introduction>

ASSIGNMENT IS DUE FIRST DAY OF CLASS, AUGUST 11

1. Review Chapter 1. Pay particular attention to [1.5](#) (significant figures) and [1.6](#) (dimensional analysis)
2. Using dimensional analysis work the following problems. [Table 1.6](#) contains useful conversion factors. You can check your final answers by clicking on the number of the problem.
⇒ **IMPORTANT NOTE** – in AP Chemistry, you must **ALWAYS** show your work. If you do not, you will not get credit in class, nor will you receive credit for your answers on the AP test.
 - i) Problem 79 in [chapter 1 exercises](#)
 - ii) Problem 81 in [chapter 1 exercises](#)
3. Review [Chapter 7](#). Pay particular attention to [equations for ionic reactions](#) (end of section 1) and [stoichiometry](#).
4. Using dimensional analysis when appropriate (stoichiometry problems), work the following problems from the [exercises](#) section of chapter 7.
 - i) Problem 4 a,b,e & f
 - ii) Problem 7
 - iii) Problem 11
 - iv) Problem 12
 - v) Problem 46
 - vi) Problem 49
 - vii) Problem 53
 - viii) Problem 59
 - ix) Problem 61 – write a balanced equation and prove your answer mathematically. How much of the excess reactant was left over?
5. Memorize the **solubility rule below**, the **6 strong acids** and the **ion list**, and make sure you know what **net ionic equations** are, and how to write them. There will be several quizzes on these during the first two weeks of school. I suggest you make flashcards of the ions to memorize.
Solubility Rule: Na^+ , K^+ , NH_4^+ & NO_3^- are ALWAYS soluble:
Strong Acids: HCl , HNO_3 , HBr , HI , HClO_4 , H_2SO_4
6. If you need more naming practice, see the attachment to the email named **apch05_namingprac07**. This document reviews the rules and has mixed up practice (ionic compounds, acids, and molecular compounds.) Do what you need to do to be prepared for a quiz on nomenclature. You can check your work ([namingpracticeanswers w corrections.pdf](#).)

4 • Reactions in Aqueous Solution**N A M I N G P R A C T I C E**

Type of Compound	Ionic	Acids	Molecular
How To Recognize	Recognize + and - ion	H ⁺ and - ion	Not Ionic / Two non-metals
How To Name	names of + ion then - ion	"ides" → hydro---ic acid "ates" → ---ic acid "ites" → ---ous acid S (add "ur") P (add "or")	mono, di, tri, tetra, penta, hexa, hepta, octa, nona, deca names ends with "ide" pentaoxide → pentoxide, etc.

Indicate the Type of Compound and then name the compound using the appropriate rules:

- | | | | |
|--|-------|------------------------------------|-------|
| 1. NaF | _____ | 21. CuCl ₂ | _____ |
| 2. FeCl ₃ | _____ | 22. AgNO ₃ | _____ |
| 3. CO ₂ | _____ | 23. CO | _____ |
| 4. MgCl ₂ | _____ | 24. H ₃ PO ₄ | _____ |
| 5. HF | _____ | 25. NaCl | _____ |
| 6. SF ₄ | _____ | 26. N ₂ O ₅ | _____ |
| 7. HC ₂ H ₃ O ₂ | _____ | 27. NO ₂ | _____ |
| 8. H ₂ O | _____ | 28. HNO ₃ | _____ |
| 9. NH ₃ | _____ | 29. NaOH | _____ |
| 10. CaO | _____ | 30. SnCl ₂ | _____ |
| 11. NH ₄ NO ₃ | _____ | 31. CaSO ₄ | _____ |
| 12. NaI | _____ | 32. HBr | _____ |
| 13. PbCO ₃ | _____ | 33. Cu(OH) ₂ | _____ |
| 14. Na ₂ O | _____ | 34. Zn(OH) ₂ | _____ |
| 15. Ba(NO ₃) ₂ | _____ | 35. BaCl ₂ | _____ |
| 16. K ₂ CrO ₄ | _____ | 36. PCl ₅ | _____ |
| 17. NO | _____ | 37. PCl ₃ | _____ |
| 18. HCl | _____ | 38. AsF ₅ | _____ |
| 19. MnO ₂ | _____ | 39. H ₂ CO ₃ | _____ |
| 20. H ₂ S | _____ | 40. OF ₂ | _____ |

4 • Reactions in Aqueous Solution

ANSWERS TO NAMING PRACTICE

Type of Compound	Ionic	Acids	Molecular
How To Recognize	Recognize + and - ion	H ⁺ and - ion	Not Ionic / Two non-metals
How To Name	names of + ion then - ion	"ides" → hydro---ic acid "ates" → ---ic acid "ites" → ---ous acid S (add "ur") P (add "or")	mono, di, tri, tetra, penta, hexa, hepta, octa, nona, deca names ends with "ide" pentaoxide → pentoxide, etc.

