Last Update: 12/13/14

Our Father's Design through Physical Science

Student Materials Notebook

This notebook contains thirty-two links to web-based RWT1 video lessons content. Additionally, over 400 pages of excellent supplement materials are provided. Also included are over 500 links to extended course materials. Finally, sixteen module tests and five exams are integrated for student content assessment. This product is designed to be used with the Apologia Exploring Creation with Physical Science, 2nd Ed., (ECPS2) textbook and its Solutions Manual.

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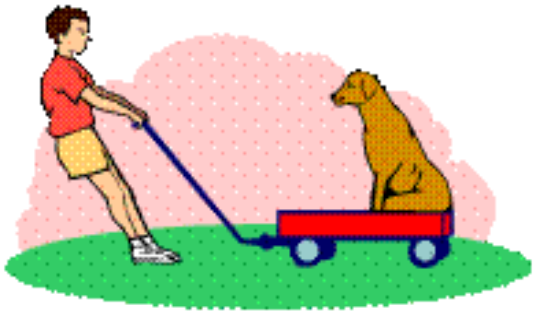
Our Father's Design through Physical Science:



Student Materials Notebook

By Steven M. Rosenoff

We would like to acknowledge the inspiration of Dr. Jay L. Wile in the production of this product. As my former employer and longtime friend, his encouragement and mentorship helped make this publication possible. Although he did not directly contribute to this work, nor has he received any financial reward from it, we feel that his influence in our lives is worthy of mention and that he deserves our utmost respect as a co-laborer in Christ.

Table of Contents

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Student Materials Notebook

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Our Father's Design through Physical Science: Student Materials Notebook

Table of Contents

Table of Contents

Start

RED WAGON TUTORIALS

Assignment Supplement

A. Steps for Success

These are the steps taken by successful students last year for completing the required Module work. Please note: these are the steps I am suggesting you take also!

As per classroom policy, any assignment submitted is assumed to be supervised and proctored by the student's parent.

First Week:

1. Read the assigned reading indicated in your syllabus, including labs, before coming to class.
2. Answer the *On Your Own* questions when you come to them. (These are not turned in. They are for your benefit. The answers are at the end of your Module.)
3. Attend Class: ask questions about reading assignment and labs. Participate, listen and learn.
4. Perform the labs included in the week's reading. Write the required informal lab report for each lab completed. Place them in your notebook for safe keeping.

Second Week:

1. Read the assigned second reading, including labs, before coming to class.
2. Answer the *On Your Own* questions when you come to them. (Again, do not turn these in.)
3. Attend Class: ask questions about reading assignment and labs. Participate, listen, and learn.
4. Perform labs included in the week's reading. Write the required lab report for each lab completed. Place them in your notebook for safe keeping.
5. Answer the *Study Guide* questions at the end of the module. (This is an open book assignment. I have provided you an example of a completed assignment below.)
6. Parents use your *Solutions Manual* to correct your student's *Study Guide* answers.
7. Have the student correct any error they may have made in the *Study Guide* assignment.

Third Week:

1. Overlap week. You will need to begin the next Module in your book during this week. Follow the steps above.

2. Ask questions in class about your *Study Guide* grade. I will give you a review for your *Module Test* during class this week. If you miss class this week, you will need to listen to the class recording for Test prep assistance.
3. Take the online *Module Test* by the date indicated in your *Course Schedule*. This assignment is *closed book and closed notes*. The *Module Tes*t will be forwarded to me automatically once you click on "*Finished*" on the Student Portal site.
4. Parents MUST sign the bottom of the test and be present during the testing session.

Fourth Week:

1. Ask questions in class about your *Module Test* grade and your finished experiment reports.
2. Continue on with next Module work.

B. Assignment Guidelines

1. Formal Experiment Reports MUST BE TYPED (MS Word 2010 docx or Adobe PDF, Times New Roman, 12 font, black print on a white background, 1" margins, single-spaced) AND SPELL CHECKED before the report is forwarded to me as an e-mail attachment: the e-mail address for submission is ccr101@comcast.net. The document file size cannot exceed 1 MB. The subject line of the e-mail MUST read Physical Science Draft Report for a draft paper and Physical Science Final Report for a final assignment. There is one formal report required per quarter.

2. Formal Experiment Report assignment requirements are outlined in detail in your *Assignment Supplement*. Remember, I expect physical science students to have had one year prior practice writing experiment reports. I do allow revisions of the experiment report during first semester and will tell your student how to improve their assignment before resubmission. During second semester, I will grade the formal experiment report as received. If you plan to use graphs or other graphics as part of your report Observations section, YOU MUST E-MAIL these to me as an e-mail attachment in MS Word 2010 docx format, Rich Text Format, Adobe PDF, or as a whiteboard presentation. As stated in the *Assignment Supplement*, when seeking help from someone or quoting facts from a book, internet source, or other media, you must include them in your bibliography in the required format.

3. Module Tests are taken online through the Student Portal site:

http://www.redwagontutorials.com/php/.

Module Test assignments ARE CLOSED BOOK AND CLOSED NOTES assignments. As per classroom policy, any assignment submitted is assumed to be supervised and proctored by the student's parent. A parent's digital signature is required on the bottom of each Test or Exam. We have a zero tolerance policy toward cheating or plagiarism. Vocabulary words for the Module (e.g. those found in question #1 of the Study Guide) MUST BE SPELLED CORRECTLY if used to answer a test question. USING SPELL CHECK DURING A TEST IS NOT ALLOWED.

4. All Test assignments, except your semester exams, must be completed within 60 minutes of logging onto the Student Portal site. Semester exams must be completed within 90 minutes. After 60 or 90 minutes, depending on the assignment, the Student Portal WILL DISCONNECT YOU AND NOT FORWARD your assignment, which could result in a zero being given on an assignment.

5. Upon submission of any assignment through the Student Portal, the Portal site will forward a copy to my e-mail address and forward a receipt copy to your e-mail address of record on the site. IT IS YOUR RESPONSIBILITY TO OBTAIN A RECEIPT FROM THE PORTAL COMPUTER AND TO MAINTAIN THE CORRECT E-MAIL ADDRESS on the Portal computer. The assignment receipt is your proof that the assignment was submitted on time and in good order. I will ask to see the receipt copy for any assignment when there is a question about the timely submission of the assignment: NO RECEIPT COPY MEANS NO CREDIT GIVEN.

6. Students must be disciplined enough to submit required work on time. As per course policy, I will deduct 10% per day from the score received on the assignment on all late work, including the Parent Notebook Report, unless the lateness results from personal illness, family emergency, or computer problem of a non-reoccurring nature. In these instances, I will grant full points. A schedule for the course, providing due dates for all assignments for the entire year, is included in this e-Notebook. If you are leaving on vacation or some other personal choice holiday, please adjust your study schedule to submit the assigned work before leaving. I will always accept an assignment early. I am available during my office hours to help you complete assignments before the due date, when and if necessary, during the school year.

7. All class assignments are due by *6:00 PM, Eastern Time, on the date indicated in the Course Schedule*. The Student Portal time stamp on your work is the final authority on whether something is submitted on time or not. *NOTE: 6:01 PM, Eastern Time, starts a new day, and I will subtract 10% if your work arrives at or after that time*.

8. Students should keep hard copies of all their work (labs, study guides, tests, etc.), not just computer saved work. Doing so will allow the student to keep a good portfolio of their class assignments should they be asked to demonstrate their work at some later date. Please note, I do not maintain copies of a student's work beyond the end of the school year. I will maintain a copy of a student's final semester grades for seven years beyond the end of our class together.

C. Study Guide Assignment

The following is an example of the completed Module 1 Study Guide assignment. The completed assignment is parent corrected or student self-correct by the due date indicated in your *Course Schedule*. Your student's completed assignment document should be handwritten or typed and saved in your student's notebook. The *Study Guide* assignment, the *On Your Own questions*, the practice test that is the *Solutions Manual*, the lecture notes, and the text itself are all sources of Module Test and Exam questions.

As per classroom policy, any assignment submitted is assumed to be supervised and proctored by the student's parent.

Isaac Newton
Physical Science
Module 1 Study Guide

Answers to #1

a. An atom is the smallest chemical unit of matter.

b. A molecule is two or more atoms linked together to make a substance with unique properties.

c. Concentration is the quantity of a substance within a certain volume

2. Carbon disulfide is made up of molecules.

3. Rust is not attracted to a magnet because when an atom is a part of a molecule, the molecule does not take on the characteristics of the atom. Instead, the atoms in the molecule join together in such a way as to give the molecule its own unique characteristics.

4. The statue will eventually turn a shade of green, just like the copper wire did in Experiment 1.1. This comes from the copper atoms reacting with water and carbon dioxide in the air to make copper hydroxycarbonate.

5. Scientists have NOT seen atoms. The scanning tunneling electron microscope "pictures" that you see are not pictures of atoms. Instead, they are the result of computer calculations involving electricity and a theory call quantum mechanics.

6. The prefix centi means 0.01; the prefix milli means 0.001; and the prefix kilo means 1,000.

7. Mass is measured in grams in the metric system. In the English system, it is measured in slugs.

8. Volume is measured in liters in the metric system. In the English system, it is measured in gallons, pints, or quarts.

9. Length is measured in meters in the metric system. In the English system, it is measured in feet, yards, inches, or miles.

