

SOLAR SYSTEM ASTRONOMY SYLLABUS

Contact Info

Instructor: David Vakil (pronounced Vuh-keel)

Course: Astronomy 20, Fall 2009

Class time: Daytime sections: Section 1056: MW 2:45-4:10pm (If you miss your class,
Section 1055: TTh 2:30-3:55pm you may be able to attend

Evening sections: Section 1057: T 6-9:10 pm (one of these other sections.)
Section 1058: W 6-9:10 pm No, we will not get out early...

Office: Physics 117F (see map at end)

Phone: (310) 660-3593 x3134.

Email: dvakil@elcamino.edu

Office Hours: MW 4:15pm-5:15pm, TTh 4-5pm, OR by appointment, OR **just stop by!** I'm around.

Web Page: www.elcamino.edu/faculty/dvakil/astronomy_20.html

All materials except exams will be posted on the web page. If something is missing, please inform me.

Videos

During class, I may wear a microphone and have my computer create a movie from what's on the computer screen and what the microphone records. These videos will be posted on the videos website and a link will be available on the course web page. Please note: things you say may be recorded on the video. If you are reading this sentence, you have now discovered there is an extra credit assignment hidden in this syllabus in sentences like this one; keep reading. These videos are provided solely to help you succeed. They should help students who need to see/hear things again or at a different pace, as well as to help students who miss class. However, daily attendance is still mandatory, as described below. Do not rely on the video instead of coming to class!

Tutoring

There is a FREE tutor, Kristen Spendlove, available in the Learning Center of the library. *Her hours are _____.* She has taken both lecture astronomy courses with me, so she is a good resource for you. She can also be reached by email at _____. She is very knowledgeable and friendly. Put that to good use. For students in Astronomy lab courses, Jeff *may* be available one night per week on the math roof for tutoring (emphasis on telescope usage). This evening tutoring availability is subject to change; contact me for the latest information about the nighttime tutoring. Here are your directions for receiving the syllabus extra credit, worth two points. Find the six code words in this syllabus and write them down on a piece of paper and which syllabus page you found the clue. Yes, there really are six. Turn that paper in by the second class if your class meets only once per week, or by the third class if we meet twice per week.

Books and Supplies

SCANTRON FORM 882-E IS REQUIRED FOR ALL EXAMS! The bookstore sells a 6-pack which I suggest you purchase. (Form 882-N-E is ok also, but has numbers instead of letters. My tests have lettered answers instead of numbered answers.) Total estimated scantron form cost: \$1-2.

Texts. There are two texts and both are required.

Text #1, required (or use the library's reserved copy) and may be purchased bundled new with required text #2 to save money. Bring this book to class every day, or sit next to someone who does.

You must have regular access to one of the following texts:

The Cosmic Perspective: The Solar System, 5th edition by Bennett, Donahue, Schneider, and Voit. The newest version is called the "Media Update." You may also use the non-media update version.

OR

The Cosmic Perspective, 5th edition by Bennett, same authors, which is called the "combined version" below. The newest version is called the "Media Update." You may also use the non-media update version.

Deciding on text #1 Textbook costs are: approximately \$80 for the Solar System version bundled with text #2 or \$132 for the "combined version" bundled with text #2. Adding text #2 to the bundle adds little cost to the price. I recommend the "combined version" to students who are taking (or who plan to take) Astro 25 (Stars & Galaxies) with me or Astro 12 (the lab class) with any teacher. The "combined version" is the text for both Astro 20 and 25 for my classes only. (Other teachers may use other books, so be careful.) The lab class covers material from both classes. Students who think they may develop a recreational interest in astronomy are also encouraged to buy the combined version. However, if you know you will not use your book after the end of the semester, get the single-volume version specifically titled "The Solar System" to save money.

Note: the "combined version" will be on reserve in the library, for use only inside the library. Both the 4th edition and two copies of the 5th edition are on reserve. (One of the two copies is the "media update" version.) The 4th edition is similar to the 5th, so feel free to use it, too.

Text #2 is a workbook and is also required. It is available at a BIG discount when purchased new in a bundle with Text #1. Bring this book to class every day.

The workbook is titled *Lecture Tutorials for Introductory Astronomy*, 2nd edition (black cover) by Prather, Slater, Adams, and Brissenden. This book will come bundled with text #1 if purchased new from ECC's bookstore. It costs approximately \$30 if purchased separately and its ISBN on its own is 9780132392266.

Course Calendar, Test dates

Homework due dates are not known yet. You may want to fill them in on page 9.

Last day to add or drop and still receive a refund: Sep 11

Unit 1 – week 4, Sep 21-25

Last day to drop and not receive any note on your transcript: Sep 25

Unit 2 – week 6, Oct 5-9

Unit 3 – week 8, Oct 19-23

Unit 4 – week 10, Nov 2-6

Veteran's Day Holiday: Friday, November 13. (We don't have class on Fridays.)

Last day to drop and get a "W": Friday, November 20.

Unit 5 – week 13, Nov 23-27

Unit 6 – week 16, Dec 14-18 (last day of class)

(If we have a test on unit 7, the above deadlines will be moved to earlier dates. This will be announced in class.)

Note: the study guides for the tests and more detailed descriptions listed above begin on page 15.

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Disabilities

If you have a disability (learning, physical, seeing, hearing, or otherwise), let me know so I can work with you. The note card that I ask you to fill out (see homework handout) is a good place to do this. You should also consider visiting the Special Resource Center, located in the Student Services Building. The first code is my (i.e. your astronomy professor's) last name and my office location.

Safety notice

Campus police and cadet escorts are available to take you to and from your car before, during, and after class. You can contact them with a campus "blue light" phone, located in various areas on campus. Or ask your instructor to call them for you. I am certainly happy to place this call. If you prefer, you can call them from any phone: 310-660-3100, or dial 3100 from any campus phone. I suggest you save the ECC Campus Police phone number in your cell phone's contact list.

Course Description

Astronomy 20 is an introductory-level course which concentrates on the foundation of modern astronomy and the study of the major worlds of the Solar System. The course has no astronomy, physics, or math prerequisites. Math will be used rarely.

Course goals

Primary goals

Written by Professor Vakil. All concern the nature of scientific thinking.

1. **Appreciating** science in general, and astronomy in specific.
2. **Understanding** how knowledge is gained and be critical of what you see and hear. You will begin to ask "How can we test that?" when forming hypotheses or "How do we know that?" when reading new information.
3. **Distinguishing** scientific from non-scientific work, and therefore understanding what science is.
4. **Developing** a working knowledge of the scientific method and how to apply it to real world situations.
5. **Critically analyzing and evaluating** information, scientific or otherwise

Student Learning Outcomes and Course Objectives

The following outcomes and objectives were developed either by the astronomy department when denoted with an (A) or Professor Vakil when denoted with a (V).

