# **AP Environmental Science Exam Preparation**

2009-2010

## **Overview**

- APES Curriculum Review
- Exam Dav
- Review Calendar
- Multiple Choice tips
- Multiple Choice samples
- Free Response tips
- Free Response samples



#### Earth Systems and Resources (10 - 15%)

- Earth Science Concepts
   (Geologic time scale; plate tectonics, earthquakes,
   volcanism; seasons; solar intensity and latitude)
- The Atmosphere (Composition; structure; weather and climate; atmospheric circulation and the Coriolis Effect; atmosphere – ocean interactions; ENSO)
- **Global Water Resources and Use** (Freshwater/saltwater; ocean circulation; agricultural, industrial, and domestic use; surface and groundwater issues; global problems; conservation)
- Soil and Soil Dynamics (Rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation)

#### The Living World (10 - 15%)

- Ecosystem Structure (Biological populations and communities; ecological niches; inter-interactions among species; keystone species; species diversity and actions edge effects; major terrestrial and aquatic biomes)
- Energy Flow (Photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids)
- Ecosystem Diversity (Biodiversity; natural selection; evolution; ecosystem services)
- Natural Ecosystem Change (Climate shifts; species movement; ecological succession)
- Natural Biogeochemical Cycles (Carbon, nitrogen, phosphorus, sulfur, water, conservation of matter)



#### Land and Water Use (10 - 15%) page 1 of 2

- Agriculture
- Agriculture Feeding a growing population (Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture) Controlling pests (Types of pesticides; costs and benefits of pesticide use; integrated pest management; relevant laws) Ecoretic

- Forestry (Tree plantations; old growth forests; forest fires; forest management; national forests)
- Rangelands (Overgrazing; deforestation; desertification; rangeland management; federal rangelands)





#### Energy Resources and Consumption (10 - 15%) page 2 of 2

- Nuclear Energy (Nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion)
- Hydroelectric Power (Dams; flood control; salmon; silting; other impacts) Energy Conservation (Energy efficiency; CAFE standards; hybrid electric vehicles; mass transit)
- Renewable Energy (Solar energy; solar electricity; hydrogen fuel cells; blomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages)

#### Pollution (25-30%) page 1 of 2

- Pollution Types

  - Air pollution (Sources—primary and secondary; major air pollutants; measurement units; smog; acid deposition—causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; Clean Air Act and other relevant laws)
  - Noise pollution (Sources; effects; control measures)
  - Water pollution
  - (Types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws)
  - Solid waste (Types; disposal; reduction)



#### Global Change (10-15%)

 Stratospheric Ozone (Formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties)

#### Global Warming

- (Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties)
- Loss of Biodiversity
  - Habitat loss; overuse; pollution; introduced species; endangered and extinct species
  - Maintenance through conservation
  - Relevant laws and treaties

#### Exam Day – May 11, 2010

- Get a good night's sleep
- Eat a nutritious breakfast
- Dress comfortably and bring a jacket in case the testing room is cold
- Pack a snack and drink for the break
- Bring plenty of pencils and pens
- Bring a good plastic eraser
- Wear a watch
- Know where to go on the morning of the exam
- Cell phones are not allowed in the testing room
- Calculators are not allowed on the APES Exam

#### **Review Calendar**

- Set up a review calendar (see handout)
- Everyone can stay on task during the most hectic portion of the school year
- Complete FRQs
  - Step 1: in ink, answer without resources
- Step 2: in pencil, complete the answer using the textbook and other resources
- Complete a Review Sheet Write out the stem and correct answer for each question of a MC test

#### **Multiple Choice Tips**

- Each question has a stem that may be in the form of a question or statement, and five options that are the possible answers to the question. Exactly one of the five options is correct
- Sometimes, the "correct" answer is "the best" among the options given. In that case, more than one answer may actually be correct, but one is the best option
- With 90 minutes to answer 100 questions there is less than one minute to answer each question.
   Answering 25 questions every 20 minutes will leave 10 minutes at the end of the exam to look back over the test

#### More Multiple Choice Tips

- Try reading the stem with the options covered. Answer in your mind, and then select the option that is closest to your answer
- Carefully and completely read the entire question. The item writers may have intentionally included attractive options for students who are rushing through the exam
- Fill in the answer document carefully. If it must be erased, do so completely. Use a white plastic eraser on the answer document. The exam will be scored by a machine and any stray marks may be read as answers. When skipping questions, don't forget to skip the corresponding lines on the answer sheet, or valuable time will be wasted erasing and moving answers.

