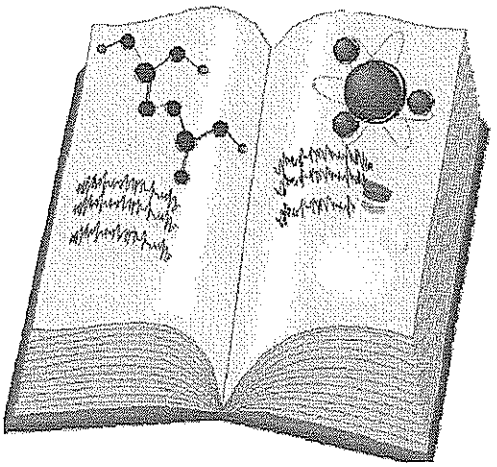
SCIENCE HANDBOOK



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RULES

Rule: *directions that define expected behaviors; the standards that control behaviors in class.*

Rules are not procedures; they are not guidelines. They are non-negotiable. Rules control the way we behave in class. Not following rules results in consequences. When rules are broken in science class, we will follow the Warning, Call, Consequence procedure.

THREE RULES OF SCIENCE CLASS

WHY WE HAVE RULES:

- ★ *To allow each student the opportunity to learn*
- ★ *To prevent the disruption of learning*
- ★ *Too create a safe place to learn*

1. You will do nothing to prevent teaching.
2. You will do nothing to prevent learning.
3. Everybody will be treated with respect. Respect includes, but is not limited to,
   a. No name calling – even as a joke
   b. No teasing – even as a joke
   c. Listening when people talk without interrupting
   d. Waiting your turn to speak or get supplies
   e. Avoiding sarcasm
   f. Never saying "shut up"
   g. Practicing the Eight Keys of Excellence
   h. Absolutely no bullying or "dissing" of any kind, ever

WARNING, CALL, CONSEQUENCE

1. The first time one of the three rules is broken, you will receive a "friendly warning." It is not part of warning, call, consequence.
2. The second time one of the three rules is broken; you will receive a "formal warning." This will be recorded on an office referral sheet. It is part of warning, call, consequence.
3. The third time one of the three rules is broken; you will make a phone call with a script. Part of the script informs your parents that the next time a rule is broken, an "N" in conduct will be given. *An "N" will prevent membership in the National Junior Honor Society for this year.* Your parents will also be informed that the next infraction will result in an office referral. The phone call will be recorded on the referral sheet. This is part of the warning, call, consequence policy at AHJS.
4. Any further infractions will result in a "U" in conduct and further referrals.

EIGHT KEYS OF EXCELLENCE

We practice the Eight keys of Excellence in science:

- **INTEGRITY** - The state of authenticity when our values and our behavior are aligned. Integrity happens when what we value is evident in our actions.
- **FAILURE LEADS TO SUCCESS** - Failure provides the information we need to learn so that we can succeed.
- **SPEAK WITH GOOD PURPOSE** - Speaking in a manner that moves the group or us forward. Being responsible for honest and direct communication and focusing on truth-telling, stating assumptions and maintaining integrity.
- **THIS IS IT!** - The commitment to focus our attention on the present moment and the willingness to make whatever we are doing most important - to live in the now!
- **COMMITMENT** - The ability to follow our vision without wavering; staying true to the desired course.
- **OWNERSHIP** - The quality of accountability and responsibility. The ability to be counted upon and the willingness to take responsibility for the choices we make.
- **FLEXIBILITY** - The ability to change what we are doing to achieve the desired outcome. Flexibility allows us to choose the best option to accomplish the outcome.
- **BALANCE** - When mind, body, and emotions function in alignment. Balance comes from the ongoing adjustments we make to continue moving in a positive, healthy direction.

A Lesson For All Of Us...

In ancient Greece, Socrates (469 - 399 BC) was widely lauded for his wisdom.

One day the great philosopher came upon an acquaintance who ran up to him excitedly and said, "*Socrates, do you know what I just heard about one of your students*?"

"*Wait a moment*," Socrates replied. "*Before you tell me, I'd like you to pass a little test. It's called the Triple Filter Test."*

"*Triple filter*?"

"*That's right*," Socrates continued. "*Before you talk to me about my student let's take a moment to filter what you're going to say. The first filter is* ***Truth****. Have you made absolutely sure that what you are about to tell me is true*?"

"*No*," the man said, "*actually I just heard about it and..."*

"All right," said Socrates. "*So you don't really know if it's true or not. Now let's try the second filter, the filter of* ***Goodness****. Is what you are about to tell me about my student something good*?"

"*No, on the contrary..."*

"*So*," Socrates continued, "*you want to tell me something bad about him, even though you're not certain it's true*?"
The man shrugged, a little embarrassed.

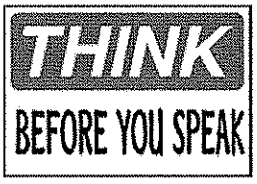
Socrates continued, "*You may still pass the test though, because there is a third filter, the filter of* ***Usefulness****. Is what you want to tell me about my student going to be useful to me*?"

"*No, not really*"

"*Well*," concluded Socrates, "*if what you want to tell me is neither* **True** *nor* **Good** *nor even* **Useful***, why tell it to me at all*?"

The man was defeated and ashamed. This is the reason Socrates was a great philosopher and held in such high esteem. And why it sometimes is better not to say anything at all.

Before you say something, ask yourself this:
"Is what I'm going to say True, Good, or Useful?"
If it is not, why are you saying it?



POLICIES

Policy: A written principle or rule to guide decision-making.

Policies are principles that determine decisions and actions. They are a plan of action for handling issues.

GRADING POLICY

WHY WE HAVE A GRADING POLICY:

- ★ *To be make sure that each student knows exactly what types of work will be assessed and evaluated*
- ★ *To make sure students are assessed and evaluated fairly*
- ★ *To make sure that students understand the weighting of assignments and grades*

Accuracy and correctness matter in science. Much of the time, scientific information is right or wrong. In middle school science, very little of what we study is completely unknown; there is a right answer.
There may be several ways to arrive at the right answer however.
What this means to students is that working hard and / or spending a long time on an assignment isn't always enough. The work has to be **correct** also.

Occasionally, there will be assignments that will be evaluated partially on hard work or effort. Evidence of effort includes, but is not limited to:

1. Neatness
2. Going above and beyond the minimum requirements
    a. More than is asked for
    b. Indicators of outside research

Seventh & Eighth Grade Science

Major Grades: 50% of final grade.
Major grades include:

1. Tests
    a. Comprehensive summative assessments that cover significant amounts of information
    b. Formal classroom reviews are provided
    c. Given on an as-appropriate basis
2. Projects
3. Labs

Daily Grades: 50% of final grade.
Daily grades include:

1. In-class assignments; written and activity-based
2. Quizzes
    a. Short, formative assessments that cover limited amounts of material, a specific topic, or scientific vocabulary
    b. No formal classroom reviews are given
    c. Given weekly

Seventh Grade GT Science

Major Grades: 60% of final grade.
Major grades include:

1. Tests
    a. Comprehensive summative assessments that cover significant amounts of information
    b. Formal classroom reviews are provided
    c. Given on an as-appropriate basis
2. Projects
3. Labs

Daily Grades: 40% of final grade.
Daily grades include:

1. In-class assignments; written and activity-based
2. Quizzes
    a. Short, formative assessments that cover limited amounts of material, a specific topic, or scientific vocabulary
    b. No formal classroom reviews are given
    c. Given weekly

TARDY POLICY

WHY WE HAVE A TARDY POLICY:

- ★ *To be make sure that each student understands the need to start class in a timely manner*
- ★ *To encourage a smooth start to class*

1. Students will be counted tardy when:
    a. They are not in the room when the tardy bell rings
    b. They are not in their assigned seats when I take attendance

MAKE-UP WORK POLICY

WHY WE HAVE A MAKE-UP WORK POLICY:

- ★ *To make sure that each student understands how to get assignments that were missed due to absences*
- ★ *To provide the opportunity to keep caught up in class*

1. Make-up work is the **responsibility of the student**.
2. In general, one day for each day absent will be given to make up assignments
3. LunchBunch is available to make up work. **Appointments** may be made to make up work before & after school also.
4. Copies of assignments and handouts can be found in the crates for each class.
5. The class website – science-class.net – also has many of the assignment posted for student access.

LATE WORK POLICY

WHY WE HAVE A LATE WORK POLICY:

- ★ *To encourage students to turn in assignments on time in order to get feedback in a timely manner*

1. All work is due when called for in class; worked turned in at any time after this will be considered late.
2. Late work turned in within 24 hours will be evaluated and given a grade of 70.
3. Late work turned in after 24 hours will be evaluated and given a grade of 50.

ACADEMIC DISHONESTY POLICY

WHY WE HAVE AN ACADEMIC DISHONESTY POLICY:

- ★ *To encourage students to do quality work at all times.*
- ★ *To promote ethical behavior.*

Academic integrity means that all work is done by the students. Any type of dishonesty in school work is not integrity. Dishonesty includes, but is not limited to:

1. Copying the work of another student
2. Using notes during tests and quizzes without permission
3. Copying and pasting from electronic media
4. Providing answers to others
5. When academic dishonesty occurs:
    a. The student(s) will receive a '0' for the assignment
    b. A second infraction will result in disciplinary action
6. If a student is using the work of others all students involved will be given a "0". If the assignment is not a science assignment, the work will be given to the appropriate teacher

DAMAGING SCHOOL PROPERTY POLICY

WHY WE HAVE A DAMAGING SCHOOL PROPERTY POLICY:

- ★ *To make sure that each that school property is kept in clean and safe condition*
- ★ *To make sure that students have clean and safe supplies to use*

1. Any damage to school property will require restitution on the part of the student
2. The type of restitution depends on extent of the damage.
    a. Destroyed items will be paid for or replaced by the student
    b. Items that have been marked on or written on will be cleaned by the student
3. Damaging school property may result in an office referral
4. Damaging school property includes, but is not limited to:
    a. Writing on desks, stools, walls or any other school property
    b. Writing in books, bending book pages

FOLLOWING WRITTEN INSTRUCTIONS POLICY

WHY WE HAVE A FOLLOWING WRITTEN INSTRUCTIONS POLICY:

- ★ *To make sure that each every student has the opportunity to produce quality work*
- ★ *To make sure every student has the opportunity to communicate his or her thoughts and ideas in a manner that is easily understood by others*

1. When written instructions have not been followed, the work is incomplete
2. Incomplete work will not be accepted
    a. It will have to be redone following all instructions
    b. Redone work is due the next day

ASSIGNED SEAT POLICY

WHY WE HAVE AN ASSIGNED SEAT POLICY:

- ★ *To make taking attendance efficient*
- ★ *To arrange students in way that is conducive to learning*
- ★ *To maintain a safe classroom*

1. Students not in their assigned seat when attendance is taken will be counted tardy
2. Students not in their assigned seat during class are disrupting the learning of others and will be given a warning, call, or consequence as appropriate

LEGIBLE WRITING POLICY

WHY WE HAVE A LEGIBLE WRITING POLICY:

- ★ *To ensure that students can communicate their thoughts and ideas in a way that all can understand*
- ★ *To make sure that student are able to demonstrate learning*

1. Students may print or write in cursive
2. Writing than cannot be read cannot be graded; and answers that cannot be read will be counted incorrect
3. Students may write with a pen or a pencil unless otherwise specified
4. Students may write with colored inks unless otherwise specified
    a. Pale and pastel inks (yellow, orange, pink) are very difficult to read
    b. When in doubt, use blue or black ink

PROCEDURES

Procedure: *a particular course of action intended to achieve a result, a particular way of accomplishing an objective.*

Procedures are the way that we do things in science. We have procedures so that our class runs smoothly and safely. Procedures help make sure that everyone in the class understands how the class works and help make sure that every one has the same chance to learn.

START OF CLASS PROCEDURE

WHY WE HAVE A START OF CLASS PROCEDURE:

- ★ *To be able to start quickly. This lets us have more time to work on our labs and activities.*
- ★ *More class time to do work means less work that has to go home!*

1. Come into the room and sit in your **assigned** seat.
2. Read the *AGENDA* and copy assignments into your agenda. The agenda will be projected on the screen at the front of the classroom.
3. A Journal Question will be displayed with the agenda. Answer this question in your science journal.
4. If you need to pick up materials or supplies or turn in an assignment, instructions will be on the screen.
5. If an assignment is due, turn it in the folder for your class period in the basket
6. You will be counted tardy if you are not in the room when the tardy bell rings or in your assigned seat when I take attendance.

ANNOUNCEMENTS PROCEDURE

WHY WE HAVE AN ANNOUCEMENTS PROCEDURE:

- ★ *To make sure that students are able to hear the announcements*
- ★ *To make sure that students are able to get the information that they need*
- ★ *To allow students to show respect to our country*

1. During the morning announcements (second period):
   a. During the Pledge of Allegiance and pledge to the Texas flag, stand quietly and face the flags. Say the pledges as they are being said over the announcements. Say the pledges with the person saying them for the school

   b. If you choose not to say one or both of the pledges, stand quietly while they are being said by others
   c. During the moment of silence – stand quietly
   d. During the remainder of the announcements – sit at your table without talking. Listen to what is being said.
2. Announcements at other times during the day:
   a. Stop what you are doing, put materials and supplies down, and listen quietly

END OF CLASS PROCEDURE

WHY WE HAVE AN END OF CLASS PROCEDURE:

- ★ *To make sure all equipment, materials, and supplies are safely put away so that we will have them to use again.*
- ★ *To keep our classroom clean and safe*

1. Begin to clean up and put your materials away only *AFTER* you have been given instructions to do so. *DO NOT* get ready to leave early.
2. Put *ALL* supplies, materials, and equipment back in the appropriate place.
3. Clean up any trash; wipe down the table if needed.
4. Remain at your assigned seat until the bell rings and you are dismissed.
5. After you are dismissed, push your stool under the table. If it is the last class of the day (8th hour), put the stool on top of the table so that the floor may be swept.

FINISHING EARLY PROCEDURE

WHY WE HAVE A FINISHING EARLY PROCEDURE:

- ★ *To make sure that learning is not disrupted for students who do not finish early*
- ★ *To develop and practice good organization and study skills*

1. Use this time efficiently and wisely
   a. Check your science notes
   b. Organize your binder
   c. Study your notes, background information, vocabulary
   d. Read the science textbook
2. Don't waste the time socializing with people around you; you will distract those who need the time to finish their work

SUBSTITUTE PROCEDURE

WHY WE HAVE AN END OF SUBSTITUTE PROCEDURE:

- ★ *To make sure that learning is not interrupted when the teacher is not in the class*

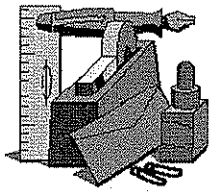
1. When a substitute will be in the room, students will receive a student instruction sheet. This sheet will have the day's assignments and any other needed instructions written on it.
2. Students are to follow the instruction sheet exactly; the instruction sheet serves as the teacher's instruction when she is not there.
3. Substitute teachers are to be treated respectfully and politely.

