

AP Chemistry 2022-23

Summer Work

Ms. Smith

WELCOME to AP Chemistry!

We will try our best to cover all of the topics and the required labs for the AP Exam that is in early May. All of you will find AP chemistry to be challenging and some of you will find it to be down-right hard. There is a lot to cover and while we can do it we will all need to work very hard. You should expect this class to be more difficult than your first chemistry class but also more relaxed and with lots of lab time. Since there is so much material to learn (2 semesters of college chemistry), we must stay on schedule to get through everything before the test. This means that we cannot slow down if you don't understand a topic. Many students who take AP classes are also involved in other activities that will take them away from class. You need to make sure that you are staying current with all assignments, and come in for help if you are falling behind. Please communicate with me so that I can best support your efforts. I understand that you will have other things going on next year too 😊

We need to use our class time effectively during the upcoming year, and the goal of the summer work is to review/preview material. This summer assignment is designed to help you prepare to take AP chemistry by helping you review important chemistry and math topics that are prerequisites. Rushing through this summer assignment the day before school starts is an ineffective method for reviewing this material. Your focus should be on the learning. Students are encouraged to work together to complete the summer assignment. Think study group, not copying. You should spread out the assignment over a few weeks in mid-late August. You will have an opportunity to ask questions on anything in the summer assignment on the summer day. This assignment must be completed and ready to turn in by the **end of the second week**.

We will discuss lab safety first thing in the fall. We will do a lab the first week of class, and you **MUST** get 100% on the lab safety quiz before you can participate in chemistry lab work. You will also need a notebook and binder. I will provide you with a lab notebook. This is a lab-intensive course, and we will be doing lots of labs. The College Board requires lab work to make up a minimum of 25% of our class time.

I would also like you to join our AP Chemistry Google classroom. The class code is **3xzceqn** you should have already gotten an invite from me as well. Please join by the end of June, I will post resources that you can use for your summer work.

AP Chemistry will be taught with the assumption that all students are taking the AP exam in the spring.

If you have any questions about any of the topics covered in this assignment, please do not hesitate to email me at mgsmith@rsu16.org. I will be happy to answer any questions, and I will be checking my email all summer long. I want to help you be as successful as possible in this course! I look forward to seeing all of you in the fall, and I am so excited to have you in AP chemistry!

WHY DO WE HAVE TO DO SUMMER WORK?

- It is a review of some basic content you need from the get go
- It provides the necessary fundamentals you will need to be successful in AP chemistry.
- There will not be enough time before the AP exam in May to reteach Chemistry 1 and cover all the material tested on the AP exam
- I encourage you to take a break this summer - so, take one! I would say do this in the middle to end of August so it's fresh when we start the year. In the fall will hit the ground running!

SUMMER WORK ASSIGNMENT

All work should be done neatly and clearly. All work for every problem (**including units**) needs to be shown. This is an expectation on the AP exam in the spring and we want to make this a habit early. On the AP exam you must show all work including units or you will lose points. (**Accordingly in this class and this packet, credit will NOT be given for answer-only responses!**) SO. . . you need to show all work for every problem including

- equation you will be using (if applicable)
- knowns/unknowns (if applicable)
- plugged in equations and any algebraic work

Complete the summer work in the packet or on additional paper – your choice, just make it clear to me which problem is which.

Summer Work Assignments Checklist

Part 1 – Why are you taking this course? Due by June 30

- Email me at mgsmith@rsu16.org with a paragraph about yourself. Subject Line: AP Chemistry 2021-22, Your Name Body: Your full name, nickname that you go by if you have one, and stuff about you!

- Who was your last science teacher? What class?
- What science classes have you taken? What other science classes are you taking?
- What are you looking forward to the most in AP Chemistry?
- What are you most anxious about in AP Chemistry?
- Why are you taking AP Chemistry? What do you hope to accomplish/gain?

- Include any other relevant details that can help me develop a sense of who you are and how you learn. Describe your plan for succeeding in this class and overcoming any challenges that you will face. Also include how I can help to make this year a success for you! While you may be tempted to make this message informal, especially if I have taught you before, please keep in mind that you are representing yourself in writing in an academic setting. Therefore, you should use appropriate formatting, grammar, and language. Don't type this email on your phone. Hopefully, this will be the only time I'll need to remind you of this during the year. You must hold yourself to the highest academic standards in this class.