# More Multiple Choice Tips

- Write in the multiple-choice booklet. As options are eliminated, cross them out by drawing a line through them. On questions with a negative stem or roman numerals write a T or an F next to the options while working through the question. If an extremely difficult or long question is skipped, circle it and return to it after you have answered all of the easy questions. Underline key words in a question that help to focus on what is important in the question. Use the test booklet as scratch paper for any questions that require calculations.
- Calculator use is not permitted on the AP Environmental Science exam.

## More Multiple Choice Tips

- Points are deducted for incorrect answers, however, the point deduction for each incorrectly answered question should not be considered a "guessing penalty."
- Each correctly answered question is worth 1 point, and there is a 1/4-point deduction for each incorrectly answered question. Which, while it prevents a student who guesses from having an advantage—it does not penalize the student.

## More Multiple Choice Tips

- To illustrate why the point deduction for incorrect answers should not be considered a guessing penalty, consider the following example.
- Imagine that we took an APES Exam and guessed on every one of the 100 multiple-choice questions without eliminating any of the five options. With perfect statistics, we would answer correctly one-fifth of the time, which means that we would correctly answer 20 questions, and incorrectly answer 80 questions. Our score would then be:  $(20 \times 1) - (80 \times 0.25) = 20 - 20 = 0.$
- In other words, there is no advantage or disadvantage (penalty) for randomly guessing from the five options

# More Multiple Choice Tips

- o Another example:
  - If we imagine another exam where this time we can eliminate one of the five options for each question, with the same perfect statistics, we would correctly answer one-fourth of the questions (25 questions), and incorrectly answer three-fourths of the questions (75 questions). Our score would then be: (25 x 1) - (75 x 0.25) = 25 - 18.75 = 6.25
- So, in this case, there is actually an *advantage*, *albeit small, to answering* questions if just one of the five options can be eliminated.

# More Multiple Choice Tips

- To take this one more step, if we can eliminate two options…
  - O Using the same set of arguments, we get 33 correctly answered questions, and 67 incorrectly answered questions. Our score would then be:
     (33 x 1) - (67 x 0.25) = 33 - 16.75 = 16.25
- So, if one or more options can be eliminated, one should guess from the remaining options, and if none of the options can be eliminated, statistically it shouldn' t matter if you guess or not; the outcome should be the same.

# More Multiple Choice Tips

- When guessing, make a random selection from the options that were not eliminated. Avoid picking an option if it only "sounds right". Picking options that sound right could lead into a trap set by the item writer for a student who knows a little bit, but not quite enough, about the question to select the one best answer. Try to make an unbiased random selection from the options that remain after you have eliminated those you are certain are wrong.
- Remember, if a question is skipped, there is no point deduction, but don't forget to skip the corresponding line on the answer sheet or you will waste valuable time erasing and moving answers.

# **Multiple Choice Section**

- Question types
  - Options-First
  - Traditional
  - Negative-Stem
  - Roman-Numeral
- Expect the exam to start with 15-25 Options-First questions
- Of the remaining questions, expect about 90% to be Traditional questions
- Expect 2-5 Negative-Stem and 2-5 Roman-Numeral questions

## **Options-First Questions**

- The multiple-choice section of the AP Environmental Science Exam usually begins with 15-25 Options-First questions.
- These questions require the use of the same set of options for a series of questions.
- The same option may be the answer for more than one of the questions, and some may not be used at all.
- A good way to think about this type of question is as a series of questions that all happen to have the same set of options.
- When thought of in that way, one would not wonder if an option can be correct more than once, or if all of the options will be used.