GETTING MATERIALS, SUPPLIES, AND EQUIPMENT PROCEDURE:

WHY WE HAVE A GETTING MATERIALS, SUPPLIES, AND EQUIPMENT PROCEDURE:

- ★ *To make sure that everyone has the tools they need to learn.*
- ★ *To make sure the equipment stays in good working condition.*

1. Supplies are numbered for each group or each individual. It is very important that you use only the supplies with your number. **You will be held responsible for the materials assigned to you**.
   a. Each seat in the class has a colored number. The numbers are on the corners of the tables. This is your number while you are sitting in that seat.
   b. Each set of two tables has a number. The numbers are hanging from the ceiling above the tables. These are the group numbers.
2. General materials (stapler, hole punch, etc) for student use are kept on a table by the wall. Other supplies are in different places around the room. **Materials on the teacher's desk are *OFF LIMITS* to students**.
3. Pick up supplies *AFTER* you have been given instructions to do so. If you need the supplies immediately, instructions will be on the television/overhead as you enter the classroom. If we are not going to use them right away, you will be given instructions when they are needed.
4. Never pick up supplies until you have been instructed to do so.
5. Supplies, materials, and equipment already on your table at the start of class must be left alone until instructions are given for their use.



TEXTBOOK PROCEDURE

WHY WE HAVE A TEXTBOOK PROCEDURE:

- ★ *To make sure that textbooks are available for student use*
- ★ *To make sure that books stay in good condition for student use*

1. Books are numbered 1 – 30. Each seat in the room is also numbered students are to use the book corresponding to their table number.
2. Books are stored in **numerical order** on the white bookshelves; when you are finished using a book, put it back in its' place.
3. Do not write or mark in the books.

HANDING IN PAPERS PROCEDURE

WHY WE HAVE A HANDING IN PAPERS PROCEDURE:

- ★ *To make sure that all student work gets turned in so that it can be graded.*
- ★ *To make sure that students understand when and how to turn in work.*

1. All papers are turned into the basket in the folders labeled for your class unless you are given different instructions.
2. All work is due when called for. Work not turned at this time will be late and will not receive full credit.
3. Check the agenda to see if a paper is due at the beginning of class.

LAB SAFETY PROCEDURES

WHY WE HAVE LAB SAFETY PROCEDURES:

- ★ *To keep all students safe and healthy*

1. Safety procedures will vary from day to day depending on the labs and activities that day
2. Safety procedures will be written on labs
3. General safety procedures are:
   a. Rules in the SAFETY CONTRACT will be followed at all times
   b. The student will behave responsibly at all times
   c. All instructions (written and verbal) will be followed
   d. Goggles will be worn anytime you are using heat or chemicals

~SEE SAFETY SECTION~

COMPUTER USE PROCEDURES

WHY WE HAVE COMPUTER USE PROCEDURES:

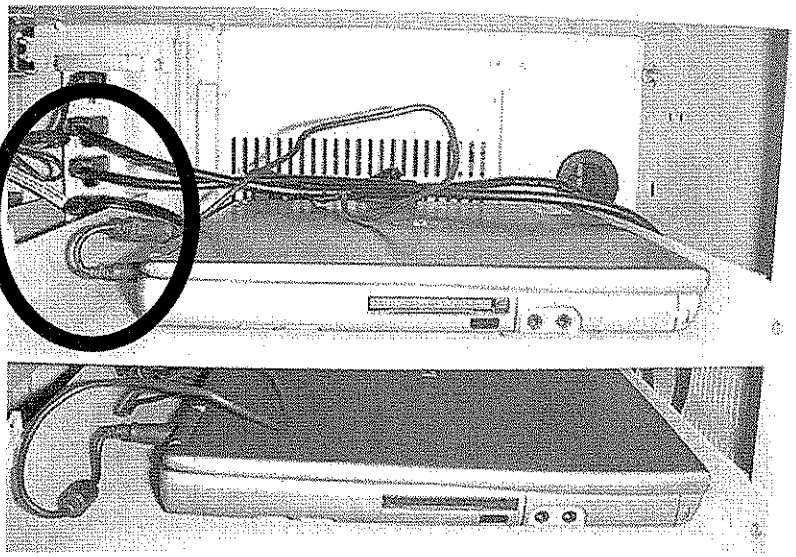
- ★ *To keep expensive equipment in good working condition so that we will always have it to use.*
- ★ *To keep the laptops charged and ready for use*
- ★ *To make sure that students are able to access files as appropriate*

1. Each student must have a signed *ACCEPTABLE USE POLICY* (in the agenda) before computer access will be allowed.
2. No settings (screensavers, desktop, cursor) may be changed on the computers.
3. File must be saved with the student's last name. Upper case letters for the first letter of the name, lower case letters for the remainder of the name.
4. All files must be saved in the designated folder on Scommon.
5. When using removable media (floppy disks, CDs, jump drives):
   a. Always run a virus scan
   b. Do NOT pull a jump drive straight out of the computer. Make sure you remove the hardware by clicking on the icon in the system tray and waiting for the message that it is safe to remove hardware.
6. Laptops must be plugged back in with the correct cord.
7. Violations of the acceptable use policy will result in a suspension of computer privileges; alternate assignments will be given.
8. NO water may be on the table when computers are in use.

Put the laptops into the cart **sideways** with the cord plugged in on the left hand side.

Do not let the cord get tangles with other cords.

This lets us quickly check to see if the computers are plugged in for recharging.



INDIVIDUAL WORK PROCEDURES

WHY WE HAVE INDIVIDUAL WORK PROCEDURES:

- ★ *To allow students quiet time to learn material*

1. Students will work without talking during individual work
2. Individual work is just that – individual – there is no helping, or sharing during these assignments

GROUP WORK PROCEDURES

WHY WE HAVE GROUP WORK PROCEDURES:

- ★ *To make sure that all instructions are heard and followed*
- ★ *To be respectful of our neighbors*
- ★ *To keep students safe during activities*
- ★ *To make sure each student has the opportunity to participate in lab activities*

1. Some of our work is group work
2. QUIET talking is allowed during group work.
3. If materials or supplies are needed during group work, someone will be assigned to get the supplies. Only one person from each group is allowed out of their seats at a time.
4. Do your fair share of the work
5. Collaborate with your group. That means sharing, learning, participating and helping EVERYONE in the group
6. Practice Active Listening
7. Turn your stool to face the teacher during teacher instruction

CLASS DISCUSSION PROCEDURES

WHY WE HAVE CLASS DISCUSSION PROCEDURES:

- ★ *To make sure that all students have a chance to ask questions*
- ★ *To give everyone a chance to be heard*
- ★ *To give everyone a chance to learn from each other*
- ★ *To make sure the teacher can hear questions and comments*
- ★ *To make sure students have "wait time" to think*

1. Raise your hand to speak; wait to be called on
2. Speak in a classroom voice (no yelling)
3. If we are having a brainstorming discussion, it will not be necessary to raise your hands, It **will be necessary** to speak one at a time without interrupting

EATING & DRINKING IN THE CLASSROOM PROCEDURES

WHY WE HAVE EATING & DRINKING PROCEDURES:

- ★ *To keep the classroom clean*
- ★ *To keep the classroom safe*
- ★ *To prevent damage to supplies*

1. Treats given to you in other classes must be completely eaten before you enter the classroom or saved until later.
2. Food given to you in science must be completely finished before the bell rings. You will not be allowed to leave the room with food in your mouth.
3. Water is allowed in the classroom. It must be in a plastic bottle with a "sport top" – the kind of top that can be opened and closed. A screw on / off lid is not acceptable.
   a. You will not be allowed to leave the room to fill your water bottle.
   b. You may not have anything except water in your bottle.
   c. You may not have water at your desk when laptops are in use
   d. Water is ENCOURAGED for students have are taking athletics 1st period!

LEAVING THE CLASSROOM DURING CLASS PROCEDURES

WHY WE HAVE LEAVING THE CLASSROOM PROCEDURES:

- ★ *To prevent the disruption of learning*
- ★ *To make sure important information is not missed*

1. TO GO TO THE NURSE:
   a. I have band-aids if you need one. Wait until you are working independently before you ask for one.
   b. If it is a non-emergency, please do not interrupt to ask to leave; ask during independent work time.
   c. If you feel sick or faint, ask immediately. This is the one time when it is not rude to interrupt. If you feel like you are going to be sick and do not have time to ask, go straight to the restroom!
2. TO GO TO THE RESTOOM, WATER FOUNTAIN, OR LOCKER:
   a. Your agenda serves as your hall pass. You must have your agenda or you may not leave the room.
   b. Bring me your agenda, opened to the correct date, with the time and where you are going already written in, and I will sign it for you.
   c. You may bring me your agenda for signing during independent work.
   d. Do not interrupt instructions, class discussion, or student questions to ask to leave the room.
3. If you do not have your agenda, you will not be allowed to leave the room; it is your pass.

TALKING & ASKING QUESTIONS PROCEDURES

WHY WE HAVE TALKING & ASKING QUESTIONS PROCEDURES:

- ★ *To make sure every one who wants to speak has the opportunity to do so*
- ★ *To be able hear and learn from others*

1. Whenever another person is speaking, you should be listening.
2. Raise your hand to speak. Wait to be called upon.
3. **Never interrupt someone while they are speaking**. Interrupting is very bad manners.
4. *Quiet* talking is allowed during group work.
5. If you have a question during a lab or activity, raise your hand and let me come to you. It is a safety issue to have students moving around the room. Be patient, there are a lot more of you than there is of me. Try to problem-solve the question in your group.

SHARPENING PENCILS & BORROWING SUPPLIES PROCEDURES

WHY WE HAVE SHARPENING PENCILS AND BORROWING SUPPLIES PROCEURES:

- ★ *To make sure everyone has the supplies they need when they need them*
- ★ *To make sure learning is not interrupted by getting supplies*

1. Be prepared with all of your supplies BEFORE class begins.
2. An electric pencil sharpener and other supplies are kept on the table; you may use any supplies on this table without asking. They are there for you.
3. Never sharpen your pencil or ask to borrow something while someone is talking. This is very inconsiderate and bad manners.

MAKE-UP WORK PROCEDURES

WHY WE HAVE MAKE-UP WORK PROCEDURES:

- ★ *So that students can easily find the work they missed while absent*
- ★ *To make sure students are able to keep caught up with assignments*

1. **Make up work is the responsibility of the student**. You must ask for missing work.
2. In general, you have one day for each day absent to complete the missing work.
3. Papers handed out in class are kept in the green crate on the table by the demo desk. Extra copies of handouts are also kept in this crate. You may get your work from the crate at any appropriate time.

FOLLOWING WRITTEN INSTRUCTIONS PROCEDURE

WHY WE HAVE A FOLLOWING WRITTEN INSTRUCTIONS PROCEDURE:

- ★ *To make sure that every student has the opportunity to produce quality work*
- ★ *To make sure every student has the opportunity to communicate his or her thoughts and ideas in a manner that is easily understood by others*

Almost all written assignments will have instructions and directions printed on them. Although you will usually be given oral instructions in class, the written instructions will be there to remind you of what you are to do and for you to double check what you are doing.

1. You are responsible for checking the written instructions
2. Always read the written instructions before beginning any work
3. Check the written instructions before you turn any work in to be graded
    a. Have you completed all parts of the assignment?
        i. Turn the paper over and make sure there is nothing on the back
    b. If you have been asked to explain your reasoning, have you do so?
    c. If you have been asked to use notebook paper, have you done so?

ASSIGNED SEAT PROCEDURE

WHY WE HAVE AN ASSIGNED SEAT PROCEDURE:

- ★ *To make taking attendance efficient*
- ★ *To arrange students in way that is conducive to learning*
- ★ *To maintain a safe classroom*

1. Seating will always be assigned.
2. In some classes, the teacher will always assign the seats.
3. In some classes students will be allowed to pick their assigned seat.
    a. Students that are allowed to pick their own seats are those that show maturity, responsibility, and the ability to follow procedures.
4. Students are to remain in their assigned from bell to bell.
    a. Do not get up to talk to classmates
    b. Do not change seats to work with friends
5. When it is necessary to leave your seat, you will be given instructions on when and how to do so

FIRE DRILL PROCEDURE

WHY WE HAVE A FIRE DRILL PROCEDURE:

- ★ *To ensure student safety in the event of a fire*

1. At the sound of the alarm, stop whatever you are doing and line up at the door
2. We will go down the first stairwell and out the door by the auditorium.
3. Walk single file, following the classes in front of us.
4. Walk without talking

PLACING BOOKS AND SUPPLIES ON FLOOR PROCEDURE

WHY WE HAVE A PLACING BOOKS AND SUPPLIES ON THE FLOOR PROCEDURE:

- ★ *To keep from disturbing the class below us*

When you need to clear your desk and put your binder and books on the floor:

1. Easily SET the books down
    a. Do not drop the books

TRANSITION PROCEDURE

WHY WE HAVE A TRANSITION PROCEDURE:

- ★ *To keep the class flowing smoothly*
- ★ *To limit the amount of "down time" during class*
- ★ *To prevent the disruption of learning*

A transition is the time between activities in class: when we changing what we are doing.
Transitions are not a social time; changing activities is not a signal to get out of your seats or begin talking to classmates.
They are a time to be listening carefully to new instructions.

1. Do not get out of your seat
2. Do not starting talking with classmates
3. Put away supplies and materials and get new ones a quickly as you can

LUNCHBUNCH PROCEDURE

WHY WE HAVE A LUNCHBUNCH PROCEDURE:

- ★ *To provide a quiet place for homework, reading, and make-up work.*
- ★ *To provide the opportunity for extra help.*
- ★ *To allow students extra time for assignments.*

LunchBunch will be held on most days. There will be days when there is no LunchBunch. LunchBunch is a quiet time to do work.

1. LunchBunch is not just for science; any type of work may be done in LunchBunch.
2. Students coming to LunchBunch after the tardy bell must have a pass.
3. LunchBunch is a quiet time; students who need to be loud will be asked to leave.

TEST & QUIZ PROCEDURE

WHY WE HAVE A TEST PROCEDURE:

- ★ *To allow each student the opportunity to demonstrate knowledge and skills*
- ★ *To provide a disturbance-free place for evaluation*

Tests and quizzes are important ways for students to demonstrate what they have learned. The results of this type of evaluation help guide instruction in class.

1. During tests & quizzes, students will use 'privacy protectors' during tests and quizzes.
2. NO talking of any kind will permitted until every student is finished with the assignment. Talking:
    a. Disturbs others
    b. Can be mistaken for academic dishonesty
3. If another assignment is not given, students may read after a test or quiz
4. Quizzes are generally graded in class by the student. Pens will be provided for grading.

VIDEO & MULTIMEDIA PRESENTATIONS PROCEDURE

WHY WE HAVE A VIDEO AND MULTIMEDIA PRESENTATIONS PROCEDURE:

★ *To allow students the opportunity to learn from a variety of sources*

Videos, PowerPoints, and other forms of multimedia will be used during classroom instruction. They will rarely last more than half of a class period; 10 – 20 minutes in average. Presentations are another type of instruction; students must pay attention to them in order to understand the information being presented.

1. There is no talking of any kind during presentations.
2. Presentations are not an appropriate time to ask to leave the class for non-emergencies.

SCIENCE SAFETY

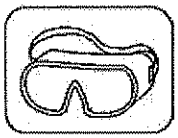
Safety is priority in science. There is NEVER an excuse for unsafe behavior in a science class. Safety precautions will be given orally and written on assignments.

GENERAL GUIDELINES

1. Follow ALL directions, written and oral.
2. Tell the teacher of any incident – fire, breaking glassware, injury, spills, immediately.
3. Tie back loose hair.
4. Remove dangling jewelry.
5. Work ONLY on activities assigned by your teacher
6. Do not begin before you are instructed to do so.
7. Pointed heated test tubes away from people.
8. When you need to test an odor, waft the chemicals towards your nose.
9. ALWAYS remain in your assigned areas – do not move around the classroom.
10. Keep your lab area clean and tidy.
11. Put equipment & supplies away as instructed.
12. Keep your voices low so that you can hear instructions.