Part 2 – Review AP Chemistry Course Online

- Get a feel for what the course covers. Go to college board website <https://apstudent.collegeboard.org/apcourse/ap-chemistry> and review the course by clicking on the “AP Course Overview (PDF)” link and the “AP Chemistry Course and Exam Description (PDF)” link

Part 3 – Complete Review Work

- This is due at the end of the second week of class. *Students are encouraged to work together to complete the work but THAT DOES NOT MEAN COPY!*

Part 4 – Complete assigned work on Flinn Prep

- This will be assigned after Aug 1 and will be posted on classroom. Flinn Prep assignments meet STANDARD grades in jumprope.

AP Chemistry Class Perception and Reality

Students need to be realistic about the expectations for this course. Many students **THINK** they are ready for college level work, but really don't know what that means. In order to get a more realistic view of this course, I have included some perceptions entering students have, and the reality of the situation.

1. **PERCEPTION:** I can miss class (sports, activities, family vacations, jobs, field trips, etc.) and catch up on my own. I always have before.

REALITY: You can't!!! In AP Chemistry, missing class is the number one reason why students fall behind, get lost, give up, and either drop the class or get a low grade. You cannot be gone for three days and expect to get caught up with a 10-minute session after school. I cannot teach in 10 minutes what it took 4.5 hours to teach earlier. You will need to come in for tutoring and/or make arrangements for assignments to catch up. I'm happy to help you catch up but you have to put in the time and effort to do so.

2. **PERCEPTION:** Ms. Smith is making this class a lot tougher than it really needs to be.

REALITY: Never forget-this is a college level course **NOT** an advanced high school course. If I am doing my job, students in this course should learn as much as they would if they were taking freshman chemistry at any college or university in the United States. A second goal is to properly prepare students for the AP Exam in May. I cannot make the course easier and still accomplish the above goals.

3. **PERCEPTION:** If the majority of the class falls behind. Ms. Smith will just have to slow down so that we can catch up.

REALITY: I can't!!! You will find that time is of the essence in this course. As much as I may like to, our schedule cannot be adjusted. You will need to come in for tutoring if you fall behind. Students will be expected to study the text on their own, and class time will be used more for practice problems, labs and activities than for reviewing old material. There is really no other way to cover the vast amount of material required by the AP exam. If we slow down to make the course easier, we will not cover the required subject matter, and students will have to face exam questions on material not covered in class. As a result, I will make up a schedule that will allow us to complete all required material prior to the exam, and students **MUST** keep to this schedule. Chemistry topics build upon each other, and students who fall behind have to be responsible and take action to catch back up.

4. **PERCEPTION:** All of this work Ms. Smith is talking about must be necessary only if I don't pay attention in class. I've never had to study before!

REALITY: All students who expect to be successful in this course will have to spend time after school—either by getting help with an assignment, completing lab work/ homework, or reviewing for tests. If you are not willing or able to work/study after school to complete chemistry work, you should not take this course! I **WILL** be available almost every day after school. Students are encouraged to come in for help and to form study groups with peers. Students should expect to spend time outside of class in the study of chemistry most nights. Students who have after-school jobs or who are heavily involved in after-school activities will have to budget their time accordingly.

5. **PERCEPTION:** Ms. Smith doesn't really expect us to do a summer assignment, and she isn't really going to test us the first week of classes.

REALITY: I am serious about this—the summer assignment is mainly a review naming and equation. You will have a quiz on naming week 1. This early work will allow us to spend additional time later in the year on more difficult topics.

Congratulations on choosing AP Chemistry!!! It is a fun and interesting course, but both of those outcomes depend upon WORK. You should be proud that you are challenging yourself to the limit of your academic ability, and know that if you apply yourself you will reap the rewards. I'm excited to work with you next year!

