WRITING A FREE RESPONSE FOR A.P. ENVIRONMENTAL SCIENCE

The Free Response section has 4 problems (1 data, 1 document-based, 2 synthesis) worth 40% of the exam.
The Multiple Choice section has 100 problems worth 60% of the exam.
Calculators are not allowed and no Formula Sheets are provided.
90 minutes is given for this section.

Before answering any questions

- Read the question twice.
- Underline (highlight, outline, etc.) what the question is asking for.
- Begin answering the question in the order it is written; **DO NOT restate the question or write an introductory paragraph!**

If the question says to '**discuss**' or '**describe**'

1. Define the topic
2. Describe or elaborate on the topic
3. State an example of that topic

If the question says to '**compare and contrast**'

1. Clearly state what the items have in common
2. Clearly state how items are different

If the question asks for a **graph** to be made

1. Label each axis with a name and with units
2. Title the graph
3. Scale and number the axes correctly
4. Use the correct type of graph (2 sets of numbers = line graph, 1 set of numbers & 1 set of words = bar graph)

If the question asks a **mathematical** problem, (especially APES)

1. Show every single step of all work
2. Set up problems so that labels cancel out (dimensional analysis)
3. Write answers with labels
4. If numbers are very large or very small, use scientific notation if at all possible

If the question asks for **lab design**

1. State a hypothesis in the "If, then" format
2. Describe each step of a planned experiment in detail
3. State exactly what the controls are
4. Make sure to mention that the experiment uses multiple samples (50+) or is repeated multiple times
5. Describe expected results

For ALL questions

- Answer in complete sentences; do NOT use lists, charts, outlines, etc.
- Label each section as it is labeled in the question (e.g. A, B, C or I, II, III)
- Add a clearly labeled diagram to support your answer, but it cannot be the entire answer
- For every statement you write, ask yourself "WHY." If there is an answer to that 'why' keep on writing!!!!!
- Do not answer more than what is asked for; e.g. If the questions says to choose 3 out of 5 topics, ONLY answer three out of 5; e.g. If the question asks specifically about RNA, don't discuss DNA duplication.

Remember - time is of the essence. You have 22.5 minutes per question.

Hints for doing well on the APES Exam

1. DO NOT STAY UP LATE STUDYING THE NIGHT BEFORE THE EXAM! Have your favorite snack and go to bed early. A clear, rested mind is the most important thing you can take to the AP Exam.
2. Dress comfortably and make sure to bring plenty of sharpened pencils and good erasers.
3. Think before you bubble. Read questions completely before answering. Eliminate careless mistakes.
4. Do not waste time on multiple-choice questions that are extremely difficult. Skip them; then return to them after you get warmed up.
5. Use leftover time to double check your answers.
6. On the free-response section, distribute the 90 minutes equally on the four essay questions (22 minutes each). Do not make the mistake of wasting a large percent of your time on one question, and then not having enough time to answer the other three.
7. Devote time to answering all the sections (a, b, c, d, etc.) for each essay question.
8. Take a few moments to think and organize your thoughts before you start to answer each essay question.
9. Write very clearly and large enough for the reader to read your words.
10. If you use diagrams, label and explain them. A diagram without an explanation gets zero points.
11. Eliminate "fluff." You don not need fancy introductions or conclusions on your essays. Get right to the point.
12. Be a point sponge! Write down what you know best, first. Think broadly when you are answering the essay questions; you have more information in your head than you realize. Don't forget to add detail and examples. Don't fabricate information that you don't know is true, it is a waste of time and will not earn any points.
13. Use underlining, especially if you are a poor writer, but be sure to give a full explanation. Just listing things will earn zero points.
14. If you are going to write down several points, write down the best ones first. Graders may be instructed to just grade the first one or two things you write, ignoring the rest.
15. When answering the essay questions, stay on the topics that are being asked. Do not add extraneous information that does not pertain to the question being asked.
16. Go in with a positive attitude—you have the knowledge to do a great job on this test!

More Hints for doing well on the APES Exam

1. YOU MUST SHOW YOUR WORK, be certain to write out all the steps clearly so the reader/grader can easily see and understand your work. Many students lose points because they do their math calculations in their heads or on a sheet of paper other that the answer sheet, and then fail to transfer the information onto the answer sheet.
2. No points are taken off for wrong or incorrect information, but simply writing a lot will not necessarily earn points—you must answer the question being asked. It is not uncommon for answers that fill two or three pages to earn no points.
3. Students will not receive points for restating the question. Embellishing and embroidering the question and then writing it down as an answer will receive no credit. Students must demonstrate knowledge and understanding.
4. Be careful when you interpret charts and graphs. Many students draw erroneous conclusions because the have misinterpreted a graph or chart.
5. Practice your math! Every AP Environmental Science student should be comfortable working with percentages, decimals, rounding, fractions, algebra, exponents, and scientific notation.
6. Outline form and bullets are not acceptable, answers must be written in prose style.
7. Students must demonstrate a deep understanding of the subject whether it's a biogeochemical cycle or a solar panel. Just throwing out terms, vocabulary and factoids is not enough.
8. Do not be fragmentary in your explanations, everything should fit together logically into a complete answer. Make sure you tie all the "pieces" of your answer together.
9. Make sure, whenever possible, to support your statements with examples. Good examples will let the reader/grader know that you understand what you are talking about. Often, examples are required to earn some of the points available on a question.

Miscellaneous AP Tips

- Environmental science is a topic that is frequently in the news. Students who keep up to date on current events, and who are similar with the most significant environmental events in recent history, will find that knowledge useful. Using examples from recent events may be appropriate, helpful, and, more important, point worthy on the APES exam. The AP exam writers also keep up with current events and often use news stories as a basis for questions. Recent examples include questions about hydraulic fracking, bio-fuels, methane digesters, electric cars, infectious diseases, and genetically modified crops.