6. (V) Learn some simple astronomical nomenclature/terminology. However, note that memorization of most vocabulary is not emphasized in this class.
7. (V) Learn about some problems astronomers and astrophysicists are trying to solve, and understand the methods scientists are using to try to solve these problems.
8. (V) Develop a sense of what scientists know about the overall universe, its constituents, and our location
9. (A) Diagram the positions of the Sun, the Earth, and the Moon during solar and lunar eclipses.
10. (A) Predict the phase of the Moon that would be seen in the sky, given the positions of the Earth, the Sun, the Moon, and the observer.
11. (A) Explain the causes of seasonal variations in the length of the day, the direction of sunrise and sunset, and the amount of solar heating.
12. (V) Understand the following ideas related to gravity:
 - a. Falling in a gravitational field

- b. Newton's 3rd law relating action forces and reaction forces
 - c. Three components that determine the strength of the gravitational force
 - d. Orbits
 - e. Tides, tidal stretching (i.e. tidal force)
13. (V) Understand the link between the composition and location of the constituents in the solar system
 14. (A) Sketch how the planets were formed.
 15. (A) Compare the characteristics of the planets and major moons of the Solar System.
 16. (A) Compare and contrast the terrestrial, jovian, and uranian planets.
 17. (A) Estimate the age of the solar system, given data on the isotopic composition of meteorites.
 18. (A) Construct a history of a planet in terms of the processes of impact, volcanism, tectonics, and erosion.
 19. (A) Describe the composition, structure, and properties of planetary atmospheres. Contrast the conditions on planets with atmospheres with the conditions on airless worlds.
 20. (A) Explain the climatic conditions of the inner planets.
 21. (V) Understand and be able to make predictions about orbital motions, as explained by Kepler's laws as revised later by Isaac Newton.

The following student learning outcomes may not be covered in this course.

22. (A) Judge whether a particular study is a science or a "pseudo-science" using the scientific method.
23. (A) Illustrate the apparent motions in the sky of inferior and superior planets.
24. (A) Explain how electromagnetic radiation and astronomical instruments are used to reveal the properties of stars and planets. NOTE: This may be covered briefly.
25. (A) Discuss the basic principles of spaceflight. Evaluate the impact of the major manned and unmanned space missions on planetary astronomy.
26. (A) Evaluate the possibilities for life on a given planet.
27. (V) Newton's laws of inertia (i.e. Newton's 1st law) and acceleration (i.e. Newton's 2nd law).

Philosophical statement

A sense of curiosity regarding the universe in which we live is an essential asset in any science course. Develop the habit of questioning, critiquing, and wondering about the things you observe around you; the quality and enjoyment of your life will be immensely enriched. Hopefully this class will help you ask and answer questions.

Learning stars, constellations, and the structure and origin of the universe

If you are looking for a class that will teach you about specific stars and constellations, you should enroll in Astronomy 12, which is a nighttime astronomy lab class that may use the planetarium more than we will. You will receive credit for both Astronomy 20 and 12. If you are interested in learning about stars, galaxies, black holes, the Big Bang, and the universe as a whole, you should enroll in Astronomy 25. These topics will be covered very minimally in astronomy 20 (if at all). The second code word is quasar.

Credit for the Course, Transferability to a University

Credit for 3 units of Astronomy 20 is fully transferable to the California State University system. Credit is fully transferable to the U.C. system unless you also take Astronomy 25. See a counselor if you have taken or will take Astro 25 and are planning to transfer to a U.C.

Grades, Homework, Academic Honesty, Plagiarism, Late Policy

Grades

Your overall course grade will be determined as follows:

Clicker questions/participation....	20 pts total*	No penalty for wrong answers
6 (maybe 7) Tests.....	100 pts each**	Mult. choice questions, rewrites available
Homework.....	2 pts each (usually).....	Assignment type varies.
Extra credit.....	Up to 30 pts max.....	See page 13 for more information.

* There is a correlation between participation and final course grade. The more often you come to class and participate, the more likely you are to receive a better grade. While participation usually helps, it does not guarantee any specific grade.

**Every test will be graded out of a different number of questions. Your score will be converted into a percent, which I called “points” in the table above. The third code word is brown dwarf. For example, test 1 may be graded out of 75 questions. If you got 68 correct, you’d have $68/75 = 90.7\% = 90.7$ points. What matters is your percent on each test.

A grade of "A" will be earned for a 90% average, "B" for 80%, "C" for 65%, "D" for 50%, and "F" for below 50%. This scale will not be revised during the semester.

Homework

Homework will probably be collected almost every day in class, except on days when we have tests. See page 9 for a list of assignments and page 10 for the directions for homework assignments. For classes that meet only once per week, two separate homework assignments may be collected in a single class session. Most homework assignments will be graded out of 2 points. Many of those will be graded for completion rather than correctness.

Unless you request otherwise, it is likely you will only receive a score on your homework paper when you get it back. However, if you wish for more detailed comments from me, write your request clearly in large and/or colorful letters at the top (so I notice your request) and I will do my best to honor your request. I do tend to write more comments on homework submitted via email. (See below for instructions on how to submit homework via email.)

Homework will be accepted during the first 15 minutes of class. It does not need to be typed, but it must be easy for me to read in order to receive credit.

Working with others, Plagiarism, Academic Honesty, Student Conduct

You are allowed to work together with as many as 2 other classmates on your homework. In fact, you are encouraged and recommended to do so. However, the assignments you submit must either be in your own words and significantly different from your groupmates’ papers, unless all names of all people are clearly stated on your homework. Similarly, when appropriate, students are also expected to **cite the work done by others** that helped students complete their assignment. We use this rule because College and University students, as well as most professionals in most jobs, are expected to submit work that is their own and to give credit to others when appropriate. Failure to comply with these directions may be considered plagiarism, and appropriate follow-up action may be necessary.

See also the College Catalog, Standards of Student Conduct section, including the “Cheating and Plagiarism” section. (This is found on page 27 of the 2009-2010 ECC Catalog. A similar policy and location may be found in older editions of the catalog.)

Submitting homework over email

You are also **welcome, but not required, to submit homework via email *before class begins, as long as you send the email from your El Camino email account and indicate which day(s) your***

class meets in the subject line of your email. I will reply with an email or two acknowledging I received your email and informing you of your grade on the assignment. These two emails may come separately or may be combined into one.

Late Policy & NQA (No Questions Asked) coupons

If you do not submit your homework by the first 15 minutes of class, you will receive no credit for the work. There are only two exceptions.

Exception #1: you are given two NQA (No Questions Asked) coupons in this syllabus on page 12. You may submit one NQA coupon to receive a one-week extension on any homework assignment. Submit the coupon when you turn in the (late) assignment. I strongly urge you to save your coupons for the Test Rewrites, described below. Those are the homework assignments that are most likely to improve your grade.

Exception #2: circumstances arranged in consultation with the instructor. Leaving me a message notifying me that you'll be late does NOT count as prior arrangement. The fourth code word is your last name.

I will keep track of coupon usage on my computer, so you do not need to cut the coupons out of your syllabus on page 12 if you wish. You may simply write on your assignment in big letters that you are using a coupon.

Clicker questions/participation

A radio-frequency personal response system (a.k.a. "clickers" which function like "Ask the audience" on TV's *Who Wants to Be a Millionaire* and *1 vs. 100*) will be used frequently during the class. Clickers will be used to take attendance daily and to ask questions during class. Answering these questions will give you full participation points. There is no penalty for answering incorrectly. See also page 25 for a description of how to use the clickers.

Tests

Note cards

You are permitted and encouraged to use one handwritten 3-inch by 5-inch double-sided index card for each test.

Scantron

SCANTRON FORM 882-E IS REQUIRED FOR ALL EXAMS!

Test dates

Test dates are listed on page 2 in the course calendar. For classes that meet twice per week, tests will take place on the second day of the week. The dates listed in the calendar are tentative, but will not change unless announced one week in advance. Any changes may also be posted on the class website.

Test Rewrites

Test re-writes are available for all but the last test. These rewrites are an educational way to increase the scores you earned for the tests and help you learn from your mistakes. See page 11 for test rewrite directions and for more information. The fifth code word is your first name.

