ACT Science Tips

Introduction

In preparing to take the Science section of the ACT, it is imperative to note that this test is NOT a comprehensive exam of the science classes you have taken in school. Certainly, students who have an affinity for the sciences may find the passages a little more interesting, but any student, with enough guidance and practice, can achieve a top score on this section; as such, if you feel that you are not a “great” science student, that simply does not matter on the ACT. This does not mean that knowledge of Chemistry (such as balancing equations), Physics (understanding velocity and acceleration, for example) and Biology (having some concept of what genes are) is useless; in fact, such knowledge can be useful on the exam. I simply want to make clear to you, the reader, that you do not have to review three years of science in order to succeed on this exam.

As you may know, the Science section consists of seven passages with a total of 40 questions in 35 minutes. Performing well on this section requires that you are able to read and synthesize information quickly and that you are able to interpret any relevant charts and/or graphs. There are three different types of passages, which are commonly referred to as Data (3 passages), Research (3 passages) and Conflicting Viewpoints (1 passage) passages. Many students find the “Conflicting Viewpoints” passage the hardest of the three; if this is the case for you, leave this passage for last.

As you begin your practice, I highly recommend that you use a clock or a stopwatch to make sure that you are working within the correct time frame. More importantly, you must get used to conditions that are as close to those faced on the test as possible; your basketball team wouldn’t practice on 8-foot rims, so neither should you practice for an exam in less-than-genuine conditions. There are two approaches to time management on this test, one more specific than the other:

A. By passage type – 3 Data passages in 14-15 minutes, 3 Research passages in 14-15 minutes, Conflicting Viewpoints passage in 5-7 minutes

B. By number of questions – my “rule of thumb” is that you should take one fewer minute than the number of questions on a given passage (ex: a passage, of any type, which has six questions should be answered in five minutes)

**Please note that the second approach listed above often elicits the reaction of, “Are you crazy?” First off, I assure you that, no, I am not, but, secondly, with enough practice, you will understand that these are easily attainable goals.

Last, students often ask whether they should read the passages or just jump to the questions and scan the passage for the answers. I believe that the students who can achieve high scores by simply reading the questions and skimming are very gifted outliers; unfortunately, many of the students reading this document will have to do this the “old-fashioned” way. As such, I recommend reading the passages so as to glean the information required to answer the questions, but not to get caught up in any scientific jargon that is presented. Much like the SAT Critical

Reading passages, the goal is not to be able to define every last word or recite the passage verbatim, but to attain a basic understanding of the information being presented. If you need to annotate the passage (circles, underlines, etc.), do not make more than one annotation per paragraph. When given a diagram, make sure to understand what the picture is telling you. For instance, on graphs, look for basic trends (does the line/curve generally increase or decrease?) and understand the axes; if there is a chart, does it show a trend? If not, what is different about each data point? (addressed further below)

The Strategic Approach

Data Passages

These questions ask you to interpret information presented in some visual way (chart, graph, table, etc.), along with some accompanying text to provide background information. DO NOT DISREGARD THE TEXT! Again, it is not necessary to read the passage three or four times over to understand every word, but the ACT test makers are doing their very best to explain all of the subsequent pictures and the context of the graphs/charts; please, let them help you understand the information!

Once you’ve read the passage for context, look at each chart or graph. First, note the trend(s). These trends are vital to answering most questions, because you will often be asked to estimate/calculate the next (or a missing) point on the graph, based on those trend(s); for the SAT vocabulary fans among you, this is known as extrapolation (calculating the next point) and interpolation (filling in the missing point). Recall that “directly proportional” means that the variables “move” in the same way; that is, when one value is low, so is the other, and when one value is high, so is the other. Meanwhile, “indirectly (or inversely) proportional” means that the variables move in opposite directions (one is low while the other is high or vice versa). If you can deduce a mathematical relationship between the variables, even better (for instance, as one variable doubles, the other variable triples), but do not waste time looking for one, as such an occurrence is uncommon. Rarely, data may be provided that intentionally shows a maximum or minimum (see example below). In such cases, this, too, is a “trend”, though it takes a keener eye to catch it.

Time in Sunlight (hrs)	Production of Glucose (in mg)
2	3.5
4	6.7
6	9.4
8	8.5
10	7.1

Here, the chart is trying to tell you that there is a maximum amount of glucose produced at 6 hours' time. Perhaps this is a special type of plant, in which photosynthesis occurs most readily at 6 hours, and slows down after "too much" sunlight, due to the kinetic and thermodynamic parameters of the involved enzymes (or, more likely, maybe the ACT test makers just made up an experiment to get you to figure out a trend). While the numbers might not make sense at first glance, noting that there is a maximum (or, on a similar problem, there could be a minimum) is important toward your goal of answering the accompanying questions.

Please note that sometimes, it may seem that there is no trend; when you encounter such a scenario, it may be the case that the data is intentionally out of order, such that if you rearrange the chart, a trend appears. It may also be the case that the chart has several columns; when working with such charts, realize that each column represents a different aspect of the data, and,therefore, may not ALL have the same trend. Last, there may, indeed, not be a trend because the data are not both "variables". For example, in a list of the names of your classmates and their shoe sizes, any arrangement of data would work, as there is no trend based on name (though, as you may know, there are trends based on height and gender). In any event, it is quite rare on the ACT to have a table in which there is no discernible trend.