- One way to lose a point in a free-response essay on the APES exam is by contradicting yourself. In an essay, if you need to identify a chemical compound and if you are certain that you know either the formula or the name of a chemical, but not both, write only that of which you are certain. If you write a correct formula with an incorrect name, or vice versa, you risk earning and then losing a point for correcting yourself.

- When determining whether a feedback loop is a positive or negative, focus on the initial and final states of the system. If the system change is in the same direction as the input it is a positive feedback loop. If the system change is in the opposite direction, it is a negative feedback loop. Don't get hung up in the details.

- For the AP exam, it will be important that you have a clear understanding of the different roles microbes play in the ecosystem. Much of the Earth's diversity we can't even see. These organisms, collectively known as microbes or microorganisms, include bacteria, single celled protists and fungi. They provide invaluable ecological services such as decomposing organic waste. Although we typically associate bacteria with disease, we actually couldn't survive without them. Millions of bacteria live in and on your body keeping harmful fungal populations in check and regulating your digestive and immune systems. So let's hear it for the little guys.

- It is a good idea as you go through your course of study in AP Environmental Science to make note of the important people who have contributed to this field. You may be asked to recall their importance on the AP Exam. For example, Wangari Maathai is a Kenyan woman who won the 2004 Nobel Peace Prize for starting the Green Belt Movement. This movement began as a humble tree nursery in her backyard and has now grown to over 50,000 members in over 6,000 different villages in Africa. Today, this project has planted over two billion trees in 55 different countries. While reducing soil erosion, these trees also provide sustainable supplies of fuelwood, building materials, and food. Such projects also reduce poverty for women as they are employed in maintaining the nurseries and have a new source of income by selling the products from the trees that are harvested. For a full list of important people to know for the AP Environmental Science Exam, see the list later in this packet.

- Human population growth is one of the topics that may be used to provide the data for the free-response question, also known as the "math question."

- Terminology: When answering a free-response question, avoid dropping terms without demonstrating an understanding of what they mean. Terms like "eutrophication," "biomagnification," and "pesticide treadmill" may not earn points unless the answer includes some indication of a basic understanding of the term's meaning.

- The AP Exam will test your knowledge on how human activities impact the natural selection of organisms in our environment. Recently, we have seen an increase in resistance to pesticides by target insects and to antibiotics by pathogenic bacteria. How does this occur? Widespread use of pesticides or antibiotics eliminates the weaker individuals in a rapidly reproducing population such as insects or

bacteria. This causes an increase in the frequency of individuals in the population who have a genetic resistance to pesticides or antibiotics because they are the ones left to rapidly reproduce. What can we do? As you learned in Chapter 4, sustainable agricultural practices can reduce the need for pesticides to control pest populations in the production of crops, and the use of free-range practices or reduced crowding in feedlot operations can lower the amount of antibiotics necessary to control disease in animals.

- A common prompt in the free response section of the APES exam is to request a description of ways to reduce the environmental costs associated with an activity like burning coal. Often the best way to respond to such a prompt is by invoking conservation strategies; you may be able to avoid a lengthy description of a complicated technology. For example, it is easier to describe the act of turning off the lights when leaving a room to lower electricity consumption and eliminate sulfur dioxide emissions than it is to describe the operation of a wet scrubber on a coal-fired power plant to eliminate those same emissions

- Many questions on the APES exam have tested student knowledge of alternate energy. Practice the APES FRQs that are available on the college board website. The topics covers in past questions include hydroelectric dams, wind power, active and passive solar energy, biofuels, methane digesters, and electric cars.

- Pollution is a much-abused word in environmental science and also on the APES exam. Simply stating that an activity "causes pollution" is unlikely to earn points on the exam. Rather, graders are looking for a deeper understanding of issues. At least state whether the activity causes "air pollution" or "water pollution." But, more than likely, graders will only accept specific information, for example, a statement that an activity "release sulfur dioxide into the atmosphere." So, be specific!

- Be careful that you don't state, in answering a free-response question, that an air pollutant is bad because it is a greenhouse gas. Remember that without greenhouse gases the temperature on earth would be below the freezing point of water. Life needs the greenhouse effect; what most living things do not need is more of it. The addition of anthropogenic greenhouse gases is bad because they enhance the natural greenhouse effect, causing global warming and climate change.

- While they are the same structural molecule, remember that ozone in the stratosphere plays a different role from that in the troposphere. Stratospheric ozone is the so-called "good" ozone that protects life from the sun's ultraviolet radiation. Tropospheric ozone is the "bad" ozone that irritates our eyes and our respiratory systems, causes crop damage, etc. The instability of ozone molecules is necessary for both roles: good (destroying UV radiation) and bad (destroying cells in living organisms).

- In the early 1940s and 1950s, the Hooker Chemical Company buried at least 200 drums of hazardous waste at a location called Love Canal near Niagara Falls, New York. The company then sold this property to the local school board where many homes and an elementary school were built. In the 1970s, the storage drums began leaking and hazardous waste entered storm sewers, basements, and school playgrounds. Many cases of cancer were linked to this contamination, and all residents were affected financially because of the loss of property value. The entire area ultimately had to be evacuated. In order to remediate the site, all leaking drums had to be located and removed as well as the surrounding soil. This case sparked the creation of CERCLA and superfund law. The contamination of toxic waste that occurred in Love Canal, NY, is an example of just one of the many well-known environmental case studies the AP exam will expect you to know. Make sure you pay close attention to these case studies as you read your textbook. See a list of well-known case studies later in this packet.