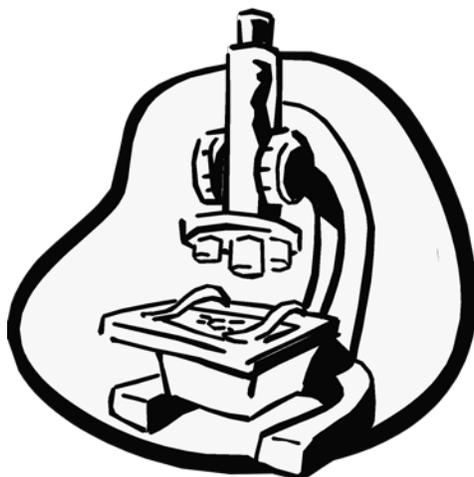


# *Success in the Sciences*



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For any follow-up assistance please call  
(707) 826-4266 and ask to make an appointment.

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## **STUDYING FOR THE SCIENCES**

Check for success –

- I **plan** my time carefully to allow for regular study sessions by **using a planner**.
- I have a dedicated **study area** that is diversion free.
- I meet regularly with a group of peers or a **study buddy** for studying and homework.
- I **always** prepare for lecture and lab the night before.
- For lecture, I **always** bring the textbook/notebook, colored pens/pencils; for lab, I bring the text/lab manual/notebook and other important materials (dissection kit, digital camera).
- I **read** my text and lab assignments **before** class.
- I use **SQ4R** for reading texts. [See pg 4]
- I use a **3-ring binder** to organize my notes, handouts and reading notes.
- I **process** my notes as soon as possible after lecture by annotating and/or recopying them. [See pg 12]
- I make **flashcards**, review pages, charts, and study guides to **quiz myself**. [See pg 9]
- I formulate **questions** from reading and lecture notes to ask my professor, lab assistant, support staff or classmates.
- I **begin preparing** for tests immediately after the previous test/quiz.
- I **review** regularly and repeatedly, [and then I do it again].
- I know techniques that help me **memorize** information. [See pg 5]
- I keep my **math skills** polished and sharp; math is an integral part of science.
- I do all **assigned problem sets** whether they are collected or not.
- I **analyze** and correct tests and quizzes when I get them back.

## The SQ4R Method of Study Reading

What does this title mean? The title for this method is abbreviated to make it easier to remember, and make reference to it simpler.

- 1. Survey**

Glance over the headings or sub-topics to see the points that will be developed. Look at **tables, graphs, diagrams and pictures**.\* Think about them and what you already know. Read the abstract or summary if there is one. Read any questions given at the end of the chapter. Take about five minutes for this step. (For steps 2, 3, 4, and 5, take a total of 45 minutes for an average chapter.)
- 2. Question**

Turn the first heading into a question. It demands a conscious effort on the part of the reader to make this a question for which (s)he must read to find the answer. (Ask: What, How, Where, When, Who?)
- 3. Read**

Now read with the definite purpose of finding the answers to the questions you have made. This is active reading.
- 4. Recite**

When you have finished reading each part, look away from your book and recite the answer(s) to your questions. Jot down key phrases or ideas in the margin.
- 5. wRite**

Write brief notes, approximately one page per chapter. On the left-hand column of the page, write questions. On the right-hand column of the page, jot down the answer in an abbreviated form. Write just enough to jog your memory when you review. You can also write answers to questions at the end of the chapter.
- 6. Review**

Now that you have finished the chapter assignment or report, look over your notes to get an overall bird's-eye view of the points and their relationship. Check your memory of the content by reciting major sub-points under each heading. (Take about 5 to 10 minutes for this.)

What are the results?

You will learn to pick out the important points quickly.

You will understand difficult material better.

You will be able to remember more of the material longer.

It will help you predict questions for quizzes and tests.

You can review your notes quickly and easily without going back to the text.

You will read faster without wasting time.

*After you have practiced using SQ4R, you develop a habit that becomes an effective method of study reading.*

\***Tables:** large amount of statistical information

**Diagrams:** visualization of complex relationships

**Graphs:** relationship between two sets of variables.

**Pictures:** intended to deepen understanding

## Improving Memory

*As with any subject, good study habits, dedication, perseverance, and a positive attitude are crucial ingredients for success in the sciences. Improving your memory will help you minimize study time and maximize success in your science classes.*

### 1. **Make a Conscious Decision to Remember Information.**

Remember the time you or your friend parked the car at the mall or stadium and forgot to take note of where you left the car? In order to remember something, you must actually decide to do it.

### 2. **Relate New Material to Information You Already Know.**

When you link new material to what you know, you understand it better and it becomes easier to access because you can relate to it. For instance, information about cross-pollination can be related to an ear of corn since corn silk is a familiar image. Relating ideas will help you understand the concepts you encounter.