SYMBOLS

Symbols are often used to alert scientists to possible safety hazards. These are the symbols you will find on you labs to alert you to possible safety considerations.
The National Science Teachers Association uses the symbols below:

 General safety alert	Follow all directions.
 Chemical danger	Wear goggles. Clean up as instructed. Do not smell or taste. Avoid contact with skin.
 Fire hazard	Wear goggles. Tie back hair and loose clothing.
 Electrical hazard	Do not use near water.
 Poison or toxic	Wear goggles. Do not smell or taste. Avoid contact with skin.
 Goggles required	Not optional when using: Fire Chemicals Sharp instruments

SCIENCE SAFETY CONTRACT

Science is an active, hands-on class. We will be doing many activities that require the use of sensitive equipment and potentially hazardous chemicals. **Safety is the # 1 priority in our classroom**. To ensure a safe learning environment, all students will be instructed in science classroom safety, a safety quiz will be given, and the student / parent / guardian safety contract will be signed and filed at school. A copy of this contract will also be kept in your science notebook as a reminder of safe classroom practices.

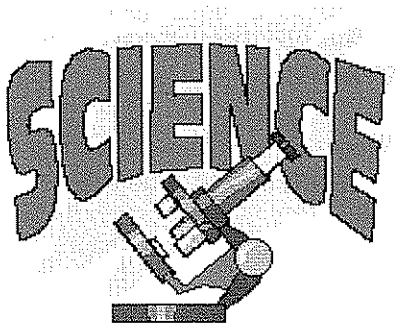
When necessary, safety considerations will be included on student handouts; they also will be given orally at the start of each activity and posted on the classroom safety poster.

- ❑ I will act responsibly at all times in the classroom. I understand that horseplay, jokes, and pranks are not appropriate in a science classroom.
- ❑ I will follow all instructions, written and verbal, about the laboratory procedures given by the teacher.
- ❑ I will not touch any equipment or supplies until instructed to do so by the teacher.
- ❑ I will perform only those activities that have been authorized by the teacher. I will never do anything that is not called for by the procedure. **I understand that unauthorized experiments are forbidden**.
- ❑ I will keep my table and the area around it clean and neat.
- ❑ I will wear my safety goggles whenever we are working with chemicals or heat. **I understand that there are no exceptions to this rule**.
- ❑ I will immediately notify the teacher of any emergency.
- ❑ I will tie back long hair, baggy clothes, and dangling jewelry while doing a laboratory activity.
- ❑ I know whom to contact for help in case of an emergency.
- ❑ I will not take anything out of the classroom without permission from the teacher.
- ❑ I will never eat, drink, or chew gum in the classroom unless instructed to do so by the teacher. I will not use classroom equipment as containers for food or drink.
- ❑ I will only handle living organisms when authorized to do so by the teacher.

SCIENCE SKILLS & PROCESSES

Definitions to Know –

Science is way of learning more about the natural world that provides possible explanations to questions and involves using a collection of skills. Science helps us answer questions and solve problems. Science is the process of trying to understand the world.



Scientific methods are procedures of scientific problem solving, which can include identifying the problem, forming and testing a hypothesis, analyzing the test results, and drawing conclusions.

Scientific theories are possible explanations for repeatedly observed patterns in nature.

Scientific laws are rules that describe a pattern or behaviors in nature. They predict or describe what will happen, but do not try to explain why something happens. Laws frequently have mathematical evidence to support them.

Technology is use of science to help people in some way. It is the application of science to make useful products and tools, such as computers and use of knowledge gained through scientific thinking and problem solving to make new products or tools.

TYPES OF SCIENTIFIC RESEARCH INVESTIGATIONS

There are two general types of scientific investigations: Qualitative or Descriptive

1. Descriptive or Qualitative – Based on observations
2. Experimental – Involves the manipulation and control of variables

VARIABLES

1. Independent variables – also called manipulated variables
   a. What is being tested by the scientist
   b. single factor in an experiment that the scientist chooses to change
   c. What is being changed by the scientists
   d. The difference between the groups
   e. The 'cause' of a change
   f. When something is observed or measured over a period of time, TIME is the independent variable

2. Dependent variables – also called responding variables
    a. What is observed
    b. What is measured
    c. The data
    d. The 'effect' caused by the independent variable
3. Controlled variables – also called constants
    a. Things that could change, but don't
    b. Kept constant by the scientist
    c. Allow for a fair test

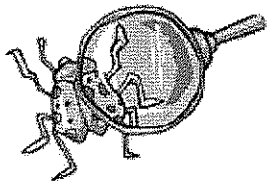
CONTROL GROUPS

Control groups are groups that do not get the experimental treatment; they provide an "untreated" basis of comparison for the experimental group. They are used as a baseline measure.

1. Identical to all other items or subjects that are being investigated except that it does not receive the treatment or the experimental manipulation that all other items or subjects receive.
2. Provides the scientist with a way to evaluate the effects of the treatment by comparing the treatment group and the control group after the treatment has been received.
3. The standard by which experimental observations are evaluated
4. Not needed in all investigations
5. More common in biological experiments

OBSERVING

Observation is the most basic skill in science. Observing is to carefully explore all of the properties or characteristics of an object or phenomenon. Properties are things such as color, shape, texture, mass, volume, or density.



1. Two kinds of observations:
    a. Facts – true for everybody
    b. Opinions – based on personal preference
2. Can use all 5 senses
3. Scientific observations are called data
4. Qualitative Observations
    a. Hard to measure, count, or describe using numbers
    b. Describes the characteristics (or qualities) of something
        i. Color
        ii. Taste
        iii. Sound
5. Quantitative Observations
    a. Can be expressed in numbers

   b. Can be counted or measured
      i. Amounts
      ii. Temperature
      iii. Mass
      iv. Length
   c. Allow us to communicate specifics
   d. Provide a basis for comparison
6. Tools are often used to collect quantitative data
7. Observations are recorded in data tables or data charts

INFERRING

Inferences are deductions based on observations. They are assumptions. Inferences are not guesses, they are interpretations of observations.

1. Ideas or facts that are implied or suggested instead of observed stated outright
2. A logical interpretation based on observations and prior knowledge
3. Evidence is usually some kind of prior knowledge
4. Are used to make predictions and hypotheses

DEVELOPING TESTABLE QUESTIONS

In order to conduct a true experiment (one with variables), the scientist must have a testable question. A testable question clearly identifies

1. The independent variable
2. The dependent variable
3. Has quantifiable data

PREDICTING

Predictions are guesses about future observations. They are based on careful observations and inferences.

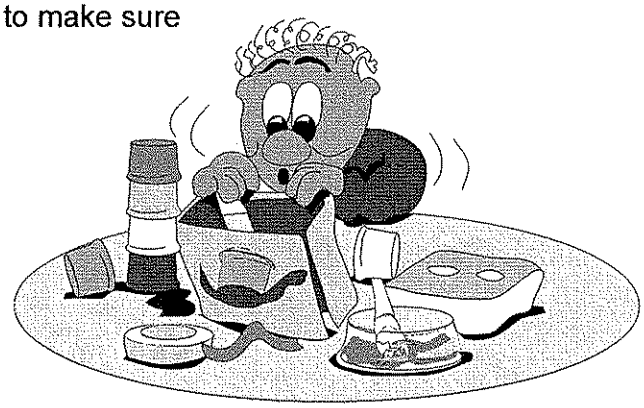
1. Educated guesses about what will happen during an investigation
2. Based on prior knowledge (observations, background research, etc)
3. Related to observations and inferences
   a. Information obtained by using senses – observation
   b. Why it happened – inference
   c. What might happen in the future - prediction

HYPOTHESIZING

1. A special kind of prediction
2. It is an educated guess about the relationship between the independent and dependent variable.
3. Testable; an experimental investigation can be done based on the hypothesis.
4. One way to write a hypothesis is to use an "If..., Then...." statement.
    a. Shows possible cause and effect.
    b. What **effect** does the independent variable have on the dependent variable? Or what does the independent variable **cause** the dependent variable to do?
    c. Format: An If, Then... statement
        i. **IF** the independent variable changes, **THEN** the dependent variable will change.
        ii. Specify the exact changes.
        iii. This type of sentence shows what the IV will do to the DV
5. Null Hypothesis
    a. A statistical procedure
    b. Stated as if there will be no relationship between the variables

DESIGNING AN INVESTIGATION

1. Descriptive
    a. Includes an objective
    b. The plan is specific
    c. Includes an list of materials and equipment
    d. Eliminates bias
2. Experimental
    a. The plan of the experiment which specifies the independent variables , what is to be measured (dependent variables)
        i. An experimental investigation indicates the variables
        ii. Includes a list of materials and equipment
        iii. Measurement techniques are described
        iv. Includes repeated trials to make sure results are accurate
        v. Eliminates bias



COLLECTING DATA

Observations and measurements made during scientific investigations are called data. Data collected during an investigation must be organized in some way to make sense. Data charts and data tables are usually used.

1. Data tables
    a. Used to organize quantitative, or numerical data
    b. Organized in rows and columns
    c. Variables are identified
2. Data charts
    a. Used to organize qualitative data
    b. Frequently in list form
3. Traditionally:
    a. The independent or manipulated variable is in a column on the left-hand side
    b. The dependent or responding variables are in columns on the right-hand side
        i. There are as many dependent variable columns as there are number of trials in the investigation
        ii. Frequently an extra column for the average, or other measure of central tendency is included
    c. All columns are labeled; units are included in the labels
    d. Titles that describe the variables are used

REDUCING DATA

Often so much quantitative data is collected that it is difficult to make sense of it all. It is helpful to reduce the amount of data to just a few numbers. Measures of central tendency are numbers that represent what is normal or typical of the data.

1. Common measures of central tendency:
    a. Mean (average)
    b. Median
    c. Mode
2. Other ways to reduce data:
    a. Frequencies
    b. Range

DISPLAYING (GRAPHING) DATA

Reduced data is usually displayed in as a graph. Graphs allow us to see patterns, relationships, trends, and comparisons easily.

1. Types of Graphs:
   - **a. Bar Graphs**
     - i. Show comparisons of data with discreet categories
     - ii. Used to show data that are not continuous.
     - iii. Allows us to compare data like amounts or frequency or categories
     - iv. Allow us to make generalizations about the data
     - v. Help us see differences in data
     - vi. Let us find the value of one variable when we know the value of the other
   - **b. Line Graphs**
     - i. For continuous data
     - ii. Shows changes
     - iii. Shows relationships between two variables or sets of data
     - iv. Shows how one variable is affected by another variable and how the variables change depending on one another
     - v. Shows how one variable thing varies (changes) with another
     - vi. Useful for showing trends in data and for making predictions
     - vii. Very useful for showing trends over time; this means that they show how one variable is affected by the other as the variable increases or decreases.
   - **c. Circle (Pie) Graphs**
     - i. Show parts of a whole
     - ii. Fractions
     - iii. Percentages
   - **d. Scatter Plots**
     - i. Similar to line graphs
     - ii. Used to represent trends and relationships between variables
     - iii. Data points are not connected
     - iv. Can be used with a line of best fit
     - v. Show how much one thing is affected by another
       1. This relationship is called a correlation.
          - a. When data points are plotted on a scatter plot, the closer the data points come to making a straight line the higher the correlation between the two variables, or the stronger the relationship.
          - b. Data points that make a straight or almost straight line going from the lower left to the upper right on the graph, then the variables are said to have a positive correlation

c. Lines that go from the upper left to the lower right on the graph, then the variables have a negative correlation.
d. No particular pattern shows no correlation.
e. Correlation does not mean cause and effect.

e. Box and Whisker Plot

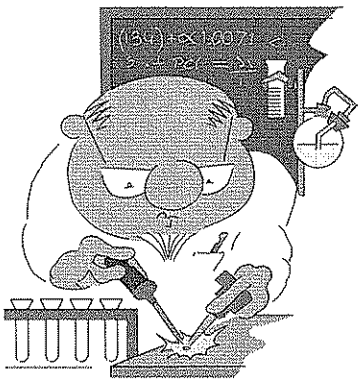
i. Helpful in interpreting the distribution of data
    1. Indicates whether a distribution is skewed and whether there are potential unusual observations
ii. Presents information from a five-number summary.
iii. Center, spread and overall range are immediately apparent
iv. The ends of the box are the upper and lower quartiles, so the box spans the interquartile range
v. The median is marked by a vertical line inside the box
vi. The whiskers are the two lines outside the box that extend to the highest and lowest observations.

f. Stem-and-Leaf Plot

i. Classifies either *discrete* or continuous variables
ii. Used to organize data as it is collected
iii. Shows the first digits of the number (thousands, hundreds or tens) as the *stem* and shows the last digit (ones) as the *leaf.*
iv. Usually uses whole numbers. Anything that has a decimal point is rounded to the nearest whole number
v. Looks like a bar graph when it is turned on its side
vi. Shows how the data are spread—that is, highest number, lowest number, most common number and outliers (a number that lies outside the main group of numbers).

ANALYZING DATA

Data analysis includes examining the data – frequently the reduced data and graphs – to find and identify the patterns, relationships, trends, and comparisons.



CONCLUDING

Conclusions are written answers to the original question.

1. A summary of the investigation
    a. Does the data support the hypothesis?
        i. If it does – the hypothesis is accepted
        ii. If it does not – the hypothesis is rejected
    b. Discussion of issues or problems with the investigation – sources of error
    c. Discussion of the importance or relevance of the investigation
    d. Discussion of how the results can be used
    e. Discussion of how the results can be expanded
2. **Always, always** supported by actual data from the experiment. An answer without evidence is meaningless.

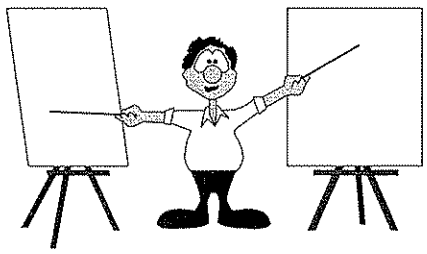
APPLYING AND EXPANDING

1. Applications are discussions of how the results of the investigation can be used.
    a. Practical uses for the information
    b. Often included as part of the conclusion
2. Expansions are discussions of how the investigation can be carried further.
    a. Other investigations on the same topic
    b. More detailed investigations on the topic
    c. Investigations to answer questions that arose during the investigation
    d. Often included as part of the conclusion

COMMUNICATING

Finding out something new doesn't do anyone any good unless the new knowledge is shared, or communicated with others.

1. Good communication:
    a. Describes only what is observed
    b. Has brief descriptions
    c. Uses precise languages
    d. Is accurate
    e. Considers other points of view
2. Communication can occur through:
    a. Professional journals & magazines
    b. Presentations at conferences
3. Communication can be:
    a. Written (reports)
    b. Visual (PowerPoint)



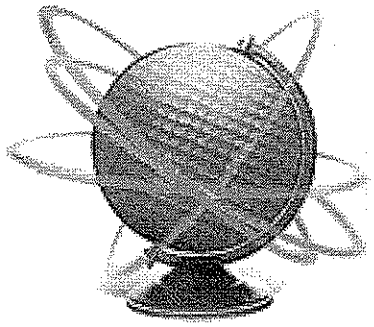
CLASSIFYING

Classification is grouping or categorizing according to similarities and differences. In science, many things are classified according to their properties.