## **Options-First Question Sample**

- (A) Mercury
- (B) Carbon monoxide
- (C) Lead (D) Ozone
- (E) Sulfur dioxide
- 1. A secondary air pollutant that is formed in
- photochemical smog 2. A contaminant of coal that accumulates in
- the tissues of some species of fish
- 3. Reacts in air to form acids which can fall to the ground as acid rain

#### Traditional Questions

- Nearly all of the multiple-choice guestions will be Traditional multiple-choice questions.
- These questions will be straight forward questions with five options and one correct answer.
- These questions simply require students to read the question and select the most correct answer

# Traditional Question Sample

- 1. Which of the following is an asphyxiant produced during incomplete combustion reactions?
  - (A) Mercury
  - (B) Carbon monoxide (C) Lead
- (D) Ozone
- (E) Sulfur dioxide

#### **Negative-Stem Questions**

- In Negative-Stem questions, all of the options are correct except one.
- These questions usually begin with a statement like, "All of the following are correct EXCEPT..." or "Which of the following is NOT..." In either case, there will be four options that are in the correct context, and one that is not—that is the correct answer.

- not—that is the correct answer.
  Students should expect to encounter few of this type of question, but they must be prepared for them. They may be the hardest questions on the exam.
  If the answer is not immediately obvious, they may want to circle this type of question and return to it later.
  One way to approach these questions is as a series of True/False questions. There is only one false answer, and that is the correct answer. Marking the options with a T or an F while reading will help to keep track of which options are true and false.

# Negative-Stem Question Sample

- 1. Which of the following is NOT one of the criteria air pollutants monitored by the U.S.-EPA?
  - (A) Ozone
  - (B) Carbon monoxide
  - (C) Lead
  - (D) Mercury (E) Sulfur dioxide

## **Roman-Numeral Questions**

- Students should also expect to encounter relatively few Roman-Numeral questions.
- These questions are not as difficult as the Negative-Stem questions because students are looking for correct answers.
- In Roman-Numeral questions, there are usually three or four answers labeled with Roman numerals. One or more of the answers could be correct.
- A series of options are provided with from which to select the correct Roman numeral or set of Roman numerals.
- The option listing the Roman numeral(s) which are followed by a correct answer is correct.

## **Roman Numeral Question Sample**

- 1. Which of the following is a toxic heavy metal? (I) Mercury (II) Carbon monoxide
- (III) Lead (A) I only (B) II only (C) III only (D) I and II only (E) I and III only

# A Few More Multiple Choice Tips

- Students will encounter a few "Least and Most Likely" Questions
  These questions may have two or more options that are correct, but only one that is the least or most likely. When answering these questions, don't answer until reading through all of the options, and if more than one is correct, rank the likeliness of each correct ontion by unlocing a number point to the correct option by placing a number next to the option.
- 1. If released or formed in the atmosphere, which of the following will least likely result in long-term environmental damage to an ecosystem?
  - (A) Mercury (B) Carbon monoxide (C) Lead (D) Ozone (E) Sulfur dioxide

# A Few More Multiple Choice Tips

- Students will also encounter a few "Data Interpretation and Analysis" questions in the multiple-choice section.
- In this type of question, there is a data set, graph, or chart for to review and interpret. Often there is more than one question that makes use of the data set, graph, or chart.
- These questions may require some calculations to determine the answer.
- Remind students to use the test booklet for scratch work.
- Calculators are not permitted on the AP Environmental Science exam.





- Data Set (Math)
- Synthesis & Evaluation
- One Document-Based Question
- One Data-Set Question
- Two Synthesis & Evaluation Questions

## **Document-Based Question**

- One question that is prompted with some type of document that will pertain to the questions being asked.
- The document is primarily used to introduce the question, and although numbers or information provided in the document will help answer the question, students should not expect to pull their answers directly from the passage.
- The purpose of the document is to introduce the question or questions. Students are expected to demonstrate comprehension by adding information learned from readings or class.
- A common mistake that students make is to simply repeat information given in the document as their answer.