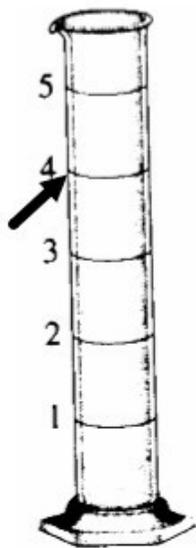
Ms. Smith

Summer Packet – Some Chem Review

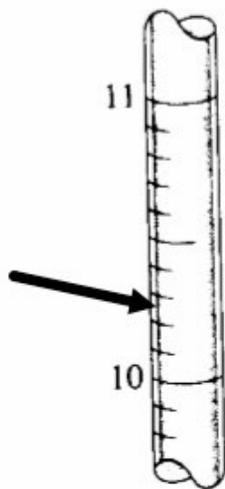
A. Matter and Measurement

– Know the rules for significant figures.

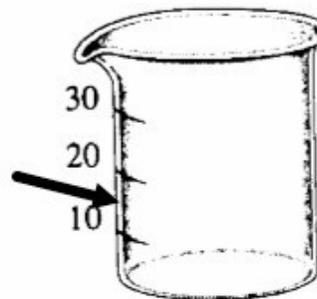
1. For each of the following pieces of glassware, provide a sample measurement at arrow and discuss the number of significant figures and uncertainty.



a.



b.



c.

2. A student performed an analysis of a sample for its calcium content and got the following results: 14.92%, 14.91%, 14.88%, and 14.91%. The actual amount of calcium in the sample is 15.70%. What conclusion can you draw about the **accuracy and precision** of these results?
3. Calculate the percent error for the following measurements.
- The density of an aluminum block determined in an experiment was 2.64 g/cm³. (Accepted value = 2.70 g/cm³)
 - The experimental determination of iron in ore was 16.48%. (Accepted value was 16.12%)
4. How many significant figures are in each of the following?
- | | | |
|----------|----------------------------|---------------------------|
| a. 12 | d. 2.001 x 10 ³ | g. 1000. |
| b. 1.098 | e. 100 | h. 22.04030 |
| c. 2001 | f. 0.0000101 | i. 1.00 x 10 ³ |
5. Round each of the following numbers to two significant figures, and write the answers in scientific notation.
- | | |
|---------------|---------------|
| a. 0.00031254 | c. 35,900 |
| b. 31,254,000 | d. 0.00000399 |
6. Use scientific notation to express the number 480 to
- One significant figure
 - Two significant figures
 - Three significant figures

7. Perform the following mathematical operations, and express each result to the correct number of significant figures.
- a. $97.381 + 4.2502 + 0.99195$
 b. $171.5 + 72.915 - 8.23$
 c. $0.102 \times 0.0821 \times 273.5$
 d. $(9.04 - 8.23 + 21.954 + 81.0) / 3.1416$

B. Dimensional Analysis

8. Precious metals and gems are measured in troy weights in the English system:

24 grains = 1 pennyweight

20 pennyweights = 1 troy ounce

12 troy ounces = 1 troy pound

1 grain = 0.0648 gram

1 carat = 0.200 gram

- a. Diamonds are measured in carats. If a lucky girl receives a 5 carat diamond how many pennyweights is it?
- b. What is the mass of 2.3 troy ounces of gold in grams?
- c. The density of gold is 19.3 g/cm^3 . What is the volume of a troy pound of gold?

9. Apothecaries (druggists) use the following set of measures: 20

grains ap = 1 scruple

3 scruples = 1 dram ap

8 dram ap = 1 oz. ap

1 dram ap = 3.888 g

- a. An aspirin tablet contains $5.00 \times 10^2 \text{ mg}$ of active ingredient. How many grains ap of active ingredient does it contain?
- b. From (a) how many scruples?
- c. What is the mass of 1.00 scruple in grams?

10. The world record for the hundred meter dash is 9.79 s.

- a. At this speed how long would it take to run a mile (5,280 ft)?