MODELS

A model is any representation of an object or an event used as a tool for understanding the natural world. Models represent something that is too big, too small, too dangerous, too time consuming, or too expensive to observe directly. Models can help you visualize, or picture in your mind, something that is difficult to see or understand.

1. Save time
2. Save money
3. Can be:
    a. Physical
        i. Models that you can see and touch
    b. Mathematical
        i. Formulas that describe a concept
    c. Computer generated
        i. Built using computer software
        ii. Can model events that take a long time or take place too quickly to see
    d. Idea
        i. ideas or concepts that describe how someone thinks about something in the natural world
4. Limitations:
    a. May be less accurate
    b. May not work exactly like the actual object or phenomenon



HOW TO…

…MEASURE IN SCIENCE

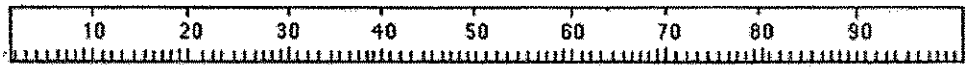
Scientific measurement uses the SI or metric system. A common measurement system allows scientists all over the world to understand and repeat investigations.

~ See the Metric System in the Resources Section of this Handbook ~

Length & Distance

Tool: Meter stick, Metric Ruler
Most Common Units: millimeter (mm), centimeter (cm), meter (m), kilometer (km)

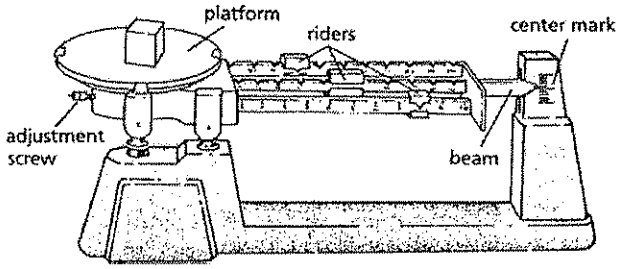
1. Millimeters (mm)
   a. Use a ruler
   b. Count the number of lines; each line = 1 mm
2. Centimeters (cm)
   a. Use a ruler
   b. Count the number of whole numbers
   c. Put a decimal after the whole number
   d. Count the number of lines that follow the whole number if needed
   e. Write the number of lines after the decimal



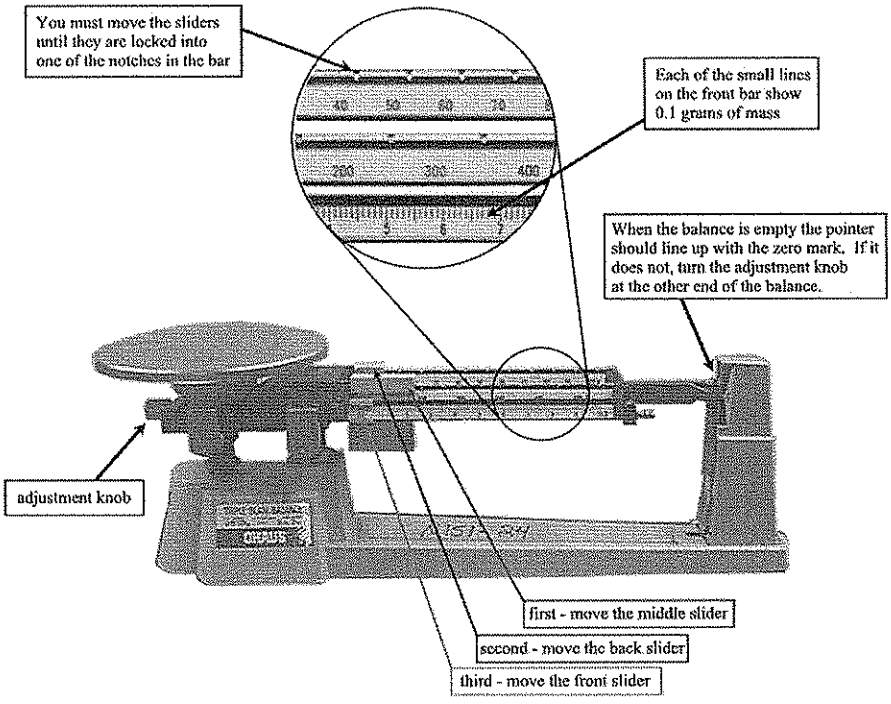
3. Meters
   a. Use a meter stick
   b. Determine if you have more or less than one meter (is the object longer or shorter than the meter stick?)
   c. If the length is less than a meter, put the decimal before the number
   d. If the length is more than a meter, the decimal goes after the first number
   e. Count the number of whole numbers
   f. Put a decimal after the whole number
   g. Count the number of lines that follow the whole number if needed
   h. Write the number of lines after the decimal

Mass

Tool: Triple Beam Balance, Electronic Balance
Most Common Units: grams (g), kilograms (kg)



1. Check to see that the balance is level. To adjust::
   a. Take everything off the pan
   b. Set all riders at 0
   c. Use the adjustment screw to put the beam level with the center mark
2. Place a piece of paper or container on the pan
   a. Find the mass
3. Place object to be measured on paper or in container
4. Move the biggest rider along its beam one notch at a time until the pointer drops
5. Move the rider back one notch
6. Repeat this procedure with the next biggest rider
7. Repeat with the smallest rider
8. Add up the masses on the beams – the mass of the object is equal to the sum of the masses minus the mass of the paper or container



Irregular Solid Volume

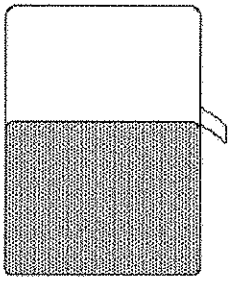
Tools: displacement cups, beakers with water
Most Common Units: liters (l), milliliters (ml), cubic centimeters (cc or c^3)

Volume is measured by measuring the amount of volume that water displaces.

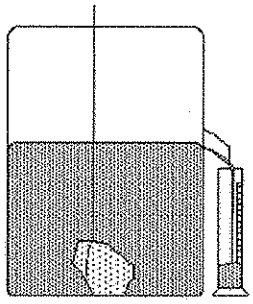
1. Fill the displacement cup up to the outlet hole so that a little water drains out
2. Place a graduated cylinder or beaker under the opening
3. Tie a string around the object to be measured and lower it into the water
4. Measure the amount of water that has run into the graduated cylinder or beaker

Alternate method

5. Fill a beaker or graduated cylinder with water
6. Note the amount of water
7. Tie a string around the object to be measured and lower it into the water
8. Note the increase in water level
9. The difference in water level is equal to the volume of the object

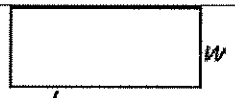
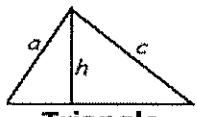
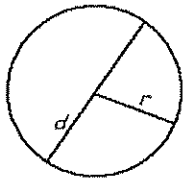
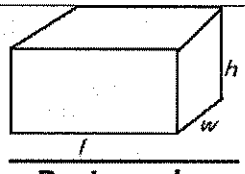


Overflow container filled to starting point.



Water displacement from submerged object.

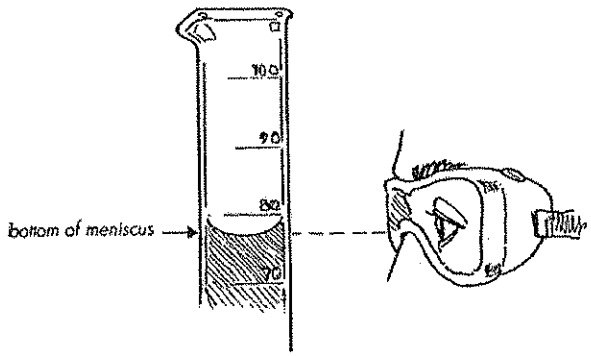
Regular Solid Volume:

 **Rectangle:**	Area = Length X Width A = lw Perimeter = 2 X Lengths + 2 X Widths	 **Triangle**	Area = 1/2 of the base X the height a = 1/2 bh Perimeter = a + b + c
 **Circle**	The distance around the circle is a circumference. The distance across the circle is the diameter (d). The radius (r) is the distance from the center to a point on the circle. (Pi = 3.14)	 **Rectangular Solid**	Volume = Length X Width X Height V = lwh Surface = 2lw + 2lh + 2wh

Capacity or Liquid Volume

Tool: Beaker or graduated cylinder
Most Common Units: liters (l), milliliters (ml), cubic centimeters (cc or c^3)

1. Using a beaker
   a. Place the graduated cylinder or beaker on a flat surface
   b. Make sure you are eye level with the top of the liquid surface
   c. Read to the nearest significant digit
2. Using a graduated cylinder
   a. Place the graduated cylinder or beaker on a flat surface
   b. Make sure you are eye level with the top of the liquid surface
   c. The liquid will tend to curve downward
      i. This curve is called the meniscus
   d. Read the bottom of the meniscus
   e. Read to the nearest significant digit

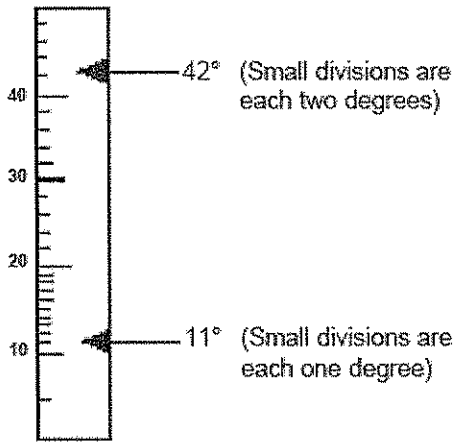


Temperature

Tool: Thermometer, Temperature Sensor
Most Common Units: degrees Celsius (°C)

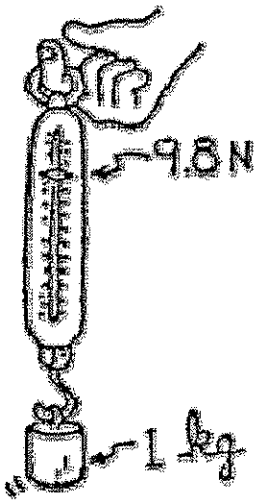
Handle thermometers carefully – they are very fragile.
Do NOT shake laboratory thermometers

1. Place the thermometer in the material to be measures
2. Do not let the thermometer rest on the bottom of a hot container
3. Make sure the bulb is submerged
4. To read the thermometer:
   a. Your eye should be level with the liquid in the thermometer
   b. Read to the nearest significant digit



Force

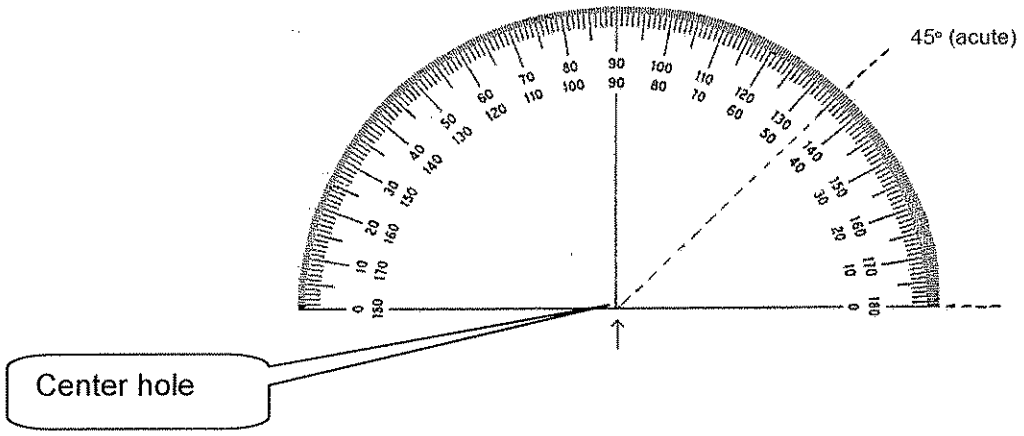
Tool: Spring Scale or Force Sensor
Most Common Units: newtons (N)



1. Attach the mass or object to be measured to the hook at the bottom of the scale
2. Hold the scale at eye level to read the scale
3. If you are measuring the force of a moving object, pull the spring scale slowly and observe the measurement on the scale

… Measure Angles Using a Protractor

1. Find the center hole on the straight edge of the protractor
2. Place the hole over the vertex, or point, of the angle you wish to measure
3. Line up the zero on the straight edge of the protractor with one of the sides of the angle
4. Find the point where the second side of the angle intersects the curved edge of the protractor
5. Read the number that is written on the protractor at the point of intersection. This is the measure of the angle in degrees



... WRITE A TESTABLE QUESTION

~ See the Science Skills Section of this Handbook for a Description of Predictions ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

1. Identify what you want to test (the independent variable)
2. Identify what will be measured (the dependent variable)
3. Make sure the data is quantifiable (numbers)
4. Make sure the investigation can be control (is a fair test)

...MAKE A PREDICTION

~ See the Science Skills Section of this Handbook for a Description of Predictions ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

1. Read the question or problem carefully
2. Think about what you already know about the topic
3. Write down what you think will happen (based on what you already know)
4. Use a complete sentence
5. Double check spelling and grammar

...MAKE A HYPOTHESIS

~ See the Science Skills Section of this Handbook for a Description of Hypotheses ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

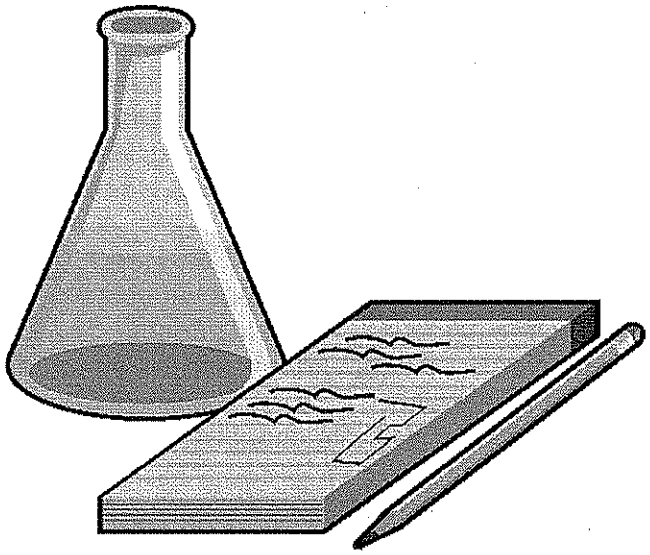
1. Read the question carefully
2. Identify the independent and dependent variables
3. Identify the change in the independent variable
4. Predict what the independent variable will do to the dependent variable
5. Use an If, Then statement
    a. If the independent variable changes, then the dependent variable will change.
        i. Use the exact independent and dependent variables

   ii. Specify the exact changes you expect
6. Use a complete sentence
7. Double check spelling and grammar

...DESIGN AN EXPERIMENT

~ See the Science Skills Section of this Handbook for a Description of Investigation Design ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

1. Read the question or problem carefully – make sure you understand what you are trying to find out or solve
2. Identify the independent and dependent variables
3. Determine the materials and amounts needed
4. Develop a step-by-step procedure for conducting the investigation. Include:
   a. Every step, no matter how small or obvious
      i. Labeling
      ii. Numbering
   b. How you measure
      i. Tools
      ii. Units
   c. Repeated trials
5. Do not include:
   a. Gather materials
   b. Graph data
   c. Write a conclusion



...COLLECT DATA IN A CHART OR TABLE

~ See the Science Skills Section of this Handbook for a Description of Charts & Tables ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

1. To make a table to collect numerical data
    a. Determine the exact independent and dependent variables
    b. Determine the units used with the dependent variable
    c. Use a ruler to draw the table
        i. Make a column on the left hand side for the independent variable
            1. make a separate row for each specific independent variable
        ii. Make columns to the right of the independent variable column
            1. one column for each trial
            2. one column for averages or other reduced data
        iii. Give the table a title that includes both the independent and dependent variable and the unit of measurement
2. To make a chart to collect descriptive data
    a. Determine exactly what observations you will be making
    b. Use a ruler to draw the chart
        i. Make a column of the left hand side to label you observations
        ii. Make a column on the right hand side to record your observations
        iii. Give the chart a title that describes the observations

...GRAPH DATA

~ See the Science Skills Section of this Handbook for a Description of Graphs ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

Bar Graph

1. Put the independent (amounts, frequencies, categories) variable on the X-axis.
    a. The X-axis is the horizontal axis on the bottom of the graph.
2. Put the dependent (what was measured) variable on the Y-axis.
    a. The Y-axis is the vertical axis on the side of the graph.
3. Decide on an appropriate scale for each axis.
    a. The numbers used on the axes of the graph.
    b. Usually begins at zero, but not always
    c. May not have numerical scales on the X-axis.

   d. The scale of the graph is very important. The same data can be plotted on different scales and not look like the same data at all.
   e. Choose a scale that lets you make the graph as large as possible for your paper and data
4. Select an appropriate interval for your graph.
   a. The amount of space between one number and the next or one type of data and the next on the graph.
   b. The interval is just as important as the scale
   c. Choose an interval that lets you make the graph as large as possible for your paper and data
5. Label each axis.
   a. X-axis
      i. Specific independent variables
      ii. General independent variable
   b. Y-axis
      i. Dependent variable
      ii. Units of measurement
6. For each of the specific independent variables (category, frequency, or amount) draw a solid bar to height of appropriate dependent variable
7. Do not connect the bars
   a. Spread them out equally across the X-axis
8. Give the graph a descriptive title (ex: A Comparison of...)