Missing an exam

If you miss an exam... All students will have their lowest test grade dropped. Therefore there are no make-up tests after the last section of the class has taken its test. If you know you will be absent on one of the dates

above, **contact the instructor at least two calendar days prior** to the test to see if there is a way to accommodate you at another time (e.g. another section).

Student Expectations

Keep all handed-back assignments

My computer frequently deletes and changes scores. If my computer has a mistake, this will allow you to make sure you receive the grade you have earned.

Attendance

Please be prompt and do not leave class early without a good reason. **Attendance in this class is mandatory, will be taken daily, and will form part of your grade** through the clicker points. The reason attendance is mandatory is because material will be covered in class in more detail than in the text and this extra material will appear on tests. We will also be doing several activities that require your participation and discussion. For this reason, watching the videos at home instead of coming to class is insufficient.

See also the College Catalog for attendance policy information. This can be found on page 11 of the 2009-2010 College Catalog.

Drop/withdraw deadlines, non-attendance

If you've missed more than **six** hours of class without justification, you **may** be dropped. However, if you wish to be dropped from the class, it is your responsibility to withdraw. Do not count on me to drop you just because you do not show up for class. Students who withdraw from the course after **November 20** will receive a letter grade based on the entire semester's requirements. If you wish to receive a refund for this class, you must drop by **September 11**. If you wish to drop and receive no mark on your record, do so by **September 25**.

See also the College Catalog for attendance policy information. This can be found on page 11 of the 2009-2010 College Catalog.

Study sufficiently

You should plan to work outside of class for at least 1.5 hours (and more likely 2-3 hours) for every hour of class time (which amounts to 4.5-9 hours per week). It should take you at least 30 minutes alone to do the required reading and homework each night. While this may sound like a lot, probably more than your work in high school, it is no more an impingement on your time than most college classes at four-year schools (e.g. USC, UC, CSU). You are expected to work at (or above) the college level and most of you will find that this requires a lot of preparation outside of class.

Ask Questions

The most important expectation I have of you is to **ask questions** (either in class or in office hours) especially if you do not understand something covered in class (or in the readings). **Don't be shy**, since **others likely share your concerns**. Chances are that if you are having trouble with something in class, **you are not alone** and I need to address it.

Cell Phones and Pagers – please turn them off

Ringtone phones and pagers are distracting to the teacher and other students. Please be considerate and turn off such devices.

HOMWORK ASSIGNMENTS

Important note: you may not need to turn in all homework assignments. Make sure there is a due date for an assignment.

Unit 1 – Overview of Universe

Due _____ 1. Index card & clicker contract.

Due _____ 2. Article: *Ten Important Days in the History of Astronomy*. Answer 10 questions at the end. (See web page and/or handout.)

Due _____ 3. Answer the questions at the bottom of the “See for Yourself,” on page 8. (You don’t need the sky chart. You saw it in class.) Also do the Common Misconception interviews on pp. 7 & 13 as described on the Homework Directions page of this handout.

Due _____ 4. Chapter 1 end-of-chapter questions on page 24: 15, 17, 21, 24, 25, 26, 29, 34.

Unit 2 – Moon phases & Scientific Method

Due _____ 5. Chapter 3 end-of-chapter questions on pages 88-89: 21, 22, 24 34, 35, 36.

Due _____ 6. Chapter 2 end-of-chapter questions on page 54: 26, 33, 35, and Think About It on p. 44 and Common Misconception Interview for the misconception on p. 44 “What is the dark side of the Moon?” and “Is that side always dark?”

Due _____ 7. Ranking Tasks (handout) Moon Phases: 1 through 4. You should definitely look at #5, though. (hint)

Unit 3 – Light, Earth’s Atmosphere

None (yet).

Unit 4 – Seasons

Due _____ 8. Common Misconception interviews for pp. 38 & 39. “What causes seasons on Earth?” and “Point where the Sun is at noon.”

Due _____ 9. Ranking Tasks (all of them) related to Seasons (separate handout)

Unit 5 – Kepler’s Laws, Newton’s Laws

Due _____ 10. Chapter 3 end-of-chapter questions on page 89: 29, 30, 31, 32, 33

Due _____ 11. Chapter 4 end-of-chapter questions on page 145: 21, 23, 29, 30, 32.

Due _____ 12. Chapter 4 end-of-chapter questions on page 145: 20, 33, 36, 37.

Due _____ 13. Gravity Ranking Tasks 1-5 & 7.

Unit 6 – Tides, Solar System Overview

Due _____ 14. Chapter 4 end-of-chapter questions on page 145: 24, 25, 38.

Due _____ 15. Chapter 7 end-of-chapter questions on pages 231-232: 17, 20, 22, 23, 27, 30.

Unit 7 – Solar System Formation, Solar System Geology, Radioactive Decay & Radiometric Dating

Due _____ 16. Think About It on page 237, Chap 8 end-of-chapter quest on page 252: 25, 27, 29, 31, 33.

There are no radiometric dating questions in your textbook appropriate for homework. But you should DEFINITELY study this topic.

There may be one more assignment, from the Chap 9 end-of-chapter questions on p. 292.

HOMWORK DIRECTIONS

Important homework formatting instruction: All homework should specifically list the assignment at the top of the page and include the chapter number and the types of questions/assignment being submitted. List this information at the top of the page. This will help both you and me verify that you have done the correct assignment.

- Example, “Assignment #4, Chapter 1: 15, 17, 21, 24, 25, 26, 29, 34.”

How to do a “Common misconception” homework assignment

- Read the Common Misconception on the page indicated and understand it. Then ask 5 people **not in an astronomy class** about the misconception, following the examples below. **Write down and submit their answers AND THEIR explanations.** If the people you interview ask you a question you can't answer, share it with the class next time we meet or write it on your paper. I urge you to explain the real situation to the people you interview who get it wrong, but that's optional.
 - Common Misconception question #1: For the misconception on page 7, ask “Is the following statement reasonable or correct: ‘It will be light-years before anyone builds a better product?’”
 - Common Misconception question #2: For the misconception on page 13, ask “Which is bigger, the solar system, the galaxy, or are they the same?”
 - GENERAL DIRECTIONS: In general, when you are assigned a Common Misconception, you will ask 5 people a question to determine if they have the common misconception or if they understand things correctly.
- **Why I assign these problems.** These assignments ask you to interview people in “the real world” about their knowledge of astronomy. This helps you understand (and hopefully appreciate) how much you have learned compared to those less educated. It also gives you a chance to learn using one of the best known techniques that exists: teaching something to other people who don't understand.

How to answer a “Test Your Understanding,” “Quick Quiz,” or any question that offers a choice of answers.

- For each question, pick your answer **and write at least one sentence justifying your choice** and explaining why your choice is the best from the options listed. Read the directions for the “Test your Understanding” questions because they change from one chapter to the next! Example answer for Chapter 1 question #23 (page 24). ANSWER: Does not make sense because if the Earth is the size of a basketball, some objects would be too far away to fit inside a park.
- **Why I assign these problems.** These assignments are typically multiple choice types of questions, although some of the “choices” are non-conventional. Some questions like these appear on your tests. You are asked to explain your choice because you may incorrectly understand a topic while still picking the right answer. Tests tend to ask questions about the same topics but with slightly different words, or they expand on the topics in the homework. Therefore it is important for you to understand the concept, not just to get the right answers on the homework. I ask for your reasoning behind your choice so I might provide feedback where necessary.

