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ACT Science Review Packet

GENERAL SCIENCE TIPS

- Practice makes perfect: the more passages you take, the more comfortable you'll be.
- Passages I-IV are significantly easier than passages V-VII. This means that you don't need to understand the subtle elements of the experiments in passages I-IV to get the questions in those passages correct.
- Budget your time accordingly: on average, passages I-IV should take less time than passages V-VII
- If there are two answer choices that are opposites, there's a good chance one of them is the correct answer.
- Within each passage, the questions are arranged in order of difficulty.
- If you are taking chemistry, biology, physics or earth science, pay attention to your lab work, because some of it may be very similar to the ACT questions.

Specific Tips for the First 4 Passages

- In the first 30 seconds, skim through the text of the experiment. Pay specific attention to lines that explain the figures (example: "Figure 1 shows...")
- When you reach a line that explains a figure, *take a second to look at that figure*: pay careful attention to the axes, units,direction of increasing/decreasing values, and what the figure is showing.
- Doing the above should take no longer than 30 seconds: remember that you don't need to understand every detail of the experiment.
- Most questions will refer you to the chart, table or graph that provides the data or information you'll need to answer the question.
- Read carefully! Most of the questions are straightforward - make sure you're answering the correct question!

Specific Tips for Passages 5 -7

- You'll need to put a little more effort into understanding the experiment.

- Read the experiment descriptions in more depth.
- In general, questions will NOT refer you to a graph or chart: you'll need to know where to look. This means that at the beginning, you should try to understand exactly what each figure is showing.

Conflicting Viewpoints Passage

One type of passage you'll encounter on the ACT is the "fighting scientists" kind of question. Here, two scientists write out their theories or viewpoints on a certain scientific issue.

The way to tackle these questions is to read each passage separately, taking note (either on paper or in your head) of what the basic idea of each one is. The passages often use confusing or complicated words or phrases. Try not to let this discourage you; it is most important that you understand the main idea of each passage, not the complicated vocabulary.

Let's try an example. First read the first scientist's opinion, then try to summarize in a sentence, phrase, or even a few key words the basic idea of the paragraph. Summarizing the passage right after you read it ensures that you really understand what you are reading. If you don't get the main idea the first time, try skimming or reading through it again until you do. Then, do the same thing for the second passage.

Two scientists disagree about how mountain ranges form.

Scientist 1:The Earth's crust is not static; it is constantly moving and changing. The Earth formed as a ball of molten rock, but only the relatively thin outermost layer cooled and solidified, culminating in a thin, solid crust over an extremely hot layer of molten iron magma. The crust is not all one big slab, though; instead, it is broken into pieces called "tectonic plates". Each continent is made up of one or more of these "plates". The hot, liquid magma flows under the surface of the crust as convection currents. The magma carries pieces of the crust along as it flows. Plates often move in opposing directions, and mountain ranges form where these plates gradually collide over the course of millions of years. Tectonically active mountain ranges continue to grow, even today, as certain continents move closer together.

Scientist 2:The crust of the Earth is fixed and unvarying, and has not changed since the planet finished forming. The Earth originally formed billions of years ago as a molten liquid ball. The Earth soon cooled and the core solidified, and as it did so, the inner layers of the planet contracted. Much like the skin of a baked apple would, the outermost "skin" of the earth crumpled because the surface area of the crust was larger than the surface area of the inner core. This crumpling is the cause of both the highest mountain peaks and the deepest ocean basins. The locations of these mountain ranges and oceanic trenches are purely due to chance, but they have remained essentially unchanged for all of history.

Now, let's try to summarize what each scientist is saying. Scientist 1 talks a lot about the Earth's crust moving and magma flowing. He believes that Earth's crust is changing, and that the collision of things called tectonic plates are what cause mountains to form. Scientist 2, however talks about the Earth being "fixed" and "unvarying" - this is the opposite of what Scientist 1 said. Scientist 2 thinks that the Earth's crust was formed by "crumpling" and that it hasn't changed at all since then.

The most important thing to get out of these passages is that Scientist 1 believes that the Earth's crust is changing, and that Scientist 2 believes that the crust is not changing. 1.

According to Scientist 1, what conditions can cause mountain formation?

a) The collision of continental plates over time.
b) Increased gravity in polar regions.
c) Temperature fluctuations in Earth's crust.
d) Gaseous discharges from Earth's core.

(We can find the answer to this question directly in the first passage. Scientist 1 believes that the collision of continental (or tectonic) plates causes the formation of mountain ranges, choice A. Gravity (choice B), temperature fluctuations (choice C), and gaseous discharges (choice D) are not mentioned in the passage and are not part of the theory of Scientist 1. Choice A is the correct answer.)

