

AP for AP Chemistry



Hello Future AP Chem All-Stars,

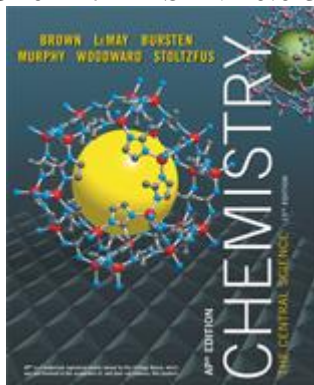
I hope that you will find the AP Chemistry Class to be rewarding. To be successful, I find that it is beneficial to start well and not feel overwhelmed at the beginning of the school year. The questions that I have attached are meant for you to review 1st-year chemistry topics and allow you to get a jump on some of the material that will comprise your first assessment of the year.

Your first assessment will cover information from Chapters 1 (Introduction: Matter and Measurement), 2 (Atoms, Molecules, & Ions), 3 (Chemical Reactions and Reaction Stoichiometry), and 21 (Nuclear Chemistry). This assessment will take place about 3 weeks into the school year.

Textbook: (Not Required as there will be a classroom set.)

Brown, LeMay, Bursten, Murphy, Woodward, and Stoltzfus. (2015). *Chemistry: The Central Science* (13th ed./AP ed). Boston: Pearson

ISBN-13:978-0-321-91041-7 ISBN-10:0-321-91041-9



Other Resources to Consider (choose 1)

Pearson Education Test Prep Series: AP Chemistry 13th Edition (matches our textbook)

Pearson Education – Author: Edward L. Waterman

ISBN-13: 978-0133598025 ISBN-10: 0133598020

Pearson Education Test Prep Series: AP Chemistry 14th Edition

Pearson Education – Author: Edward L. Waterman

ISBN-13: 978-0134661483 ISBN-10: 0134661486

5 Steps to a 5: AP Chemistry 2022

McGraw-Hill

ISBN-13: 978-1264267972 ISBN-10: 1264267975

AP Chemistry Premium Prep 2022 Edition

The Princeton Review (Publisher: Random House Children's Books)

ISBN-13: 978-0525570578 ISBN-10: 0525570578

AP Chemistry Crash Course 2020 – Author: Adrian Dingle

By Research & Education Association

ISBN-13: 978-0738612638 ISBN-10: 0738612634

Or any other test prep book that you like

Chapter 1 – Introduction: Matter & Measurement

Task 1a

Convert the following numbers to scientific notation.

| | | |
|----|---------|--|
| 1. | 24500 | |
| 2. | 356 | |
| 3. | 0.00099 | |
| 4. | 0.222 | |
| 5. | 12200 | |

Convert the following scientific notation numbers to non-scientific notation numbers.

| | | |
|----|-----------------------|--|
| 1. | 4.2×10^3 | |
| 2. | 2.15×10^{-4} | |
| 3. | 3.14×10^{-6} | |
| 4. | 9.22×10^5 | |
| 5. | 9.57×10^2 | |

Task 1b

Convert the following quantities from one unit to another using the following equivalence statements. Show work. $1\text{m} = 1.094\text{ yds}$ $1\text{ mile} = 1760\text{ yds}$ $1\text{kg} = 2.205\text{ lbs}$

| Problem | Work | Answer |
|-------------------|------|--------|
| 30 m to miles | | |
| 1500 yds to miles | | |
| 206 miles to m | | |
| 34 kg to lbs | | |
| 34 lbs to kg | | |

Task 1c

Determine the number of significant figures in the following numbers.

| | | |
|----|----------------------|--|
| 1. | 250.7 | |
| 2. | 0.00077 | |
| 3. | 1024 | |
| 4. | 4.7×10^{-5} | |
| 5. | 34000000 | |

Using a calculator, carry out the following calculations and record the answer to the correct number of significant figures.

| | | |
|----|----------------------------------|--|
| 1. | 34.5×23.46 | |
| 2. | $123 / 3$ | |
| 3. | $2.61 \times 10^{-1} \times 356$ | |
| 4. | $21.78 + 45.86$ | |
| 5. | $23.888897 - 11.2$ | |
| 6. | $6 - 3.0$ | |

- Understand the concepts involved in chromatography

Chapter 2 – Atoms, Molecules, & Ions and Chapter 21 – Nuclear Chemistry

Task 2a

1. Name the compounds below:

- (i) NaCl _____
- (ii) SrO _____
- (iii) AlN _____
- (iv) BaCl₂ _____
- (v) K₂O _____
- (vi) CuO _____
- (vii) Cu₂O _____

Task 2b

1. What are the formulas for the following ionic compounds?

- (i) Ammonium nitrate _____
- (ii) Copper (II) bromide _____
- (iii) Copper (I) bromide _____
- (iv) Zinc hydrogensulfate _____
- (v) Aluminum sulfate _____
- (vi) Sodium perchlorate _____
- (vii) Copper (II) iodite _____