## Data-Set Question

- One question that is often referred to as the math question will center around a graph, diagram, table, chart, or statistics that are given in the introductory paragraph.
   Approximately 50% of the points on this type of question are earned by performing arithmetical calculations. Students must show all work for all calculations and include the appropriate units with each number in the pink answer booklet.
- Students who do not feel that they can do the math part of the question should not give up! Even though this is considered the math question, these questions typically have one to two parts on which points can be earned that do not deal with any calculations, but rather with the environmental issue or concept referred to in the question.
- Encourage students to read the remaining sections of the guestion and answer the portions that do not require calculations. Reminder: Calculators are not permitted on the AP Environmental Science exam so students will need to be comfortable using basic algebra such as multiplying and dividing exponents and scientific notation.

## Synthesis & Evaluation Questions

- There are two Synthesis & Evaluation questions on the free-response section of the AP Environmental Science exam.
- It may be easiest to understand what a Synthesis & Evaluation question is by understanding what it is not. That is, if a question is not a math question, and it is not a DBQ, then it is a Synthesis & Evaluation question.
- A Synthesis & Evaluation question, will require students to write an essay in which they demonstrate knowledge about one of the numerous topics of study in the AP Environmental Science course. Their ability to earn points in these essays will be determined by their knowledge of the subject matter.
- In rare cases, a simple calculation may be required in a Synthesis & Evaluation question; however the calculation will likely be worth only one or two points. These questions will usually have a small paragraph to introduce their topic and then 4 5 questions or prompts pertaining to that topic. topic.

# Free Response Tips

#### Identify or List

- These terms are asking students for a specific object, advantage, disadvantage, cause, solution, etc. Students are required to write in prose (complete sentences) even if it may seem like they can answer this type of question in one word. They must write the answer in a complete sentence to receive credit receive credit.
- For example, if a question states, "Identify two uses of fuelwood in developing countries." The answer can be as short as, "Two uses of fuelwood in developing countries are for heating and cooking. However, you would earn no points for simply writing "heating and cooking."

## More Free Response Tips

#### • Describe or Explain

- These terms are asking for details beyond just identifying an object or solution. Often these terms are used with the exact number of solutions or objects to be described. A good description will usually take more than one sentence.
- usually take more than one sentence. For example, a question may state "Describe TWO benefits of using fuelwood." A good response to this prompt is, "Two benefits of the use of fuelwood are the ability for people to heat their homes without using fossil fuels which are non-renewable and result in habitat loss during their ovtraction (fmanaed custinght) the use of extraction. If managed sustainably, the use of fuelwood can minimize habitat loss and is considered a renewable resource.

# More Free Response Tips

#### Discuss

- Here students must elaborate on their answer to the question. Often, 2 3 points may be earned for this type of question; therefore, it is important to write additional detail and go beyond a simple description or explanation. A good discussion may take as much as an entire paragraph. For example, a nuestion states "Discusse herefitte
- entire paragraph. For example, a question states, "Discuss a benefit to using fuelwood over current conventional fossil fuels." A good response to this prompt is, "A benefit of using fuelwood over a conventional fossil fuel like coal is the reduction in sulfur dioxide emissions associated with coal burning practices. By decreasing sulfur dioxide emissions we also reduce acid deposition problems that cause tissue damage to trees in terrestrial ecosystems." and cause fish kills due to lower pH in aquatic systems."
- Remember, discussion questions require students to not only identify and define concepts but to further elaborate on an issue.

#### More Free Response Tips

#### • Write an Argument

- An argument is a series of statements all in support of a stated position on an issue. This is the only time that students may be rewarded for writing a lengthy list. An argument is the most *extensive* and detailed response that students could be called upon to write and it should be at least one paragraph in length.
- Least one paragraph in length.
   For example, a question states, "Write an argument in support of the practice of sustainably harvesting fuelwood." A good response to this prompt is, "Harvesting fuelwood sustainably avoids using practices like clear-cutting forests. Clear-cutting causes soil erosion, and runoff into waterways causing sedimentation, which decreases primary productivity, increases fish kills due to suffocation, and results in poor water quality for people who depend on the waterways for their domestic water use. Furthermore, when the rate of tree harvesting exceeds the rate of replanting, tracts of forest that function as carbon dioxide reservoirs are no longer available, which will increase carbon dioxide levels in the atmosphere and further global climate change."