10. 1.3 m is the same as 130 cm.

$$\frac{1.3\ \text{m}}{1} \times \frac{1\ \text{cm}}{0.01\ \text{m}} = 130\ \text{cm}$$

11. The person's mass is 75,000 g.

$$\frac{75\ \text{kg}}{1} \times \frac{1000\ \text{g}}{1\ \text{kg}} = 75{,}000\ \text{g}$$

12. There are 1.89 L in 0.500 gallons.

$$\frac{0.500\ \text{gal}}{1} \times \frac{3.78\ \text{L}}{1\ \text{gal}} = 1.89\ \text{L}$$

13. There are 39.4 inches in a meter stick.

$$\frac{100.0\ \text{cm}}{1} \times \frac{1\ \text{in}}{2.54\ \text{cm}} = 39.4\ \text{in}$$

14. Baking bread is not a dangerous activity because the ozone it produces is not concentrated enough to be dangerous. Ozone is a poison, but at low enough concentrations, it does not adversely affect people. At higher concentrations, however, it can be toxic enough to kill you!

D. Informal Laboratory Report Format

The experiments in this course are designed to be done as you are reading the text. I recommend that you keep a notebook of these experiments. This notebook serves two purposes. First, as you write about the experiment in the notebook, you will be forced to think through all of the concepts that were explored in the experiment. This will help you cement them into your mind. Second, certain colleges might actually ask for some evidence that you did, indeed, have a laboratory component to your physical science course. The notebook will not only provide such evidence but will also show the college administrator the quality of your physical science instruction. I recommend that you perform the experiments in the following way:

- When you get to an experiment, read through it in its entirety. This will allow you to gain a quick understanding of what you are to do.

- Once you have read the experiment, start a new page in your laboratory notebook. The first page should be used to write down all of the data taken during the experiment. What do I mean by "data"? Any observations or measurements you make during the experiment are considered data. Thus, if you see an organism during an experiment, you need to either describe it or draw it. If you measure the length of something during the experiment, that is part of the experiment's data and should be written down. In addition, any data analysis that you are asked to do as a part of the experiment should be done on this page.

- When you have finished the experiment and any necessary analysis, write a brief report in your notebook, right after the page where the data and calculations were written. The report should be a brief discussion of what was done and what was learned. You should not write a step-by-step procedure. Instead, write a brief summary that will allow someone who has never read the text to understand what you did and what you learned.

PLEASE OBSERVE COMMON SENSE SAFETY PRECAUTIONS! The experiments in this course are no more dangerous than most normal, household activity. Remember, however, that the vast majority of accidents do happen in the home. Chemicals used in the experiments should never be ingested; hot beakers and flames should be regarded with care; and all experiments should be performed while wearing eye protection such as safety glasses or goggles.

E. Formal Laboratory Report Format

Standard six-step, typewritten formal laboratory write-up should include the following: (You do not have to follow this format for your penciled, handwritten, laboratory notebook. There is information on how to prepare an informal lab notebook report included above.) You are required to produce one formal report per quarter. Formal Experiment Reports MUST BE TYPED (MS Word 2010 docx or Adobe PDF, Times New Roman, 12 font, black print on a white background, 1" margins, single-spaced) AND SPELL CHECKED before the report is forwarded to me as an e-mail attachment: the e-mail address for submission is ccr101@comcast.net. The document file size cannot exceed 1 MB. The subject line of the e-mail MUST read Physical Science Draft Report for a draft paper and Physical Science Final Report for a final assignment. There is one formal report required per quarter. Your formal report must be formatted as follows and included the following sections:

Name Date

Title of the Experiment

A. Purpose

You must tell what the experiment is about and what area it will test. Background on the area is expected. (In other words, provide details about what is being experimented on.) You must use your textbook and two outside resources preparing your report background. You must also include a statement of what the experiment hope to show and why this topic is of interest. You must also include a hypothesis statement in the standard "If, then" format for scientific research work. First person pronouns are not used in scientific writing.

B. Equipment

Provide a complete list of equipment necessary to conduct the experiment. Equipment should be listed in a 1, 2, 3, 4, 5, etc., fashion down the page.

C. Procedure

Provide a complete list of the procedure used. Procedure should be written in a cookbook

fashion and be numbered 1, 2, 3, 4, 5, etc., fashion down the page.

D. Observations

Provide a detailed, objective report of observations -- what was seen, heard, felt, tasted, smelled -- when the experiment was performed. Charts and graphs which provide detail are encouraged, but these do not take the place of the narrative observations.

E. Conclusions

Provide analysis of the experiment: try to explain what was seen, heard, felt, tasted, or smelled while the experiment was happening. Be sure to provide ways that the experiment could be improved if the experiment was done again and any ideas for further research the experiment might have generated. Note: there are ALWAYS ways to improve how an experiment is done and ideas further research generated.

F. Bibliography

If you seek help from someone or quote facts from a book, internet source, or other media you should include them in bibliography in using the format I provide. You are required to research two outside resources other than your textbook and use them in the background of your report. Additionally, you must cite your textbook and me as a "class source" or "personal interview" on every lab report.

The completed Word 2010 docx or Adobe PDF document of the formal experiment report should be printed and saved to your student's notebook. The completed and spell-checked Experiment Report is then forwarded to me as an e-mailed attachment. An example of a completed Physical Science experiment follows. Please note -- I expect you as incoming physical science students to be able to produce a quality lab report similar to the one below:

Miss. LB 10/24/14

Atmospheric Pressure

A. Purpose:

This experiment is showing that the atmospheric pressure is exerting pressure on everything that it comes in contact with. It is showing that even on a soda can there is pressure. The objective is meant to show how this pressure is exerted on objects. The soda can is a great example of this pressure because it is easy to find and easy to see.

The experiment helps an understanding about what cannot be seen but rather felt. It's a pressure that is constantly everywhere. The pressure is called Atmospheric Pressure. This pressure could

kill a person because of its exertion, but the way God designed us, we hardly feel a thing. But how do we measure atmospheric pressure? The answer is a barometer, which has some liquid called mercury in a glass tube. The pressure is pushing down on the mercury and forcing it up the small glass tube, this is a great way to measure atmospheric pressure.

If this experiment goes well then when the hot can is turned over in the ice cold water the can should instantly crumple. This will give a greater understanding about Atmospheric Pressure. The experiment will be short but very helpful. Hopefully, the experiment will go well and produce the right amount of pressure on the can.

This topic about atmospheric pressure is important to science because atmospheric pressure cannot be seen. However it can be felt. Should the experiment succeed then an understanding about this pressure can be gained. So if atmospheric pressure cannot be seen, heard, tasted, or smelled than how do we know it even exists. The experiment shows that there is such a thing as atmospheric pressure, the can that will crumple, only crumpled because there was a pressure exerting force on it.

Hypothesis: If the can is hot enough and the water is cool enough, then the can should almost instantly crumple.

B. Equipment:

1. A stove
2. A frying pan
3. Two empty, 12-ounce aluminum cans (like soda pop cans)
4. Two bowls
5. Water
6. Ice cubes
7. Tongs
8. Eye protection, such as goggles or safety glasses

C. Procedure:

1. Put a small amount of water in each of the aluminum can. Use only enough to cover the bottom of the can with a small amount of water. The more water used, the longer the experiment will take, and the less dramatic the effect.
2. Place the two aluminum cans in the frying pan so that they stand up.
3. Put the frying pan on the stove and turn the heat up to "high." This will heat up the water in the cans.
4. While waiting for the water in the cans to heat up, fill each bowl half full with water.
5. Place a few ice cubes in each bowl so that the water becomes ice cold.
6. Wait for steam to start rising out the opening of each can. That will tell you the water inside is boiling vigorously.
7. Once a steady stream of steam is coming out of each can, use the tongs to grab one can and place it upright in one of the bowls of water.
8. Note what happens.
9. Use the tongs to grab the other can and place it upside down in the bowl of water.

10. Note what happens.
11. Clean up your mess.

D. Observations:

1. The aluminum cans took a while to heat up.
2. There was not enough water in the cans, so the second (upside down) can did not crumple at all. So the experiment had to be repeated.
3. The pan used in the experiment was hot and so it smelled like stinky burning metal.
4. There was a lot a steam when the cans finally got hot.
5. Putting three ice cubes in the bowls worked well for chilling the water.
6. Using long tongs made it easier to grab a hold of the cans.
7. The first can took a few moments to cool down.
8. When the first can was placed upright in the bowl of iced water there was no dramatic effect, but when the second can was placed upside down in the other bowl of iced water the can instantly crumpled.
9. Grabbing the can from the middle made it easier to turn over.
10. Standing back and away from the bowl was a good idea because of the instant reaction from the aluminum can.

E. Conclusions:

The above hypothesis was supported. That when the hot can touched the cold water the can instantly crumpled. This happened because the steam that was rising out of the can was replaced by iced water and it created a seal so the air was quickly compressed and crumpled the can. Because the experiment was successful an understanding was gained about atmospheric pressure.

How might the above experiment be improved? Well the experiment could have been improved by adding a set amount of water: instead of "Put a small amount of water in each aluminum can," it could say "Put 1 tablespoon in each aluminum can." It could say "Hold can upright if not, it will tip over." Also, pulling out all the ice cubes helped the second can crumple. And finally using long tongs helped the process of grabbing cans from the hot pan.

Ideas the experiment generated for further research. Studying a barometer would give an even greater understanding about the atmospheric pressure. It would be interesting to study further the different results on different objects that are affected by a pressure. Looking in books would be a great source of further research, also building a barometer would be a great way to constantly watch the pressure at different times and seasons.

F. Bibliography:

Domain: http://en.wikipedia.org
Document: /wiki/Atmospheric_Pressure

Domain: http://www.ace.mmu.ac.uk

Document: /eae/weather/older/pressure.html

Domain: http://en.wikipedia.org
Document: /wiki/Barometer

Rosenoff, Steven. Classroom Lecture. October 26, 2013

Wile, Dr. Jay L. Exploring Creation with Physical Science, 2nd Edition. Apologia Educational Ministries, Inc. 2007

An example of lab report grading criteria follows:

A. Purpose (10 points possible) (10 points earned)

You must include the following five paragraphs (minimum) and present them in this sequence:

Para 1 - What the experiment is about: the objective
Para 2 - Background information on the experiment from your textbook and two other sources. You may need more than one paragraph here, which is okay
Para 3 - What the experiment hopes to show
Para 4 - Why this topic is of interest to science
Para 5 - A hypothesis statement in the proper "If, then" format

SUPERIOR (I will include comments in all capitals here. Please note: I am not shouting at your student! I am simply trying to set my comments apart from the template information. Remember: no personal pronouns can be used in your lab report!)