### 3. **Over-learn It.**

Once you think you've "got it," go over it once more. Repetition makes new material easier to remember (or find in your mind!). Remember writing and rewriting your spelling words or going over your multiplication tables in elementary school? Those are examples of over-learning. Flashcards are a good way to put over-learning into practice.

### 4. **Take Advantage of your Learning Style to aid in Memorization.**

Every person has strengths and weaknesses when learning new things. Some people have an easier time memorizing information in a visual format, while others prefer to learn using their auditory or tactile senses.

<http://www.metamath.com/lweb/dvcllearn.htm>

► Tools for Memorization Using Different Learning Styles:

*Visual Learners:*

Draw comparison charts and flow charts...Rewrite notes...Make flashcards  
...Color code note cards...Diagram on note cards... Create concept maps.

*Auditory Learners:*

Tape record lectures (and listen to the tapes)...Make mnemonic devices...Form study groups...Talk with study buddies...Quiz yourself out loud...Read difficult material out loud.

*Kinesthetic Learners:*

Make flash cards...Draw pictures...Make physical models...Paint vocabulary words...Act out important processes...Take field trips to experience what you are studying.

### 5. **Organize Material Into Groups.**

What makes lots of information easier to recall? Grouping or "chunking." This method explains why phone numbers and social security numbers are easier to remember than a long string of random numbers. Color coding your notes or putting material into charts are other ways to organize.

### 6. **Use Images and Pictures.**

When you are reading or studying about anything that could be visualized, form a mental image of each step along the way. For instance, you might want to picture the various stages of cloud formation to help you understand the steps. Mathematical word problems are excellent examples, too: draw pictures to represent problems.

**7. Use Colors**

Color coding is useful when you need to group information; for instance, when writing notes or flashcards about a certain order in botany class, use one color. Then use a different color for another order of plants or to represent another topic.

**8. Other Mnemonic Devices**

(Devices to assist in memory)

~Use rhymes or songs (our alphabet is a fine example of this)

~Make up your own acronyms (SCUBA stands for Self Contained Underwater Breathing Apparatus)

~Use silly sentences to remember the order of processes or groups. (“King Phillip Came Over For Great Soup” is one way to remember the order of taxonomic groups in Zoology: Kingdom, Phylum, Class, Order, Family, Genus, Species)

~Use Humor to remember: ☺The meaning of the word “rife” is “full” or “rifle /ri-ful/”. Prosaic means dull, as in my dull friend Rosa.

**9. Learn actively**

Talk about new material with a study partner; take notes, draw pictures. Try standing while studying or using your hands to gesture or reciting material aloud. If you sit, try the edge of the chair. (Being too comfortable promotes daydreaming and poor concentration.)

**10. Create Interest**

It’s easy to forget information you don’t want in the first place. (This explains why parents must often repeat themselves.) Try to find an interesting angle to help you remember, consider possible future uses, and relate the information to your goals.

**11. Spread-out Study Sessions**

Plan several short periods of study time instead of a couple long ones. Do you have breaks between classes or have times while you wait for appointments? Even fifteen minutes can be used to review your flashcards/notes or preview your textbook chapters.

**12. Test Yourself**

~Turn headings of your reading into questions. Write out the answers.

~Flashcards ☑ (make piles of the terms, etc. that you know and do not know)

~Answer the questions at the end of the chapter. Don’t peek at answers! Expand and write out explanations if you get the wrong answer.

~Write a summary of what you have learned or read.

~For definitions, names, etc., divide your paper up into two columns: one for the term (or name) test and one for the definition (or description). Cover the second column and write out the descriptions of the terms or names. Check yourself. Repeat by covering the first column. Mark the ones that you know and study the ones that you had difficulty with.