11. You're planning to buy a new car. One model that you're considering gets 32 miles per gallon of gasoline in highway travel. The one that your spouse likes gets 14 kilometers to the liter. Which car has the better gas mileage? (1 gal = 4 qt., 1.057 qt = 1 L)

12. You pass a road sign saying "New York – 112 km".
- If you drive at a constant speed of 65 mi/hr., how long should it take you to reach New York?
 - If your car gets 28 miles to the gallon, how many liters of gasoline are necessary to travel 112 km?

C. Classifying Matter Basics

13. What are some of the differences between a solid, a liquid, and a gas? Draw particle diagrams of each.
14. What is the difference between homogeneous and heterogeneous matter?
15. Classify each of the following as homogeneous or heterogeneous.
- | | |
|----------------------------|------------------------------------|
| a. soil | d. gasoline |
| b. the atmosphere | e. gold |
| c. a carbonated soft drink | f. a solution of ethanol and water |
16. Classify each of the following as a mixture or a pure substance. Of the pure substances, which are elements and which are compounds?
- | | |
|---------------|------------|
| a. Water | d. Iron |
| b. Blood | e. Brass |
| c. The oceans | f. Uranium |
17. Distinguish between physical and chemical changes.
18. List four indications that a chemical change (reaction) has occurred.
19. If you place a glass rod over a burning candle, the glass appears to turn black. What is happening to each of the following (physical change, chemical change, both, or neither) as the candle burns? Explain each answer
- | | | |
|------------|-------------|------------------|
| a. the wax | b. the wick | c. the glass rod |
|------------|-------------|------------------|

D. Writing Formulas and Naming Compounds – On the AP Exam you won't have an ion chart – so you will have to know all ions by heart! I don't think it's worth memorizing them up front (unless you want to), over the course of the year you will use them so much that I think you will know them by heart by then anyway! For now use the periodic table from regular chem to help you.

20. Name each of the following compounds:

- | | | |
|----------------------------|---------------------------------|--------------------------------------|
| a. NaCl | h. AlI_3 | o. BaSO_3 |
| b. Rb_2O | i. Al_2O_3 | p. KMnO_4 |
| c. FeBr_3 | j. ZnCl_2 | q. Sr_3P_2 |
| d. Cr_2O_3 | k. Li_3N | r. $\text{Ca}_3(\text{PO}_4)_2$ |
| e. CaBr_2 | l. Ag_2S | s. $\text{Pb}(\text{NO}_3)_2$ |
| f. CsF | m. KClO_4 | t. NaNO_2 |
| g. CaS | n. $\text{Al}_2(\text{SO}_4)_3$ | u. $\text{K}_2\text{Cr}_2\text{O}_7$ |

21. Name each of the following molecules:

- NI_3
- PCl_3
- SO_2
- N_2O_4
- ICl_3
- SF_2
- N_2F_4
- P_2S_5

22. Name each of the following acids:

- HCl
- H_3PO_4
- H_2SO_3
- $\text{HC}_2\text{H}_3\text{O}_2$
- H_2SO_4

23. Write the formula for each of the following compounds/molecules and acids:

- | | | |
|--------------------------|---------------------------------|-------------------------------|
| a. Cesium bromide | h. Sulfur difluoride | o. Ammonium acetate |
| b. Barium sulfate | i. Sulfur hexafluoride | p. Ammonium hydrogen sulfate |
| c. Chlorine trifluoride | j. Sodium dihydrogen phosphate | q. Cobalt (III) nitrate |
| d. Ammonium chloride | k. Silicon tetrachloride | r. Copper (I) sulfide |
| e. Beryllium oxide | l. Lithium nitride | s. Potassium chlorate |
| f. Chlorine monoxide | m. Chromium (III) carbonate | t. Lithium tartrate |
| g. Magnesium fluoride | n. Tin (II) fluoride | |
| u. sodium oxide | aa. Lead (IV) sulfide | ff. Hydrobromic acid |
| v. Sodium peroxide | bb. Copper (I) chloride | gg. Bromous acid |
| w. Potassium cyanide | cc. Cadmium selenide | hh. Perchloric acid |
| x. Copper (II) nitrate | dd. Zinc sulfide | ii. Silicon dioxide |
| y. Silicon tetrafluoride | ee. Ammonium hydrogen phosphate | jj. Sodium sulfate |
| z. Lead (II) sulfide | | kk. Aluminum hydrogen sulfate |