2. Which of the following statements could best be used to support the view of Scientist 2?

a) Earth's crust is up to 100 km thick.
b) Fluctuating magnetic fields indicate that beneath the Earth's crust is a layer of molten iron
c) Europe is moving 5 cm further from North America every year.
d) The Zagros mountains in Iran are the same age as the Alps, a mountain range in Europe.

(For this type of question, we have to really understand what Scientist 2 believes, because the answer isn't directly in the passage. Scientist 2 believes that all mountains were created at the same point in Earth's history, when the core solidified and the crust crumpled around it. If several sets of mountains were the same age, as in choice D, this would support the theory of Scientist 2. It does not matter how thick the crust is, as in choice A. A molten layer under the crust (choice B) and moving continents (choice C) actually support Scientist 1, not Scientist 2. The only one that supports Scientist 2 is choice D.)

Passage with Line Graph- Enzyme activity vs. pH

Another type of graph that you'll encounter on the ACT is a line graph. Like all graphs, a line graph allows you to easily visualize the data presented. We'll follow the same procedure that we'll use for any set of questions that involves any type of graph. First, read the introduction. Second, look at the axes to identify the variables. Third, look at the legend and identify the lines on the graph. Fourth, identify general trends and make sure you understand what the graph is showing.

Let's start with an example:

An enzyme is a kind of protein that speeds up a chemical reaction, a process called catalysis. Enzymes catalyze (or speed up) a variety of reactions in the human body. Enzymes work best under specific conditions that depend on the type of enzyme. One thing that affects the activity of an enzyme is the pH of the surrounding solution. The pH is a measure of hydrogen ion (H+) concentration, and is used to describe the acidity of a solution. A pH of 7 is neutral, a pH below 7 is considered acidic, with lower numbers being the most acidic, and a pH above 7 is basic.

Graph 1 shows how enzyme activity varies for two different enzymes at a range of pH values.

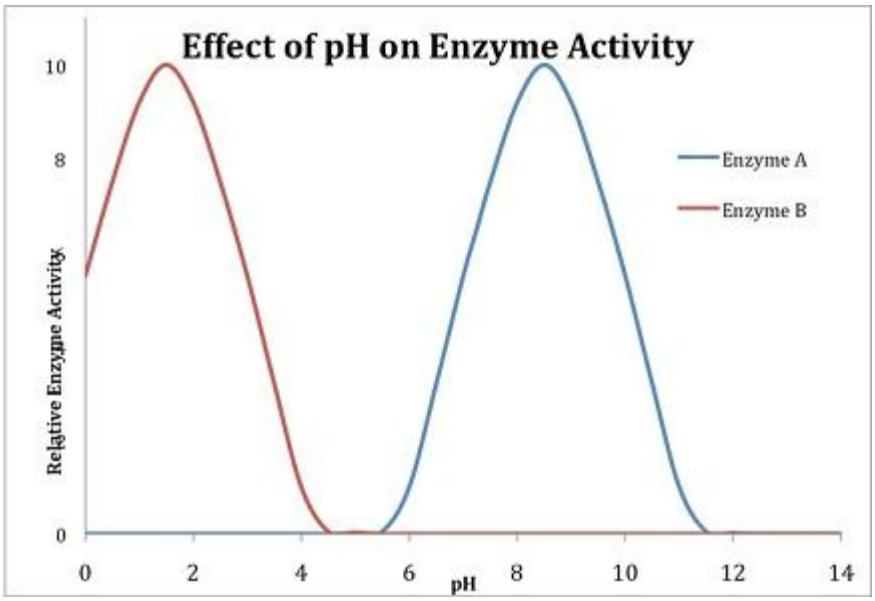


Table 1 shows different pH ranges for different fluids of the human body.

Fluid	**pH**
Gastric (stomach) juices	1-2
Urine	4.5-8
Saliva	6-7
Blood	7.3-7.5
Mucus of small intestine	8-9

First, let's read the introductory paragraph. It gives us background information that might be useful in solving the question. We learn what an enzyme is, and the fact that the activity of an enzyme is different depending on its surroundings.

Now we can examine the graph. First, we should look at the axes. The y-axis says "Relative Enzyme Activity." This indicates that the enzyme activity increases as we go up the axis. Note that there are no units, which indicates that the numbers given are just relative to each other. The x-axis is labeled with "pH" and ranges from 0 to 14. As we learned in the introduction, lower pH means more acidic and higher pH means more basic, so the x-axis ranges from acidic to neutral to basic as we go from left to right.

Looking at the legend, we see that the blue line corresponds to Enzyme A and the red line corresponds to Enzyme B.