**13. Memory Dump**

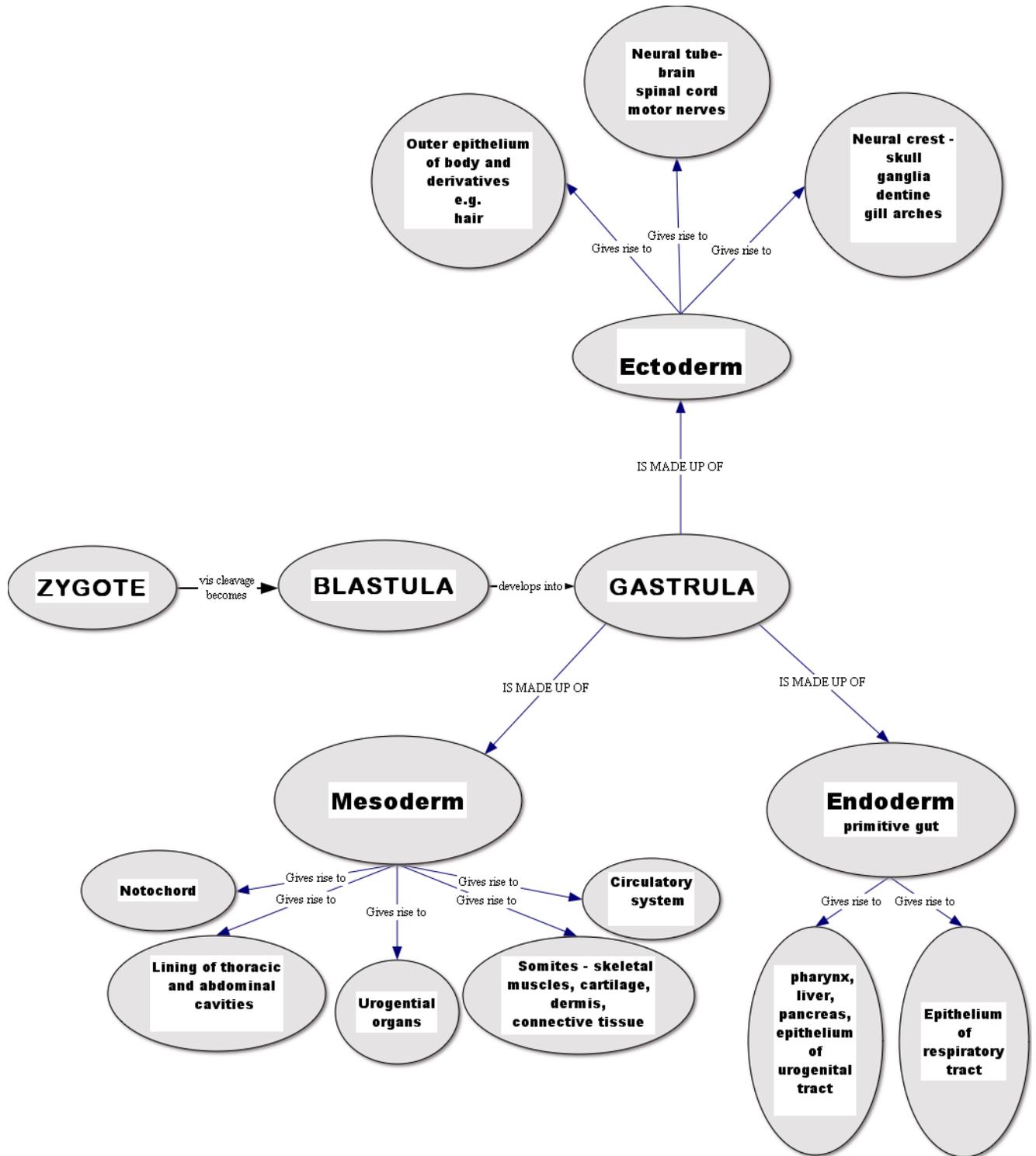
WARNING: Use only as a last resort ☹ (You can only hold small amounts of information in short-term memory. This is not a method for long term storage of information).

When cramming for a test is unavoidable, keep info in short term memory right before a test.

Write formulas, acronyms, etc. down as soon as you receive the exam. Use this information as you proceed through your test. If you want to retain this information, review your notes, chapters and test as soon as possible.

**SAMPLE CONCEPT MAP**

DERIVATION OF PRIMARY GERM LAYERS



## Flash Card Dos and Don'ts



### Do:

---

- ~Write definitions in your own words (except in technical classes\*). Make sure that your definitions convey the same meaning as original definitions.
- ~Understand the definitions that you write down.
- ~Separate flash cards into two piles: cards that you know well and cards that you don't know well. Focus your studying on the cards that you don't know.
- ~Include examples that illustrate your definitions or concepts.
- ~Use both sides of the card. Put a question or term on one side of the card, and put the definition and example on the other.
- ~Include diagrams or drawings.
- ~Include small chunks of information.
- ~Write down the page number and your original source of information.
- ~Separate your flash cards into different topic areas. (Separate flash cards into chapters, periods of time in history, and for different topics.)
- ~Use different colors to classify your cards. (For example, use different ink colors to indicate different parts of speech or to indicate masculine or feminine words for Spanish class.)
- ~Carry your flash cards with you so that you can study while waiting in line, on the bus, between classes, or whenever.
- ~Put them on a ring or in a "flash card binder."
- ~Photocopy diagrams from your textbook and paste onto flash cards. Cover up the labels on the front of the flash card to test yourself, and put the answers on the back.