There are also compounds that do not follow any of the above rules... they use their "common" names.

Indicate the Type of Compound and then name the compound using the appropriate rules:

- | | | | | | | | |
|--|-----------|---|------------------------------------|-------------------------|---------------------------------|-------------------------|-----------------------|
| 1. NaF | I | sodium fluoride | 21. CuCl ₂ | I | cupric chloride | Copper (II) chloride | |
| 2. FeCl ₃ | I | ferric chloride | Iron (III) chloride | 22. AgNO ₃ | I | silver nitrate | |
| 3. CO ₂ | M | carbon dioxide | 23. CO | M | carbon monoxide | | |
| 4. MgCl ₂ | I | magnesium chloride | 24. H ₃ PO ₄ | A | phosphoric acid | | |
| 5. HF | A | hydrofluoric acid | 25. NaCl | I | sodium chloride | | |
| 6. SF ₄ | M | sulfur tetrafluoride | 26. N ₂ O ₅ | M | dinitrogen pentoxide | | |
| 7. HC ₂ H ₃ O ₂ | A | acetic acid | 27. NO ₂ | M | nitrogen dioxide | | |
| 8. H ₂ O | M | water | 28. HNO ₃ | A | nitric acid | | |
| 9. NH ₃ | M | ammonia | 29. NaOH | I | sodium hydroxide | | |
| 10. CaO | I | calcium oxide | 30. SnCl ₂ | I | stannous chloride | Tin (II) chloride | |
| 11. NH ₄ NO ₃ | I | ammonium nitrate | 31. CaSO ₄ | I | calcium sulfate | | |
| 12. NaI | I | sodium iodide | 32. HBr | A | hydrobromic acid | | |
| 13. PbCO ₃ | I | lead carbonate | Missing (II) | 33. Cu(OH) ₂ | I | cupric hydroxide | Copper (II) hydroxide |
| 14. Na ₂ O | I | sodium oxide | 34. Zn(OH) ₂ | I | zinc hydroxide | | |
| 15. Ba(NO ₃) ₂ | I | barium nitrate | 35. BaCl ₂ | I | barium chloride | | |
| 16. K ₂ CrO ₄ | I | potassium chromate | 36. PCl ₅ | M | phosphorus pentachloride | | |
| 17. NO | M | nitrogen monoxide | 37. PCl ₃ | M | phosphorus trichloride | | |
| 18. HCl | A | hydrochloric acid | 38. AsF ₅ | M | arsenic pentafluoride | | |
| 19. MnO ₂ | I* | Manganese IV oxide (manganese dioxide) | 39. H ₂ CO ₃ | A | carbonic acid | | |
| 20. H ₂ S | A | hydrosulfuric acid | 40. OF ₂ | M | oxygen difluoride | | |

* this is an odd one... while it looks like it might be manganese (II) peroxide, the manganese is really in the +4 state and is named like a molecular compound... manganese dioxide. Just memorize this one. This chemical shows up as a catalyst for one of our demonstrations and is also used as an oxidizer.

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PERIODIC TABLE OF THE ELEMENTS

18

1	2											13	14	15	16	17	2
H 1 1.008												He 2 4.00					
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 * Hf	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103 †	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

*Lanthanoids

57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97
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†Actinoids

89 Ac 232.04	90 Th 231.04	91 Pa 238.03	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
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AP® CHEMISTRY EQUATIONS AND CONSTANTS, EFFECTIVE 2025