B. Equipment (5 points possible) (5 points earned)

You may copy/paste this from the online textbook, but you must make the following changes to the textbook list:

1. Provide a complete list of equipment necessary to conduct the experiment. If you substituted or changed anything, please list it here also.
2. Equipment should be listed in a 1, 2, 3, 4, 5, etc., fashion down the page; not in the A, B, C, D, etc., fashion used in your textbook.

PERFECT.

C. Procedure (5 points possible) (5 points earned)

You may copy/paste this from the online textbook, but you must make the following changes to the textbook list:

1. Provide a complete list of the procedure used. If you change any, be sure to note it.
2. Procedures should be written in a cookbook fashion
3. Procedures must be numbered 1, 2, 3, 4, 5, etc., down the page, use a, b, c, d, etc. for sub-items

PERFECT.

D. Observations (10 points possible) (10 points earned)

1. Provide a detailed, objective report of observations -- what you saw, heard, felt, tasted, smelled, etc -- when the experiment was performed. (Charts and graphs which provide detail are encouraged. These MUST be e-mailed as an attachment to me as stated in your assignment guidelines.) A numbered list of observations works well here: a well-detailed list may be as many as 10 observations or more long. You can also provide me with a narrative of your observations in paragraph form if you desire.

GREAT JOB.

E. Conclusions (10 points possible) (10 points earned)

You must include:

Para 1. An analysis of the data
Para 2. Ways to improve the experiment
Para 3. Ideas the experiment generated for further research

OUTSTANDING.

F. Bibliography (10 points possible) (10 points earned)

You must include the following four citations in alphabetical order:
Cit 1 - A reference for me as a class lecture or interview note in proper format as given in examples
Cit 2 - A reference for your textbook in proper format as given in examples
Cit 3 - A reference for your first outside resource
Cit 4 - A reference for your second outside resource

WONDERFUL BIBLIOGRAPHY.

ASSIGNMENT GRADE: 50/50 100% Excellent.

As per stated policy, any assignment submitted is assumed to be supervised and proctored by the student's parent.

F. Laboratory Notebook Requirements

Please note: If you live in cold weather environments, you should plan for collection or completion of some labs that can only be done during warm weather when these conditions exist. You may need to accomplish some experiments when weather permits *before the due date, which may require you to complete these experiment during summer*. Experiments 2.3 and 15.1 requires a sunny window, Experiments 7.1 and 8.2 are weather observation labs, 11.3 requires lots of space outside, and 14.4 requires outside activity.

As per stated policy, any assignment submitted is assumed to be supervised and proctored by the student's parent.

Students should keep hard printed copies of all their work (labs, study guides, tests, etc.), not just computer saved work. I would divide the notebook into sixteen sections, one for each Module of the Wile's text. Doing so will allow the student to keep a good portfolio of their class assignments should they be asked to demonstrate their work at some later date. Please note, I do not maintain copies of a student's work beyond the end of the school year. I will maintain a copy of a student's final semester grades for seven years beyond the end of our class together. Please note that some of the experiments require long periods of time to complete. As I do not set the lab schedule in your home school, you will need to look ahead and adjust your lab time accordingly. I require a Parent Notebook Report to be submitted at the end of first and second semesters which states how many of the required experiments have been completed by your student. The student should have the following completed and in his or her notebook for each semester listed:

First Semester:

Experiment 1.1
Experiment 1.2
Experiment 1.3
Experiment 2.1
Experiment 2.2
Experiment 2.3
Experiment 3.1 – Formal Report Required
Experiment 3.2
Experiment 4.1
Experiment 4.2
Experiment 4.3
Experiment 4.4
Experiment 4.5
Experiment 4.6
Experiment 5.1
Experiment 5.2
Experiment 5.3
Experiment 6.1
Experiment 6.2

Experiment 6.3
Experiment 6.4
Experiment 7.1 – Formal Report Required
Experiment 8.1
Experiment 8.2

Second Semester:

Experiment 9.1
Experiment 9.2
Experiment 9.3
Experiment 10.1
Experiment 10.2
Experiment 10.3
Experiment 10.4
Experiment 11.1 – Formal Report Required
Experiment 11.2
Experiment 11.3
Experiment 12.1
Experiment 12.2
Experiment 12.3
Experiment 14.1 – Formal Report Required
Experiment 14.2
Experiment 14.3
Experiment 14.4
Experiment 14.5
Experiment 15.1
Experiment 15.2
Experiment 15.3
Experiment 15.4
Experiment 15.5

No assigned lab work due for Module 16.

G. Module Tests and Exams

Module Tests and Semester Exams are taken online through the Student Portal site. Module Tests and Semester Exams ARE CLOSED BOOK AND CLOSED NOTES assignments. As per classroom policy, any assignment submitted is assumed to be supervised and proctored by the student's parent. A parent's digit signature is required at the bottom of the Test or Exam. We have a zero tolerance policy toward cheating or plagiarism. Vocabulary words for the Module (e.g. those found in question #1 of the Study Guide) MUST BE SPELLED CORRECTLY if used to answer a test or an exam question. USING SPELL CHECK DURING A TEST IS NOT ALLOWED.

All Module Test assignments must be completed within 60 minutes of logging onto the Student Portal site. Semester exams must be completed within 90 minutes. After 60 or 90 minutes, depending on the assignment, Student Portal WILL DISCONNECT YOU AND NOT FORWARD your assignment, which could result in a zero being given on an assignment. Please time yourself during your Module Test or Semester exam to ensure completion within the time limit.

Table of Contents

Start

RED WAGON TUTORIALS

Course Schedule

Welcome to Physical Science class. I am excited about the new school year for two reasons: (1) our class will be live-feed Internet. Unlike some Internet courses that require you to just send in assignments, which I would score then return, you and I will be communicating directly with each other on at least a weekly basis. This arrangement gives us greater opportunity to interact and learn from each other because we will be together for ninety minutes each week; (2) our curriculum will be challenging and exhilarating. Sixteen major topics will be covered during the course of this year. These units are all outlined in the following syllabus and in the book *Exploring Creation with Physical Science, 2nd Edition*, by Dr. Jay Wile, which will also be our classroom text. As a former medical and industrial research scientist, you can be certain I will bring a depth of knowledge to the topics we will study together. I am eager to share my experience with you in a tutorial capacity.

This document in conjunction with stated requirements, the *Assignment Supplement*, and the *Parent Agreement* outline and detail the requirements for the Physical Science Course.

Schedule:

FIRST SEMESTER

Module 1: The Basics

Class discussions: Week of 9-8, Week of 9-15

For the first class meeting (Week of 9-8), you need to have read up to and including the section called "Manipulating Units."

For the second class meeting (Week of 9-15), you need to have finished reading Module 1.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

(All required experiments in the textbook are to be completed as they are encountered. Experiment reports are to be handwritten in the informal format provided at the front of your textbook, completed on notebook paper, and kept in a 3-ring binder. I will ask each parent at the end of each semester for a count of the number of experiments completed during the semester. Failure to complete the all the required experiments may keep your student from continuing on into the next semester of science.)

Assignments Due:

Module Study Guide: Due by 9-17
Required Experiments: Due by 9-24: Experiment 1.1, Experiment 1.2, and Experiment 1.3 informal reports in notebook
Online Module Test: Due by 9-24

Module 2: Air

Class discussions: Week of 9-22, Week of 9-29

For the first class meeting (Week of 9-22), you need to have read up to and including the section called "Experiment 2.3: Carbon Dioxide and the Greenhouse Effect."

For the second class meeting (Week of 9-29), you need to have finished reading Module 2.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 10-1
Required Experiments: Due by 10-8: Experiment 2.1, Experiment 2.2, and Experiment 2.3 informal reports in notebook
Online Module Test: Due by 10-8

Module 3: The Atmosphere

Class discussions: Week of 10-6, Week of 10-13

For the first class meeting (Week of 10-6), you need to have read up to and including the section called "The Homosphere."

For the second class meeting (Week of 10-13), you need to have finished reading Module 3.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 3.1 Draft Report

Assignments Due:

Module Study Guide: Due by 10-15
Required Experiments: Due by 10-22: Experiment 3.1 Draft Report to Mr.R and Experiment 3.2 informal report in notebook
Online Module Test: Due by 10-22

Module 4: The Wonder of Water

Class discussions: Week of 10-20, Week of 10-27

For the first class meeting (Week of 10-20), you need to have read up to and including the section called "Experiment 4.3: Solvents and Solutes."

For the second class meeting (Week of 10-27), you need to have finished reading Module 4.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 3.1 Corrected Report

Assignments Due:

Module Study Guide: Due by 10-29
Required Experiments: Due by 11-5: Experiment 3.1 Corrected Report to Mr.R, and Experiment 4.1, Experiment 4.2, Experiment 4.3, Experiment 4.4, Experiment 4.5, and Experiment 4.6 informal reports in notebook
Online Module Test: Due by 11-5

Module 5: The Hydrosphere

Class discussions: Week of 11-3, Week of 11-10

For the first class meeting (Week of 11-3), you need to have read up to and including the section called "Experiment 5.2: Ice and Salt."