ASTRONOMY TEST REWRITE INSTRUCTIONS

For up to half of the credit lost per question, you may rewrite any questions that you got wrong, except the ineligible questions listed by the instructor when handing back the tests. (These ineligible questions will also be posted to the web page.) To get credit, you must:

1. Explain BOTH why your answer is incorrect and why the correct answer is correct. Often you can explain both with the same explanation.
2. You should NOT explain why you picked the wrong answer – you should only explain why that answer is not correct, as discussed in #2 above. (I'm not interested in why you got the answer wrong.)
3. Write or type all answers on your own paper, NOT the original test or scantron.
4. Do not write on the scantron form or on the test questions – I will not look at them.

This re-write is due one week after the test is handed back in class, except as noted in the next sentence. You may use the NQA coupon to postpone the rewrite due-date by one week. After that, the test rewrite will not be accepted.

Questions NOT eligible to be re-written will be given during class. Maximum extra credit per question re-written: $\frac{1}{2}$ the value of the question
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You may use any resource available to you to help you determine the correct answers, including other people. However, **what you submit must be written in your own words.** If you work in a group, **you must make sure not to have identical explanations or else you will get no credit for the assignment.**

Test rewrites, like all homework, may be submitted by email. Email submissions tend to get more comments, but also tend to be handed back a little later.

NQA COUPONS

Everyone deserves another chance, so here are two “NQA coupons” for you. You may use an NQA coupon if you are unable to turn in a homework assignment on the day it is due. Coupons allow you to postpone assignments by one week. Coupons will only be accepted for homework assignments or test rewrites, not tests.

For once-a-week classes, you will often have two assignments due per week, so you may need to use BOTH coupons if you forget all of your homework for the week if you need to postpone all homework.

Remember there are many ways to get the homework to me on time, even if you don't make it to class. You can ask a classmate to submit it for you (although YOU are held responsible if I don't get it), you can email it to me, or drop it off early.

You need not cut out the coupon below. You can simply turn in a piece of paper (or email) with your name, the day(s) your class meets, and which assignment you are using the coupon for.

I keep track in my computer of which assignments you have used your coupon for and how many you have used. Unused coupon(s) will automatically be redeemed at the end of the semester if a student has missed an assignment(s).

NO QUESTIONS ASKED COUPON #2

Used by: _____

Used for: _____

Only valid for Homework Assignments or for postponing test rewrites.

NO QUESTIONS ASKED COUPON #1

Used by: _____

Used for: _____

Only valid for Homework Assignments or for postponing test rewrites.

EXTRA CREDIT

Extra credit – should you do it?

While extra credit is available, it is MUCH more likely that you will improve your grade by spending time studying. How much could you learn during the time it takes to go to watch an astronomy movie? You have to go to the store and get the movie (1 hour). You have to watch the movie (3 hours). Then you have to write a report about it. (1 hour). Total time spent: 5 hours. You'll probably gain more points by taking those 5 hours and preparing for the next test.

Extra Credit write-ups are due no more than 2 weeks following completion of the extra credit event. Use complete sentences for all answers. Always explain your thinking clearly.

Grading scheme:

- 5 points – complete answers with enough detail so that *others could learn astronomy from what you wrote*
- 4 points – complete answers with detail such that I can see what you learned about astronomy
- 3 points – most answers are complete; you discussed some astronomy
- 2 points - evidence indicates entire event was attended (for open-ended events, such as ECC telescope viewing, you must provide physical evidence of attendance for at least 45 minutes).
- 0 points - some answers are missing or provide insufficient detail. You did not demonstrate that you paid attention or learned much about astronomy.

Sky (naked eye/telescope) viewing OR visiting an astronomical establishment

Examples include:

- **Griffith Observatory** (eligible for up to double credit **if** you give detailed responses and explanations because there are so many exhibits). This is one of the best public astronomy facilities in the world. Many of the topics we discuss in this class have corresponding exhibits at Griffith. The more you explain about those exhibits, the more credit you will receive. Entrance to the observatory is free, but planetarium show tickets are not. For reservations and for more information, check out <http://www.griffithobs.org>
 - Telescope viewing available at night, but much less than what'd you see at an ECC session
- **Jet Propulsion Laboratory Open House** (only occurs during Spring semester; eligible for up to triple credit **if** you give detailed responses and explanations because there are so many exhibits). This is where the work behind many of the discoveries about the planets were done. Most of the planet pictures I show during class were taken by spacecraft built by JPL. The more you explain about those exhibits, the more credit you will receive. Entrance to the open house is free. For more information, check out <http://www.jpl.nasa.gov/pso/oh.cfm>
- **ECC telescope viewing sessions:** look around the planetarium for upcoming dates.
- **Mt. Wilson Observatory:** north of Pasadena, may be open to visitors on weekends. Their 100-inch reflector was the world's largest during the first half of this century. Call (626) 793-3100 for hours.
- **Palomar Mountain Observatory:** about 100 miles south of here, has a small astronomical museum and a gallery for viewing of (not through) the 200-inch telescope. Call (626) 395-4033 or <http://www.astro.caltech.edu/palomarpublish/index.html> for info. Feedback about the posters in the gallery is required in your report (since I made some of them.) This is a few hours away and is up a mountain on a curvy road. Allow 3 hours travel, each way. Closer to San Diego than LA.
- **California Science Center** (but they don't always have astronomy exhibits), is located at 700 State Drive in Exposition Park, Los Angeles. Open from 10am-5pm daily. Admission is free, but parking is \$5. See <http://www.casiencectr.org> or call (323) 724-3623 for more info
- **Local planetarium events** like a public show at ECC, Santa Monica College, Orange Coast College.

You are not allowed to visit the same place twice, except for public viewing (e.g. telescope sessions).

Questions you must answer for sky viewing OR visiting an astronomical establishments

1. **The most important question:** What did you learn about astronomy? What did you see/hear that you already knew from class?
2. Answer the appropriate version of this question.
 - a. *For observatories/museums only:* What exhibits did you see & what did they try to teach?
 - b. *For night sky indoor planetarium shows only:* What did you see that would help you learn things we discussed in class?
3. What were your overall impressions of the visit/event?
4. Was it a good show or program?
5. What was the most interesting aspect, and/or what impressed you most? Why?
6. What was the most confusing part, and/or what impressed you least? Why?
7. Would you recommend it to other astronomy students? Why or why not?
8. According to the scale at the top of this page, how many points do you deserve and how do you meet the criteria listed at the top of the page?

Movies, books, and television shows. You may suggest other movies or TV shows not on this list. Movies include: *Apollo 13*, *An Inconvenient Truth*, *Deep Impact*, *Contact*, *Roving Mars*, and *Armageddon*. TV shows include: any episode of *The Universe* (on History Channel), any episode/segment related to astronomy of NOVA (on PBS and some are online at <http://www.pbs.org/wgbh/nova/>). Books need instructor approval first.

Questions for movies, books, and television shows

1. **The most important question:** What did you learn about astronomy? What did you see/hear that you already knew from class?
2. What were your overall impressions about the astronomy/science in the show/book?
3. According to what you already knew, was the astronomy accurate? If you don't know, ask me *specific questions related to the astronomy in the movie* before you submit this.
4. Was watching/reading the show/book worthwhile, in terms of helping you with astronomy?
5. What was the most interesting aspect, related to astronomy?
6. What was the most confusing part about the astronomy?
7. Would you recommend it to others for astronomy learning? Why or why not?
8. What impressed you most about the science in the movie? Least? Why?
9. According to the scale at the top of this page, how many points do you deserve and how do you meet the criteria listed at the top of the page?