Finally, looking at the lines, we can identify general trends. It appears that the enzymes are only active at a small range of pH values with a maximum at a particular value, and at any one pH value, only one enzyme is active. Having two lines on the same graph is an easy way of visualizing the differences between the two different enzymes.

This question also involves a simple table. The first thing to do with a table is to look at the headings. In this case, the left column lists various fluids present in the human body, and the right column lists their corresponding pH ranges. You should be able to pick a data point on the table and figure out all of its relevant data. For example, the pH of blood ranges from 7.3-7.5, meaning that it is slightly basic.

Now, for the first question:

1. Enzyme A has maximum activity at what range of pH values?

a. Below pH=1

b. Between pH=1 and pH=2

c. Between pH=8 and pH=9

d. Above pH=10

The first thing we need to do here is to identify Enzyme A on the graph. Looking at the legend, it appears to be the blue line. The blue line has its maximum value at around pH=8.5, which is choice C. Whenever possible, try to answer the question on your own before looking at the answer choices. You'll avoid getting confused by the deceptive answer choices that way.

2. Using data from both Table 1 and Graph 1, Enzyme B would be most active in which part of the human body?

a. Stomach

b. Small Intestine

c. Blood

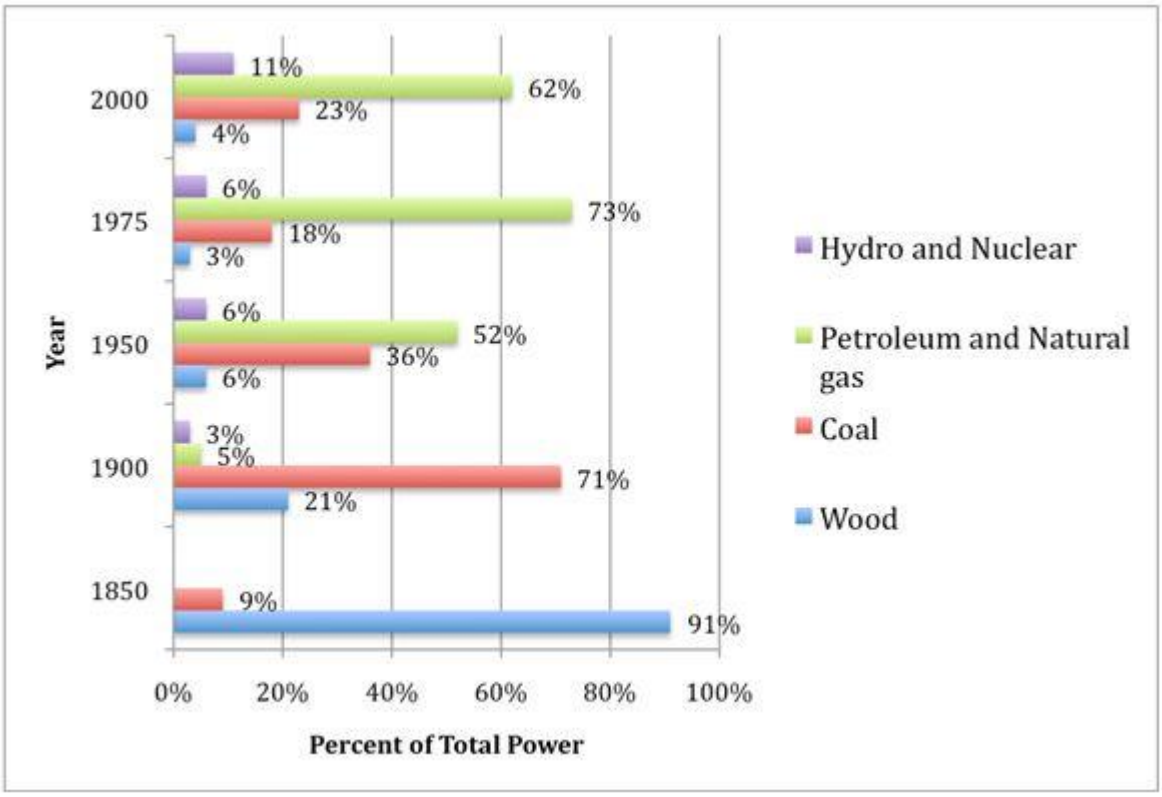
d. Saliva

Here, we should first identify the pH value of maximum activity for Enzyme B. Enzyme B is the red line on the graph, which has maximum activity at a pH value of around 1.5. Looking at the table, this corresponds to the pH of the stomach. Therefore, enzyme B would be most active in a human stomach, choice A.