For the second class meeting (Week of 11-10), you need to have finished reading Module 5.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 11-12
Required Experiments: Due by 11-19: Experiment 5.1, Experiment 5.2, and Experiment 5.3 informal reports in notebook
Online Module Test: Due by 11-19

Module 6: Earth and the Lithosphere

Class discussions: Week of 11-17, Thanksgiving Break: 11/22 to 11/30, Week of 12-1

For the first class meeting (Week of 11-17), you need to have read up to and including the section called "The Earth's Core."

For the second class meeting (Week of 12-1), you need to have finished reading Module 6.

(Start Experiment 7.1 NOW!!! Extremely Long Experiment – Plan Ahead)

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 12-3
Required Experiments: Due by 12-10: Experiment 6.1, Experiment 6.2, Experiment 6.3, and Experiment 6.4 informal reports in notebook
Online Module Test: Due by 12-10

Module 7: Factors That Affect Earth's Weather

Class discussions: Week of 12-8, Week of 12-15, Christmas Break: 12/20/2014 to 1/4/2015

For the first class meeting (12-8), you need to have read up to and including the section called "Earth's Thermal Energy."

For the second class meeting (12-15), you need to have finished reading Module 7.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 7.1 Draft Report (Extremely Long Experiment – Plan Ahead)

Assignments Due:

Module Study Guide: Due by 12-17
Required Experiments: Due by 1-7: Experiment 7.1 Draft Report to Mr.R
Online Module Test: Due by 1-7

Module 8: Weather and its Prediction

Class discussions: Week of 1-5, Week of 1-12

For the first class meeting (Week of 1-5), you need to have read up to and including the section called "Experiment 8.1: Making your Own Lightning."

For the second class meeting (Week of 1-12), you need to have finished reading Module 8.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 7.1 Corrected Report

Assignments Due:

Module Study Guide: Due 1-14
Experiment Reports: Due 1-21: Experiment 7.1 Corrected Report to Mr.R, and Experiment 8.1, and Experiment 8.2 informal reports in notebook
Semester Exam: Due 1-21 (Exam covers Modules 1 thru 8. There WILL be questions over Module 8 on the Exam.)

Parent Notebook Report -- Due 01/23/2015

SECOND SEMESTER

Module 9: An Introduction to the Physics of Motion

Class discussions: Week of 1-19, Week of 1-26

For the first class meeting (Week of 1-19), you need to have read up to and including the section called "Experiment 9.1: The Importance of Direction."

For the second class meeting (Week of 1-26), you need to have finished reading Module 9.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 1-28
Required Experiments: Due by 2-4: Experiment 9.1, Experiment 9.2, and Experiment 9.3 informal reports in notebook
Online Module Test: Due by 2-4

Module 10: Newton's Laws

Class discussions: Week of 2-2, Week of 2-9, Winter Break: 2/14 to 2/22

For the first class meeting (Week of 2-2), you need to have read up to and including the section called "Experiment 10.3: Friction."

For the second class meeting (Week of 2-9), you need to have finished reading Module 10.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 2-11
Required Experiments: Due by 2-25: Experiment 10.1, Experiment 10.2, Experiment 10.3, and Experiment 10.4 informal reports in notebook
Online Module Test: Due by 2-25

Module 11: The Forces in Creation – Part 1

Class discussions: Week of 2-23, Week of 3-2

For the first class meeting (Week of 2-23), you need to have read up to and including the section called "The Gravitational Forces at Work in Our Solar System."

For the second class meeting (Week of 3-2), you need to have finished reading Module 11.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 11.1 Draft Report

Assignments Due:

Module Study Guide: Due by 3-4

Required Experiments: Due by 3-11: Experiment 11.1 Draft Report to Mr.R, Experiment 11.2, and Experiment 11.3 informal reports in notebook
Online Module Test: Due by 3-11

Module 12: The Forces in Creation – Part 2

Class discussions: Week of 3-9, Week of 3-16

For the first class meeting (Week of 3-9), you need to have read up to and including the section called "Experiment 12.2: Making and Using an Electroscope."

For the second class meeting (Week of 3-16), you need to have finished reading Module 12.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 11.1 Corrected Report

Assignments Due:

Module Study Guide: Due by 3-18
Required Experiments: Due by 3-25: Experiment 11.1 Corrected Report to Mr.R, Experiment 12.1, Experiment 12.2, and Experiment 12.3 informal reports in notebook
Online Module Test: Due by 3-25

Module 13: The Forces in Creation – Part 3

Class discussions: Week of 3-23, Week of 3-30, Spring Break: 4/4 to 4/12

For the first class meeting (Week of 3-23), you need to have read up to and including the section called "The Strong Force."

For the second class meeting (Week of 3-30), you need to have finished reading Module 13.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 4-1
Required Experiments: Due by 4-15: None
Online Module Test: Due by 4-15

Module 14: Waves and Sound

Class discussions: Week of 4-13, Week of 4-20

For the first class meeting (Week of 4-13), you need to have read up to and including the section called "The Speed of Sound in Other Substances."

For the second class meeting (Week of 4-20), you need to have finished reading Module 14.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 14.1 Draft Report

Assignments Due:

Module Study Guide: Due by 4-22
Required Experiments: Due by 4-29: Experiment 14.1 Draft Report to Mr.R, Experiment 14.2, Experiment 14.3, Experiment 14.4, and Experiment 14.5 informal reports in notebook
Online Module Test: Due by 4-29

Module 15: Light

Class discussions: Week of 4-27, Week of 5-4

For the first class meeting (Week of 4-27), you need to have read up to and including the section called "Experiment 15.3: Refraction of Light."

For the second class meeting (Week of 5-4), you need to have finished reading Module 15.

Formal Experiment report to be turned in to Mr. Rosenoff:

Experiment 14.1 Corrected Report

Assignments Due:

Module Study Guide: Due by 5-6
Required Experiments: Due by 5-13: Experiment 14.1 Corrected Report to Mr.R, Experiment 15.1, Experiment 15.2, Experiment 15.3, Experiment 15.4, and Experiment 15.5 informal reports in notebook
Online Module Test: Due by 5-13

Module 16: An Introduction to Astrophysics

Class discussions: Week of 5-11, Week of 5-18

For the first class meeting (Week of 5-11), you need to have read up to and including the section called "Classifying the Stars in the Universe."

For the second class meeting (Week of 5-18), you need to have finished reading Module 16.

Formal Experiment report to be turned in to Mr. Rosenoff:

None

Assignments Due:

Module Study Guide: Due by 5-20
Required Experiments: None

Exam Review: During class week of 5-18

Final Assignments:

Second Semester Exam: Due 5-27 (Exam covers Modules 9 thru 16. There WILL be questions over Module 16 on the Exam.)

Parent Notebook Report -- Due 05/22/2015

Please note that 5/27 is the LAST POSSIBLE DAY to turn in assignments for the school year. I will close my grade book at 6:01 PM, Eastern, and finalize grades. Please do not be late with your final assignments.

To you, the parent, I promise that I will make every effort possible to keep in close contact with you; however, in order to do that, I need to be able to find you! Please keep the school and me advised of a daytime phone number where you can be reached, and provide me with an e-mail account to which only you have access. I do not make evening or weekend phone calls or answer or send e-mails on the weekends. (My family needs my time during these hours.) Therefore, it is imperative that I be able to contact you during daylight hours. If you have any questions or concerns, please feel free to contact me at 360-347-1799 during my school year office hours, which are 3:00 – 6:00 PM, Eastern Time, Monday, Wednesday, or Friday or e-mail me at rwt1@comcast.net.

God Bless your efforts this year and always,

Steven Rosenoff
Physical Science Instructor
Cleo's Classroom

Table of Contents

Start

RED WAGON TUTORIALS

Parent Agreement

Thank you for your interest in Cleo's Classroom Physical Science class. I am excited about the new school year for two reasons: (1) our class will be live-feed Internet. Unlike some Internet courses which require you to send in assignments which I grade and then return, you and I will be communicating directly with each other on at least a weekly basis. This arrangement gives us greater opportunity to interact and learn from each other because we will be together for ninety minutes each week; (2) our curriculum will be challenging and exhilarating. Sixteen major topics will be covered during the course of this year. These units are all outlined in the book ***Exploring Creation with Physical Science, 2nd Edition***, by Dr. Jay Wile, which will also be our classroom text. As a former medical and industrial research scientist, you can be certain I will bring a depth of knowledge to the topics we will study together. I am eager to share my experience with you in an educational capacity.

In order to start out with a firm understanding of my expectations for this class, I would ask that you please review the following requirements with your student:

1. Students entering physical science should be concurrently enrolled in or have completed pre-algebra prior to the start of the academic year. (Success in physical science at this level and math ability go hand-in-hand, according to research.)

2. Incoming physical science students should have mastered the introductory concepts covered in a basic general science course, including basic laboratory procedures and experiment report writing. (Please see ***Exploring Creation with General Science, 2nd Edition***, by Dr. Jay Wile for guidance as to basic curriculum covered in a general science course.)

3. Students are expected to have a basic understanding of document citation and have the ability to produce a one-to-two page formal laboratory experiment report following a standardized documentation style I will provide.

4. Students or their parents should have basic computer literacy, including knowledge of how to download files, load web pages, open and create e-mail attachments in Word 2010 docx or Adobe PDF format, and how to copy from a Word 2010 docx or Adobe PDF document and paste to a website template. (These are not skills I teach in class.)