Talks given by an expert in some field of astronomy

Examples include: talks given during South Bay Astronomical Society meetings (SBAS). Meetings are typically held on the first Friday of each month, except when there is a nearby holiday, in which case it is the second Friday of the month.

Questions for talks

1. Where is the speaker from and what is his or her area of expertise? Get this information from the speaker's introduction. If there is no introduction, specifically state that and try to answer this question based on the rest of the talk.
2. Beyond simply rephrasing the title, what is the overarching scientific question the speaker is trying to address?
3. Where does the data come from? (Which telescope, observatory, satellite, person, etc.?)
4. What makes this particular work complex or what difficulties did the speaker encounter in doing the work?
5. What does the speaker still not know about this area or what are the next steps in the project?
6. Ask a question to the speaker not on the list above and write down the answer.
7. What was the most interesting aspect of the talk?
8. What was the most confusing part of the talk?
9. According to the scale at the top of this page, how many points do you deserve and how do you meet the criteria listed at the top of the page?

STUDY GUIDES AND COURSE UNITS

This course is broken up into 7 units. Each unit will conclude with a test.

Strongly recommended reading:

- Pages xxiv-xxv, How to Succeed in Your Astronomy Course

Interesting reading

- Pages xxvi-xxviii, Forward: The Meaning of *The Cosmic Perspective*

Most of the Study Guide is a list of useful review questions & “common misconceptions” from *The Cosmic Perspective*, 5th edition. Some numbers refer to question numbers at the end of the chapters, while others refer to page numbers where the indicated item can be found. For the questions at the end of the chapter, underlined numbers refer to more conceptual questions, and more closely resemble test questions. Non-underlined numbers refer to more factual (or vocabulary) questions which, while less likely to be on tests, are important because you need to understand some facts and vocabulary to help understand certain concepts. See also Course Goals #6 & #8.

Unit 1 info – Universe Overview, Scale Models, Motions

Don't forget to make a 3x5 handwritten notecard for the test.

Useful reading, questions, and activities

Chapter 1 – Universe Overview, scale models, and motions

(page 23) Short answer: 3, 4, 5, 6, 7, 8, 10, 14

(page 24) Test understanding: 15, 16, 17, 18, 21, 22, 23, 24

(page 24) Quick Quiz: 25, 26, 27, 28, 29, 32, 33, 34

Think about it page 17.

See it for yourself page 8.

Common Misconceptions pages 7, 13

Lecture Tutorials: Milky Way Scales (p. 123), Looking at Distant Objects (p. 131), Expansion of the Universe (p. 133)

Don't forget to make a 3x5 handwritten notecard for test #1

Below are **notes that I used for the planetarium show** that we did during the first week.

Things you should learn/remember from the planetarium show

The planetarium show covers several topics in chapters 1 and 2 of the book. So, while it may have been fun, there were some things I expect you to learn from it.

The following planetarium show concepts are from chapter 1.

- Concept of light year and consequences of things being far away (pages 7-9)
- Definitions (page 2 & 6) and distance (pages 9-14) to the Moon, Sun, general distances to planets, stars, and galaxies.
- Why is the north star special (pages 15-16)
- Motions in the sky (pages 15-19)

The following planetarium show concepts are from chapter 2.

- What are constellations (pages 28-29)
- What is the Milky Way and what does it look the way it does (page 30)
- Why do stars rise and set (pages 31 & 33)

Fun stuff

Zodiac signs. See web page for your true zodiac sign. We will also discuss this at the end of our “seasons” portion in astronomy 20 (but not astronomy 25). For a sneak peak, look at pages 41-42 about precession & Sun signs.

Unit 2 info & study guide - Science & Scientific Method, Moon Phases

Chapter 3 – Science & Scientific Method

(page 88) Short answer: 1, **13**, 14, 15.

(page 88) Test understanding: (unusual format for these questions) 18, 20, 21, 22, 23, 24, 25, 26.

(page 89) Quick Quiz: 34, 35, 36.

Process of Science: 40 (worth thinking about, but not on your test)

Think about it pages 84.

See for Yourself, page 86.

Chapter 2 – Moon phases

(page 54) Short answer: 12, 13, 14

(pages 54-55) Test understanding: 26

(page 55) Quick Quiz: 27, 30, 33, 34, 35

(page 55) Process of Science: 38

Think about it pages 30, 33, 44, 45

Common Misconceptions pages 31, 33, 36, 44, 45

Lecture Tutorials: Causes of Moon phases (p. 79), Predicting Moon Phases (p. 83)

Ranking Tasks: See web page/handout for Moon phases Ranking Tasks 1-5.

Don't forget to make a 3x5 handwritten notecard for the test

Unit 3 info & study guide – Light, Earth's Atmosphere

Chapter 5 – Light, read section 5.1 (pp. 150-152), “What is the electromagnetic spectrum” part of section 5.2 on pages 155-157, “Chemical fingerprints” of section 5.4 on pages 166-167, and “How does light tell us the temperatures of planets and stars” pages 167-168

Short answer: 2, 3, 5, 7, 15, 16

Test understanding: 19, 20, 21, 22

Quick Quiz: 29, 31, 36, 37

Common Misconceptions pages 157 (both of them), 158

See It For Yourself page 168

Chapter 10 – Planetary atmosphere, read “Where Does an Atmosphere End?” through pages 299-302, “What factors can cause long-term climate change” part of section 10.2 on pages 311-312, on “Martian Seasons and Winds” on page 317, about ozone on the first paragraph of page 325, and “How is human activity changing our planet” on pages 328-331. You may also enjoy reading why the sky is blue on pages 304-305. (Why the sky is blue won't be on any tests.)

(page 333) Short answer: 4, 5, 17, 22

(page 333) Test understanding: 31

(page 333) Quick Quiz: 36, 40

Common Misconceptions page 302, 325

Think About It page 303
See It For Yourself page 301

Don't forget to make a 3x5 handwritten notecard for the test

Unit 4 info & study guide – Seasons

Seasons, Chapter 2 – Seasons

(page 54) Short answer: 9, 10, 11

(page 55) Test understanding: 24

(page 55) Quick Quiz: 31, 32

Think about it page: 38

Common Misconceptions pages 38, 39. “What makes it hot in summer & cold in winter?” and “Point where the Sun is at noon.”

Lecture Tutorials: Path of the Sun (pp. 87-90), Seasons (pp. 91-96)

Ranking Tasks: Seasons

Don't forget to make a 3x5 handwritten notecard for the test

Unit 5 info & study guide – Kepler's Laws, Newton's Laws

Chapter 3 – Kepler's laws

(page 88) Short answer: 12

(page 89) Quick Quiz: 29, 30, 31, 32, 33

Think about it pages: 74

Lecture Tutorials: Kepler's 2nd law (pp. 21-24), Kepler's 3rd law (pp. 25-27)

Ranking Tasks: Kepler's Laws 1, 2, 3, 5 (skip #4)

Chapter 4 – Gravity. Also read pages 313-316 in chapter 10 about the “Losses of Atmospheric Gas” and how it works on the Moon and Mercury.