### Don't:

---

- ~Don't copy definitions straight out of the book.\* (\*except in technical classes)
- ~Don't put both the question and answer (or term and definition) on the same side of the flash card.
- ~Don't squeeze tons of information onto one card.
- ~Don't use full sentences when you can use phrases or short answers.
- ~Don't mix up your flash cards from different subjects.
- ~Don't leave your flash cards at home where you can't study them.
- ~Don't expect your flash cards to organize themselves.

### Other Activities:

---

Mix up a group of flashcards of one topic and spread them out. Close your eyes and pick up two randomly. How are they related?

With a study buddy, spread out cards term side up; keep cards you can define. Play as a game to see who gets the most. Make up rules for your game.

## **Strategies for Success**

*A Specific Case from Botany 105:*

by Dr. Stephen C. Sillett, Assistant Professor

Here is a fundamental truth:

*Attitude is everything.*

### **Lectures and the Text**

Read text assignments before coming to lecture in order to get a feel for information and important terminology (**bold** typeface). As you take notes during lecture, summarize, use symbols and shorthand, make quick diagrams, and personalize the material. Use different colors of ink to enliven and clarify your notes. I recommend those combination black, red, blue, and green ballpoint pens. Carefully reread text assignments within 24 hours of lecture and take notes on information that is new to you. Do not highlight passages from the text in lieu of taking hand-written or typewritten notes. Rewriting material in your own words greatly facilitates both comprehension and retention of new information. The text used in this course is excellent. You will be responsible for some information in the text that is not covered in detail during lectures. Be sure to study the 'Questions' section at the end of each chapter. Some of these questions may appear on the lecture exams! Pursue areas of personal interest by exploring the Internet as well as reading articles and books in the Library.

### **Taking Notes**

Organization is the key to retaining material and to accessing it efficiently when studying. I recommend the following method of organizing your Botany 105 notes. Use a 3-ring binder for your notes and course handouts. The first notes you will take on any given topic will be in lecture. Within 24 hours of lecture and before rereading the text, recopy your lecture notes onto the right-hand pages of notebook paper. You need to rewrite your notes completely; do not leave anything out. Use several colors to highlight key features of diagrams. Be sure to sequentially number the pages and do not write on the backs of pages. At this point you can discard your original notes taken during lecture. Please recycle. Then do the careful rereading of the text. Take notes on the left-hand pages, facing the rewritten (and colorful!) lecture notes on the same topic. When reviewing material, you will be able to open your binder and have both lecture and text information in the same visual space.

### **Preparing for Lab**

Your lab time is scheduled quite rigorously. Reading lab handouts and related text materials before lab is essential for the timely completion of assignments during scheduled laboratory periods. Do not leave lab early. The more you work with material, the better you will learn it. This is the fun stuff!

### **Do Not Fall Behind**

You will soon find yourself awash in wave after wave of alien terminology and concepts. Assume that material from previous lectures and labs is a foundation for future material. Review often.

### **Study for Exams**

Review new terminology with a chart or flashcards. Cover the labels to important diagrams (e.g., life cycles) and try to label them again. Reread your notes and outline them at least one week prior to exams, highlighting problematic areas and referencing pages in both the text and your 3-ring binder. Use

this outline to guide your cramming of the material two days prior to the exam. Reread and intensively study only those sections that give you trouble.

### **Talk Plants**

People learn in many different ways, and one of them is talking. Constantly exchange information and questions with your instructors and your lab group. Teach someone else about what you're working on. Sharing discoveries makes everyone's experience richer and more fun.

### **Draw Plants**

Your experience in botany lab will be extremely visual. You will spend hours looking at organisms and their structures. In most cases, you will have only one opportunity to see a particular item before it is filed, returned to the greenhouse, or discarded. A detailed, carefully labeled drawing is indispensable.

Making drawings in lab forces you to observe material closely. If you train yourself to make careful, accurate, and detailed drawings, your powers of observation will increase, thus further enhancing your understanding of the material. You will be at a great advantage if you take your drawing seriously. Some suggestions follow to help you learn this skill.

1. **Dedicate space to drawing**—In your notebook for this class, reserve a section for lab notes and drawings. The laboratory manual is printed on only one side of the pages. Use the other sides for drawings pertaining to the exercises on the facing pages. Central organization of all your course material in a 3-ring binder will greatly increase your studying efficiency.
2. **Draw what you see**—Idealized drawings that show what you think should be there are no help to you. Anyone in lab should be able to look at your drawings, understand them, and be able to correlate them to the material.
3. **Be economical**—Use only simple, narrow lines. Indicate depth only when it is essential. Usually it is not. Make your drawings large enough to see important details without crowding them. Show only as much detail as is necessary for an understanding of the structure. Do not draw the entire microscope field if only one type of structure is present. Usually, a small section through the field of view will suffice.
4. **Label your drawings**—Accurate labeling is the key to retaining information for later study.
5. **Review your drawings**—Use lab drawings just as you do lecture and text notes. Go over them in the fifteen minutes prior to the following week's lab. When studying for a laboratory quiz, try covering labels to test yourself, redrawing and labeling troublesome structures, and making charts that summarize a collection of drawings.