5. The text we will be using for our course, as stated earlier, is ***Exploring Creation with Physical Science, 2nd Edition***, by Dr. Jay Wile. You are also required to purchase the textbook *Solutions Manual*. The textbook and manual, or a complete CD-ROM version of the text/manual, and other support materials are available through Christian Book Distributors, http://www.christianbook.com/. The text is divided into 16 modules. Unless otherwise noted in the physical science course schedule: (1) a parent-graded module study guide; (2) a paper-and-ink informal report (following an informal format I will provide) for each module experiment; and (3) an instructor-graded online module test MUST be completed for each module. Each student will also produce a formal lab report each quarter following a formal report format that I will provide. There will also be an instructor-graded semester exam given at the end of 1st and 2nd semesters. I will also require that the student maintain a penciled lab notebook of all lab experiment work completed: I will post a list of the required experiments to be completed for each semester. **Remember**: these assignments MUST BE COMPLETED BY THE DUE DATES LISTED in the course schedule, which I will post.

6. Students must complete the module test and the semester exam ONLINE on the Student Portal website. Parents MUST post their parent notebook report on the Student Portal site also. Completing this assignment submission process provides the student/parent with a receipt for the assignment which is time stamped and gives me a computer-stored copy to look back on. There is a link for posting each one of these assignments available on the Student Portal site. Students will forward their formal experiment report as a Microsoft Word 2010 docx or Adobe PDF document. Please note: I require that you word process (using Word 2010 docx or Adobe PDF, Times New Roman, 12 font, 1" margins) and spell check the formal experiment report prior to its being sent as an e-mailed attachment. I will provide you with a *Steps to Success* handout (in your Assignment Supplement) which will detail the best method to accomplish all this assignment work.

7. Laboratory work is an important endeavor in your child's overall grade and education and should be completed to continue on to biology. Please be sure to be diligent in completing ALL the required lab assignments indicated in the Course Schedule. Laboratory supplies for this course are obtained from common household and pantry items, hunting and gathering activities, and by purchasing a few supplies through local variety stores. I will require a parent notebook report be submitted each semester stating the total number of experiments completed per number required. This report will amount to one third of your student's laboratory grade. Please do not be late.

(Those of you living and working overseas may have special needs regarding completion of laboratory work. Please feel free to contact me on an individual basis so that I can help with any concerns you may have.)

8. Students should be disciplined enough to submit required work on time. As per stated policy, I will deduct 10% per day from the score received on the assignment on all late work (**including the parent notebook report**), unless the lateness results from personal illness, family emergency, or computer problem of a non-reoccurring nature. In these instances, I will grant full points. A Course Schedule showing due dates for all assignments for the entire year has been provided above. (If you are leaving on vacation or some other personal-choice holiday, please

adjust your study schedule to submit the assigned work before leaving. I will always accept an assignment early. I am available during my office hours to help you complete assignments before the due date, when and if necessary, during the school year.)

All class assignments are due by *6:00 PM Eastern Time on the date indicated in the Course Schedule*. (The Student Portal time stamp on your work is the final authority on whether something is submitted on time or not.) *NOTE: 6:01 PM Eastern Time starts a new day and I will subtract 10% if your work arrives at or after that time.*

9. In order to begin class immediately, students are expected to be signed on to their computers at the class start time with materials ready. Technology is often a fickle thing. Many students have to log in several times to get a decent connection. *Try to log into class five minutes early to avoid being late*. (This also provides the student time to chat with classmates prior to the start of our session.) Those students who are habitually tardy for no valid reason will be referred to the school administrator.

(Those of you living and working overseas have special problems regarding absences and tardiness. Please feel free to contact me on an individual basis so that I can help with your needs.)

10. Students are expected to come to class prepared every day, which means all assigned reading, exercises, and labs have been completed.

The following rules and procedures have been established to create an environment conducive to learning:

a. Be Prepared -- have assignments finished prior to class.
b. Be Prompt -- turn in all work on the date it is due.
c. Be Respectful -- to yourself, other students, and your tutor.
d. Be Involved -- daily participation is required.

Those students who follow the rules stated above will receive positive reinforcement through the use of participation points. These points will be given, at my discretion, to students who are organized, complete work on time and to the best of their ability, and behaved in an appropriate manner.

11. Daily participation in class is also required. Students are expected to have a working microphone for this purpose. Students are expected to ask questions, participate in discussions, and generate and share ideas. Often participation is the deciding factor when figuring grades (an 'A' vs. an 'A-' or perhaps a 'D' vs. an 'F'). You need to do more than show up to class and complete your assignments to succeed -- you need to be an active participant in your education.

(Please note: I cannot and will not, in good conscience, pass a student who does not participate in his or her education.)

12. The following grade scale will be used for the course:

A	93 - 100%	C+	77 - 79%	F	59% and below
A-	90 - 92%	C	73 - 76%		
B+	87 - 89%	C-	70 - 72%		
B	83 - 86%	D+	67 - 69%		
B-	80 - 82%	D	60 - 66%		

The two, typewritten, formal, laboratory write-ups (one required each quarter) and the parent notebook report detailing completion of all required experiment work comprise 25% of the student's semester grade; seven module tests each semester make up an additional 50% of the student's grade; the end-of-semester exam comprises 25% of the total score for each semester.

A perpetual grade report for each semester for every student is available on the password protected Student Portal web site for viewing at any time during the school year.

If you have further questions regarding course requirements, my e-mail address is rwt1@comcast.net. Please feel free to contact me on Monday, Wednesday, or Friday afternoons between 3:00 PM – 6:00 PM, Eastern Time. My phone number is 360-347-1799.

Looking forward to seeing you in September!

God Bless,

Steve Rosenoff
Physical Science Instructor
Cleo's Classroom

Table of Contents

Start

Module 1

Lesson 1:

Reading Assignment: ECPS, pp. 1 - 11

Lesson Video: PModule01-1

Lesson Starts: 30:15

The Basics, Part 1

Please watch this video before class starts or the session video is viewed:

http://www.youtube.com/watch?v=yQP4UJhNn0I

(Parents: Please be advised that these are You-Tube videos. We have no control over the ads that are presented. We do our best to screen the presentations, but ads change daily. Please preview the video environment before your student views the links. We feel that Google Chrome is the best browser for students to watch videos. It screens content very well.)

https://www.google.com/chrome/browser/

1. Atoms are the _____ unit of matter.

2. T or F: Atoms are so small that they cannot be seen even with a powerful electron microscope? _____

3. There are roughly 1,000,000,000,000,000,000 atoms contained on

a. the head of a pin
b. the moon's surface
c. your little sister's head
d. your computer's screen

4. There are currently how many known basic kinds of atoms in creation? _____

5. When a substance is made of billions and billions of the same kind of atom, it is called a/an _____.

6. T or F: Images of atoms produced by scanning tunneling electron microscopes are pictures of

actual atoms and prove beyond a doubt that atoms exist? _____

7. Calculated electron microscope images are part of the large amount of _____ evidence that indicates the existence of atoms.

a. direct
b. objective
c. indirect
d. observable

8. When two or more atoms link together, they form a what, which has its own unique properties? _____

9. T or F: A water molecule is formed when an oxygen atom links together with two sodium atoms? _____

10. Y or N: A molecule is broken down into its constituent atoms. Do these atoms have the same properties as the molecule? _____

11. When table salt is dissolved in water, it actually breaks down into two different atomic substances, _____ and _____.

12. Substances made up of billions and billions of the same molecule are called _____.

13. T or F: Some substances, called mixtures, are made of more than one kind of atom or molecule? _____

14. In Experiment 1.1, the copper (an element) in the wire reacts with _____ _____ molecules to make copper hydroxycarbonate.

15. The Statue of Liberty has turned _____ because hydrogen, oxygen, and carbon atoms from various substances in the air have combined with copper atoms to make copper hydroxycarbonate.

a. yellowish-purple
b. orangish-red
c. whitish-gray
d. bluish-green

16. T or F: On July 23, 1983, the pilot of an Air Canada Boeing 767 passenger airplane had to make an emergency landing because his plane ran out of fuel? _____

17. When making measurements, the _____ reported are just as important as the numbers.

18. While the base English unit for mass is the slug, the base metric unit for mass is the what? _____

19. T or F: The base metric unit for weight is the Rosenoff, while the base English unit for weight is the Wile? _____

20. Although the weight of an object varies depending on gravity, the _____ does not.

21. The base metric unit for distance is the meter, and the base English unit for distance is the _____.

a. mile
b. inch
c. yardstick
d. foot

22. T or F: The base metric unit for volume is the liter, and the base English unit for volume is the gallon? _____

23. In the metric system, prefixes govern the _____ of a unit.

24. While the "centi" prefix means 0.01, the "milli" prefix means what? _____

25. One kilogram equals how many grams? _____

Table of Contents

Start

Answers & Links:

Lesson 1:

The Basics, Part 1

http://redwagontutorials.com/AD/HandoutsP/Module01/1stOverhead01.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/2ndOverhead.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/3rdOverhead.htm

http://www.redwagontutorials.com/php/

http://redwagontutorials.com/AD/HandoutsP/Module01/PModule1SG.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/SampleInformalReport.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/FormalReport2a.htm

Please watch this video before class starts or the session video is viewed:

http://www.youtube.com/watch?v=yQP4UJhNn0I

(Parents: Please be advised that these are You-Tube videos. We have no control over the ads that are presented. We do our best to screen the presentations, but ads change daily. Please preview the video environment before your student views the links. We feel that Google Chrome is the best browser for students to watch videos. It screens content very well.)

https://www.google.com/chrome/browser/

1. Atoms are the _____ unit of matter.

Answer: Atoms are the smallest unit of matter.

http://www.chem4kids.com/files/atom_structure.html

2. T or F: Atoms are so small that they cannot be seen even with a powerful electron microscope?

Answer: True. Atoms are so small that they cannot be seen even with a powerful electron microscope.

http://en.wikipedia.org/wiki/Image:Atomic_resolution_Au100.JPG

3. There are roughly 100,000,000,000,000,000,000 atoms contained in the head of a _____.

Answer: There are roughly 100,000,000,000,000,000,000 atoms contained in the head of a pin.

http://dogdreams.files.wordpress.com/2008/04/pins.jpg

http://en.wikipedia.org/wiki/Names_of_large_numbers

4. There are currently how many known basic kinds of atoms in creation?

Answer: There are currently about 116 basic kinds of atoms known in creation.

http://www.webelements.com/

5. When a substance is made of billions and billions of the same atom, it is called a/an _____.

Answer: When a substance is made of billions and billions of the same atom, it is called an element.

http://en.wikipedia.org/wiki/Chemical_element

6. T or F: Images of atoms produced by scanning tunneling electron microscopes are pictures of actual atoms and prove beyond a doubt that atoms exist?