(page 145) Short answer: 1, 2, 4, 5, 11, 13, 18

(page 145) Test understanding: 19, 20, 21, 22, 23

(page 145) Quick Quiz: 29, 30, 31, 32, 33, 36, 37

See for yourself page: 122

Think about it page: 124, 134

Common Misconceptions pages 125, 128

Lecture Tutorials: Newton's Laws & Gravity (pages 29-31)

Ranking Tasks: Gravity (all of those handed out)

Don't forget to make a 3x5 handwritten notecard for the test

Unit 6 info & study guide – Tides, Solar System Overview

Chapter 4 – Tides

(page 145) Short answer: 15, 16, 17

(page 145) Test understanding: 24, 25

(page 145) Quick Quiz: 38

Think about it page 141

Common Misconceptions page 141

Chapter 7 – Solar System overview

(page 231) Short answer: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

(page 231) Test understanding: 15, 17, 18, 20, 21, 22, 23

(pages 231-232) Quick Quiz: 25, 26, 27, 28, 29, 30, 31, 32, 33

Think about it pages: 209, 212.

See for yourself page 230 (for fun)

Don't forget to make a 3x5 handwritten notecard for the test

Unit 7 info & study guide – Solar System Formation, Solar System Geology, Radioactive Decay & Radiometric Dating

Chapter 8 – Solar System formation and radioactive decay

(pages 251-252) Short answer: 1, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14

(page 252) Test understanding (unusual directions): 15-20, 22-24 [i.e. all except #21]

(page 252) Quick Quiz: 25, 26, 27, 28, 29, 31, 33, 34

Think about it pages: 237, 240, 249

See for yourself page 238

Common Misconception page 243

Chapter 4 – Conservation of Angular Momentum, page 129 (just this one topic on this one page)

Chapter 9 – Planetary geology

(page 291) Short answer: 2, 3, 4, 5, 8

(pages 291-292) Test understanding: (unusual directions): 20, 21, 23, 26, 28

(page 292) Quick Quiz: 31, 32, 33, 34, 36,

Think about it pages: 262, 271, 276

Common Misconception pages 260, 262

Don't forget to make a 3x5 handwritten notecard for the test.

There will be no rewrite for test #7.

Due to time limitations, we are unable to cover all of chapter 9 and must omit most of chapter 10 (other than what we covered with global warming and the ozone layer), chapter 11 (about the Jovian planets), chapter 12 (asteroids, comets, and plutoids/dwarf planets), and chapter 13 (other planetary systems). We have touched on all of these subjects throughout the class, particularly the other planetary systems.

While it is unfortunate we cannot cover all of these last few topics in more detail, if you skim through the chapters, you will discover they are different than the first 9 chapters we covered. These last chapters are mostly encyclopedic and factual in nature. They are less conceptual. I have decided to dedicate most of our class time instruction to helping students understand concepts that are challenging to learn without an instructor. I have removed most of the memorization and presentation of facts to focus on concepts, answering student questions, appreciation of astronomy and science, and to let you know about the many exciting projects scientists – astronomers in particular – are working on. This choice comes at the expense of not “covering” the last few chapters. However, it is my firm belief that if these latter topics interest you, there was little I could do to help you learn the material that the well-written textbook does not do on its own. I would merely have been lending my narration to the well-written words crafted by your textbook authors.

SUGGESTIONS FOR GETTING A GOOD GRADE

Your teacher's commitment to you

I hope to create a friendly, non-threatening atmosphere in class. Hopefully this will give you an opportunity to form study groups with your peers.

Astronomy resources for you

These include, in no particular order:

1. The professor
2. Your classmates
3. The entire textbook, including the introduction "How to Succeed in Your Astronomy Class"
4. *The questions asked by the book in the middle of the chapters*
5. The end-of-chapter questions
6. Mastering Astronomy website: www.masteringastronomy.com, which is free to you when you purchase a new textbook.
7. The FREE astronomy tutor(s)

Why homework is assigned

In 2006, an astronomy student received low grades on the first two of the four tests I offered that semester. She came to speak to me and afterwards she started to seriously use **all** of the resources listed above. She also followed the advice given about studying regularly. As a result of her hard work and dedication, especially in the 2nd half of the semester, she earned the highest grade in her class on the last exam. The resources truly are helpful! This story (and its occurrence more than once) is why we now have frequent homework assignments based on the 4th (starred) item in the list above. It truly is for your own good, I promise

More Suggestions for getting a good grade

1. Develop college-level study habits

This is a college level class. You are expected to work at a college level, and that requires good study habits which, most importantly, include study and thinking time and effort from you. You will do better if you come to class, pay attention and are THINKING about what is discussed. If you don't do all of those, expect to have a more difficult time. And of course, **study regularly, not just a day or two before the tests.**

2. **Reading** the textbook is important; please do so often. I chose this textbook for a reason, and I want you to take advantage of this expensive and important resource. Your first week, in addition to the appropriate chapter(s), I suggest the following.

Strongly recommended reading:

- Pages xxiv-xxv, How to Succeed in Your Astronomy Course

Interesting reading

- Pages xxvi-xxviii, Forward: The Meaning of *The Cosmic Perspective*

3. Form study groups and compare notes with classmates before and/or after class

Research has shown that most groups of 2-4 study very well together, and most students benefit from studying in groups more than they benefit by working alone. The group's stronger students improve by helping the other students because **you learn the most (i.e. a lot) when trying to explain things to others.** The not-as-strong students improve because they have a personal "tutor." Everyone wins.

4. Ask questions in class

There are plenty of opportunities in class to ask questions. There may be times when you feel like you simply “don’t get any of it.” Stop me BEFORE you get to this point. If you are making a serious effort to understand class and aren’t getting the concept at all when we’re discussing it, let me know during class, because you’re not alone.

5. Physical science classes are not always focused on memorization

The bulk of the **test questions are about concepts, not facts**. Facts can be memorized; concepts must be understood. If you spend most of your study-time for this class trying to memorize things, you’re setting yourself up to do poorly because you’ve misunderstood one of the major goals of this course. You need to study concepts MORE than you need to memorize facts. Most students are required to take a science class to help learn how to think critically, not to memorize a bunch of facts you’ll never see again in your life.

6. Extra credit – should you do it?

While extra credit is available as described on page 13, it is MUCH more likely that you will improve your grade by spending time studying. How much could you learn during the time it takes to go to watch an astronomy movie? You have to go to the store and get the movie (1 hour). You have to watch the movie (3 hours). Then you have to write a report about it. (1 hour). Total time spent: 5 hours. Maximum possible score: 5 points. You’ll probably gain more points in this class by taking those 5 hours and preparing for the next test or doing a rewrite more carefully.

7. Take thorough notes

Write down anything the teacher writes down or presents on the computer screen. If there wasn’t enough time, check the video, web page, and/or visit the instructor during office hours.

The one thing most students don’t do enough: **write down things teachers say**, including questions asked during class and the answers to them. I try to give time for students to think about the answer before I give the answer, sometimes waiting until the next class period before giving the answer. Use that “wait time” to think about the question, and if you get it wrong, write yourself a note “I didn’t get this during class.” Write this note EVEN IF you understand the answer after it’s given, because it is not something you got on your first try. Therefore this was not something “easy” for you.

8. Make notes to yourself in your notes; rewrite your notes

In past semesters, students who have been happy with their grades have put marks in their notes during class when they noticed they were struggling with a concept. This note reminded them to study that particular topic more carefully. Similarly, when hints are given during class about what material will be on tests, students made notes of that and studied that material more.

Also, students rewrote, by hand, notes they took during class. Writing things in your own handwriting helps some students remember and understand material.

