Chemistry Syllabus

Required Textbook(s):
Discovering Design with Chemistry by Dr. Jay L. Wiles published by Berean Builders textbook and *Answer Key and Test Manual*

Strongly suggested calculator: TI-30 XA

Course Procedure:
Please follow the detailed reading and homework assignments (listed below) in preparation for attending class. Every week you are to complete all "Comprehension Check" questions as homework and to **read all the experiments** found within the assigned reading. **For this course to be accredited as a "High School Science with Lab," you must thoroughly complete all assigned lab write ups, homework, and graded tests and keep them in a notebook / portfolio.**

After a student completes their Review problems to the best of their ability (or during their attempt if they are struggling with the problems) students may watch the corresponding solutions session. After taking the test (directed in the syllabus) and with parental oversight, students will grade their test with the test grading session. Parents must keep records of tests and homework scores to average at the end of the year.

Definitions for **vocabulary** words should be those given in class OR in the student's own words whenever possible.

Equations given and used within the reading should be memorized. In my experience, **the easiest way to accomplish this is to write out the equation every time you use it in a homework problem**. Then by test time, it has been written and used several times and is (hopefully) memorized.

To receive **lab** credit for this course, you may perform labs at home or watch our lab in our class session and then complete your "Lab " for each of assigned lab. Directions on how to write up your labs are found on page iv of you textbook under Experiments and Activities. A basic description is:

- Keep an individual notebook for your lab write ups (possibly a spiral that fits into your other notebook).
- Each experiment should start on a new page so it is clear where each experiment starts and ends.
- The experiment number and title should appear at the top of the page.
- The next heading should be "Data" where measurements and observations should be recorded. Simple drawings should be used whenever possible so someone else could look at it and understand what you saw.
- The next heading should be "Calculations" if there are calculations to be completed with the particular experiment.
- Under the final heading "Summary" you give a general description of what you did (**not** detailed steps) AND what you learned so anyone who has not read the book can read your lab notebook and understand the basics of the experiment and your purpose for doing it.

Tests should be taken as indicated in the syllabus; completing lab write-ups help prepare you for the tests. Use a separate sheet of paper for calculations and show ALL calculations so that you may get partial credit. I recommend that tests be taken as soon as possible after attending the class in which the material was covered and completed. The parent and student will watch Mrs. Frates grade the test to determine their score.

A great resource to use throughout the year: http://www.periodicvideos.com:80/

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Reading assignments for each week are indicated by page numbers and include reading the labs within the assigned pages and completing all Comprehension Check Problems. The solutions and answers to these problems are at found at the end of each chapter. It is very important to check each problem immediately after completing it to make sure you are learning it the correct way.

When you are to "Prep for lab," read the assigned lab and be prepared to perform it in class. You will record your observations in class and complete your calculations and "Summary" as described in your textbook when you get home.

Extra Credit Lab Write-ups are worth 7 points on your test if well done.

Review Problems should be checked for accuracy as each problem is completed (NOT after completing the whole assignment.) to make sure you are learning the method correctly. Please use the designated youtube session to make sure you are learning it properly.

Before Classes Start **(about 6 hours of work so don't procrastinate)**

1) This counts as a test score! All of Mrs. Frates' science students are required to watch the 3 part Creation Interpretation before classes beginning to learn the needed creation foundation upon which to build throughout the year and throughout life. Have your parent verify you watched it by initialing this space on your syllabus and it will count as one 100% test score. (Easiest Chemistry test you'll ever take ☺.) Please write down any questions you may have on creation science and email them to me at cfscienceclasses@gmail.com so that I may try to answer them.

2) Read pp iii-iv and ix-x then go to the course website and click into the "errata for the first printing of this course". Make all the listed corrections to your book before going any further. **This took me around 2 hours** so give yourself plenty of time to accomplish this.

Prep for Class 1 **(Make sure you completed the above assignment before going on!)**
This is the homework to be done BEFORE our first class thus it is "preparation for class 1."
1) Read pages 1-19 stopping before "Measuring Mass." Be sure to read all experiments and complete all Comprehension Checks within the given reading assignment every week.
2) Prep for Experiments 1.1 and 1.2. (Described above)

Prep for Class 2 **To be completed BEFORE class 2**
1) Complete the write up for experiments 1.1 and 1.2.
2) Read and complete pp 19-26 completing all Comprehension Check problems and reading the experiment.
3) Prep for experiment 1.3
4) Complete Review Problems pp 34-35
(Do NOT take the test until after our next class together.)