Answer: False. Images of atoms produced by scanning tunneling electron microscopes are not pictures, but are the result of computer generated calculations.

The types of signals made by an SEM can include secondary electrons, back-scattered electrons, characteristic x-rays and light (cathodoluminescence). These signals come from the beam of electrons striking the surface of the specimen and interacting with the sample at or near its surface. In its primary detection mode, secondary electron imaging, or SEM, can produce very high-resolution images of a sample surface, revealing details about 1 to 5 nm in size. Due to the way these images are created, SEM micrographs have a very large depth of focus yielding a characteristic three-dimensional appearance useful for understanding the surface structure of a sample. This great depth of field and the wide range of magnifications (commonly from about 25 times to 250,000 times) are available in the most common imaging mode for specimens in the SEM (secondary electron imaging), such as the micrographs displayed on the web page below.

Characteristic x-rays are the second most common imaging mode for a SEM. X-rays are emitted when the electron beam removes an inner shell electron from the sample, causing a higher energy electron to fill the shell and give off energy. These characteristic x-rays are used to identify the elemental composition of the sample. Back-scattered electrons (BSE) that come from

the sample may also be used to form an image. BSE images are often used in analytical SEM, along with the spectra made from the characteristic x-rays as clues to the elemental composition of the sample.

http://www.microelectronics.scu.edu/REVISE/pictures/sem01.jpg

http://www.rcsms.auckland.ac.nz/uoa/home/rcsms/rcsms-facilities/rcsms-sem

http://triangleartsandentertainment.org/wp-content/uploads/2010/03/platimun_atoms_nise.jpg

7. Calculated electron microscope images are part of the large amount of _____ evidence that indicates atoms exist.

Answer: Such calculations images are part of the large amount of indirect evidence that indicates atoms exist.

http://education.jlab.org/qa/atom_01.html

8. When two or more atoms link together, they form a what, which has its own unique properties?

Answer: When two or more atoms link together, they form a molecule, which has its own unique properties.

http://www.3dchem.com/atoz.asp

http://www.3dchem.com/3dmolecule.asp?ID=9

9. T or F: A water molecule is formed when an oxygen atom links together with two sodium atoms?

Answer: False. A water molecule is formed when an oxygen atom links together with two hydrogen atoms.

http://www.lsbu.ac.uk/water/molecule.html

10. Y or N: A molecule is broken down into its constituent atoms. Do these atoms have the same properties as the molecule?

Answer: No. When a molecule is broken down into its constituent atoms, the atoms produced do not have the same properties as the molecule.

http://uw.physics.wisc.edu/~wonders/H2.JPG

11. When table salt is dissolved in water, it actually breaks down into two different substances. Is salt composed of atoms or molecules?

Answer: When table salt is dissolved in water, it actually breaks down into two different atomic substances, sodium and chloride. Table salt is composed of the Sodium chloride molecules.

http://en.wikipedia.org/wiki/Sodium_chloride

http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/Bio%20101/Bio%20101%20Lectures/Chemistry/chemistr.htm

12. Substances made up of billions and billions of the same molecules are called _____.

Answer: Substances made up of billions and billions of the same molecules are called compounds.

http://www.chem4kids.com/files/atom_compounds.html

13. T or F: Some substances, called mixtures, are made of more than one kind of atom or molecule?

Answer: True. Some substances, called mixtures, are made of more than one kind of atom or molecule.

http://www.chem4kids.com/files/matter_mixture.html

14. In Experiment 1.1, the copper (an element) in the wire reacts with _____ _____ molecules to make copper hydroxycarbonate.

Answer: In Experiment 1.1, the copper (an element) in the wire reacts with baking soda molecules to make copper hydroxycarbonate.

http://redwagontutorials.com/AD/HandoutsP/Module01/Experiment1.1.htm

http://www.cs.cmu.edu/~adg/adg-pzimages.html

15. The Statue of Liberty has turned what color because hydrogen, oxygen, and carbon atoms from various substances in the air have combined with copper atoms to make copper hydroxycarbonate?

Answer: The Statue of Liberty has turned bluish-green because hydrogen, oxygen, and carbon atoms from various substances in the air have combined with copper atoms to make copper hydroxycarbonate.

http://z.about.com/d/architecture/1/7/_/i/Statue_of_Liberty_FREE_l.jpg

http://earthcam.com/usa/newyork/statueofliberty/?cam=liberty_torch

http://www.statueofliberty.org/Statue_History.html

16. T or F: On July 23, 1983, the pilot of an Air Canada Boeing 767 passenger airplane had to make an emergency landing because his plane *ran out of fuel*?

Answer: True. On July 23, 1983, the pilot of an Air Canada Boeing 767 passenger airplane had to make an emergency landing because his plane *ran out of fuel*.

http://aircanada.com/en/about/fleet/b767-300er.html

17. When making measurements, the _____ reported are just as important as the numbers.

Answer: When making measurements, the units reported are just as important as the numbers.

http://www.unit-conversion.info/

18. While the base English unit for mass is the slug, the base metric unit for mass is the what?

Answer: While the base English unit for mass is the slug, the base metric unit for mass is the gram.

http://hyperphysics.phy-astr.gsu.edu/Hbase/Mechanics/slug.html

19. T or F: The base metric unit for weight is the Rosenoff, while the base English unit for weight is the Wile?

Answer: False. The base metric unit for weight is the Newton, while the base English unit for weight is the pound.

http://en.wikipedia.org/wiki/Weight

20. Although the weight of an object varies depending on gravity, the _____ does not.

Answer: Although the weight of an object varies depending on gravity, the mass does not.

In everyday usage, mass is more commonly referred to as weight; but in physics and engineering, weight means the strength of the gravitational pull on the object; that is, how heavy it is, measured in units of force. In everyday situations, the weight of an object is proportional to its mass, which usually makes it unproblematic to use the same word for both concepts. However, the distinction between mass and weight becomes important for measurements with a precision greater than a few percent (due to slight differences in the strength of the Earth's gravitational field at different places), and for places far from the surface of the Earth, such as in space or on other planets.

http://hyperphysics.phy-astr.gsu.edu/hbase/mass.html

21. The base metric unit for distance is the meter, and the base English unit for distance is the what?

Answer: The base metric unit for distance is the meter, and the base English unit for distance is the foot.

http://www.worldwidemetric.com/metcal.htm

22. T or F: The base metric unit for volume is the liter, and the base English unit for volume is the gallon?

Answer: True. The base metric unit for volume is the liter, and the base English unit for volume is the gallon.

http://www.conversion-metric.org/volume_conversion/

23. In the metric system, prefixes govern the _____ of a unit.

Answer: In the metric system, prefixes govern the size of a unit.

http://www.unc.edu/~rowlett/units/prefixes.html

24. While the "centi" prefix means 0.01, the "milli" prefix means what? _____

Answer: While the "centi" prefix means 0.01, the "milli" prefix means 0.001.

25. One kilogram equals how many grams?

Answer: One kilogram equals 1000 grams.

http://en.wikipedia.org/wiki/Kilogram

Table of Contents

Start

Lesson 2:

Reading Assignment: ECPS, pp. 11 - 20

Lesson Video: PModule01-2

Lesson Starts: 28:45

The Basics, Part 2

Please watch this video before class starts or the session video is viewed:

http://www.youtube.com/watch?v=XKCZn5MLKvk

1. T or F: When making measurements, the units reported are just as important as the numbers? _____

2. While the base English unit for mass is the slug, the base metric unit for mass is the what? _____

3. The base metric unit for weight is the _____, while the base English unit for weight is the _____.

4. T or F: Although the mass of an object varies depending on gravity, the weight does not? _____

5. The base metric unit for distance is the meter, and the base English unit for distance is the what? _____

6. The base metric unit for volume is the _____, and the base English unit for volume is the _____.

7. T or F: In the metric system, prefixes govern the size of a unit? _____

8. While the "centi" prefix means 0.01, the "milli" prefix means what? _____

9. One kilogram equals how many grams? _____

10. An object with a mass of 1 centigram has _____ mass than an object with a mass of 1 kilogram.

a. more
b. less
c. the same
d. none of the above

11. T or F: The metric unit for temperature is degrees Celsius? _____

12. In the Celsius system, water freezes at _____ and boils at _____.

13. In the Old Testament, the measured unit for length was called what?

a. the cubit
b. the foot
c. the yard
d. the stone

14. T or F: Concentration is the volume of a substance within a certain space? _____

15. At certain concentrations, chemicals behave in one _____.

16. At other concentrations, those same chemicals can behave in a completely _____ way.

a. similar
b. retarded
c. different
d. absurd

17. True or False: Vitamins can be toxic to your body? _____

18. In Experiment 1.3, the more concentrated the vinegar, the _____ the antacid tablet disappeared.

19. In this course, conversions are done using the _____-_____ method, in which the measurement you want to convert is multiplied by a fraction that contains both the original unit and the unit to which you want convert.

