

Name and section: _____

- Failure to follow these directions will cause your grade to be lowered.
- All science tests, including this one, are cumulative by nature.
- Answers must be based on models developed in this course.
- You may not access a computer during the test.
- Read each problem or question carefully before attempting a solution.
- Illegible or disorderly responses will be counted as incorrect.
- Make written responses complete, but concise and to the point.
- You have more than enough space for all your answers, so do not use your own paper.
- Unless otherwise explicitly stated, explanations must consist of complete sentences.
- Unless otherwise explicitly stated, responses must not contain personal opinions.
- Correct answers without adequate explanations will be counted as incorrect.
- Correct reasoning, numerical work, and mathematical notation all count.
- You must show all your work on numerical problems and questions.
- Diagrams may not be substituted for an answer unless otherwise explicitly stated.

1. (LCTTA-01HW01) Examine each of the following passages and determine whether or not it is an argument. If it is an argument, specify both its premise(s) and conclusion. If it is not an argument, explicitly state so. You must not let personal agreement or disagreement with any of the premises or conclusions affect your responses. Do not analyze the premises for truth; assume they are true as given.
 - (a) [5 points] Faster-than-light travel is not possible. It would violate the laws of nature.

 - (b) [5 points] The flu epidemic on the east coast is real. Government health officials say so. And I personally have read at least a dozen news stories that characterize the situation as a *flu epidemic*.

 - (c) [5 points] This is an actual letter to the editor of a newspaper.

I am writing about the cost of concert tickets. I am outraged at how much ticket prices are increasing every year. A few years ago, one could attend a popular concert for a decent price. Now some musicians are asking as much as 200 to 300 dollars.

 - (d) [5 points] Witches are mentioned in the Bible. There are many people today who claim to be witches. Historical records reveal that there were witches in Salem. Witches are real.

2. (LCTTA-01HW02) For each of the following sets of premises, construct a conclusion that would be supported by the premises. You must not let personal agreement or disagreement with any of the premises or conclusions affect your responses. Do not analyze the premises for truth; assume they are true as given. All scientists should reach the same conclusion when given the same set of premises.
- (a) [5 points] Premise 1: All married people are happier than unmarried people.
Premise 2: You are married.
- (b) [5 points] Premise 1: You are afraid of heights.
Premise 2: Anyone who is afraid of heights will fall if he or she climbs a tree.
- (c) [5 points] Premise 1: If stem-cell research is banned, John and Sara will be happy.
Premise 2: Stem-cell research is banned.
- (d) [5 points] Premise 1: This course is very different from what I expected.
Premise 2: Courses that deviate from my expectations make me uneasy.
Premise 3: I tend to equate uneasiness over a course with the course being difficult.

3. (LCTTA-01HW03) Consider the following claim: We may eventually discover life on another planet.
- (a) [3 points] Decide whether or not this claim is testable. If it is testable, explain one possible test. Be careful, though, that you do not use words or descriptions of procedures you know nothing about. In other words, keep the language as simple as possible. If the claim is not testable, state so.
- (b) [3 points] If you decided that the claim is testable, now assess it for falsifiability. State your conclusion in a complete sentence.
- (c) [3 points] Suppose we carry out tests for life on hundreds of target planets. Suppose all these tests gave negative results. Have we proven that life does not exist on another planet?

4. [10 points] (LCTTA-01HW04) You are discussing UFOs with someone who has never taken a science course of any kind. The dialog goes like this, with you making the first statement.

There is no evidence that alien spacecraft exist.

Of course there is! People have seen them! That's proof enough for me.

For a spacecraft to get within sight of Earth's surface, it would surely be seen by some of the hundreds of satellites in orbit around Earth. To date, this hasn't happened.

Oh they probably have some sort of cloaking technology that renders them invisible to our satellites.

It's your turn to reply. What should you say? (NOTE: You're not being asked for your opinions here! Your reply, and there is really only one correct reply, should come from the framework we have established in class.)

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5. (LCTTA-01HW05) Carefully read this letter published on the opinion page of the Hickory Daily Record on Thursday, May 22, 2008.

In one of his most memorable sermons, “Will The Church Forget?” the late Dr. D. James Kennedy, the greatest modern Presbyterian pastor the USA has produced, was discussing those who had served in the Armed Forces. He said, “My question today is will the church forget? I don’t think it will forget you unless it should be taken over by the radical liberals of the ’60s who temporarily took over some of our college campuses and said — at the time when the world was being confronted by an increasing aggressive and hostile communism — that they stood fore-square against all anti-communism.