9. Review your notes, multiple times

Review your notes at least twice: once the same day of class (with a colleague, as recommended above), and at least once more within a week. Then, review your notes again while studying for the test.

If you try to do all of your studying a day or two before the test, like the 12 foot toss in the ring toss game, you’re asking for trouble. You are also putting yourself at a big disadvantage if you try to cram at the last minute because you can’t ask questions if you get stuck.

10. What to study

First and foremost, **review your notes and handouts**. Nearly all of the questions come from material we discussed in class. Test questions may not be exactly the same questions asked in class, but if you truly understood the concepts in class, you should be able to answer all of the test questions correctly. Review the questions in the book, especially those listed in the study guides starting on page 15.

11. Under-used services

Very few students come to **see teachers during office hours**. If my office hours aren't convenient for you, set up an appointment. I'm here a lot. Another option: send me email asking questions about class or call me on the phone. Kristen Spendlove, the **FREE astronomy tutor** in the Learning Resource Center, is also available. She will offer additional help, both general and topic-specific. She's a great resource.

12. Test-taking strategies

Get a good night's sleep. The extra 1-2 hours you spend cramming at the end of a long night probably won't help you as much as having a fresh, alert mind. You don't retain a lot of material you read, if you're very tired when you read it.

Many students finish tests before class ends and then they leave. Unless you're in a hurry, there is no reason to leave the moment you answer the last question. Many students lose points even when they know material because they accidentally left questions blank, marked the wrong answer, or marked the answer but for the wrong question. You have plenty of time in class to take the exams, and I give you that much time for a reason. **Use the time to your advantage. Check your work and don't leave ANYTHING blank.** You might guess right.

Read a question entirely, TWICE, before you write anything down.

You have plenty of time to **go through the test multiple times**. I recommend answering all of the "easy" questions first. For questions you don't know, leave them blank on your first try, and then go back through the test later and answer them. Whatever you do, before you turn in the test don't leave a question blank, even if it seems too hard.

Compare questions that are asking about similar concepts. For instance, if question 1 asks when a new moon rises, and question 12 asks when a new Moon sets, you should know the time difference (12 hours) and can make sure your answers are consistent.

On questions that seem confusing or tricky or unfamiliar, try to **break the question down into smaller questions**. On ANY question, ask yourself a question similar to the one on the test, to see if you understand the concept. In other words, change the question around. If you can't answer your own question, you might want to think about the actual question more. For complicated questions, try to simplify the question and answer that. Then try to add in the complication.

13. About the homework

- a. Don't try to answer the question by flipping through the book (or your notes), finding the appropriate text or picture, and writing down your answer. You haven't learned anything from this. Instead, try to understand the paragraphs and pictures about the topic first. Afterwards, answer the homework question in writing.
- b. **Homework is such a small part of your grade – the only reason you have to do it is to help you learn.** It is NOT a big grade factor. **Use homework to learn, not just to get a grade. If you don't think about the homework, you're not learning anything.**

STUDENT SUPPORT SERVICES

There are many student support services that may help you while you attend El Camino College. Some of these are directly relevant to astronomy, while others are more general.

For **financial assistance**, please consider visiting the **Financial Aid** office as well as the **CalWORKS** department and/or the **EOPS program**.

El Camino College also has a **full service health center** located next to the pool. Their phone number is (310) 660-3593 extension 3643. Because ECC believes healthy students are more likely to be successful students, we offer a **variety of health services for you, either free or at a very low cost**. The FREE services include: chiropractor, physician (doctor), psychological counseling (group or individual), HIV testing, and STD (sexually transmitted disease) testing. Low cost services include: pap smears, blood tests, pregnancy tests, and immunizations.

The Health Center offers **free workshops** for students on the following topics: **managing anxiety, anger management, understanding depression, test anxiety, and building long-term relationships**. See the Health Center for specific dates and times.

You may wish to consider enrolling in one of the Academic Strategy classes below. These are 2-unit, credit/no credit classes (i.e. no letter grade assigned) which meet 4 hours per week for eight weeks. See the Fall Schedule of Classes for more information.

Academic Strategies 25ab, **Thinking Skills for College Courses**

Academic Strategies 30ab, **Test-Taking Strategies**

Academic Strategies 31ab, **Study Techniques**

Academic Strategies 33ab, **Memory Techniques**

Academic Strategies 35ab, **Listening & Note-taking Strategies**

Academic Strategies 40ab, **Mathematics Anxiety**

You might also want to consider the **Student Enhancement Program (SEP) Workshops** in Counseling Services. These are a series of workshops offered throughout the year which help students generate solutions to **problems affecting academic performance**. Students discuss problems, formulate action plans, engage in exploration of resources, and report back to their group their findings and action taken. For more information visit the counseling center, or call (310) 660-3593 extension 3458.

There are also a variety of student group programs that have been shown to be very successful. These include **the First Year Experience, Project Success, the Puente Program, CASA**, and other programs in the Student Services area, often called “**SSTARS**.” Please investigate.

For more information about anything on this page, and especially for help choosing which courses to take, **see your counselor. If you don't have a counselor you know by name, make that a TOP PRIORITY!**

ADVICE ON CREATING FLASH CARDS

Flash cards are useful for a variety of study environments, especially memorization. Generally, breaking up memorization is easier when you break it up into smaller increments. Here are some tips created by one of my geology colleagues about creating flashcards for this or any college course:

1. Use small cards, such as 3 x 5 cards, or cut up paper into small cards. The more cards the better.
2. Do not put too much information on each card. Just one or two things (otherwise, you defeat the whole purpose of them). Cards are not study sheets. They are “quick checks” of one or two items.
3. Put the question/vocabulary word on one side (label it “Q”) and put the answer/definition on other side (label “A”).
4. To make study time more efficient, go through your notes a few times before creating your flashcards, so that you can write flashcards for only information you haven’t already memorized.
5. Do not wait until just before the exam to make the cards. These should be done every week – remember the 3 foot tosses - and studied well before the exam.
6. The cards should be studied by you first. Then, the have a partner ask you the question and you provide the answer.
7. There are at least four types of flash cards:
 - a. Concepts: These are typical long answer questions on tests. These often involve why and how things happen.
(example: Q: What is the cause of longer summer daytimes?)
 - b. Lists: These are typical multiple choice questions.
(example: Q: Which direction is the Sun at 6am
A: East
 - c. Definitions: Know the meaning of important words.
(example: Q: What is an astronomical unit?
A: The distance between the Earth and Sun, 93 million miles, 8 light minutes.
 - d. Diagrams: Know how to draw, label, and understand the diagrams (including maps) we have used in class.
(example: Q: Draw the Moon, Earth, and Sun when the Moon is first quarter and it is noontime.)

Remember: These don’t do you much good unless you give yourself time to study them and quiz yourself over and over.

Make one example of each type of flash card (see attached advice sheet)

Put “question” or blank diagram on “front side” and “answers” or labeled diagram on “back side.”

Name: _____

Class Time: _____

LIST

“Front”	“Back”
---------	--------

DEFINITION

“Front”	“Back”
---------	--------

DIAGRAM

“Front”	“Back”
---------	--------

CONCEPT

“Front”	“Back”
---------	--------

CLICKER USAGE

Please read this entire sheet! Keep this for your records.

Each clicker has a label on the back with a number on it. From now on, you should use the same clicker for every class.