UNIT SYMBOLS	UNIT CONVERSIONS	METRIC PREFIXES		
gram,	g	Factor	Prefix	Symbol
mole,	mol	10 ⁹	giga	G
liter,	L	10 ⁶	mega	M
meter,	m	10 ³	kilo	k
second,	s	10 ⁻²	centi	c
hertz,	Hz	10 ⁻³	milli	m
atmosphere,	atm	10 ⁻⁶	micro	μ
millimeter of mercury,	mm Hg	10 ⁻⁹	nano	n
degree Celsius,	°C	10 ⁻¹²	pico	p
Kelvin,	K			
joule,	J			
volt,	V			
coulomb,	C			
ampere,	A			

1 hertz = 1 s ⁻¹
1 atm = 760 mm Hg = 760 torr
K = °C + 273.15
1 volt = $\frac{1 \text{ joule}}{1 \text{ coulomb}}$
1 ampere = $\frac{1 \text{ coulomb}}{1 \text{ second}}$

ATOMIC STRUCTURE

$$E = h\nu$$

$$c = \lambda\nu$$

$$F_{\text{coulombic}} \propto \frac{q_1q_2}{r^2}$$

$$E = \text{energy}$$

$$\nu = \text{frequency}$$

$$\lambda = \text{wavelength}$$

$$F = \text{force}$$

$$q = \text{charge}$$

$$r = \text{separation}$$

$$\text{Planck's constant, } h = 6.626 \times 10^{-34} \text{ J s}$$

$$\text{Speed of light, } c = 2.998 \times 10^8 \text{ m s}^{-1}$$

$$\text{Avogadro's number} = 6.022 \times 10^{23} \text{ mol}^{-1}$$

GASES, LIQUIDS, AND SOLUTIONS

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$PV = nRT$$

$$P_A = P_{\text{total}} \times X_A, \text{ where } X_A = \frac{\text{moles } A}{\text{total moles}}$$

$$P_{\text{total}} = P_A + P_B + P_C + \dots$$

$$n = \frac{m}{M}$$

$$D = \frac{m}{V}$$

$$KE = \frac{1}{2}mv^2$$

$$M = \frac{n_{\text{solute}}}{L_{\text{solution}}}$$

$$A = ehc$$

$$P = \text{pressure}$$

$$V = \text{volume}$$

$$T = \text{temperature}$$

$$n = \text{number of moles}$$

$$X = \text{mole fraction}$$

$$m = \text{mass}$$

$$M = \text{molar mass}$$

$$D = \text{density}$$

$$KE = \text{kinetic energy}$$

$$\nu = \text{velocity}$$

$$M = \text{molarity}$$

$$A = \text{absorbance}$$

$$\epsilon = \text{molar absorptivity}$$

$$b = \text{path length}$$

$$c = \text{concentration}$$

$$\text{Gas constant, } R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$$

$$= 0.08206 \text{ L atm K}^{-1} \text{ mol}^{-1}$$

$$\text{STP} = 273.15 \text{ K and } 1.0 \text{ atm}$$

$$\text{Ideal gas at STP} = 22.4 \text{ L mol}^{-1}$$

KINETICS

$$[A]_t - [A]_0 = -kt$$

$$\ln[A]_t - \ln[A]_0 = -kt$$

$$\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$$

$$t_{1/2} = \frac{0.693}{k}$$

$$k = \text{rate constant}$$

$$t = \text{time}$$

$$t_{1/2} = \text{half-life}$$

EQUILIBRIUM

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}, \text{ where } aA + bB \rightleftharpoons cC + dD$$

$$K_p = \frac{(P_C)^c(P_D)^d}{(P_A)^a(P_B)^b}$$

$$K_w = [H_3O^+][OH^-] = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

$$pK_w = 14 = \text{pH} + \text{pOH at } 25^\circ\text{C}$$

$$\text{pH} = -\log[H_3O^+], \quad \text{pOH} = -\log[OH^-]$$

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}, \quad K_b = \frac{[OH^-][HB^+]}{[B]}$$

$$pK_a = -\log K_a, \quad pK_b = -\log K_b$$

$$K_w = K_a \times K_b, \quad pK_w = pK_a + pK_b$$

$$\text{pH} = pK_a + \log \frac{[A^-]}{[HA]}$$

Equilibrium Constants

$$K_c$$
 (molar concentrations)
$$K_p$$
 (gas pressures)
$$K_w$$
 (water)
$$K_a$$
 (acid)
$$K_b$$
 (base)