Solve the Following Problems:

20. Convert 83.2 kL into L. _____

21. Convert 0.0005 g to mg. _____

22. Which takes up more volume: 750 mL or 0.6 L? _____

23. How many centigrams are in 26.2 g? _____

24. If an object has a volume of 405.7 mL, what is its volume in liters? _____

25. If a road is 113.1 miles long, how many feet long is it? _____

26. How many cm are in 61.2 m? _____

27. If an object has a mass of 34.56 mg, what is its mass in grams? _____

28. If a football field is 300.0 feet long, how many yards long is it? _____

29. Convert 4510 grams into kg _____

Table of Contents

Start

Answers & Links:

Lesson 2:

The Basics, Part 2

http://redwagontutorials.com/AD/HandoutsP/Module01/1stOverhead02.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/2ndOverhead.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/3rdOverhead.htm

http://www.redwagontutorials.com/php/

http://redwagontutorials.com/AD/HandoutsP/Module01/PModule1SG.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/SampleInformalReport.htm

http://redwagontutorials.com/AD/HandoutsP/Module01/FormalReport2a.htm

Please watch this video before class starts or the session video is viewed:

http://www.youtube.com/watch?v=XKCZn5MLKvk

1. T or F: When making measurements, the units reported are just as important as the numbers?

Answer: True. When making measurements, the units reported are just as important as the numbers.

http://ts.nist.gov/WeightsAndMeasures/Publications/appxc.cfm#4a

2. While the base English unit for mass is the slug, the base metric unit for mass is the what?

Answer: While the base English unit for mass is the slug, the base metric unit for mass is the gram.

http://www.bing.com/images/search?q=Slug&qpvt=Slug&FORM=IGRE

http://hyperphysics.phy-astr.gsu.edu/Hbase/Mechanics/slug.html

3. The base metric unit for weight is the _____, while the base English unit for weight is the _____.

Answer: The base metric unit for weight is the Newton, while the base English unit for weight is the pound.

http://hypertextbook.com/facts/2004/WaiWingLeung.shtml

http://www.unit-conversion.info/weight.html

4. T or F: Although the mass of an object varies depending on gravity, the weight does not?

Answer: False. Although the weight of an object varies depending on gravity, the mass does not.

http://cdn.blisstree.com/files/2012/04/weight-loss-plateau.jpg

http://www.exploratorium.edu/ronh/weight/

5. The base metric unit for distance is the meter, and the base English unit for distance is the what?

Answer: The base metric unit for distance is the meter, and the base English unit for distance is the foot.

http://geography.about.com/od/learnabouttheearth/a/earthfacts.htm

6. The base metric unit for volume is the _____, and the base English unit for volume is the _____.

Answer: The base metric unit for volume is the liter, and the base English unit for volume is the gallon.

http://www.aquaworldaquarium.com/Articles/TonyGriffitts/Seattle_Aquarium.htm

7. T or F: In the metric system, prefixes govern the size of a unit?

Answer: True. In the metric system, prefixes govern the size of a unit.

http://en.wikipedia.org/wiki/Metric_prefix

8. While the "centi" prefix means 0.01, the "milli" prefix means what?

Answer: While the "centi" prefix means 0.01, the "milli" prefix means 0.001.

http://thehomeschoolzone.com/FREEBasics/centimeters%2001.png

9. One kilogram equals how many grams?

Answer: One kilogram equals 1000 grams.

http://en.wikipedia.org/wiki/Kilogram

http://upload.wikimedia.org/wikipedia/commons/thumb/b/b5/CGKilogram.jpg/1024px-CGKilogram.jpg

10. An object with a mass of 1 centigram has _____ mass than an object with a mass of 1 kilogram.

Answer: An object with a mass of 1 centigram has less mass than an object with a mass of 1 kilogram.

http://www.translatorscafe.com/cafe/units-converter/mass/calculator/centigram-%5Bcg%5D-to-kilogram-%5Bkg%5D/

11. T or F: The metric unit for temperature is degrees Celsius?

Answer: True. The metric unit for temperature is degrees Celsius. This unit uses no prefixes.

http://en.wikipedia.org/wiki/Temperature_conversion

http://www.kidzucation.com/wp-content/uploads/2013/11/Order-of-Operations-Slides-FINAL-JPEG.015.jpg

12. In the Celsius system, water freezes at _____ and boils at _____.

Answer: In the Celsius system, water freezes at 0 degrees and boils at 100 degrees.

13. In the Old Testament, what was the measured unit for length called?

Answer: In the Old Testament, the cubit was the measured unit for length.

http://en.wikipedia.org/wiki/Cubit

http://www.pbase.com/paulthedane/noahs_ark

http://zerobs.net/wp-content/uploads/2012/02/capacity-of-noahs-ark-vs-titanic.png

http://nbad.narod.ru/pic/na/na_042.jpg

14. T or F: Concentration is the volume of a substance within a certain space?

Answer: False. Concentration is the quantity of a substance within a certain volume.

http://en.wikipedia.org/wiki/Concentration

15. At certain concentrations, chemicals behave in one _____.

Answer: At certain concentrations, chemicals behave in one fashion.

http://www.bigkitchen.com/MerchantUploads/edgeCpiGroup/C82K.jpg

http://www.womansday.com/cm/womansday/images/30/6-glass-iced-tea-lemon-mint-lgn.jpg

http://en.wikipedia.org/wiki/Oxygen

16. At other concentrations, those same chemicals can behave how?

Answer: At other concentrations, those same chemicals can behave in a completely different way.

http://sixpacktech.com/wp-content/uploads/2010/03/Foundry.jpg

http://upload.wikimedia.org/wikipedia/en/2/25/Clark1974.png

17. True or False: Vitamins can be toxic to your body?

Answer: True. Vitamins are good for your body at low concentrations, but they become toxic at high concentrations.

http://en.wikipedia.org/wiki/Vitamin_poisoning

18. In Experiment 1.3, the more concentrated the vinegar, the _____ the antacid tablet disappeared.

Answer: In Experiment 1.3, the more concentrated the vinegar, the faster the antacid tablet disappeared.

http://redwagontutorials.com/AD/HandoutsP/Module01/Experiment1.3.htm

19. In this course, conversions are done using what method?

Answer: In this course, we do conversions using the factor-labeling method, in which the measurement you want to convert is multiplied by a fraction that contains both the original unit and the unit to which you want to convert. The factor-labeling method is also called dimensional analysis. It is the standard way that calculations are done in chemistry and physics classes and in research laboratories.

http://images.slideplayer.us/7/1739160/slides/slide_54.jpg

Solve the Following Problems

There are three rules on determining how many significant figures are in a number:

1. Non-zero digits are always significant.
2. Any zeros between two significant digits are significant.
3. A final zero or trailing zeros in the decimal portion ONLY are significant.

Focus on these rules and learn them well. They will be used extensively throughout the remainder of this course. You would be well advised to do as many problems as needed to nail the concept of significant figures down tight and then do some more, just to be sure.

20. Convert 83.2 kL into L.

$$\frac{83.2\ \text{kL}}{1} \times \frac{1000\text{L}}{1\text{kL}} = 83{,}200\ \text{L}$$

(Three significant figures in 83.2; requires three significant figures in answer: 8, 3, and 2 are significant.)

21. Convert 0.0005 g to mg.

$$\frac{0.0005\ \text{g}}{1} \times \frac{1\ \text{mg}}{0.001\ \text{g}} = 0.5\ \text{mg}$$

(One significant figure in 0.0005; requires one significant figures in answer: 5 is the only significant number.)

22. Which takes up more volume: 750 mL or 0.6 L?

$$\frac{750\ \text{mL}}{1} \times \frac{0.001\ \text{L}}{1\ \text{mL}} = 0.75\ \text{L}$$

0.75 L is larger than 0.6 L.

(Two significant figures in 750; requires two significant figures in answer: 7 and 5 are significant.)

23. How many centigrams are in 26.2 g?

$$\frac{26.2\ \text{g}}{1} \times \frac{1\ \text{cg}}{0.01\ \text{g}} = 2{,}620\ \text{cg}$$

(Three significant figures in 26.2; requires three significant figures in answer: 2, 6, and 2 are significant.)

24. If an object has a volume of 405.7 mL, what is its volume in liters?

$$\frac{405.7 \text{ mL}}{1} \times \frac{0.001 \text{ L}}{1 \text{ mL}} = 0.4057 \text{ L}$$

(Four significant figures in 405.7; requires four significant figures in answer: 4, 0, 5, and 7 are significant.)

25. If a road is 113.1 miles long, how many feet long is it? (1 mile = 5,280 feet)

$$\frac{113.1 \text{ miles}}{1} \times \frac{5{,}280 \text{ feet}}{1 \text{ mile}} = 597{,}168 \text{ feet or } 597{,}200 \text{ feet}$$

(Four significant figures in 113.1; requires four significant figures in answer: rounding necessary; the 5, 9, 7, and 2 are significant.)

26. How many cm are in 61.2 m?

$$\frac{61.2 \text{ m}}{1} \times \frac{1 \text{ cm}}{0.01 \text{ m}} = 6{,}120 \text{ cm}$$

(Three significant figures in 61.2; requires three significant figures in answer: 6, 1, and 2 are significant.)

27. If an object has a mass of 34.56 mg, what is its mass in grams?

$$\frac{34.56 \text{ mg}}{1} \times \frac{0.001 \text{ g}}{1 \text{ mg}} = 0.03456 \text{ g}$$

(Four significant figures in 34.56; requires four significant figures in answer: 3, 4, 5, and 6 are significant.)

28. If a football field is 300.0 feet long, how many yards long is it? (3 feet = 1 yard)

$$\frac{300.0 \text{ feet}}{1} \times \frac{1 \text{ yard}}{3 \text{ feet}} = 100.0 \text{ yards}$$

(Four significant figures in 300.0; requires four significant figures in answer: 3, 0, 0, and 0 are significant. The last zero comes at the end of a number and after the decimal, which makes it significant. The two other zeros fall between the 3 and final significant zero, which makes them significant also.)