Line Graph

1. Put the independent (amounts, frequencies, categories) variable on the X-axis.
   c. The X-axis is the horizontal axis on the bottom of the graph.
2. Put the dependent (what was measured) variable on the Y-axis.
   d. The Y-axis is the vertical axis on the side of the graph.
3. Decide on an appropriate scale for each axis.
   a. The numbers used on the axes of the graph.
   b. Usually begins at zero, but not always
   c. The scale of the graph is very important. The same data can be plotted on different scales and not look like the same data at all
   d. Choose a scale that lets you make the graph as large as possible for your paper and data
4. Select an appropriate interval for your graph.
   a. The amount of space between one number and the next or one type of data and the next on the graph.
   b. The interval is just as important as the scale
   c. Choose an interval that lets you make the graph as large as possible for your paper and data
5. Label each axis.
   a. X-axis
      i. Specific independent variables
      ii. General independent variable

   b. Y-axis
      i. Dependent variable
      ii. Units of measurement
6. Plot the ordered pairs of data
7. Connect the data points with a line
   a. Begin with the first ordered pair
8. Give the graph a descriptive title (ex: The Relationship Between…)

Scatter Plots:

1. Put the independent (amounts, frequencies, categories) variable on the X-axis.
   a. The X-axis is the horizontal axis on the bottom of the graph.
2. Put the dependent (what was measured) variable on the Y-axis.
   b. The Y-axis is the vertical axis on the side of the graph.
3. Decide on an appropriate scale for each axis.
   a. The numbers used on the axes of the graph.
   b. Usually begins at zero, but not always
   c. The scale of the graph is very important. The same data can be plotted on different scales and not look like the same data at all.
   d. Choose a scale that lets you make the graph as large as possible for your paper and data
4. Select an appropriate interval for your graph.
   a. The amount of space between one number and the next or one type of data and the next on the graph.
   b. The interval is just as important as the scale
   c. Choose an interval that lets you make the graph as large as possible for your paper and data
5. Label each axis.
   a. X-axis
      i. Specific independent variables
      ii. General independent variable
   b. Y-axis
      i. Dependent variable
      ii. Units of measurement
6. Plot the ordered pairs of data
7. Do not connect the data points
8. Give the graph a descriptive title (ex: The Relationship Between…)

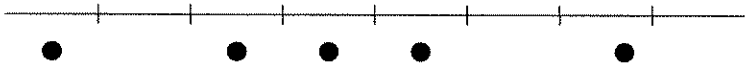
Pie (Circle) Graphs:

1. Identify the percentages you want to graph
2. Convert the data you want to graph into parts of 360
   a. percent ÷ 100 x 360 degrees = the number of degrees
3. Draw a circle with your protractor

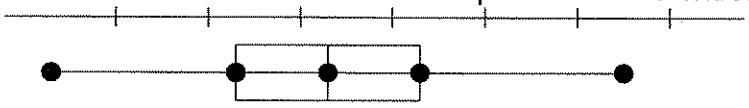
4. Starting from the 12 o'clock position on the circle, draw in a section for each set of data
5. Try to make the sector sizes look as close to the percentage of the circle as the percentage of the data group.
6. Give your graph a descriptive title

Box and Whisker Plot

1. Find the median point:
2. Find the third quartile, Q_3, the median of the upper half of the data. This is often called the upper hinge.
3. Find the first quartile, Q_1, the median of the lower half of the data. This is often called the lower hinge.
4. Find the extremes: the minimum and maximum data points.
5. Mark dots along a line plot for the median, the quartiles, and extremes.

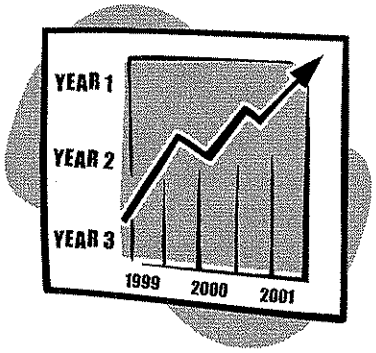


6. Draw a box between the two quartiles. Mark the median with a line across the box. Draw two whiskers from the quartiles to the extremes.



Stem and Leaf Plot

1. Find the smallest value and the largest value
2. Write the stems vertically with a line to the right.
3. Separate each data value into a stem and a leaf and put the leaves on the plot to the right of the stem
4. The numbers in the stems are the hundreds and tens places of each of the data values while the leaves are the numbers in the ones places of the data entries.



...MAKE A TABLE AND GRAPH USING EXCEL

~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

1. Open Excel
2. Enter data in a table
   a. Put the independent variable in column a
      i. Label the variable in the first row
   b. Put the dependent variables (data) in a column to the right of the independent variable
      i. Label the variable and include units in the first row
      ii. Do not use letters in the cells where you are recording data

	A	B	C
1	Independent Variable		Dependent Variable (Units)
2	Specifc variable		Data
3	Specific variable		Data
4	Specific variable		Data
5	Specific variable		Data

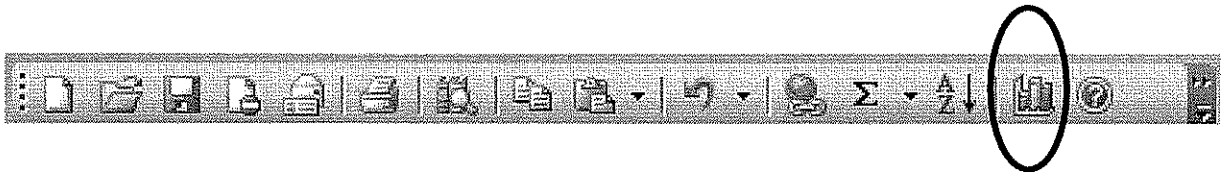
Example:

8	Type of Fertilizer		Height of Plant (cm)
9	Miracle Gro		27
10	Super Gro		21
11	Peter's Plant Food		18
12	No Fertilizer		2

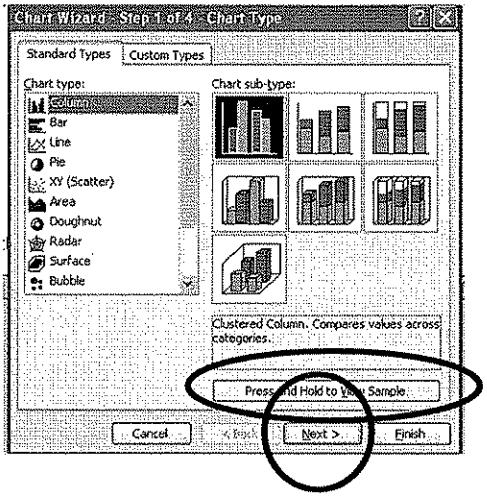
3. To make a graph –
   a. Highlight the data

8	Type of Fertilizer	Height of Plant (cm)
9	Miracle Gro	27
10	Super Gro	21
11	Peter's Plant Food	18
12	No Fertilizer	2

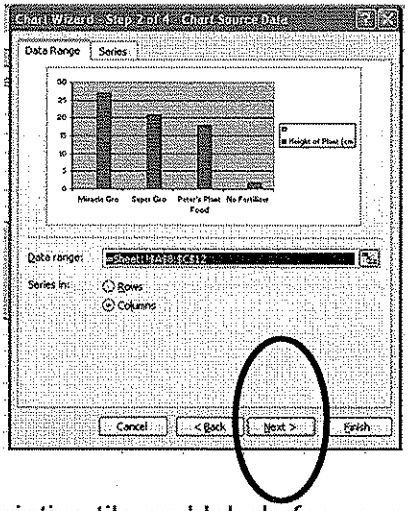
b. Click the chart wizard icon on the toolbar



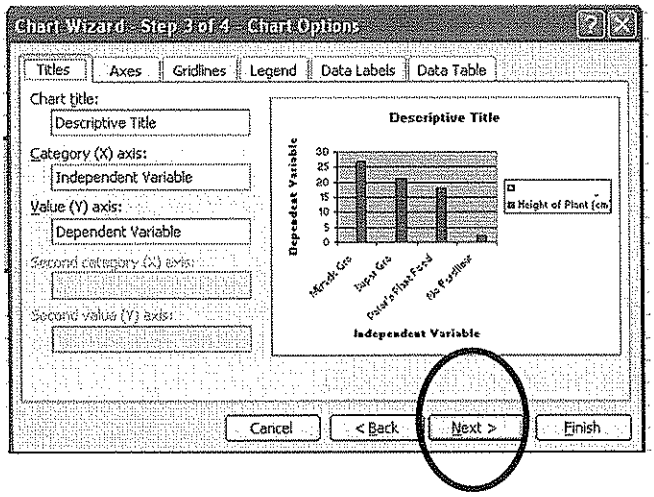
c. From the Chart Wizard box that opens select the type of graph you want to use



d. Click Press and Hold to View Sample.
    i. If your graph looks the way you want it to, continue
    ii. If not, go back and check what you have highlighted
e. Click Next
f. At the Data Range Box, click Next; do not change the information

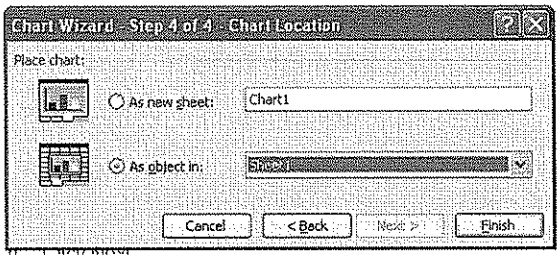


g. Type in a descriptive tile and labels for your variables
    i. If you have chosen a 3-dimensional graph, use the Z-axis for the dependent variable

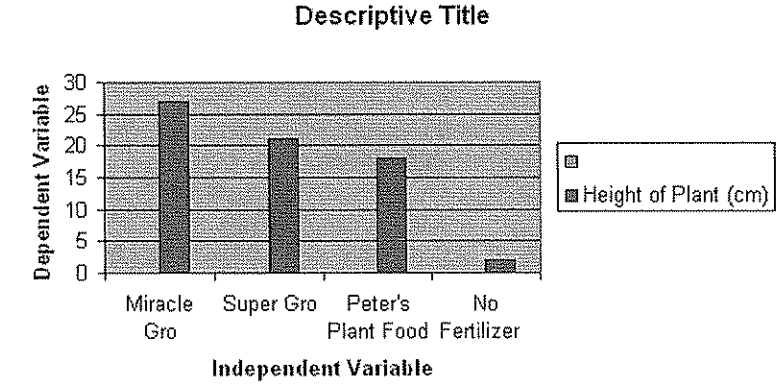


h. Click Next

i. Choose where you want your graph (usually a new sheet)



j. Click Finish and your graph is complete!

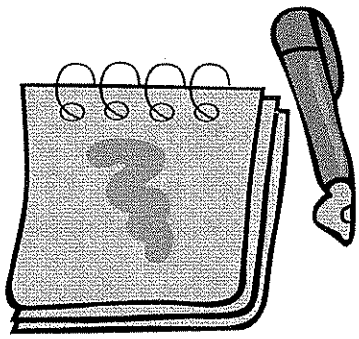


...WRITE A CONCLUSION

~ See the Science Skills Section of this Handbook for a Description of Conclusions ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

A conclusion is a summary of an investigation. It may be in different forms for different investigations. ALWAYS check your instructions; sometimes you will be asked to answer questions, sometimes you will be asked to respond in paragraph form. Sometimes you will be asked to do both.

1. Read the instructions carefully. Make sure you understand exactly what you are being asked to do.
2. If you are asked to answer questions:
    a. Read the question carefully
        i. Answer the question that is asked
        ii. Use a complete sentence
3. If you are asked to respond in paragraph form:
    a. Begin with a topic sentence
    b. Answer the original question
    c. Accept or reject your hypothesis
        i. Does the data support the hypothesis?
            1. If it does – we accept the hypothesis
            2. If it does not – we reject the hypothesis
    d. All back up what you say with data
        i. Evidence
        ii. Actual numbers from your investigation
    e. Discuss issues or problems with the investigation – sources of error
    f. Discuss the importance or relevance of the investigation (application)
    g. Discuss ways the investigation can be extended or areas that need more research (expansion)
    h. End with a concluding sentence that ties the paragraph together.



...COMPLETE A LAB REPORT

The following *may* be parts of a laboratory investigation. Not all of our investigations will have each part. Sometime you will be expected to complete all parts on your own; sometimes you will be expected to complete a few of them.
In order to do quality work (and get a quality grade), always double check your work and compare it to the guidelines below.