THERMODYNAMICS/ELECTROCHEMISTRY

$$q = mc\Delta T$$

$$\Delta H^\circ_{\text{reaction}} = \sum \Delta H^\circ_{f, \text{products}} - \sum \Delta H^\circ_{f, \text{reactants}}$$

$$\Delta S^\circ_{\text{reaction}} = \sum S^\circ_{\text{products}} - \sum S^\circ_{\text{reactants}}$$

$$\Delta G^\circ_{\text{reaction}} = \sum \Delta G^\circ_{f, \text{products}} - \sum \Delta G^\circ_{f, \text{reactants}}$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$= -RT \ln K$$

$$= -nFE^\circ$$

$$I = \frac{q}{t}$$

$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{RT}{nF} \ln Q$$

$$q = \text{heat}$$

$$m = \text{mass}$$

$$c = \text{specific heat capacity}$$

$$T = \text{temperature}$$

$$S^\circ = \text{standard entropy}$$

$$H^\circ = \text{standard enthalpy}$$

$$G^\circ = \text{standard Gibbs free energy}$$

$$R = \text{gas constant}$$

$$K = \text{equilibrium constant}$$

$$n = \text{number of moles of electrons}$$

$$E^\circ = \text{standard potential}$$

$$I = \text{current (amperes)}$$

$$q = \text{charge (coulombs)}$$

$$t = \text{time (seconds)}$$

$$Q = \text{reaction quotient}$$

$$\text{Faraday's constant, } F = 96,485 \text{ coulombs / 1 mol } e^-$$

Solubility Rules

You will not be provided with a solubility table on the AP test and are expected to know that Na^+ , K^+ , NH_4^+ , and NO_3^- are ALWAYS soluble.

SOLUBLE COMPOUNDS	EXCEPTIONS
Compounds containing alkali metal ions (Li^+ , Na^+ , K^+ , Rb^+ , Cs^+)	none
Compounds containing the ammonium ion (NH_4^+)	none
Nitrates (NO_3^-), acetates ($\text{C}_2\text{H}_3\text{O}_2^-$), chlorates (ClO_3^-), and bicarbonates (HCO_3^-)	none
Halides (Cl^- , Br^- , I^-)	Ag^+ , Hg_2^{+2} , Pb^{+2}
Sulfates (SO_4^{-2})	Ag^+ , Ba^{+2} , Hg_2^{+2} , Pb^{+2}
INSOLUBLE COMPOUNDS	EXCEPTIONS
Sulfides (S^{-2})	Alkali metal ions, NH_4^+ , and Ca^{+2} , Sr^{+2} , Ba^{+2}
Carbonates (CO_3^{-2})	Alkali metals ions, and NH_4^+
Phosphates (PO_4^{-3})	Alkali metals ions, and NH_4^+
Hydroxides (OH^-)	Alkali metals ions, and NH_4^+ , and Ca^{+2} , Sr^{+2} , Ba^{+2}

Ions to Memorize

Positive ions:

ammonium	NH_4^+
hydronium	H_3O^+
silver	Ag^+
cadmium	Cd^{+2}
zinc	Zn^{+2}
aluminum	Al^{+3}

Know ALL **alkali metals** (group 1) ions have a +1 charge.

Know ALL **alkaline earth metals** (group 2) ions have a +2 charge.

Know the following element symbols for ions with more than one charge.

antimony, Sb	iron, Fe
arsenic, As	lead, Pb
cobalt, Co	manganese, Mn
chromium, Cr	mercury, Hg
copper, Cu	tin, Sn
nickel, Ni	

(For instance, chromium (III) would be Cr^{+3})

Negative ions:

acetate	$\text{C}_2\text{H}_3\text{O}_2^-$	carbonate	CO_3^{-2}
chlorate	ClO_3^-	chromate	CrO_4^{-2}
cyanide	CN^-	dichromate	$\text{Cr}_2\text{O}_7^{-2}$
hydrogen carbonate	HCO_3^-	oxalate	$\text{C}_2\text{O}_4^{-2}$
hydroxide	OH^-	oxide	O^{-2}
hypochlorite	ClO^-	peroxide	O_2^{-2}
nitrate	NO_3^-	sulfate	SO_4^{-2}
perchlorate	ClO_4^-	sulfide	S^{-2}
permanganate	MnO_4^-	sulfite	SO_3^{-2}
thiocyanate	SCN^-	nitride	N^{-3}
		phosphate	PO_4^{-3}

Know ALL **halides** (group 17 ions) have a -1 charge.