Believe it or not, those were Americans. Those were the radical liberals of the ’60s. Some people think they went away. They didn’t go away; they simply went underground. Today, they are still in our universities, but they are tenured, and they are teaching in our schools.”

Yes, folks, these are the professors of your children who you pay to belittle your children’s Christian faith, who you pay to teach evolution as fact and who you pay to encourage your children to equate the homosexual lifestyle with the heterosexual lifestyle.

In addition, you parents pay the colleges to provide your children with co-ed dorms and possibly co-ed rooms.

I would hazard a guess that very few colleges teach courses on Western civilization. There are probably a lot of classes on feminism, relativism and homosexual rights, but nothing on Western civilization. How many colleges teach about the Christian foundations of this nation?

How many teach that our Supreme Court in 1892 declared America to be a Christian nation by a 9-0 vote?

Are we growing a nation of pagans?

The writer’s name has been removed, and the letter has not been changed so any grammatical errors are assumed to be the either the writer’s or the newspaper editor’s.

- (a) [5 points] After reading the letter, underline the writer’s ultimate conclusion if there is one. If there isn’t one, explicitly say so.
- (b) [5 points] Strike through any statement that supports the writer’s conclusion. If you decided above that there is no conclusion, then explicitly state that there is no conclusion. Obviously, a writer can’t support a conclusion that doesn’t exist.
- (c) [5 points] Strike through any statement that provides background information or expresses a personal opinion.
- (d) [5 points] Based on whether or not a conclusion exists, state whether the writer is attempting to persuade the reader or just relating personal opinions.
- (e) [5 points] Based on this letter, what is the writer’s attitude toward education?
- (f) [5 points] Based on this letter, what is the writer’s attitude toward science?

- (g) [5 points] If you see any factual errors in this letter, circle them and do some research and correct them. Cite your sources.

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6. [10 points] (LCTTA-01HW06) You are having a discussion about science with a friend. Your friend happens to be a *relativist*. If you are not familiar with that term, you need to research it. You may be comforted to know that the term has nothing to do with physics or Einstein. After you understand what a *relativist* is, continue reading this question.

During your conversation, you state that science is a process that attempts to find truthful explanations for natural phenomena. Your friend responds by stating, "There is no absolute truth." How would you rebut this statement?

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7. [20 points] (LCTTA-01HW07) Develop a valid experiment to investigate whether or not prayer plays a role in a medical patient's recovery. You must provide detailed descriptions of your hypothesis, procedures, and analysis.

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8. (LCTTA-01HW08)

(a) [3 points] At what point, if any, in a discussion is it okay to accept someone's assertions because of their credentials?

(b) [3 points] What are the consequences of participating in a "debate" (note the quotes) over something for which there is overwhelming evidence?

(c) [3 points] To what extent should true scientists participate in "debates" as described above? Does doing so constitute the equivalent of medical malpractice?

9. [10 points] (LCTTA-01HW09) Some antiscientists say that science once told us there are only nine planets. If science was wrong about that, then it is also wrong about global warming and climate change. Critique this reasoning. Your response must not contain any personal opinions, especially about global warming or climate change.

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10. (LCTTA-01HW10) Think about the rest of this class period. See if you can come up with three events for each of the following categories.

(a) [3 points] certain to happen

(b) [3 points] likely to happen, but not certain

(c) [3 points] unlikely to happen, but not impossible

(d) [3 points] impossible

(e) [3 points] How did you interpret the meaning of *certain*?

(f) [3 points] How did you interpret the meaning of *likely*?

(g) [3 points] How did you interpret the meaning of *impossible*?

11. (LCTTA-01HW11) This question is not asking for your personal opinions on anything as there is a clear, objective answer to each part.
- (a) [5 points] You are a typical research scientist working in a lab hosted and financed by Screw U. (insert your favorite university there if you wish). Your specific job is oversee a group that test drugs for efficacy and safety. A representative from International Medicines, Inc. approaches you and requests that your group tests their newest product Darnitol, a drug for treating high blood pressure, to show that it is safe and has no dangerous side effects. IM makes no offer to finance your testing. What should your response to IM be?
- (b) [5 points] Suppose the IM representative had instead requested that your group tests their newest product to determine whether it is safe and has no dangerous side effects. Again, IM makes no offer to finance your testing. What should your response to IM be?
- (c) [5 points] Suppose the IM representative had instead requested that your group tests their newest product to show that it is safe and offers to completely fund your testing. What should your response to IM be?
- (d) [5 points] Suppose the IM representative had instead requested that your group tests their newest product to determine whether it is safe and has no dangerous side effects and this time, IM offers to completely fund your testing. What should your response to IM be?