Prep for Class 3
1) Complete the write up for experiment 1.3
2) Study for and take Chapter 1 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test
3) Read and complete pp 37-46 completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 2.1 & 2.2

Prep for Class 4
1) Complete write up for experiments 2.1-2.2
2) Read and complete pp 47-60 completing all Comprehension Check problems and reading all experiments
3) Prep for experiments 2.3
4) Complete the Review Questions on pp 64-65

Prep for Class 5
1) Complete write up for experiments 2.3
2) Study for and take test Chapter 2. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 67-80 completing all Comprehension Check problems and reading all experiments
4) Perform and write up experiment 3.1at home and be prepared to discuss your results
5) Prep for Experiment 3.2

Prep for Class 6
1) Complete write up for experiments 3.2
2) Read and complete pp 81-90 completing all Comprehension Check problems and reading all experiments
3) Complete Review Questions on pp 95-96

Prep for Class 7
1) Study for and take Chapter 3 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
2) Read and complete pp 97-109 completing all Comprehension Check problems and reading all experiments
3) Optional Extra Credit – Experiment 4.1

Prep for Class 8
1) Read and complete pp 109-120 completing all Comprehension Check problems and reading all experiments
2) Prep for experiment 4.2-4.3
3) Complete the Review Questions pp 124-125

Prep for Class 9
1) Complete write up experiment 4.2-3
2) Study for and take Chapter 4 test . When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 127 - 142 completing all Comprehension Check problems and reading all experiments
4) Prep for experiment 5.1

Prep for Class 10
1) Complete write up for experiment 5.1
2) Read and complete pp 143-153 completing all Comprehension Check problems and reading all experiments
3) Prep for experiments 5.2
4) Complete the Review Questions pp 159-160

Prep for Class 11
1) Complete write up experiment 5.2
2) Study for and take test Chapter 5. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 161-176 stopping before "Balancing Chemical Equations" completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 6.1 and 6.2

Prep for Class 12
1) Complete write up experiments 6.1-6.2
2) Read and complete pp 176-188 completing all Comprehension Check problems and reading all experiments
3) Prep for experiments 6.3-6.4
4) Complete the Review Questions pp 195-196

Prep for Class 13
1) Complete write ups for experiments 6.3-6.4
2) Study for and take test Chapter 6. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 197-206 stopping before "There is a Limit!" completing all Comprehension Check problems and reading all experiments
4) Prep for experiment 7.1

Prep for Class 14
1) Complete write ups for experiments 7.1
2) Read and complete pp 206-217 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 7.2-7.3
4) Complete the Review Questions pp 224-225

Prep for Class 15
1) Complete write up experiment 7.2-7.3
2) Study for and take test Chapter 7. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 227-237 stopping before "Determining Empirical Formulas with Combustion Analysis" completing all Comprehension Check problems and reading all experiments
4) Prep for experiment 8.1

Prep for Class 16
1) Complete write up experiment 8.1
2) Read and complete pp 237-247 completing all Comprehension Check problems
3) MEMORIZE THESE POLYATOMIC IONS, THEIR NAMES, CHARGES, AND FORMULAS!!!
4) Complete the Review Questions on pp 254-255

Prep for Class 17
1) Study for and take Chapter 8 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
2) Read and complete pp 257-270 stopping before "Using Molarity in Stoichiometry" completing all Comprehension Check problems and reading all experiments
3) Prep for experiments 9.1, 9.2, and 9.3

Prep for Class 18
1) Complete write up experiments 9.1-9.3
2) Read and complete pp 270-279 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 9.4
4) Complete the Review Questions on pp 286-287

Prep for Class 19
1) Complete write up experiment 9.4
2) Study for and take Chapter 9 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 289-306 stopping before "Dalton's Law of Partial Pressure" completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 10.1-10.2

Prep for Class 20
1) Complete write up experiments 10.1-2
2) Read and complete pp 306-316 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 10.3-10.4
4) Complete the Review Questions on pp 323-324

Prep for Class 21
1) Complete write ups experiments 10.3-4
2) Study for and take Chapter 10 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 325-339 stopping before "Experiment 11.2" and completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 11.1 (For the procedure, just write "Test with litmus paper the following samples:" and then leave room for filling in the samples while doing the lab in class.

Prep for Class 22
1) Complete write up experiments 11.1
2) Read and complete pp 339-345 stopping before Experiment 11.3 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 11.2 (In your procedure, please start with #6 as the first step as the red cabbage juice will be provided for you in class.)
4) Start working on the Review Problems and the Extra Practice Problems to start preparing for your test.