My Clicker Number is _____

Voting

To vote, press and release the number of your choice. The **light** above the “1” should blink amber (orange) until the signal is received by the teacher’s computer. When the signal is received, the light should turn green and then go off. If your response was a valid choice (i.e. 1 or 2 for a True/False question – 3 through 9 are not valid choices for T/F questions), the response box (projected on the same display as the question) corresponding to your clicker number should change from the background color to a different color.

Changing your vote

Except for questions that allow more than one choice, you may change your vote as many times as you like until polling closes. Only your final vote will be recorded by the computer unless told otherwise. Each time you change your vote, the response box corresponding to your clicker number will alternate between two colors. Polling opens when the PowerPoint presentation shows a green box in the upper right corner. When that box turns red, polling closed.

Troubleshooting:

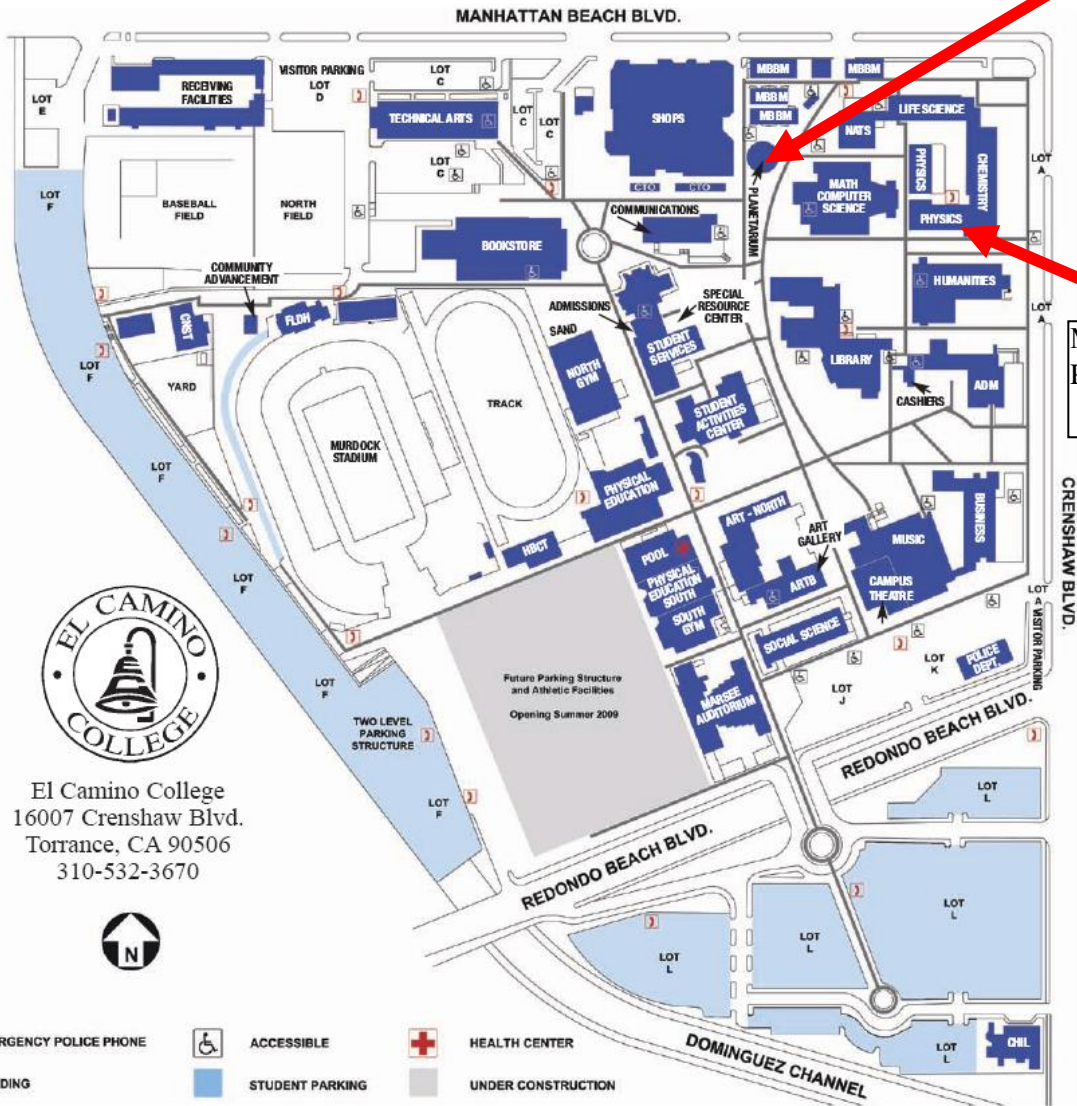
- 1) If your signal was not received by the teacher’s computer, your light will flash amber (orange) up to 10 times and then turn red. Try resubmitting your vote. If it doesn’t work the second time, try again and if it still fails, ask your teacher for a temporary replacement clicker to be used for the rest of class.
- 2) **Don’t press the “Go” button** below the “7”. This will change the “channel” of your clicker, and your teacher’s computer only reads channel 41 right now. All clickers are currently set to channel 41. If you do accidentally press “Go”, the colors on your clicker light should alternately flash red-orange-green. When this happens, press “4” and “1” and press “Go” again. This should turn the light green, indicating you successfully changed back to channel 41. If not, try “Go” “4” “1” “Go” again. If that doesn’t work, ask your teacher for a temporary replacement clicker to be used for the rest of class. The last syllabus extra credit word is astronomy.



On your homework sheet, there is a clicker contract you MUST sign and submit to the instructor.

ECC CAMPUS MAP

Planetarium is here



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Torrance, CA 90506
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KEY:

- EMERGENCY POLICE PHONE
- BUILDING
- ACCESSIBLE
- STUDENT PARKING
- HEALTH CENTER
- UNDER CONSTRUCTION

EL CAMINO COLLEGE

BUILDING / LOCATION	ABBREVIATION	BUILDING / LOCATION	ABBREVIATION
ADMINISTRATION	ADM	MATH / COMPUTER SCIENCE	MCS
ART AND BEHAVIORAL SCIENCE	ARTB	MURDOCK STADIUM	STAD
ART BUILDING - NORTH	ARTN	MUSIC	MUSI
BASEBALL FIELD	BBFL	NATURAL SCIENCE	NATS
BOOKSTORE	BKST	NORTH FIELD	NFLD
BUSINESS	BUSI	NORTH GYM	NGYM
POLICE DEPARTMENT	ECPD	PHYSICAL EDUCATION	PE
CAMPUS THEATRE	TH	PHYSICAL EDUCATION SOUTH	PE-S
CHEMISTRY	CHEM	PHYSICS	PHYS
CHERRY TREE OFFICES	CTO	PLANETARIUM	PLAN
CHILD DEVELOPMENT CENTER	CHIL	POOL	POOL
COMMUNICATIONS	COMM	SAND COURTS	SAND
COMMUNITY ADVANCEMENT OFFICE	CADV	SHOPS	SHOP
CONSTRUCTION TECHNOLOGY	CNST	SOCIAL SCIENCE	SOCS
FIELDHOUSE	FLDH	SOUTH GYM	SGYM
HANDBALL COURTS	HBCT	SPECIAL RESOURCE CENTER	SRC
HUMANITIES	H	STUDENT ACTIVITIES CENTER	ACTC
SCHAURMAN LIBRARY	LIB	STUDENT SERVICES CENTER	SSVC
LIFE SCIENCE	LS	TECHNICAL ARTS	TECH
MANHATTAN BEACH BLVD. MODULES	MBBM	TRACK	TRAK
MARSEE AUDITORIUM	AUD	YARD	YARD