12. (LCTTA-01HW12) This question addresses terminology that frequently confuses laypeople. Unless specifically stated, you must not include any personal opinions in your responses.

(a) [5 points] Consider this statement: *Jupiter is bigger than Earth*. In your personal opinion, what does this statement mean?

(b) [5 points] Consult with classmates and make a list of as many different interpretations of the statement as you can find.

(c) [5 points] Consult mathematics or science textbooks or reputable online sources and define the following terms:

1. radius:
2. volume:
3. mass:

Your definitions must not contain any equations or numbers, and must consist only of simple words. Do not make up your own definitions! Everyone must unanimously agree on your definitions.

(d) [5 points] Note that you were asked to consult *textbooks* and *online sources*; note the plurals. Why were you asked to consult multiple sources?

- (e) [5 points] Given your unanimously agreed upon definitions, which of the three terms is most likely meant in the original statement?
- (f) [5 points] For each of the remaining two terms, invent a way of describing that property that does not use confusing terminology such as *bigger*. You need not confine yourself to one word descriptions. Sometimes, using multiple words is better.
- (g) [5 points] In an earlier part of this question, you were asked to consider different *interpretations* of a statement. Do you now see an issue with having to *interpret* a statement or a question? If so, what is the issue.
- (h) [5 points] Consider the term *literal interpretation*. Very briefly explain why this term is oxymoronic.

13. [10 points] (LCTTA-01HW13) One source's definition of *intelligence* is that intelligent beings can understand the laws of Nature and can invent technology to change the way they live. Critique this definition. Is it universally applicable? Your answer may contain personal opinions.

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14. (LCTTA-01HW14) There is a flower native to Thailand called the parrot flower that looks very much like a colorful parrot. Proponents of intelligent design argue that this flower is just too beautiful to have come about by chance. They claim that it, like every other being, was here since Earth was created.
- (a) [5 points] Is the concept of *beauty* subjective or objective? (If you don't know what those words mean, look them up.)

 - (b) [5 points] Are we born understanding the concept of *beauty* or are we somehow conditioned to it?

 - (c) [5 points] Suppose a flower looks amazingly like a hideous creature or something otherwise grotesque. Would this equally signify the work of an intelligent designer? Put another way, are only things perceived as beautiful worthy of having been intelligently designed?

 - (d) [5 points] Suppose an alien creature from another solar system were shown a parrot flower. Would this alien reach the same conclusion regarding the flower's beauty? Consider both possible outcomes, and comment on the consequences of each.

15. (LCTTA-01HW15) Cindy found mysterious burned tufts of grass, roughly arranged in a geometric pattern, in her back yard. The local paper has been printing stories of UFO sightings in the area. A group of three high school students claims to have made up some of the UFO sightings. They even claim to have left fake alien artifacts at random houses in the neighborhood.

(a) [5 points] Construct a scientifically invalid hypothesis to explain the observations, and describe why the hypothesis is invalid.

(b) [5 points] Construct a scientifically valid hypothesis to explain the observations, and describe why the hypothesis is valid.

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16. (LCTTA-01HW16) In 2007, daylight saving time began in the U.S. about three weeks before it had begun in previous years. I have a radio controlled clock radio that adjusts itself at midnight every night based on time signals broadcast from Boulder, CO. These signals are synchronized with the time given by a master atomic clock at the United States Naval Observatory in Washington, D.C. Among other things, the signals tell my clock (and any other radio controlled clock) whether or not daylight saving time is in effect and the clock sets itself appropriately. The clock has performed perfectly since I bought it in 2003.

About one week after the new daylight saving time rules went into effect, the clock radio woke me up at what I thought was 6:00 am, the time for which the alarm had been set, as usual. However, the time announcement from the radio announcer said the time was actually 7:00 am. I thought the announcer had just made a mistake, but subsequent time announcements indicated the time really was after 7:00 am. I examined the clock and observed that the time had been reset one hour earlier than the correct time so that it read 6:00 am when the correct time was actually 7:00 am. The year had been reset to 2000 and the date and day had been reset to one, two, or three days earlier (I cannot remember which). The alarm was still set to go off at 6:00 am. This concerned me because I had overslept by one hour and could have been late to work. All ended well, though, and I got to work on time. A similar incident happened about a week later, but this time over a weekend so I was not concerned about being late for anything.

- (a) [15 points] List **every possible** explanation you can think of, no matter how far fetched, for how the clock radio got reset to the wrong time and date and year. **Do not attempt to rule out any explanations at this point.** State each explanation with complete sentences.
- (b) [15 points] Of the possible explanations you have listed, list the ones that cannot be tested or are not falsifiable. **List only the ones that cannot be tested.**
- (c) [15 points] Of the remaining explanations, list them in order from *most probable* to *least* probable.
- (d) [15 points] List and discuss the criteria you used to perform the ranking in the previous part.
- (e) [15 points] For **each** remaining explanation, discuss how you would go about testing it. Include consideration of **every** possible outcome of each test. This will take considerable effort and possibly even more paper.