#### More Free Response Tips

- For the free-response portion of the exam, students will be given a green booklet with the guestions in it and a pink answer booklet with the questions and the space in which you will write your answers. The green insert stays at their school and will never be seen by an AP exam grader. So, make sure all calculations, scratch work, and answers are written in the pink answer booklets—especially for any mathematical calculations.
- Read each question carefully, considering the verb types being used. Take a few minutes to organize an answer before beginning to write.
- Write in prose. Always answer in complete sentences. Make sure all writing is clear and large enough for the reader to read your answer easily. Outline forms or bulleted lists are not acceptable and will not be graded.

#### More Free Response Tips

- Shy away from using examples or solutions that are specific to your local region or are uniquely your own ideas. Remember, answers on the rubric for the free-response section must be able to be applied to every single student across the country taking this exam. Therefore you should only use commonly known examples or solutions. Avoid fabricating information as well. It is a waste of time and will not earn any points. points.
- Be time-conscious. There are approximately 22 minutes to answer each FRQ. Encourage students to read through all four questions and work on the essays they feel most comfortable with first. Doing so may increase the amount of time they have for the essays they don't know as well.

#### More Free Response Tips

- Strike out to save time. When students make mistakes, they should avoid wasting valuable time and losing momentum on a question by stopping to erase their work; cross or strike out the mistake and keep moving forward.
- Do not restate the question—it is a waste of time. Essays also do not need an introduction or conclusion. The reader is simply looking for correct statements that demonstrate knowledge of the concept.
- Label answers so there is no doubt where an answer is. All questions parts such as a, b, c, or i, ii, iii. This will also help students to ensure that they have finished answering the question and can move on or come back as needed.

## More Free Response Tips

- · Read the question carefully. Students may be prompted to describe an environmental problem in one part of a question, an economic problem in another, and an environmental benefit in a third. Underline or circle the key terms "environmental" and "economic," and be certain to provide an appropriate response.
- A good rule of thumb is to read "environmental" as "ecological" and to write about how the topic being addressed in the question effects the abundance, diversity, or distribution of life.
- Neatness counts. Messy or illegible writing is very difficult to grade. Avoid making it hard for the AP reader to award points on an essay. It is always best if the reader can easily find and read answers for each essay question. If they cannot decipher handwriting then awarding points is more difficult.

# More Free Response Tips

- Follow through with a full explanation of scientific terms. Many students fail to get points because they didn't finish a thought. An easy way to accomplish this is to define the scientific terms used in the essay, and, if possible, provide an example to illustrate.
- Do not write long lists in an answer! If the question says "Identify TWO" then identify only two items. The graders are instructed to grade only the first two items even if a student writes a longer list. Thus, if two items are requested, and a student lists six items of which the first two are incorrect, no points will be given even if the last four of the six answers were correct.

## More Free Response Tips

- Do not use clichés for answers and avoid rhetorical questions (for example, "there is no away in pollution," "not in my backyard," or " where are the animals supposed to go?"). Instead students must scientifically explain answers to earn points.
- Be concise—do not tell the reader everything about a topic. Only answer what is asked for to avoid wasting valuable time that could be used on other essays.
- a Answer the question other essays.
  Answer the question that you were asked...not just any question to which you happen to know the answer.
  Sometimes, in an effort to fill space, students will launch into a dissertation that is not relevant to the question that was asked. Students should not waste valuable time writing about all the things they know on another topic that is not related to the question. the question.

#### More Free Response Tips

- When asked to do calculations show all work. Students normally need to show their work and label units to receive credit on math questions.
  A math-based free-response question always contains a part of the question that can be answered without completing the calculations.
- Make sure all of the scratch work and answers are in the pink answer booklet
- Practice your math! Every AP Environmental Science student should be comfortable working with metric prefixes, decimals, percentages, fractions, algebra, exponents, and scientific notation. ٠

# **AP Environmental Science Exam Preparation**

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