**In simplest terms: FIND THE TREND! If one does not appear readily available, consider rearranging the data.

As for graphs, note the trend there as well, but be especially careful to understand the axes of the graph. Once you've discovered the trend, you might want to write in shorthand to remind yourself; for example, "# bulbs ↓, brightness ↓", meaning that you've interpreted the graph to state that as the number of light bulbs decreases, so does the value of the brightness.
Another aspect of the Data passages (and, in some cases, the other types of passages) is the table.

When working with these, read any relevant keys (usually presented at the bottom or side of the table) to better understand the information. While the tables are not crafted to confuse you, if you do not heed the key, you may miss important facts, such as the fact that the table has a scale in which one icon represents ten items.

Research Passages

As you have learned in the laboratory portion of your science classes, the core of scientific inquiry is asking questions. Once the questions have been asked, the scientist proposes at least

one hypothesis, and tests that hypothesis through experimentation. Your goal on the ACT is to understand how the experiments have been designed and what the outcomes represent. Recall that the most effective scientific experiments have a control (which does not change) and a variable (which does). There may be more than one variable tested, but that depends on the experiment; as such, it is common to be asked either what the control/variable of the experiment was or, in a poorly-designed experiment, how the assignment of either control or variable could have been improved.

Much like the Data passages, you MUST read the passage for context. Again, eliminate the jargon and get an idea as to what hypothesis is being tested and HOW this is being done. Often, results will be presented as charts, graphs or tables, and the methodology for approaching these has been mentioned above. The main difference in the Research passages is that the hypothesis may be tested in different ways, or different aspects of the same hypothesis may be tested with each experiment. As such, try to understand each experiment individually and then compare and contrast them; alternatively, if the experiments are to be used in conjunction, ask yourself what each part brings to the cohesive whole.

As an example, suppose that a Research Passage presented two experiments as follows: In order to test her hypothesis on a new medication, in Experiment 1, the researcher decides to have patients from five different age groups (variable = age) take the same amount of medication (control), and the results show that this standard dose has the greatest effect in children under the age of 3, in reducing fever (determined by temperature taken before and 24 hours after giving the drug). In Experiment 2, the researcher now qualifies the patients by how ill they are, assigning a scale of 1-5 to all patients (variable = level of illness) based on whether or not they have each of a series of symptoms; she still gives the same dose of medication (control) to all parties. Now, an interesting trend appears: the drug reduces fever by the greatest amount in the patients that have the LEAST number of symptoms. As such, this scenario easily lends itself to the question, “In which of these patients would the drug have the greatest effect?” (The answer would be something along the lines of “the youngest patient that has the fewest symptoms”.)

Conflicting Viewpoints Passages

As mentioned above, some students may find these difficult; it is my hope that such will not be the case after the discussion that follows. First off, these passages should be approached much in the same way as the “dual passages” on the SAT Critical Reading section. Your goal as a reader is to understand the overall context of the experiment/data set and how the viewpoints differ; that is, about what fundamental aspect of the information is there a disagreement? Furthermore, you will often be asked to determine the strength or weakness of a given argument. For example, one argument may be too specific, in that it only applies to one data set (as you all know, the best experiments are those that can be repeated; if a phenomenon only occurs in one scientist’s lab in one city on one day, no other scientist will care); it is far less common for an argument to be “too general” on the ACT.

Much like the SAT Critical Reading section, there are two approaches to these passages, and you must decide which better suits you as a test-taker. The first approach is to read only passage 1 (often titled “Scientist 1”), answer any questions relevant to that particular passage, then read passage 2 (“Scientist 2”), answer any questions relevant to it, and then approach the material as a whole, understanding the differing viewpoints and addressing one in terms of the other. The second approach is to read both passages and then answer the questions. Again, YOU must decide which works better for you, and the only way to determine that is to do a lot of practice.

While taking the test, it may well behoove you to annotate in a very basic way, so as to recall the key difference. For example, if a passage deals with the extinction of dinosaurs, you may write next to Scientist 1, “due to rising water levels”, while for Scientist 2, you could write, “increased carbon dioxide levels”.

One last note on the Conflicting Viewpoint passages: since you are dealing with a scientific argument, the possibility exists that new information can be discovered later on that will impact (if not change) the viewpoint of at least one scientist. This is a real-life scenario, and so it is also a commonly tested idea. The question will begin with a new fact; for example, you might be told that a new laboratory discovers that water levels have risen only in the last 100 years. This discovery would most likely:

a) Weaken the argument of Scientist 1
b) Strengthen the argument of Scientist 1
c) Weaken the argument of Scientist 2
d) Strengthen the argument of Scientist 2

Be very careful in answering this particular question. Scientist 1’s theory hinges on rising water levels, and so his argument would be weakened if the water was not rising in the time of the dinosaurs; however, this DOES NOT imply that Scientist 2’s argument is strengthened. His idea was that more carbon dioxide caused the extinction of the dinosaurs. It is NOT based on water levels, and so this fact does little to address the claim of Scientist 2. The correct answer is A. To be clear, if the scientists had a fundamental disagreement with only two alternatives, such as “Scientist 1 says that humans once had a tail, while Scientist 2 disagrees”, the existence of a tail in human fossils would simultaneously strengthen Scientist 1’s claim while weakening that of Scientist 2. Such examples are rare on the ACT.