### **Live Plants!**

Notice the botanical world as you go about your daily life. What plant products are in materials you use everyday? What plants do you eat? What plants do you see in a walk across campus or in a hike through Redwood National and State Parks? What structures and processes can you identify? Purchase a hand lens (14X Hastings triplets are the best) and examine the tiny plants growing on fallen logs and the sexual organs of flowers. Go tree climbing!

## Cornell Note-taking Method

Write questions and key term cues here after lecture. Use these to test yourself.	<i>Chem 107</i> ↓ Use this side of paper to take notes during class ↓ [?'s for prof.]	<i>9/9/07</i>
↓		
	<i>Naming Ionic Compounds</i>	
<i>What does binary mean?</i>	<i>1. Naming Binary Ionic Compounds:</i> * <i>an ionic compound that has two components,</i> - <i>cation (positive ion) is named first</i>	
<i>What are the 2 components?</i>	- <i>retains its name</i> <i>i.e.(lithium)</i> - <i>anion (negative ion) always placed last in the name formula</i> - <i>its ending changes to -ide. i.e.(chloride)</i> = <i>Lithium chloride for LiCl.</i> * <i>Ex: NaCl, sodium chloride. (table salt)</i>	
<i>Monoatomic =?</i>	<i>2. Monoatomic cation → name of element</i> * <i>can be found in groups 1A +2A of the periodic table. i.e. Na+=sodium</i> <i>H+ Li+ Na+ K+ Cs+ Be +2 Mg+2 Ca +2</i> <i>Monoatomic anion → name of element + -ide i.e. Cl - =chloride</i> * <i>can be found in groups 6A and 7A of the periodic table</i>	
<i>What is term for a 2 element compound?</i>	<i>F- , Cl -, Br -, I-, O -2, S-2 , - N -3, P-3</i>	
<i>When compounds have more than one atom per element what stays the same?</i>	<i>3. For compounds having more than one atom of each element</i> * <i>Na 2 O has more than one atom of Na</i> * <i>CaF2 has more than one atom of F, thus they are not diatomic</i> - <i>the naming rules can change to reflect this, but</i> - <i>the cation will always be first</i> - <i>the anion will always be second</i>	
		<i>[When do the naming rules not change?]</i>
		<i>[How do the rules change?]</i>

\* The Cornell Note taking System was created by Walter Pauk, Professor Emeritus, Cornell University

**SAMPLE CORNELL NOTES FROM POWER POINT LECTURE: BOT 105 Dr. Henkel**

Write study questions + key terms or cues here after lecture

Downloaded Notes with Power Point slides cut and pasted  
*handwritten notes from class added*

↓

**4. Primary root structure:**

relatively simple compared to shoots

- 3 primary tissue systems distinguishable:
- epidermis (dermal tissue system)
  - cortex (ground tissue system)
  - vascular tissues (vascular tissue system)

*(dermal tissue system) = epidermis + root hairs*

*Epidermis:*

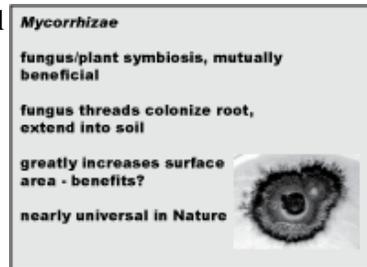
1° function: absorb water and minerals (young roots)  
*absorption high*

Root hairs: hairlike extensions of epidermal cells  
very numerous, billions; greatly extend surface area  
rye plant (4 months old): 14 billion root hairs + 10,000 km!!!  
function often taken over by symbiotic fungi

develop behind region of elongation  
= delicate “feeder” roots

Mucilage: intimate contact w/ soil, beneficial microorganisms

- i lubrication for growing tip*
- ii bacteria enable N fixation*
- iii symbiotic relationship*

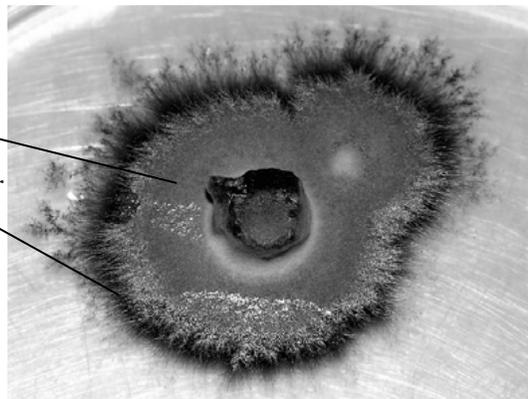


*Mycorrhiza:*

“fungus/root” symbiosis, mutually beneficial  
fungus threads colonize root, extend out into soil  
greatly increases surface areas for water and mineral absorption – benefit to plant benefit to fungus: carbon from autotrophic plant! more later ....  
nearly universal; root systems alone rarely occur