17. (LCTTA-01HW17) In exchange for a generous donation to a worthy organization, you receive two tickets to a concert given by one of your favorite musical groups. A representative from the organization explains that the tickets will be sent to you by certified mail early next week. After one week, the tickets have not arrived. You call the organization and a (different) representative tells you the tickets will actually be sent next week by certified mail.

Now, you know that when you get a letter or package by certified mail, you have to sign for it at the post office. If you are not at home when your mail is delivered, the postal carrier will leave a notice in your mailbox that you must present, along with identification, at the post office to get the letter or package. You also know the postal carrier will make three attempts to deliver the item to you and then may return it to the sender. With just one week to go until the concert, the tickets still have not arrived. You once again call the organization and this time they decide that something has probably gone wrong and promise to look into the situation and get back to you later that day. In the meantime, you call your local post office to see if perhaps the tickets are there, and indeed they are. They have been there for over a week. The postal worker tells you that your carrier left at least two different notices about the package in your mailbox. After a trip to the post office, you finally get the tickets.

- (a) [15 points] List **every possible** explanation you can think of, no matter how far fetched, for how the delivery notices failed to show up in your mailbox. **Do not attempt to rule out any explanations at this point.** State each explanation with complete sentences.
- (b) [15 points] Of the possible explanations you have listed, list the ones that cannot be tested or are not falsifiable. **List only the ones that cannot be tested.**
- (c) [15 points] Of the remaining explanations, list them again here in order from *most probable to least probable*.
- (d) [15 points] List and discuss the criteria you used to perform the ranking in the previous part.
- (e) [15 points] For **each** remaining explanation, discuss how you would go about testing it. Include consideration of **every** possible outcome of each test. This will take considerable effort and possibly even more paper.

18. (LCTTA-01HW18) You will see this exact same set of questions again in the next chapter. By then, you will have completed detailed observations of shadows and will be able to apply more advanced concepts to get more detailed answers. For now, do not worry about anything that isn't specifically asked for.
- (a) [15 points] List **as many as ten** influences that could alter a stick's shadow. **Do not attempt to rule out any of these influences at this point. You will do that later.** State each item with one complete sentence. (HINT: A stick's shadow has a length and a direction.)

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- (b) [15 points] Assume you have a stick set up outside. For each of the arguments in the following table, identify the name of the argument form and indicate whether or not it is valid. Assume that all premises are true. You will deal with the premises in greater detail in the next chapter.

Argument	Name of Form	Valid or Not Valid
If the stick's shadow is observed to change during the day, Sun's position in the sky must have also changed during the day. You observed no changes in the stick's shadow during the day. Therefore, Sun's position in the sky could not have changed during the day.		
If the stick's shadow is observed to change during the day, Sun's position in the sky must have also changed during the day. Sun's position in the sky changed during the day. Therefore, the stick's shadow was observed to change during the day.		
If the stick's shadow is observed to change during the day, Sun's position in the sky must have also changed during the day. Sun's position in the sky did not change during the day. Therefore, the stick's shadow was not observed to change during the day.		
If the stick's shadow is observed to change during the day, Sun's position in the sky must have also changed during the day. You observed the stick's shadow change during the day. Therefore, Sun's position in the sky must have changed during the day.		

- (c) [15 points] If you determined that any of the above arguments are invalid, cite one possible explanation for the incorrect conclusion. You may find your list of influences that could alter a stick's shadow helpful.

19. [10 points] (LCTTA-01SQ01) In one complete and coherent sentence, explain what it means for a claim or an argument to be *scientifically valid*.

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20. [10 points] (LCTTA-01SQ02) In one complete and coherent sentence, articulate the difference between *acceptance* and *belief*.

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21. [10 points] (LCTTA-01SQ03) In one complete and coherent sentence, articulate the meaning of Occam's razor.

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22. [10 points] (LCTTA-01SQ04) Arnold Arons, a highly respected expert in science teaching, states that science is a human invention. In one complete and coherent sentence, explain in your own words what this means. Use simple language as though you were explaining this to someone who knows nothing about science. There may be more than one way to articulate the correct answer.

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23. [10 points] (LCTTA-01SQ05) In one complete and coherent sentence, explain in your own words the difference between a *claim* and an *argument*. There may be more than one way to articulate the correct answer.

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