E. Equations & Reactions Types

24. Balance the following equations:

- $\text{CO} + \text{O}_2 \rightarrow \text{CO}_2$
 - $\text{N}_2\text{O}_5 + \text{H}_2\text{O} \rightarrow \text{HNO}_3$
 - $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + \text{HCl}$
 - $\text{CH}_4 + \text{Br}_2 \rightarrow \text{CBr}_4 + \text{HBr}$
- $\text{C}_5\text{H}_{10}\text{O}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

- f. $\text{Cr(OH)}_3 + \text{HClO}_4 \rightarrow \text{Cr(ClO}_4)_3 + \text{H}_2\text{O}$
- g. $\text{KNO}_3 \rightarrow \text{KNO}_2 + \text{O}_2$
- h. $\text{La}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow \text{La(OH)}_3$
- i. $\text{NCl}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_3 + \text{HOCl}$
- j. $\text{Mg}_3\text{N}_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{NH}_4\text{Cl}$
- k. $\text{AgNO}_3 + \text{K}_2\text{SO}_4 \rightarrow \text{Ag}_2\text{SO}_4 + \text{KNO}_3$
- l. $\text{Al(OH)}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$
- m. $\text{CH}_3\text{NH}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{N}_2$
- n. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{Cr}_2\text{O}_3 + \text{N}_2 + \text{H}_2\text{O}$

25. Write balanced chemical equations to correspond to each of the following descriptions.

- a. When solid potassium chlorate is heated it decomposes to form solid potassium chloride and oxygen.
- b. Solid zinc metal reacts with sulfuric acid to form hydrogen gas and an aqueous solution of zinc sulfate.
- c. When liquid phosphorous trichloride is added to water, it reacts to form aqueous phosphorous acid, and hydrochloric acid.
- d. When hydrogen sulfide gas is passed over solid hot iron (III) hydroxide, the resultant reaction produces solid iron (III) sulfide and water vapor.

26. Indicate what type of reaction is represented in the following equations.

A. Synthesis B. Decomposition C. Single replacement D. Double replacement E. Combustion

- a. $\text{H}_2 + \text{I}_2 \rightarrow 2 \text{HI}$
- b. Aluminum + iron (III) oxide \rightarrow aluminum oxide + iron
- c. $2 \text{C}_2\text{H}_6 + 7 \text{O}_2 \rightarrow 4 \text{CO}_2 + 6 \text{H}_2\text{O}$
- d. $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
- e. Hydrochloric acid + ammonia \rightarrow ammonium chloride
- f. $2 \text{NaClO}_3 \rightarrow 2 \text{NaCl} + 3 \text{O}_2$
- g. $2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
- h. Methane + oxygen \rightarrow carbon dioxide + water

F. Mole Conversions – use dimensional analysis to solve.

27. The molecular formula of aspartame, the artificial sweetener marketed as NutraSweet, is $C_{14}H_{18}N_2O_5$.

- a. What is the molar mass of aspartame?

- b. How many moles of aspartame are present in 3769.4 grams of aspartame?

- c. How many molecules of aspartame are present in 345.9 grams of aspartame?

- d. How many oxygen atoms are present in 23.6 grams of aspartame?

28. How many moles of ammonium ions are in 0.557 g of ammonium carbonate?

29. What is the mass, in grams, of 0.0438 moles of iron (III) phosphate?

30. What is the mass, in grams, of 2.69×10^{23} molecules of aspirin, $C_9H_8O_4$?

31. What is the molar mass of diazepam (Valium) if 0.05570 mol has a mass of 15.86 g?

CONGRATULATIONS, you have made it! Be proud of yourself, and get ready for a fun-filled, challenging year which will push you to your limits, make you a better student, get you very prepared for college, and prove to yourself how brilliant you really are! Remember, I'm here to support you and help you succeed! If you need anything, please do not hesitate to email me or come see me! Don't be a stranger!

Ms. Smith

PS. If you have NOT taken regular chem please reach out and I can direct you to many resources to make completing this work easier. Don't struggle – ask for help ☺