~ See the Science Skills Section of this Handbook for a Description of Each Part of a Lab Report ~
~ Double Check the Components of Quality Work and Lab Report Rubric in the Resources Section of this Handbook ~

HYPOTHESIS

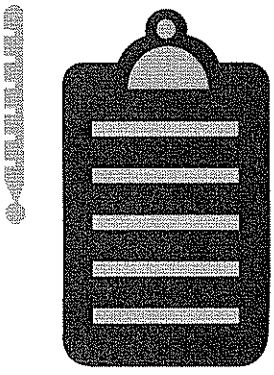
1. Refers to the question that was asked or the problem that was posed
2. Complete & specific
3. No use of internet slang (b/c, "4" instead of "for"...)
4. Written as an If, Then statement
5. Complete sentences are used

PREDICTION

1. Answers the question that was asked or the problem that was posed
2. Complete & specific
3. No use of internet slang (b/c, "4" instead of "for"...)
4. Complete sentences are used

MATERIALS

1. All are listed
2. Appropriate amounts are listed



PROCEDURE

1. Numbered steps
2. Independent variable is identifiable
3. Dependent variable is identifiable
4. Controlled variables must be identified
5. Measurement techniques are included
6. Repeat trials are included

CHART/TABLE

1. Independent variable is identified
2. Units of measurement are identified
3. Column for the independent variable
4. Column(s) for the dependent variable
5. Titled appropriately

GRAPH

1. Appropriate graph is used (bar, line, etc)
2. Independent variable is labeled on the X-axis
   a. General independent variable
   b. Specific independent variables
3. Dependent variable is labeled on the Y-axis
4. Units of measurement are identified
5. Graph has a descriptive title (A Comparison of_____; The Relationship Between _____)
6. Appropriate scale is used
7. **TAILS** – **T**itle, **A**xis, **I**nterval, **L**abels, **S**cale
8. **DRY MIX** – **D**ependent / **R**esponding on the **Y** axis; **M**anipulated / **I**ndependent on the **X** axis

DATA ANALYSIS

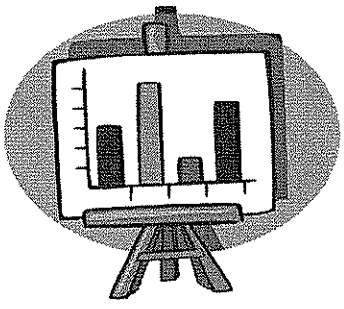
1. Describes the relationship between the independent variable and the dependent variable (As X gets _____, Y gets _____)
2. Compares the specific independent variables
3. Complete sentences are used

QUESTIONS

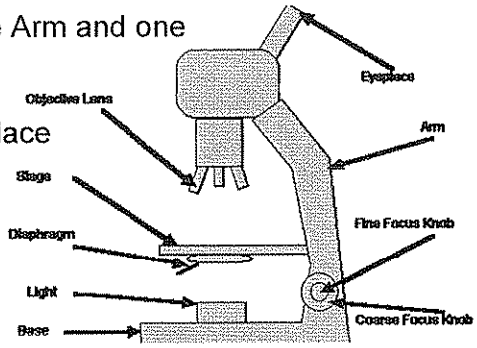
1. Answers the questions that were asked
2. Specific and complete
3. Actual data used if appropriate
4. No use of internet slang (b/c, "4" instead of "for"…)
5. Complete sentences are used

CONCLUSION

1. **Actual data** (real numbers) from your investigation supports what you say
2. Specific and complete
3. Original question or problem is answered
4. If appropriate, hypothesis is referred to (data supports or does not support NEVER right or wrong)
5. No use of internet slang (b/c, "4" instead of "for"…)
6. Complete sentences are used



... USE A MICROSCOPE



1. Always carry the microscope with one hand on the Arm and one hand on the base.
2. Carry it close to your body.
3. Remove the cover, plug the microscope in, and place the excess cord on the table or counter.
   a. Do not let the cord dangle.
4. Always start and end with Low Power
5. Place the slide on the microscope stage, with the specimen directly over the center of the glass circle on the stage (directly over the light).
6. If you wear glasses, take them off; if you see only your eyelashes, move closer. Be sure to close, or cover your other eye!
7. If you see a dark line that goes part way across the field of view, try turning the eyepiece. The dark line is a pointer.
8. If, and ONLY if, you are on LOW POWER, lower the objective lens as much as possible, then focus using first the coarse knob, then the fine focus knob.
   a. The slide will be in focus when the LOW POWER objective is close to the lowest point, so start there and focus by slowly raising the lens.
   b. If you can't get it at all into focus using the coarse knob, then switch to the fine focus knob.
9. Adjust the diaphragm as you look through the eyepiece, and you will see that MORE detail is visible when you allow in LESS light!
   a. Too much light will give the specimen a washed-out appearance.
10. Once you have found the specimen on Low Power center the specimen in your field of view, then, without changing the focus knobs, switch it to High Power.
    a. If you don't center the specimen you will lose it when you switch to High Power
11. Once you have it on High Power remember that you only use the fine focus knob!
    a. The High Power Objective is very close to the slide.
    b. Use of the coarse focus knob will scratch the lens, and crack the slide.
12. NEVER USE THE BLUE LENS.
    a. Oil immersion lens.

...DRAW CONTOUR LINES

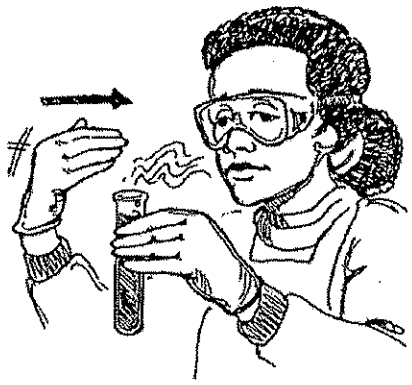
Contour lines are lines on a map connecting points of equal elevation. Contour lines:

1. Never split or divide
2. Never end, the ends must join
3. Represent one, and only one, elevation
4. Never intersect other lines
5. Form a V pattern when crossing streams
   a. The V points upstream

...TEST FOR ODORS

Odors from chemicals may be dangerous. To test an odor:

1. Hold the test tube
2. Keep the test tube several inches away from your nose
3. Waft (fan with your hand) the fumes coming from the test tube toward your nose



...SHAKE A TEST TUBE

Test tubes must be shaken carefully to avoid breaking them or spilling the contents.

1. Stopper the test tube
2. Flick it with your finger ~or~
3. Turn it over several times

...TO TAKE NOTES USING THE CORNELL SYSTEM

The Cornell system for taking notes is designed to save time but still be efficient. There is no rewriting or retyping of your notes. It is a "DO IT RIGHT IN THE FIRST PLACE" system. This format provides the perfect opportunity for following through with the **5 Rs** of note-taking:

RECORD
During the lecture or reading, record in the main column as many meaningful facts and ideas as you can. Write legibly.

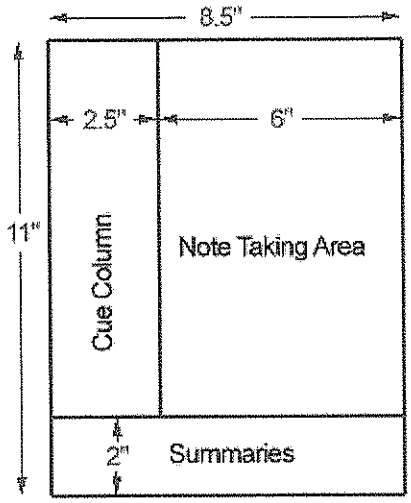
REDUCE
As soon after as possible, summarize these facts and ideas concisely in the Cue Column (left-hand column). Summarizing clarifies meanings and relationships, reinforces continuity, and strengthens memory.

RECITE
Cover the Note Taking Area, using only your jottings in the Cue Column, say over the facts and ideas of the lecture as fully as you can, not mechanically, but in your own words. Then, verify what you have said.

REFLECT Draw out opinions from your notes and use them as a starting point for your own reflections on the course and how it relates to your other courses. Reflection will help prevent ideas from being inert and soon forgotten.

REVIEW
Spend 10 minutes every week in quick review of your notes, and you will retain most of what you have learned.

First Step - PREPARATION



1. Use a large, loose-leaf notebook.
2. Use only one side of the paper. (You then can lay your notes out to see the direction of a lecture.)
3. Draw a vertical line 2 1/2 inches from the left side of you paper. This is the recall or cue column.
4. Notes will be taken to the right of this margin.
5. Later key words or phrases can be written in the recall column.
6. Write all main ideas/concepts on the right side of the page

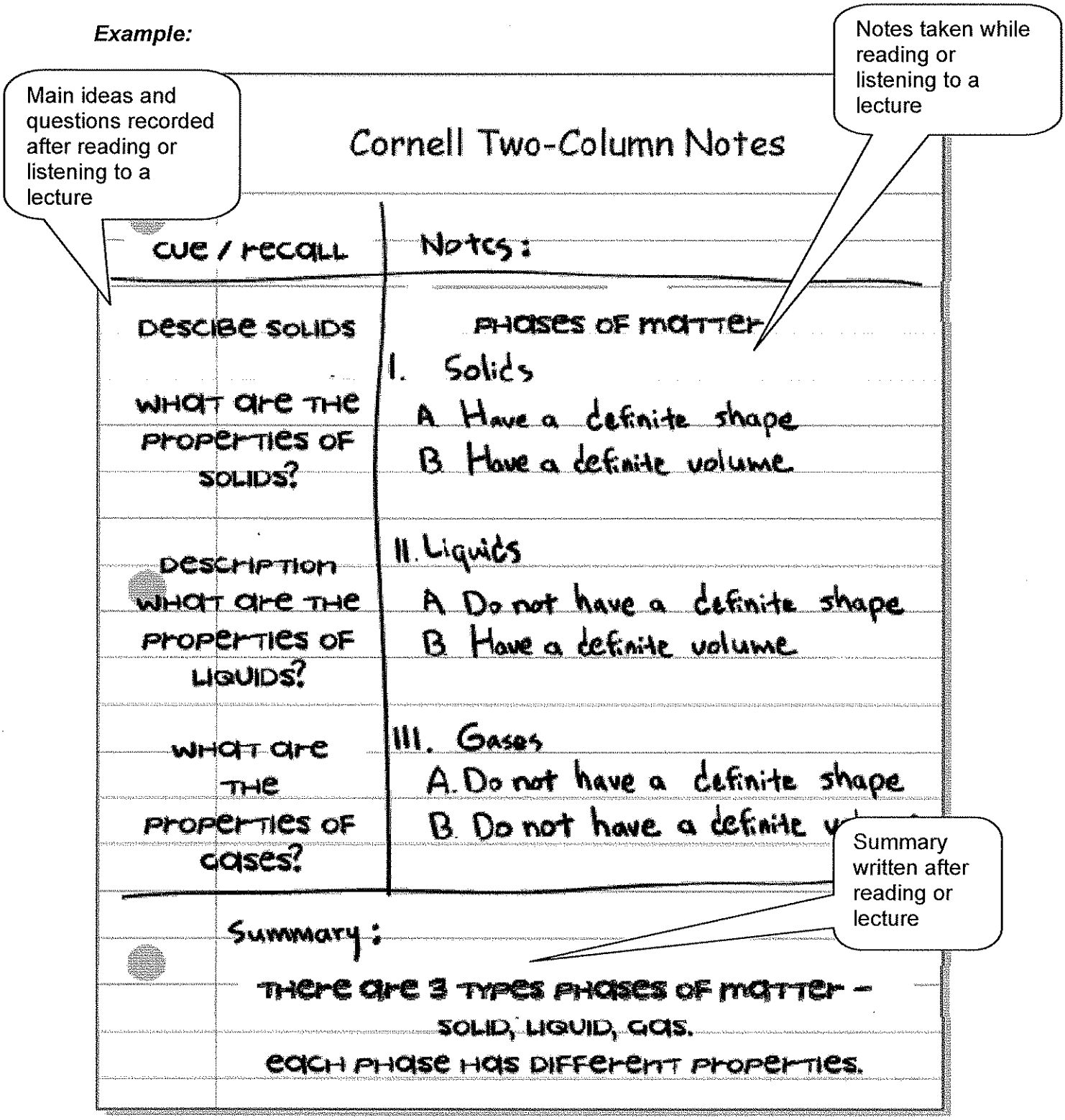
Second Step - DURING THE LECTURE OR WHILE READING

1. Record notes in paragraph form.
2. Capture general ideas, not illustrative ideas.
3. Skip lines to show end of ideas or thoughts.
4. Using abbreviations will save time. Write legibly.
5. Mark ideas that go together with an asterisk *
6. Make sure your notes are clear; that the information makes sense

Third Step - AFTER THE LECTURE OR WHEN YOU ARE FINISHED READING

1. Read through your notes and make it more legible if necessary.
2. Now use the column. Pull out main ideas, topics, terms, places, dates, etc.
3. Jot down ideas or key words which give you the idea of the lecture or reading. (REDUCE) You will have to reread the information and reflect in your own words.
4. Cover up the right-hand portion of your notes and recite the general ideas and concepts.
5. Overlap your notes showing only recall columns and you have your review.
6. Summarize
7. Write a summary at the bottom of your page
8. Mention all key points

Example:


Main ideas and questions recorded after reading or listening to a lecture
Notes taken while reading or listening to a lecture
Summary written after reading or lecture
Cornell Two-Column Notes
CUE / RECALL
Notes:
DESCIBE SOLIDS
WHAT ARE THE PROPERTIES OF SOLIDS?
DESCRIPTION WHAT ARE THE PROPERTIES OF LIQUIDS?
WHAT ARE THE PROPERTIES OF GASES?
PHASES OF MATTER
I. Solids
A Have a definite shape
B Have a definite volume.
II. Liquids
A Do not have a definite shape
B Have a definite volume.
III. Gases
A. Do not have a definite shape
B. Do not have a definite v
Summary:
THERE ARE 3 TYPES PHASES OF MATTER - SOLID, LIQUID, GAS.
EACH PHASE HAS DIFFERENT PROPERTIES.

...DESIGN AN EFFECTIVE POWERPOINT

1. The purpose of using PowerPoint to communicate information is just that: **COMMUNICATE INFORMATION**. When PowerPoint is used as a tool for communication, it is not meant to entertain the audience with lots of sound, colors, fonts, or animations.
2. There are two very important rules to remember when creating a PowerPoint presentation:
    a. Just because you **can** do something with PowerPoint doesn't mean you **should** do it.
    b. **K*I*S*S** – **K**eep **I**t **S**hort & **S**imple
3. **Design Guidelines**
    a. • Use bullet points instead of sentences
    b. • The bullets are key phrases – you fill in the rest as you speak
    c. • Don't use hyphens
    d. • Follow the 6X6 rule:
        i. No more than 6 words per bullet
        ii. No more than 6 bullets per page
    e. Pick fonts from the same family (use variations of the same font)
        i. Avoid ornate or "decorative" fonts
        ii. Verdana, Tahoma, Georgia are made for presentations
        iii. Times New Roman is a good font for a serious message
        iv. Comic Sans is a good font for an informal presentation
    f. Font colors should contrast sharply with the background color
    g. Use *italics* and **bold** sparingly – for emphasis only
    h. Titles should be 36 – 44 points
    i. Text should no less than 28 points
    j. Use the same bullets on all slides
    k. Warm colors (red, yellow, orange) command attention.
    l. Cool colors (blues, greens) are not as noticeable. Cool colors are better for backgrounds because they contrast with the text.
    m. Use a simple background
    n. Use the same background on all slides
    o. Use the same colors on all slides
    p. Transitions should help focus the audience, not distract them from what you are saying.
        i. The best transitions are those that drop down or come in from the left.
        ii. Use the same transition for each slide.
    q. Sounds are seldom needed in an informational presentation.
    r. Graphics should help make a point. One graphic per slide is enough.
    s. Always run spell check
    t. CONTENT matters the most – it doesn't matter how pretty or flashy the slide is if you are not saying anything worthwhile.
    u. It doesn't matter how good the presentation is if nobody can read it

...TYPE A SCIENTIFIC PAPER

1. Use a professional font (Arial, times New Roman.)
2. Use a 12 – 14 point font
3. Double Space

...WRITE A COMPLETE SENTENCE

A complete sentence must have two parts; a subject and a predicate (noun and verb). It expresses a complete thought.