*Pinus sp especially true for native conifers*

*Cortical cells*  
*Ectomycorrhizal layer*



## Abbreviations & Symbols for the Sciences

### How to abbreviate notes:

- ☺ Drop the ending
- ☺ Drop the internal vowels and/or consonants
- ☺ Use symbols
- ☺ Creative spellings

#### Abbreviations

Abbreviation	Meaning
aka	also known as, alias
assn	association
asst	assistant, assist
ave, avg	average
b/c	because
b/tw btwn	between
bldg	building
cf	compare
ch	chapter
dept	department
dif	different, difference
econ	economics
ed	editor, edition, education
env	environment
et al	and others
etc	etcetera, and so forth
esp	especially
e.g.	for example [exempli gratia L]
ex	example
fig	figure
ff fwd	following, fast forward; forward
freq	frequent, frequently
gov, govt	government
grad	graduate

#### Symbols

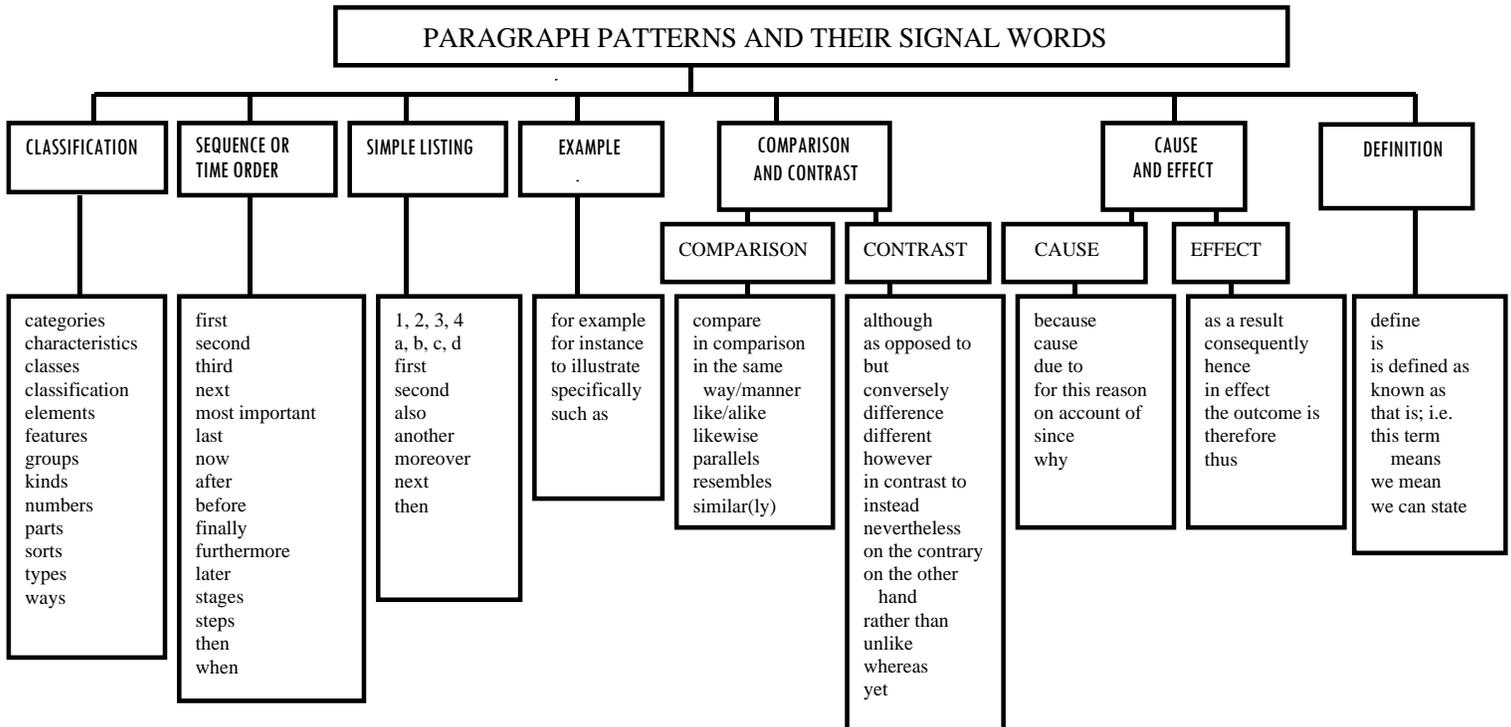
Symbol	Meaning
4	for
...	words missing here
=	equal to, same as
#	number
$\lambda$	wavelength
$\psi$	(psi), psychology
$\therefore$	therefore
$\because$	because
$\text{♀} / \text{♂}$	female / male
\$	money, dollars
"	same as above
?	question or confusion
$\Delta$	(delta) change, rate of change
$\oplus$	earth