Prep for Class 23
1) Complete write up experiments 11.2
2) Read and complete pp 345-348 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 11.3 (Please print out the new procedure found at the end of this syllabus and prepare to perform the lab as described here.)
4) Complete the Review Questions on pp 354-355 and finish the extra Practice Problems to help prepare for your test

Prep for Class 24
1) Complete write up experiment 11.3
2) Study for and take Chapter 11 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 357-380 completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 12.1, 12.2, and 12.3
5) Complete the Review Questions on pp 385-386

Prep for Class 25
1) Complete write up experiments 12.1-.3
2) Study for and take Chapter 12 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 387-400 stopping before "More Detailed Calorimetry Experiments" completing all Comprehension Check problems and reading all experiments
4) Prep for experiment 13.1-13.2

Prep for Class 26
1) Complete write up experiments 13.1-2
2) Read and complete pp 400-408 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 13.4
   OPTIONAL - You may perform and write up experiment 13.3 as extra credit.
4) Complete the Review Questions on pp 415-416

Prep for Class 27
1) Study for and take Chapter 13 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
2) Read and complete pp 417-434 stopping before "Changes in Entropy" completing all Comprehension Check problems and reading all experiments

Prep for Class 28
1) Read and complete pp 434-445 completing all Comprehension Check problems and reading all experiments
2) Prep for experiment 14.2
3) Complete the Review Questions on pp 451-452

Prep for Class 29
1) Complete write up experiment 14.2
2) Study for and take Chapter 14 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 453-467 stopping before "Activation Energy, Temperature, and the Rate Constant" completing all Comprehension Check problems and reading all experiments
4) Prep for experiments 15.1

Prep for Class 30
1) Complete write up experiment 15.1
2) Read and complete pp 467-475 completing all Comprehension Check problems and reading all experiments
3) Prep for experiment 15.2
4) Complete the Review Questions on pp 481-482

Prep for Class 31
1) Complete write up experiment 15.2
2) Study for and take Chapter 15 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Read and complete pp 483-500 stopping before "Le Chatelier's Principle and Temperature" completing all Comprehension Check problems and reading all experiments
4) Prep for experiment 16.2
5) Perform Experiment 16.1 at home. Write up is optional extra credit

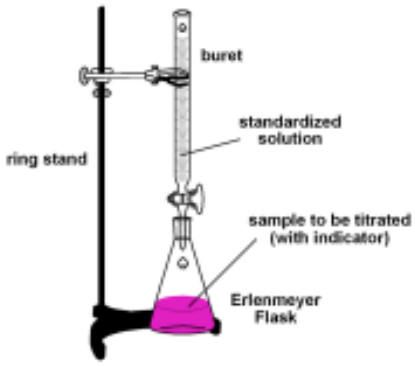
Prep for Class 32
1) Read and complete pp 500-507 completing all Comprehension Check problems and reading all experiments
2) Prep for experiment 16.3 (Please print out the new procedure found at the end of this syllabus and prepare to perform the lab as described here.)
3) Complete the Review Questions on pp 511-512

After the Last Class
1) Complete write ups experiments 16.2-3
2) Study for and take Chapter 16 test. When completed to the best of your ability showing ALL your work, have your parent watch the grading session with you and grade your test.
3) Average your scores to determine your final grade.

Experiment 11.3 Acid-Base Titration - The Percent of Acetic Acid in Vinegar

Materials:

- Ring stand
- Buret and buret clamp
- Erlenmyer flask
- Sodium hydroxide
- Mass scale
- Distilled water
- White vinegar
- Safety googles (should be worn throughout experiment)
- Around 100ml red cabbage juice



Procedure:

1. Rinse the erlenmyer flask, buret, and graduated cylinder thoroughly with water and then rinse them again with distilled water. When rinsing the buret make sure to allow some of the water to flow through the stop cock at the bottom of the buret. Set the buret and graduated cylinder aside until step 8.
2. Put the flask on the scale and turn it on. If the scale doesn't read zero, hit the tare button so it does.
3. Add sodium hydroxide to the flask until the mass scale reads above 1.0 g but less than 1.3 g.
   Record the actual reading in your lab write up under "Observations and Calulations."
4. Add distilled water to the flask until the volume is approximately 50 ml.
5. Swirl the flask to dissolve the sodim hydroxide. This will take a while. **The solution will get warm. It is also caustic, so don't get it on your skin of clothes!**
6. Once the sodium hydroxide is dissolved, set the flask aside.
7. Build the titration apparatus:
   a. Screw bottom on the ring stand and stand it up.
   b. Carefully place erlenmyer flask on the platform at the bottom of the ring stand to help you adjust the height of the buret in the next step.
   c. Hold the buret above the flask adjusting the heigth so that the end of the buret is slightly above the top of the flask. (This is different than the picture.)
   d. Using the buret clamp, fasten the buret to the ring stand at the determined height.
   e. It should look similar to the picture with the buret slightly higher so that the flask may be easily swirled and removed without dismantling the whole titration apparatus.
   f. Once the titration apparatus is assembled, remove flask from under the buret and set aside.
   g. Place a white piece of paper on the platform at the bottom of the ring stand to help you distinguish color changes in the sodium hysroxide solution as they occur during the titration.
8. Fill the graduated cylinder you rinsed in step 1 with slightly over 50 ml of vinegar and pour the vinegar into the buret of your titration apparatus.
9. Let a few drops out by opening the stop cock until the bottom of the meniscus is right at the 50 ml line at the top of the buret. Your buret now holds 50 mls of vinegar. This is a quantitative measurment so you must be as accurate as possible.
10. Add about 50 ml of red cabbage juice to the sodium hydroxide solution in the flask. It should turn a greenish yellow color because it is srongly basic.
11. Place the flask with the sodium hydroxide solution under the buret on the white piece of paper on the platform of the ring stand. While carefully swirling the flask underneath the buret, slightly opening the stop cock and start slowly adding vinegar from the buret into the sodium hydroxide solution in the flask. **Remember the sodium hydroxide is caustic so swirl gently and carefully so you don't swirl any out of the flask.**
12. Continue to add vinegar until the solution in the flask changes to a pink color. This pink may look clear but it will no longer be greenish yellow. This is the endpoint of your rough titration. Read the volume of vinegar on the buret and record it in your lab write up using the correct number of significant figures.
13. The rough titration was done by adding vinegar fairly quickly. Now you will do a fine titration.
14. Rinse your flask with water and distilled water and repeat steps 2-6 and steps 8-10.
15. Repeat step 11 only this time stop when you are winthin 15 ml of viengar from the previous end point.
16. When within 15 ml of the rought titration end point hold the flask still as you start adding vinegar one drop at a time, then swirl AFTER adding each drop. You should start to see color changes with the addition of each drop of vinegar as you near the end point

but when you swirl the greenish yellow color returns. When a drop is added and the solution remains pink after swirling STOP adding vinegar. You have reached the end point! ☺
17. Read the volume of vinegar on the buret and record it.
18. To complete the calculations for this experiment, please turn to page 346 and complete steps 19-27.

Experiment 16.3 Le Chatelier Principle and Temperature

Materials: Same as book plus red cabbage juice will be provided for you.

Procedure:
1. Put around 200 ml of water in your large beaker and start to boil the water over your alcohol burner while continuing below.
2. Add a small amount of ammonia to one of the small glasses, only enough to fill a medicine dropper a few times. **Don't let the ammonia get two close to your nose or mouth. The fumes can be very noxious.**
3. Add a similar small amount of vinegar to the other small glass.
4. Fill a styrofoam cup ¾ full with ice, then add a little water, just until the ice starts to float. Then stop adding water.
5. Pour approxiamately 20 ml of red cabbage juice into your small beaker.
6. Use one medicine dropper to add vinegar to the 100 ml beaker drop-by-drop, swirling each time you add a drop. Do this until the solution is pink.
7. Use the other medicine dropper to add ammonia to the 100 ml beaker drop-by-drop, swirling each time you add a drop. Do this until the solution turns blue.
8. Once the water in your large beaker has come to a boil, extinguish the flame but leave it on your burner stand.
9. Rinse both testubes out thoroughly with water. Then, hold both test tubes in one hand and use the other hand to add solution from the 100 ml beaker to each test tube until they are both half full.
10. Look at the color of the solutions in both test tubes. They should be the same color, since they just came from the same beaker.
11. Put one of the test tubes in the styrofoam cup of ice water.
12. Being very careful not to burn yourself, place the other test tube in the large beaker of hot water. **Don't touch the hot water or hot beaker!**
13. Wait three minutes. While waiting, clean up the rest of your mess.
14. After three minutes, pull the test tubes out of the ice and beaker and compare their colors.
15. Place both test tubes into the ice water.
16. Wait three minutes and complare their colors again.
17. Record your observations and clean up your mess.