1. Begin with a capital letter
2. Include an end mark – a period or question mark
3. "Yes" and "no" do not count as complete sentences in science
4. Avoid beginning sentences with pronouns – "it", "they" – unless you have used the noun the pronoun refers to in the previous sentence

...CITE PRINT SOURCES

1. The first line of the entry must begin at the LEFT MARGIN. Indent all additional lines.
2. Punctuation and capitalization are critical.
3. Give as much information as provided.
4. Bibliography Sample
   a. Alphabetize by the first word of the entry
   b. Begin the first line of entry at left margin – second line is indented
   c. Double-space the final Bibliography copy
   d. **Do NOT** number entries
5. Formats:

Citing an ENCYCLOPEDIA

Author (Last, First). "Title of Article." Title of Encyclopedia .
Year or Edition.

Citing a BOOK

Author or Editor (Last, First). Title of Book. City where published:
Publisher, Year or Edition.

Citing a BOOK with two or more authors

First Author (Last, First), Second Author (First Last). Title of
Book. City where published: Publisher, Year or edition.

Citing a MAGAZINE

Author(s). "Article Title." Magazine Title, Volume and Issue Number If given, Publication Date, page numbers of entire article.

Citing a NEWSPAPER

Author(s). "Article Title." Newspaper Title, Publication Date (m/d/y), section, page numbers of entire article.

~See your agenda for examples~

...CITE ELECTRONIC SOURCES

1. Provide enough information that the reader can find the original source and give credit to the author (if known).
   a. Author
   b. Title of work
   c. Title of website
   d. Date of posting or last update
   e. Name of institution
   f. Date you accessed the source
2. Formats:

Personal site (usually the least reliable)

Author (Last, First). "Title of Work." Homepage. Date of posting. Date of access < URL >.

Professional site

Author (Last, First). "Title of Work." Title of Website . Date of posting. Name of Sponsoring Organization. Date of Access <Electronic address>.

Article in an Electronic Magazine (ezine)

Author (Last, First). "Title of Article." Title of Journal/Publication. Date of Publication. Pages if given. Date of Access <Electronic address>.

Material from a Subscription Service (SIRS, EBSCO, NewsBank, etc.)

Publication information for the source (author. "title of article." Title of Source. Date of Publication. Pages if given.) Name of the database. Name of the service. Name of library. Date of access <Electronic address>.

Online Encyclopedias

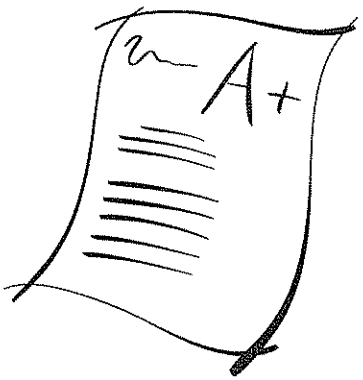
Author (Last, First). "Title of Article." Website Title, Publication or latest update. Producer or sponsor of the site. Access date <Electronic address>.

~See your agenda for examples~

RESOURCES

ESSENTIAL COMPONENTS OF QUALITY WORK

Testable Question:



1. Identifies what will be tested or measured
2. Generates quantifiable data
3. Is controllable

Prediction:

1. Reasonable
2. Based on the actual question or problem statement
3. Written as a complete sentence

Hypothesis:

1. Based on the actual question or problem statement
2. Predicts the effect or lack of effect of the independent variable on the dependent variable
    a. Exact changes are specified
3. Written in If, Then format
4. Written as a complete sentence

Materials List:

1. All materials and equipment are listed
2. Amounts or quantities are specified

Procedure:

1. Numbered list
2. Complete information
3. Independent variable identifiable
4. Dependent variable identifiable
5. Unit of measurement identified
6. Explanation of measurements
7. Repeated trials

Data Tables:

1. Column labels indicate the independent variable
2. Column labels indicate the dependent variable
3. Units are included in label or title
4. Table is organized in a way that allows for the collection and analysis of data
5. Ruler used to make lines

Data Chart:

1. Type of observation listed
2. Descriptive title
3. Ruler used

Bar Graphs:

1. Appropriate title
    a. A statement of the relationship between the independent and dependent variables – or
    b. A statement of what is being tested
2. Both axes labeled
    a. With units when appropriate
3. Appropriate number scale written along Y- axis
    a. Numbers on the gridlines
    b. Numbers such that all data to be plotted
    c. Consistently scaled
4. Appropriate Category labels written along X – axis
5. Bars are not connected
    a. Evenly spread
6. All data points correctly plotted

Line Graph:

1. Appropriate title
    a. A statement of the relationship between the independent and dependent variables – or
    b. A statement of what is being tested
2. Both axes labeled
    a. With units when appropriate
3. Appropriate number scale written along Y- axis
    a. Numbers on the gridlines
    b. Numbers such that all data to be plotted
    c. Consistently scaled
4. Appropriate number scale written along X- axis
    a. Numbers on the gridlines
    b. Numbers such that all data to be plotted

   c. Consistently scaled
5. All data points correctly plotted

Scatter Plot:

1. Appropriate title
   a. A statement of the relationship between the independent and dependent variables – or
   b. A statement of what is being tested
2. Both axes labeled
   a. With units when appropriate
3. Appropriate number scale written along Y- axis
   a. Numbers on the gridlines
   b. Numbers such that all data to be plotted
   c. Consistently scaled
4. Appropriate number scale written along X- axis
   a. Numbers on the gridlines
   b. Numbers such that all data to be plotted
   c. Consistently scaled
5. All data points correctly plotted

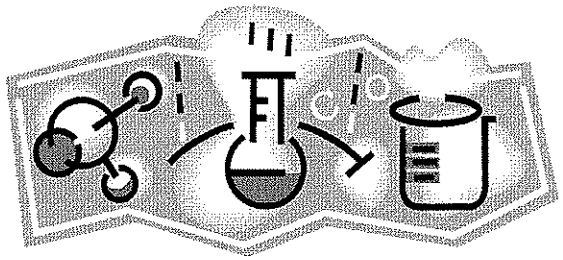
Data Analysis:

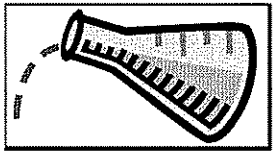
1. Relationship, pattern, trend, or comparison identified
2. Complete and accurate
3. Complete sentences used

Conclusion:

1. Directions for conclusion followed completely – all parts of conclusion included
2. Prediction or hypothesis supported or rejected
3. Specific and complete data given as evidence
4. Written in paragraph form, using complete sentences

LAB REPORT RUBRIC



	**Excellent Quality 90 – 100**	**Good Quality 80 – 89**	**Fair Quality 70 - 79**	**Poor Quality 50**
Testable Question	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Two components of quality work are present	• One component of quality work is present
Prediction	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Two components of quality work are present	• One component of quality work is present

Hypothesis	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Three components of quality work are present	• Less than three components of quality work is present
Materials List	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• One component of quality work are present	
Procedure	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Three components of quality work are present	• Less than three components of quality work is present
Data Table	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Three components of quality work are present	• Less than three components of quality work is present

Data Chart	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Two components of quality work are present	• One component of quality work is present
Graph	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Three components of quality work are present	• Less than three components of quality work is present
Data Analysis	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Two components of quality work are present	• One component of quality work is present
Conclusion	• All components of quality work are present • No spelling or grammar errors • Neat and legible	• All components of quality work are present	• Three components of quality work are present	• Less than three components of quality work is present

THE METRIC SYSTEM

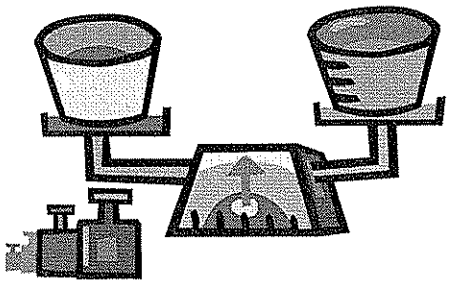
The metric system is a system of measurement created by scientists in 1795. It allows scientists to avoid problems by providing standard measurements that all scientists all over the world can understand.

A modern form of the metric system, called the International System, or SI, was adopted for worldwide use in 1960. The International System of Units is officially known as the Systeme International (SI). It is the official standard of measurement worldwide.

The metric system is based on a decimal system. This makes it very easy to use.

Each multiple of 10 has its own prefix

tera [T] 1 000 000 000 000	= 10^12
giga [G] 1 000 000 000	Thousand millions = a billion)
mega [M] 1 000 000	Million
kilo [k] 1 000	Thousand
hecto [h] 100	Hundred
deca [da] 10	Ten
1	The base unit
deci [d] 0.1	a tenth
centi [c] 0.01	a hundredth
milli [m] 0.001	a thousandth
micro [μ] 0.000 001	a millionth
nano [n] 0.000 000 001	a thousand millionth
pico [p] 0.000 000 000 001	= 10^-12



Writing SI metric properly is important to avoid confusion and to provide a common all over the world. Although there may be differences in words because of national language, SI unit symbols and SI factor symbols are identical in all languages. The following are some common standard practices. Symbols are NOT abbreviations and therefore no period is used in conjunction with symbols.

1. A space always is inserted between the number and the symbol.
2. A hyphen is NOT used between a number and the symbol. A hyphen may be used between the number and the word for the symbol: For example; 2 m or 2-meter NOT 2-m.
3. No space is inserted between the symbol prefix and the symbol. The prefix is considered part of the symbol: for example; km = kilometer
4. Symbols and prefixes are usually written lowercase letters. (km, ml, g) The exceptions to this are the symbols that are named after someone (N, J, C).
5. No "s" is used with a symbol to indicate plural; however, "s" is used in words for units for numbers greater than one or less than minus one: e.g. the symbol m = 0.6 meter and 1.3 meters.
6. Unit names are made plural by adding "s".
7. A digit always precedes a decimal point: e.g. 0.33 NOT .33
8. A slash (/) is used with symbols and NOT between words: e.g. km/h or kilometers per hour NOT kilometers/hour. Superscripts are used to indicate powers of symbols: e.g. km^2 = square kilometer(s).
9. Decimal notation is preferred over fractions.

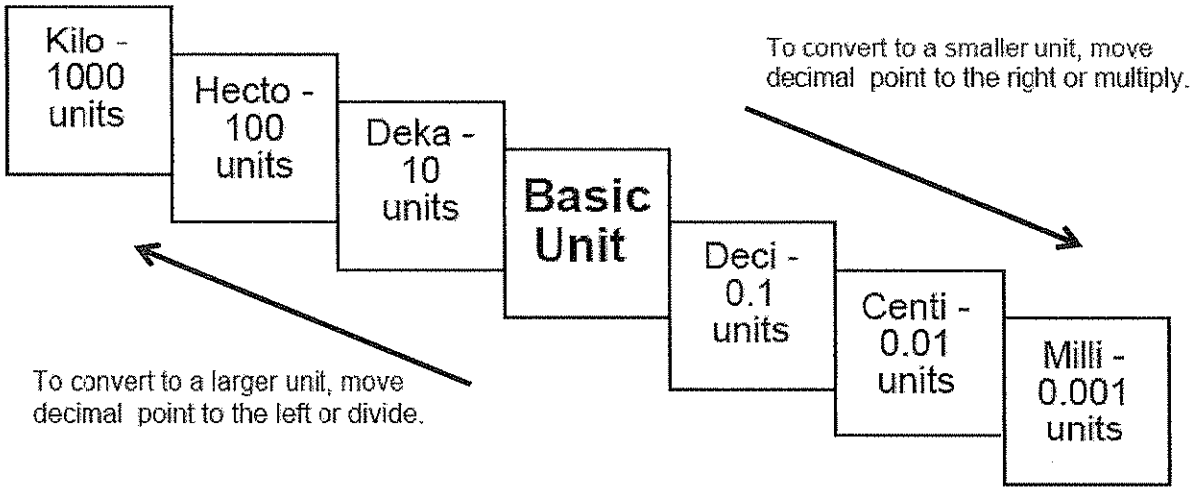
CONVERTING METRIC UNITS

To convert from a larger to smaller metric unit you multiply.

To convert from a smaller to larger unit you divide.

The Latin prefixes used in the metric system literally mean the number they represent.
Example: **1 kilo**gram = 1000 grams

This is the metric conversion stair chart.



For every step up on the chart you are dividing by 10 or moving the decimal one place to the left.

Example:

To convert 1000 milligrams to grams you are moving upward on the stairs:

"Stand" on the milligram stair and move up 1-gram stair.

You move up 3 steps dividing by 10 each time.

1000/10 = 100 → 100/10 = 10 → 10/10 = 1 or 1000/1000 = 1

Do this in your head by moving the decimal place one place to the left with each step
1000 milligrams = 1 gram.

1 0 0 0 ▪ mg ←	1000 milligrams	All represent the same amount
1 0 0 ▪ 0 cg ←	100 centigrams	
1 0 ▪ 0 dg ←	10 decigrams	
1 ▪ 0 g	1 gram	

For every step down on the chart you are multiplying by 10 or moving the decimal one place to the right and add a zero.

Example: To convert 5 kilometers to meters you move 3 steps down on the chart.

"Stand" on the kilo stair and move down to the basic unit stair. Add a zero at each stair.

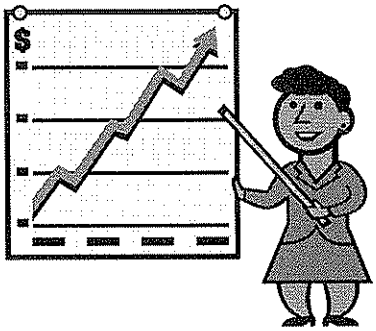
5 ▪ 0 →	5 kilometers	All represent the same amount
50 ▪ 0 →	50 hectometers	
500 ▪ 0 →	500 decameters	
5000 ▪ 0 →	5000 meters	

GRAPHING REMINDERS

DRY MIX: to remember which variable goes on which axis

D – Dependent
R – Responding
Y – Y – axis

M – Manipulated
I – Independent
X – X - axis

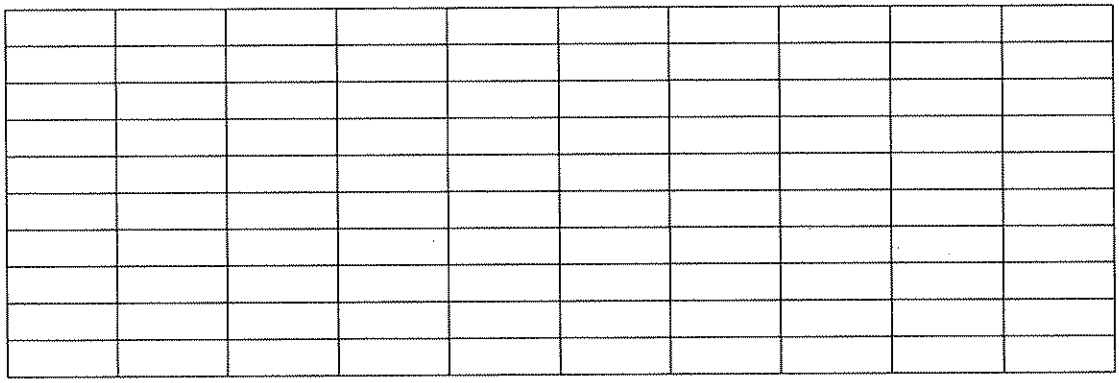


TAILS: to remember how to make a quality graph

T – Title → appropriate and descriptive, not "cutesy" or "catchy"
A – Axes → correct variable on each
I – Interval → evenly spread
L – Labels → both axes, general and specific IV; units of measurement included with DV
S – Scale → appropriate to data