### Examples:

- indiv for individual, abbrev for abbreviation
- lrg for large, dbl for double
- = for 'is' or 'are', x for times,
- thru for through, nite for night

Abbreviation	Meaning
H	hypothesis
hw	homework
i.e.	that is [id est L]
imp	important
info	information
inc, inc w/	include/ing, included with
lab	laboratory
lang	language
min	minimum
max	maximum
mid	middle
misc	miscellaneous
n., no.	number
neg	negative
na, n/a	not applicable
p.	page
pop	population, popular
prep	prepare, preparatory
stu	student
temp	temperature, temporary
thru	through
vs, v	versus (use to contrast ideas, things)
w, w/	with
w/out, w/o; w/in	without; within

Symbol	Meaning
$\sim$	approximately, about the same as
$\cong$	approximately equal to
$\neq$	not equal to
$\uparrow / \downarrow$	increase / decrease
$\uparrow \text{er} / \downarrow \text{est}$	high(er) / low(est) etc.
$\rightarrow$	leads to, results in, causes
$> / <$	greater than / less than
$\infty$	infinity, infinite
@	at
&, +	and
!	important
+ / -	positive, good / negative, bad
$\Sigma$	sum
e-, n $\overset{\circ}{\circ}$ , p+	electron, neutron, proton



For science majors, performing well on a short essay portion of a test is essential. Because you only have a small amount of allotted space and/or time in which to write your answer, your writing must be clear, concise and succinct. You must get to the point directly in your essay because your professor will be looking quickly for the answer to his or her prompt, as they have a lot of essays to read and not much time to read them. Signal words, sometimes known as ‘sign posts’, ‘markers’, or ‘transitions’, are important because they help your professor progress from one significant idea to the next in your essay, as well as between your ideas and the support you give for those ideas. Using these words can help you receive full credit because they direct the reader (your professor) to your answer quickly.

---

## TEST ANALYSIS for SCIENCE TESTS

### PART I

**Is there a pattern to the type of questions I missed on the test?**

1. On your test, circle the numbers of the questions you got wrong.
2. For each number, decide what *type* of question it was:  
fact, definition, list, example, explanation, comparison/contrast, steps in a process, environmental problem/ potential solution, cause/ effect, problem to solve.  
THEN, write the type of question in the margin next to each number.  
*Note: A question may include more than one type.*
3. Look back over the notations you have made in the margin.

**The TYPE of question I missed most often was \_\_\_\_\_**

### PART II

**Is there a pattern to the reason I missed these questions?**

*Identify why you missed each question you identified in Part I.*

**For each question you got wrong, place a mark [/] by the main reason you missed the question.**

[For example, if you missed 8 questions, there should be at least 8 marks: //////////////]

- |       |   |
|-------|---|
| _____ | a. Information not in my notes. [See A, next page.]   |
| _____ | b. Information in my notes but not totally correct.<br>[See A, next page.]                                  |
| _____ | c. Didn't really understand the material in the first<br>place. [See B, next page.]                         |
| _____ | d. Forgot all or part of the information.<br>[See B, next page.]  |
| _____ | e. Answer not precise or complete enough.<br>[See B, next page.]  |
| _____ | f. A math, calculator entry, significant figure, or<br>units error. [See C, next page.]                     |
| _____ | g. Misread the test question. [See C, next page.]   |
| _____ | h. Did not do exactly what the question asked.<br>[ex. Listing instead of explaining] [See C next<br>page.] |
| _____ | i. Ran out of time. [See C, next page.]   |
| _____ | j. Other? [Indicate the reason below.]  |

**PART III**

**Based on the patterns you see in Part II,  
✓ the things most likely to help you improve your grade on the next test.**

**A. Work on note taking** [If you checked *a* or *b* on the previous page.]

- \_\_\_\_\_ Improve note taking during class.
- \_\_\_\_\_ Read the textbook before going to class.
- \_\_\_\_\_ Work on ways of improving concentration and focus during class.
- \_\_\_\_\_ Set up note sharing with a classmate.