Passage with Bar Graph- Sources of Power

When given any graph, we should always familiarize ourselves with it before we attempt to answer the questions. Let's start with an example:

The United States draws its power from a variety of sources. The graph below plots the percentage of total power in the United States from four sources from the year 1850 to the year 2000.



First, read the sentences or paragraph above the graph. This gives helpful background information for understanding and interpreting the graph. Try not to be intimidated if the introduction is describing a concept that you are unfamiliar with, as the ACT is testing your ability to interpret the data given, not your memory of your science classes. In this case, the introduction tells us that the graph is demonstrating the fact that the United States gets its power from four different sources and this changed over time.

The next step is to look at the axes of the graph. This will tell us what the variables are, or what is changing. All graphs have a horizontal axis (x-axis) and a vertical axis (y-axis). In this case, "Year", or time, is plotted on the y-axis and "Percent of Total Power" is plotted on the x-axis. The years are increasing as we go up the y-axis, and percentages increase from 0% to 100% as we go from left to right on the x-axis.

Next, we should look at the legend of the graph. In this case, there are four different types of power, each corresponding to a different color. For example, coal is represented by red. We can then look at any year and see that coal has a corresponding percentage. In this graph, each data point is labeled.

Finally, we should be able to interpret the graph. Before you start answering the questions, be sure that you can pick out a point on the graph and be able to tell what it means. If we look at 1975, for example, on the y-axis, we see that it has four bars. Singling out the green bar in particular, we can look and see that green means "petroleum and natural gas". There is a "73%" labeling the green bar, meaning that in 1975, 73% of the power in the United States came from petroleum and natural gas.

Now that we understand the graph, we are ready to tackle a question.

Example 1:

According to the graph, which of the following is true?

a) In 1900, wood provided all of the power for the United States.

b) More power was obtained from coal than from petroleum and natural gas in 1975.

c) The percentage of total power obtained from coal increased from 1950 to 1975.

d) Coal provided a larger percentage of power in 1900 than in any other year.

This is a fact-based question, meaning that the answers are directly in the graph itself. Let's look at each of the answer choices individually.

Choice A says, "In 1900, wood provided all of the power for the United States." First, we should locate the year 1900 on the y-axis; it's the second from the bottom. We can see that no one power source provided 100% (or all) of the power in the year 1900. This choice is incorrect.

Choice B says, "More power was obtained from coal than from petroleum and natural gas in 1975." After locating 1975 on the y-axis, we can single out the green (petroleum/natural gas) and red (coal) bars. The green bar says 73% and the red bar says 18%. Therefore, petroleum and natural gas provided more power than coal in 1975, and this choice is incorrect.

Choice C says, "The percentage of total power obtained from coal increased from 1950 to 1975." Now we have to compare the same power source in two different years. The coal bar in 1950 says 36% and the coal bar in 1975 says 18%. The percentage of total power obtained from coal decreased from 1950 to 1975, so this choice is incorrect.

Choice D says, "Coal provided a larger percentage of power in 1900 than in any other year." This wants us to compare the percent of power obtained from coal in all of the years. We can see that the coal (red) bar is longest in the year 1900 than in any other year, meaning that the percentage is higher in 1900 than in any other year. This is the correct choice.

Example 2:

The percent of total power from which of the following fuels changed the most between the years 1975 and 2000?

a) Hydro/nuclear

b) Petroleum/natural gas

c) Coal

d) Wood

This is another fact-based question with the answer right in the graph. The question wants us to look at how the percents of total power changed for each of the fuels between the years 1975 and 2000. This

question requires a bit of math, but you can't use a calculator on the Science portion of the ACT, so try to practice simple math skills before the exam.

Let us look separately at each of the answer choices.

A. First, hydro/nuclear power. This is the purple bar on the graph. Looking at 1975, hydro/nucear power constituted 6% of total power. In 2000, it was 11%. The difference between the two years was 11%-6%, or 5%, meaning that hydro/nuclear power increased by 5% of the total power.

B. Next, petroleum/natural gas. This is the green bar. In 1975, petroleum/natural gas was 73% of total power. In 2000, it was 62%. The difference is 73-62, or 11%. Petroleum/natural gas decreased by 11%.

C. Coal is the red bar. In 1975, coal was 18% of total power, and in 2000, it was 23%. This is a difference of 23-18, or 5%, meaning that coal increased by 5% between these years.

D. Wood is the blue bar. In 1975, wood was 3%, and in 2000, wood was 4%. This is a difference of 1%, meaning that wood increased by 1% in this time period.

Looking back at the original question, it is asking what the largest change is in this time period. It doesn't matter if it is an increase or a decrease. The largest change is 11% for petroleum/natural gas, so choice B is the correct answer.