Descriptive Title

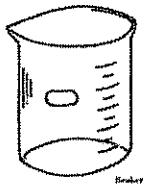
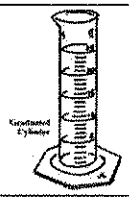
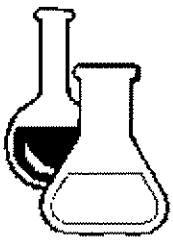
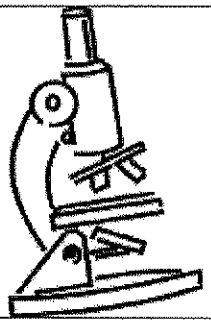
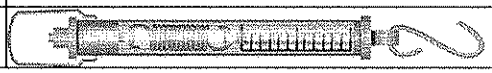
DV with Units of measurement

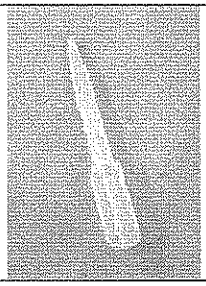
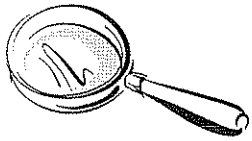
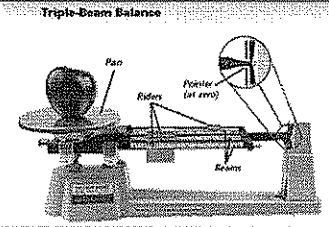
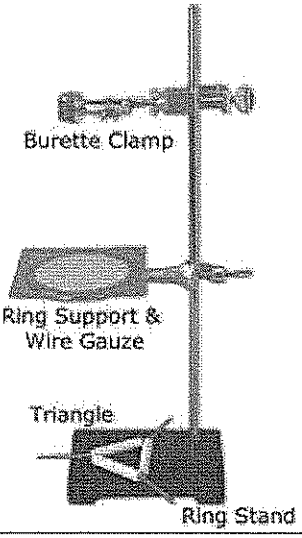


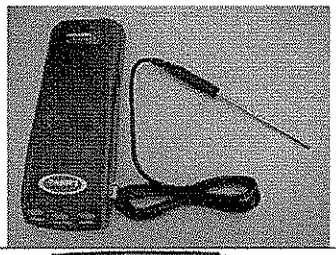
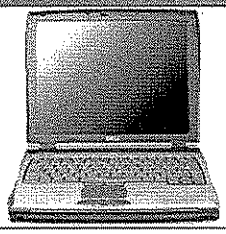
Specific IV *Specific IV* *Specific IV* *Specific IV*

General IV

COMMON EQUIPMENT USED IN SCIENCE CLASSES

Equipment	Picture / Diagram	Use
Stopwatch		Timing short periods of time
Test Tube		Holding liquid and dry chemicals Heating chemicals
Beaker		Holding liquid & dry chemicals Mixing chemicals Measuring large amounts of chemicals
Graduated Cylinder		Measuring small amounts of chemicals
Flask		Holding chemicals Heating chemicals Mixing chemicals
Microscope		Observing very small objects and organisms
Meter Stick		Measuring length and distance
Spring Scale		Measuring force

Eye Dropper		Adding small amounts of liquids
Hand Lens		Magnifying and observing small items
Thermometer		Measuring heat
Triple Beam Balance		Measuring mass
Ring Stand		Hold items up Heating beakers and flasks

LabPro + Probes		Collecting data
Laptop Computer		Collecting and recording data Research Virtual labs Creating products

THE LANGUAGE OF SCIENCE

Sometimes science is hard; not because of the science itself, but because of vocabulary used in science. There are many words used in science that are not used in everyday speech, or that may be used in different ways in day to day conversation.

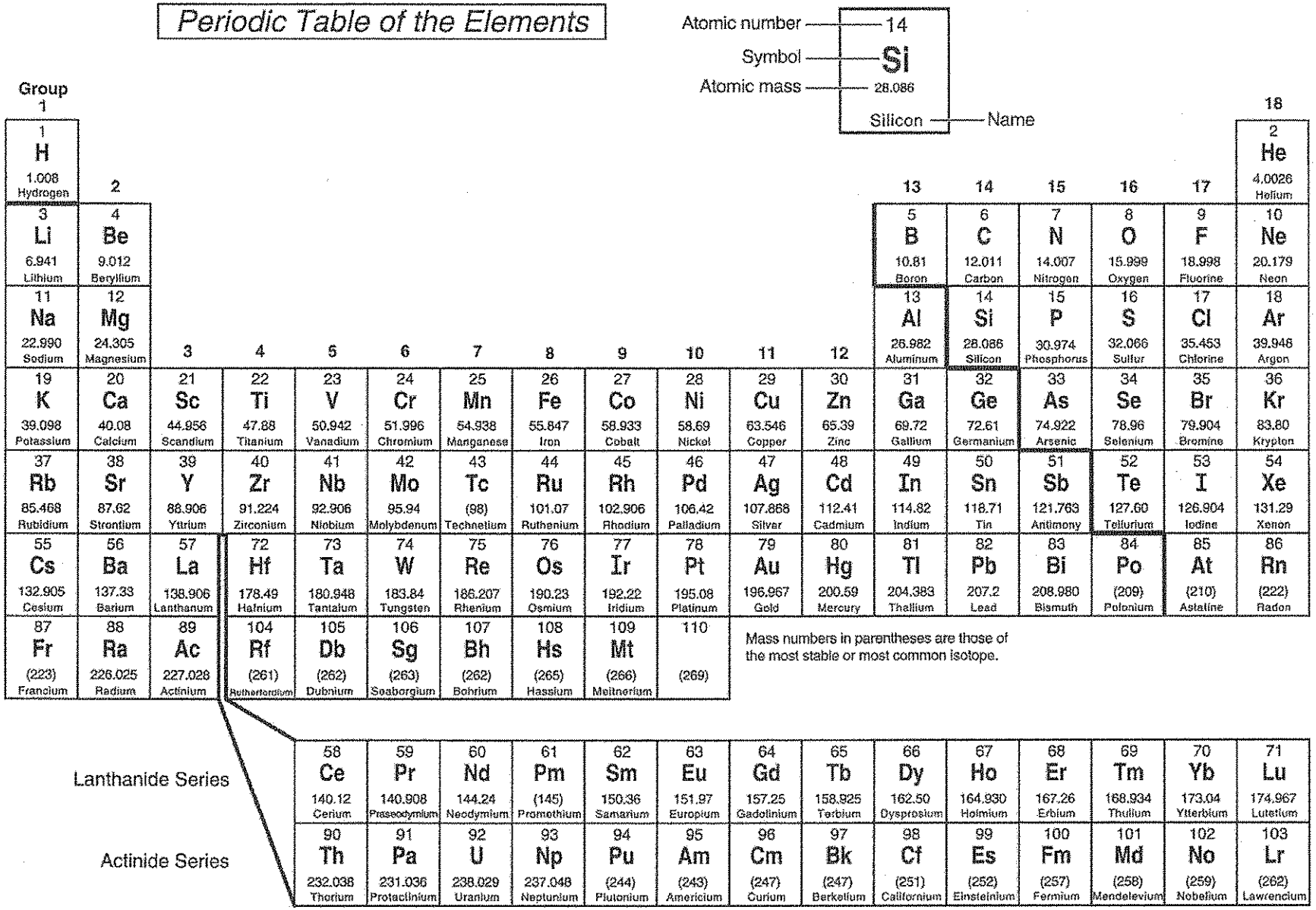
Most scientific vocabulary is a mixture of prefixes, suffixes, and root words that are linked together to have different meanings. Most of these are Greek or Latin. If you learn the meanings of the prefixes, suffixes, and root words, you'll find scientific vocabulary much easier to understand.

Word	**Meaning**	**Example**
A or an	Not or non, without	Abiotic, amoral, atypical, anaerobic
Ad-	To	Addict, adrenal
Ambi-	Both	Ambidextrous
Anthrop-	Human	Anthropology, philanthropy, anthropomorphic
Aero	Needing oxygen or air	Aerobic
Amphi	Both, doubly	Amphibian
Ante-	Before	Antecedent, anterior
Anti	Against	Antibiotic, antigen
Aqua	Water	Aquatic
Arthro	Joint	Arthritis, arthropod
Aster/astra	Star	Astronomy
Audi	Hear	Audible
Auto	Self	Automatic, autonomous
Bi	Two, twice, double	Bilateral
Bio	Life, living	Biology, biography
Centi-	Hundred	Centimeter
Cephal	Head	Cephalopod

Chloro	Green	Chloroplast, chlorophyll
Chromo	Color	Chromosome, chromatogram
Chron-	Time	Chronic, chronicle, synchronize, chronometer
Cide	Killer, kill, killing	Pesticide, homicide
Circum-	Around	Circumvent
Cyto	Cell	Cytoplasm
Dem-	People	Democracy, demography, epidemic
Derm	Skin	Epidermis
Di	Two, double	Dichotomy
Ecto (exo)	Outer, external	Exoskeleton
Endo	Internal	Endoderm
Epi	Above	Epidermis
Gastro	Stomach	Gastric
Gen	Origin, beginning	Spermatogenesis, generate
Geo	Earth; geography	Geography, geomagnetism, geophysics, geopolitics
-Gram	Something written or drawn, a record	Cardiogram, telegram
-Graph	Something written or drawn; an instrument for writing, drawing, or recording	Monograph, phonograph, seismograph
Herba	Plants	Herbology
Hetero	Different	Heterogeneous
Homo	Alike, similar	Homogeneous
Hydro	Water	Hydrophilic, hydrate
Hemo	Blood	Hemoglobin
Hyper	Above	Hypersensitive
Hypo	Below	Hypodermic

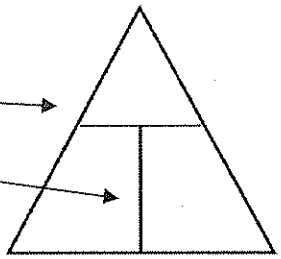
Intra	Within, inside	Intravenous
Inter	Between, among	International, intertwine, intercellular, interrupt
Itis	Disease, inflammation	Bronchitis
Lateral	Side	Bilateral
Logy	Study of	Biology
Meter	Measurement	Geometry, kilometer, parameter, perimeter
Meso	Middle	Mesoderm
Mono	One, single	Monocle, monoxide
Micro	Small	Microcosm, micronucleus, microscope
Macro	Large	Macromolecule
Ocu	Eye	Ocular
Osteo	Bone	Osteoporosis
Peri	All around	Periscope, perimeter, pericardium
Pod	Foot	Pseudopod
Phobia	Dislike, fear	Hydrophobia
Proto	First	Protest, protozoa
Photo	Light	Photography, photosynthesis
Poly	Many	Polygon
Post	After	Postdate, postwar, postnasal, postnatal
Synthesis	To make	Photosynthesis
Sub	Lesser, below	Submarine
Troph	Eat, consume	Heterotrophic
Therm (o)	Heat	Thermal, thermometer, thermostat
Tract	To pull, drag, draw	Attract, contract, extract, protract, traction
Tri	Three	Triangle
Zoo, zoa	Animal	Zoology

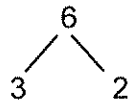
Periodic Table of the Elements



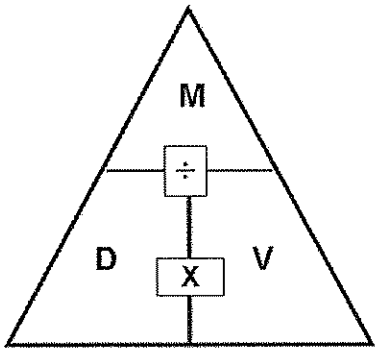
FORMULAS

Triangles can help you remember when to multiply and when to divide when using formulas in science.
The horizontal line represents DIVIDE.
The vertical line represents MULTIPLY.
Cover up the value you want to find.
Look at the other two values.
If they are next to each other, multiply them.
If one is above the other one, divide them.
The triangles work like the *factor trees* you have used in math.





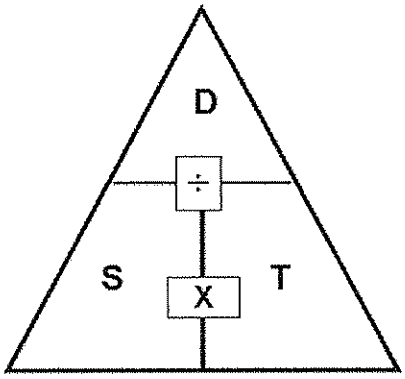
Mass, Volume, & Density



Density = Mass ÷ Volume
Mass = Density X Volume
Volume = Mass ÷ Density

D= M/V
M=DxV
V=M/V

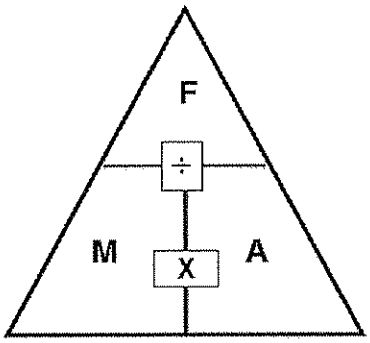
Speed, Distance, & Time



Speed = Distance ÷ Time
Distance = Speed X Time
Time = Distance ÷ Speed

S=D/T
D=SxT
T=D/S

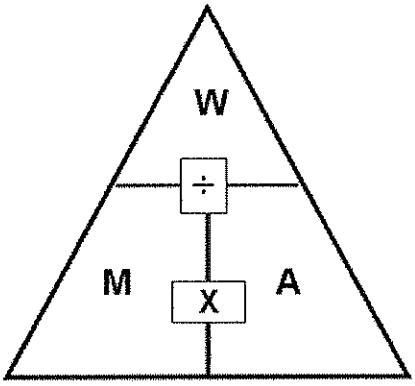
Force, Mass & Acceleration



Mass = Force ÷ Acceleration
Force = Mass X Acceleration
Acceleration = Force ÷ Mass

M=F/A
F=MA
A=F/M

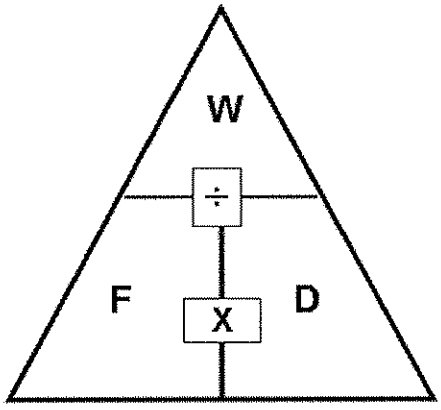
Weight, Mass & Acceleration



Mass = Weight ÷ Acceleration
Weight = Mass X Acceleration
Acceleration = Weight ÷ Mass

M=W/A
W=MxA
A=W/M

Work, Force & Distance



Force = Weight ÷ Distance
Weight = Force X Distance
Distance = Weight ÷ Force

F=W/D
W=FxD
D=W/D

FORMULA CHART
Middle School Science

Work = force × distance	$W = Fd$
Speed = $\frac{\text{distance}}{\text{time}}$	$s = \frac{d}{t}$
Force = mass × acceleration	$F = ma$
Weight = mass × acceleration due to gravity	$Weight = mg$
Density = $\frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{v}$

Constants/Conversions
g = acceleration due to gravity = $9.8 \frac{\text{m}}{\text{s}^2}$
speed of light = $3 \times 10^8 \frac{\text{m}}{\text{s}}$
speed of sound = $343 \frac{\text{m}}{\text{s}}$ at sea level and 20°C
$1 \text{ cm}^3 = 1 \text{ mL}$