**B. Work on Memory / Study Strategies** [If you checked *c*, *d*, or *e* on the previous page.]

- \_\_\_\_\_ Ask for help from a professor, a tutor, or a knowledgeable classmate.
- \_\_\_\_\_ Refer to the textbook to clarify information that I don't really understand.
- \_\_\_\_\_ Set up a regular study routine.
- \_\_\_\_\_ Review my notes as soon as possible after each class.
- \_\_\_\_\_ Identify questions I need to answer, and then practice reciting the answers to myself.
- \_\_\_\_\_ Work with a study partner or study group.
- \_\_\_\_\_ Improve my studying for the test:
  - \_\_\_\_\_ Make flash cards, study guides, and lists to improve practice.
  - \_\_\_\_\_ Take advantage of visual learning by making charts, diagrams.
  - \_\_\_\_\_ Take advantage of auditory learning by talking, answering questions aloud.
  - \_\_\_\_\_ Do practice problems.
  - \_\_\_\_\_ Make certain my flash cards or study guides ask me to answer questions in all the levels of learning the professor wants me to know.
  - \_\_\_\_\_ Make certain I am practicing complete and accurate answers.

**C. Work on Test Taking Strategies** [If you checked *f*, *g*, *h*, or *i*.]

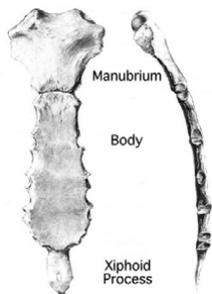
- \_\_\_\_\_ Plan my allocation of time before I begin the test.
- \_\_\_\_\_ Do the easy questions first.
- \_\_\_\_\_ Underline and circle key words in the test questions to help me focus on what is being asked.
- \_\_\_\_\_ Allow for time to recheck my answers.

**D. Other resources: Professors' Websites**

Most professors will have helpful course notes or materials online; a good example is this Wildlife website: <http://www.humboldt.edu/wildlife/faculty/johnson/courses.html>

## Using Word Roots in the Sciences

Your professors may suggest you learn the etymology, or word history, of the vocabulary words used in their classes. Although learning the Greek or Latin meaning of the various roots of words will be helpful, taking it a step further and creating visualizations, will be more powerful.



### Example from Anatomy

The sternum has three parts, the sternum proper, the manubrium, and the xiphoid. Manubrium comes from the Latin word for handle (which comes from the manus, the Latin word for hand).

Xiphoid comes from the Greek word xiphos, or sword. If you put these together visually, you could picture

yourself at the back of a boat (the stern), holding (manus) a sword (xiphos) and sticking it down into the water, the correct physical orientation of the xiphoid. Though this might seem silly, it is well established that the brain remembers longest and best that which is



*Thanks to Professor John Pelley for the example.*

### Sample of Commonly Confused Word Elements

ante-: (L) before	anti-: (G) against	arc, -i (arcus): (L) bow, curve
arch, -e: (G) first, chief	archo: (G) anus, rectum	anth, -e: (G) flower
anthra, -c, -x: (G) coal	anthrop, -o, -us: (G) mankind	bi- (bis): (L) twice, paired
bio-: (G) life	carp, -o: (G) fruit	carp, -o: (L) wrist
chrom, -o: (G) color	chron, -i, -o: (G) time	dis-, di-: (G) apart, asunder
di-: (G) twice, double	dia -: (G) through, across	gymn, -o: (G) naked
gyn, -e, -o: (G) female	gen: (G) to be born	hem, -a, -o: (G) blood
hemi-: (G) half	homeo: (G) like, similar	homo-: (G) the same, in common
homin, -i (homo, homilis): (L) man	manu, -i (manus): (L) hand	mani-: (G) madness
my, -o, -s: (G) muscle	myel, -o: (G) marrow	myc, -e, -o: (G) fungus
myx, -a, -o: (G) mucus, slime	ped- (pes, pedis): (L) foot	ped-: (G) child
phyll, -o, -um: (G) leaf	phyl, -o, -um: (G) race, class	radi, -a, -o: (L) rod, radius, ray
radix, -ici-: (L) root	trich, -o: (G) hair	tricha: (G) a thrush

Call the Learning Center (826-4266) for more assistance with Word Roots!

See also:

<http://www.technion.ac.il/~medicine/Students/latin&Greekprefixes.html>

<http://www.esindle.org/roots.html>

[http://www.csun.edu/science/ref/reference/roots/chemistry\\_roots.pdf](http://www.csun.edu/science/ref/reference/roots/chemistry_roots.pdf)

<http://members.aol.com/genfir1/pandhmpg.htm>

Large compilation drawn from literature, history, etc. An encyclopedic resource. Searchable databases.

<http://quizlet.com/108185/science-prefixes-suffixes-flash-cards/>

A recommended dictionary is available in the bookstore and at the Learning Center:

Borror, Donald J. Dictionary of Word Roots and Combining Forms. Mountain View, Calif. Mayfield Publishing Company. 1988.