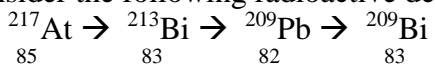
Task 2c

1. Write formulas or names for the following molecular compounds.

- (i) Dinitrogen tetroxide _____
- (ii) N₂O₅ _____
- (iii) PCl₃ _____
- (iv) Phosphorus pentachloride _____
- (v) SF₆ _____

Task 2d

1. Consider the following radioactive decay series.



Identify each of the particles **emitted** in the series

- Understand how a Mass Spectrometer works

Chapter 3 – Chemical Reactions and Reaction Stoichiometry

- Refer to the “Calculations Summary”

Calculations Summary

TYPE 1: Those involving Avogadro's number (the mole concept).

Question 1

A sample of Ge is found to contain 9.7×10^{23} atoms of Ge. How many moles of Ge atoms are in the sample? (1pt)

Question 2

How many W atoms are found in 0.43 moles of pure W? (1pt)

TYPE 2: Those involving the relationship between mass, moles, and molar mass.

Question 3

What is the mass in grams of 0.531 moles of Sn? (1pt)

Questions 4

How many moles of Ca are in 2.03 g of Ca? (1pt)

Question 5

5.00 moles of a binary, group II oxide are found to have a mass of 521 g. Identify the group II metal. (2pts)

TYPE 3: Those combining types #1 & #2.

Question 6

How many Ta atoms are found in a 1.231 g sample of Ta? (2pts)

Question 7

What is the mass of 8.11×10^{23} atoms of Sulfur? (2pts)

Question 8

What mass of Cu atoms have the same number of atoms as there are in a 4.21 g sample of Si? (2pts)

TYPE 4: % by Mass Composition

Question 9

Calculate the percent by mass composition of dimethylether, CH_3OCH_3 . (2pts)

Question 10

What is the percent by mass composition of aluminum sulfate? (2pts)

Question 11

A compound that contains a complex ion has the formula $\text{Al}_4[\text{Fe}(\text{CN})_6]_3$. What is the percent by mass composition of this compound? (2pts)

TYPE 5: Empirical formula.

Question 12

A compound containing silver and chlorine contains 75.3% Ag. What is the empirical formula of the compound? (2pts)

Question 13

In a vigorous chemical reaction, 1.403 g of sodium metal is completely reacted with 1.159 g of fluorine gas. What is the empirical formula of the compound formed? (3pts)

TYPE 6: Molecular formula from empirical formula.

Question 14

What is the molecular formula of a hydrocarbon that has an empirical formula of CH and a molecular mass of 78 g mol^{-1} ? (1pt)

Question 15

A compound contains 48.65% carbon, 8.108% hydrogen, and the remainder is oxygen. The molecular mass of this compound is approximately 74.00 g/mol . What is the empirical formula? What is the molecular formula? (3pts)

TYPE 7: Combustion analysis (Gravimetric Analysis)

Question 16

The combustion of 4.000 g of a compound that contains only C, H, N, and Br yields 3.826 g of CO_2 and 2.087 g of H_2O . Another sample of the compound with a mass of 3.111 g is found to contain 1.803 grams of Br. What is the empirical formula of the compound? (6pts)

TYPE 8: % Yield.

Question 17

Propane will combust according to the reaction below. If 11.1 g of propane produces 23.3 g of CO_2 when burned in excess oxygen, what is the % yield? (3pts)



TYPE 9: Limiting reactant.

Question 18

Consider the reaction between iron and anhydrous Copper (II) sulfate that produces Iron (II) sulfate and copper metal.

(a) Write an equation for the reaction. (2pts)

(b) If 120. g of Fe are reacted with 200. g of Copper (II) sulfate, identify the limiting reagent. Which reagent is in excess? (2pts)

(c) Calculate the mass of Copper formed. (2pts)

(d) How much of the excess reagent is left over at the end of the reaction? (2pts)

TYPE 10: Analysis of hydrated salts.

Question 19

Barium chloride is found as a hydrated salt, $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$. A student carefully heats 2.50 g of the salt to a constant mass of 2.13 g. Find x. (4pts)

TYPE 11: Moles and reacting ratios (including solutions).

Question 20

Calcium hydrogen carbonate, $\text{Ca}(\text{HCO}_3)_2$, reacts with HCl according to the equation below:



(a) What volume of 0.235 M HCl solution must be present to totally react with 0.140 moles of the calcium compound? (2pts)

(b) How many moles of water are produced when 0.491 g of the calcium compound combines with excess HCl ? (2pts)

TYPE 12: Dilution.

Question 21

Calculate the volume of 0.120 M sulfuric acid that must be diluted with water to produce 3.00 L of 0.018 M sulfuric acid. (2pts)

TYPE 13: Molality.

Question 22

Calculate the molality of a 0.342 M sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) solution that has a density of 1.12 g/mL. (2pts)