29. Convert 4510 grams into kg.

$$\frac{4510\ g}{1} \times \frac{1\ kg}{1000\ g} = 4.51\ kg$$

(Three significant figures in 4510; requires three significant figures in answer: 4, 5, and 1 are significant.)

http://redwagontutorials.com/AD/HandoutsP/Module01/NoteProb01-2.htm

Table of Contents

Start

Formal Report Example #1**:**

Mr. HC 01/06/14

Making a Fossil Cast

A. Purpose:

The objective of the making a fossil cast experiment is to show how to make a fossil cast, along with being able to see how that cast will develop. The experiment gives a keener understanding of the way casts are created. It also demonstrates the crucial fact that every cast must be made by a mold. In addition to these things, the experiment emphasizes the point that you must have the proper conditions to form a complete cast of the object. This is the objective of the experiment.

Much background information can be given on the subject of fossils. In ancient times, many people relied on myths and legends to explain fossils. The Chinese, for example, thought that fossils of ancient mammals were dragon bones and they used the grinded remains of the fossils in medicine. The Greek scholar Aristotle was the first to see it from a wiser point of view. He noticed that the ancient fossils of shells and trilobites looked remarkably similar to the seashells on the beach. Concluding that fossils were the remains of once living creatures, he left the project and moved onto his next assignment. Another man who strongly backed Aristotle's view on Fossils was the Italian painter and problem solver, Leonardo De Vince. Though he came a time later than Aristotle, he had the same principles on the subject as the Greek scholar before him. An English canal engineer by the name of William Smith noticed that in canyons and other places, each different layer of rock (strata) generally contained a different type of fossil. This led to what we now know as the Principle of Superposition. Nowadays, with the technology we have, fossils give us a gateway into the people hundreds of years ago would never have dreamed of. This is some information on fossils.

The making a fossil cast experiment is designed to exemplify the way a fossil cast is made. The goal is to demonstrate that if a shell is pushed into clay, it will form a mold. When plaster of Paris is added, the mold will be filled by "sediments" and those will hopefully harden, forming a cast coming from the mold, with the exact same design as the mold itself had. Then it should be simple enough to pull the cast out and get a close replica of the underside of the shell. That is, if the experiment goes as planned. This experiment mainly hopes to show how a cast is formed and what the result of the mold being filled will be.

As imaginable, fossils are of huge interest to science. Fossils allow the scientists a brief glance back in history. There is no telling how valuable fossils can be if they are the right kind. Clam-like fossils appear so regularly, that they are used to date the ground in which they were found. For example, if a clam was found from supposedly 300 years ago, you could date the

place where you found it back to the early 1700's. Science will forever be in debt to fossils because without them, the world would not know nearly as much as it does about the earth's past. If the cast and mold process of fossilizing was not in existence, knowledge of earth's past would decrease significantly. These fossils are the most common kind and make up much of what we know about fossils and earths past. Fossils are infinitely valuable to a scientist. These are the main reasons why fossils are of enormous interest to science.

Hypothesis: If the Plaster of Paris is poured correctly into the mold of the shell and hardens, then a cast "fossil" will be made.

B. Equipment:

1. Modeling clay
2. Plaster of Paris
3. A paper plate
4. A shell or something with a distinct shape or design
5. Vaseline or another petroleum jelly
6. Eye protection such as glasses or safety goggles

C. Procedure:

1. Cover the outside of the shell, the (part you will fossilize) with Vaseline.
2. Roll the clay out on the paper plate so it covers an area larger than the shell.
3. Choose the most interesting part of the shell and firmly press it into the clay, so an imprint forms in the clay.
4. Pull the shell away, and you should see a nice impression of the shell in the clay. At this point there will be a mold of the shell.
5. Mix the plaster according to the directions on the package and pour the plaster into the impression. Fill the impression so full that the plaster spills a little over the clay onto the paper plate.
6. Allow the plaster to harden.
7. Once the plaster has hardened, pull it off the paper plate and remove the clay from it. Check how it turned out. This is the cast of the shell.
8. Clean up the mess.

D. Observations:

1. The shell being used was in the shape of a unicorn horn and it was about one inch long. At its widest point, the shell was a bout a centimeter but then it tapered down to a point. It was coated with Vaseline and then smoothed over so that the Vaseline would not make any extra indentions of its own.
2. A slab of brown clay was spread out on the paper plate just bigger than the shell. And after a talk, it was decided that, since the shell was shaped like a screw, it was decided that it would be put in sideways. This was done because if it had been vertical, the groves would have been ruined when it was pushed in and pulled out.
3. The shell was pushed into the plaster horizontally until only half was still visible.

4. The shell was carefully pulled out and we pulled it out. The back was pushed down in order to make the point rise. It was observed that though the shell came out mostly smooth, there was a faint residue of brown clay on the underside.
5. A bucket, more than large enough for its purpose, of Plaster of Paris was brought out. The Plaster of Paris was at this point in a powder form, and the mixture was incredibly smooth to the touch.
6. To turn the Plaster of Paris into its real form, the powder had to have water added to it. There was no exact amount for the mixing in measurements, it was in proportions. The way it had to be added was this: two parts Plaster of Paris to one part water. In other words, you need twice as much plaster mixture as water.
7. The Plaster of Paris was mixed with relatively cold water using teaspoon and after some persistent stirring, it was ready to be poured into the formerly made mold.
8. The Plaster of Paris was poured into the shell mold and it was left to droop down to the plate. When the Plaster of Paris had stopped dripping, it was almost covering the slab of clay.
9. The mess made had been cleaned up and the shell was placed on a lofty shelf so that it could sit without interference and dry.

E. Conclusions:

The Making a Fossil Cast experiment was a success in demonstrating the natural process of making a fossil cast. While it did speed up the process of a cast and mold quite a bit, it was performed so that there would be as little laboratory hindrances as possible. The experiment did an excellent job of showing that a fossil cast will form only under the right circumstances. For instance, the Plaster of Paris represented sediments which would naturally leak into the mold to form the cast. If there were not proper conditions to push sediments into the mold, like water or wind, there would be no cast. This fact was laid down bare by the experiment. Obviously, the force which was acting as the push in the experiment was the bucket being tipped. Also, the experiment demonstrated that if the ground is not right, no mold will form. In the experiment, there was no one walking on top of the mold but if there had been the mold would have been squashed to a pulp. This is another fact which was kindly pointed out by the experiment. It was a good demonstration and one that gave a deeper understanding of the process of cast and mold. The Making a fossil cast experiment did an outstanding job of showing how a natural cast and mold was formed and helped out even more by speeding up the process a bit. Overall, it was a first-rate experiment.

Though the Making a Fossil Cast was a great experiment even without corrections, there was much room for improvement. To make sure that no clay stuck to the shell, it would be a good idea to have it coated with special, nonstick material using a machine. This would also eliminate the difficulty of having to spread the Vaseline over the shell just right so that the Vaseline would make no blotchy marks of its own in the mold. Another good idea would be to attain some type of nonstick clay meant especially for experiments and other scientific purposes. A further improvement would be to have a standardized type of Plaster of Paris. The results would be dramatically different between a runny type of plaster, and a thick, gooey type. Both might dry into the same material, but there will be large differences and neither one will come out remotely like the other. A standardized type of shell and clay would also be a welcomed edition. You will get much different results between a flat shell and one with more depth. Of course, many of

these things would require lab equipment but they are all in the sake of improvement. To get a better grasp of cast and mold it would be worthwhile to do the same experiment with different types of shells, leaves, and more. There are many things that this experiment can be done with.

Like mentioned earlier, more practical research could be done in a lab with the appropriate tools, but even without a lab, much more studying could be done on the subject of cast and mold fossils. It would be a good idea to do experiments similar to the Making a Fossil Cast experiment. Maybe, to give more realism, the place of clay could be taken by cement and the place of the plaster could be taken by mud or some other self-hardening substance. Other substances would work too. The main point in this experiment was to help understand the forming of cast and mold, but just the way it draws one's mind to the past and to fossils, it's impossible not to think of how incredible God is and what an amazing world he's blessed us with. With the knowledge of fossils, it is possible to look into the past of the some of the greatest gifts God has bestowed upon mankind. That gift is the earth, and everything on it.

F. Bibliography:

Domain: http://en.wikipedia.org
Document: /wiki/Fossil

D. Adelseck. Lab help. December 10, 2012

Rosenoff. Steve. Class Lecture. January 4, 2014

Wile. Dr. Jay. Exploring Creation with General Science, 2nd Edition. Apologia Educational Ministries. 2008.

Table of Contents

Start

Module 1 Test Review:

10 – Multiple Choice
10 – True or False
_5 – Essay
25 – Total Questions (35 points)

Questions are taken from Study Guide questions, OYO questions, Lecture Notes, and the practice test in your Solutions Manual.

Test is Closed-Book & Closed-Notes. 60-Minute Time Limit. Example questions follow:

A. Multiple Choice - Select the best possible answer for the following: 1 point each

1. In Experiment 1.3, what kind of substance was the vinegar?

a. a weak acid
b. a weak base
c. a gas
d. a catalyst

2. What does the term "kilo" means?

a. 1,000
b. 100
c. 0.01
d. 0.001

B. True or False - Indicate whether the following are true or false: 1 point each

3. Hydrogen atoms and oxygen atoms link together to make a water molecule.

4. 200 mL is equal to 0.1 L.

C. Essay - Answer the following in one or two complete paragraphs: 3 points each

5. A metal plaque by the front entrance to our nation's Capital in Washington D.C. commemorates the building's completion in 1826. The plaque is bluish-green in color. What kind of metal is the plaque made of, and what is the most probable cause of the blue-green color?

Module 1 Test

Table of Contents

Start