

AP Environmental Science Summer Reading

Cartoon Guide to the Environment

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***Adapted from: mchow.weebly.com/uploads/1/2/.../cartoon_guide_to_env_questions.doc**

This assignment follows the *Cartoon Guide to the Environment*, which you can purchase online. As you read these chapters throughout the summer, please answer the following questions as part of your notes. This is one of my favorite books (not joking), and goes into most of the units that we will be covering throughout the year. There are 14 chapters, so make a reasonable plan for covering the material and stick to it. Do not wait until the last couple days of summer break to start. I am more concerned with you doing the reading and taking your time with the cartoons, then hurrying to finish the questions. The more thought you put into this reading, the easier this year will be for you. Good luck, and feel free to email me anytime at khagen@lfanet.org.

Chapter 1 – Forests and Water

- 1) Where is Easter Island and how did it get its name?
- 2) How do we know that Polynesians were the ones to colonize Easter Island?
- 3) How is the island different today than it was when the Polynesians first colonized it?
- 4) Why did the Polynesians cut down the trees?
- 5) What is a watershed?
- 6) How long does it take for water in the atmosphere to be fully replaced?
- 7) What role do trees take in the water cycle?
- 8) Define groundwater and water table?
- 9) Why are trees called water pumps?
- 10) What happened when the forests disappeared on Easter Island?
- 11) What is the point of the Easter Island story?
- 12) How can we take the story of Easter Island and relate it to what is happening on the planet now?

Chapter 2 – more cycles

- 1) What is another name for the water cycle?
- 2) What does it mean by Dynamic Balance?
- 3) Explain the following cycles
 - a. Oxygen
 - b. Nitrogen
 - c. Carbon
 - d. Phosphorus
- 4) What are Producers and consumers?
- 5) What is the Gaia Theory?
- 6) What is a feedback loop?
- 7) What are Macronutrients?
- 8) What part do scavengers play in the cycling of nutrients?
- 9) What determines the rate at which the nutrients cycle?

Chapter 3 – Evolving Systems, Struggling Individuals

- 1) What does the individual organism strive to do?
- 2) How does the individual fit into the system?
- 3) What does it mean to have a selective advantage?

- 4) What is a species?
- 5) What is speciation?
- 6) Define allopatric
- 7) Define Sympatric
- 8) What is a population?
- 9) What is population dynamics?
- 10) What does it mean by biotic potential?
- 11) What are reproductive strategies?
- 12) What is environmental resistance?
- 13) What is the difference between intrinsic and extrinsic limiting factors?
- 14) What is the difference between R and K strategies?
- 15) What happens if a population is too successful?
- 16) Explain the difference in genetic diversity, species diversity and ecological diversity.
- 17) How does evolution depend on genetic diversity?

Chapter 4 – Communities Wet

- 1) How much of the earth do oceans cover?
- 2) Why are oceans important?
- 3) Why do we know more about species on land than in the oceans?
- 4) For the most part, what strategy do most aquatic life follow? (r or k) explain
- 5) What does the term Net Primary Production mean?
- 6) Describe the following Zones:

| | |
|-------------------------------|--------------------|
| a. Open Ocean (euphotic zone) | d. Streams |
| b. Coastal Zone | e. Lakes |
| c. Coastal Wetlands | f. Inland Wetlands |

Chapter 5 – And Dry

- 1) What is a Biome?
- 2) Describe the following Biomes

| | |
|------------------------------------|---------------------------------|
| a. Polar Grassland (arctic tundra) | e. Deserts |
| b. Boreal Forest | f. Tropical Rainforest |
| c. Temperate Deciduous Forest | g. Tropical Grassland (savanna) |
| d. Grassland | |
- 3) What is an Ecotone?
- 4) What is an edge effect?
- 5) Explain what ecological succession is
- 6) What is the difference between primary and secondary succession
- 7) What is the relationship between species diversity and stability?
- 8) Explain the three different aspects of ecological stability:
 - a. Inertia
 - b. Constancy
 - c. resilience
- 9) Why cant we do controlled experiments on whole ecosystems?

Chapter 6 – Let's Eat

- 1) Eating is a way to obtain _____ energy

- 2) What does the energy flow through an ecosystem depend on?
- 3) Explain the First Law of Thermodynamics
- 4) Where does all the energy on Earth ultimately come from?
- 5) What percent of the energy from the sun is:
 - a. Reflected
 - b. Converted to heat
 - c. Used by living plants
- 6) Explain what photosynthesis is
- 7) What is chemosynthesis?
- 8) Explain the Second Law of thermodynamics
- 9) Why can't energy conversions be 100% efficient?
- 10) What percent of the solar energy absorbed by a plant is converted to biomass?
- 11) What is the efficiency of herbivores and carnivores?
- 12) Draw the trophic levels explained in the chapter
- 13) What is a Niche?
- 14) When does competition occur?
- 15) What is the Principle of competitive exclusion?
- 16) When does extinction occur?
- 17) What is Symbiosis?
- 18) Explain the three kinds of symbiosis
- 19) What is predation?
- 20) What is a dynamic balance?
- 21) What is a superpredator?

Chapter 7 – From Hunting to Planting

- 1) What is life like for a hunter-gatherer?
- 2) Why was fire so important?
- 3) What made humans superpredators?
- 4) Why did agriculture come about?
- 5) What were the two major effects of farming?
- 6) Why does farming lead to large families?
- 7) How did domesticating animals contribute to the building of civilizations?
- 8) What does it mean to say that farming is extractive?
- 9) What did man do to overcome the problems created by extracting?
- 10) Why was salt a problem for the Sumerians and how do they overcome it?
- 11) What was the problem with phosphorus with the Mexicans?
- 12) What was the problem with the Nile?

Chapter 8 – What Limiting Factors?

- 1) Explain why the human race was worse off after agriculture.
- 2) Why does agriculture lead to a Landlord class?
- 3) Explain how civilization is self-perpetuating?
- 4) Why couldn't early civilization go back to hunting and gathering?
- 5) What is the consequence of civilization?
- 6) What does exponential growth mean?
- 7) Explain doubling time
- 8) Why can't a population continue exponential growth forever?

- 9) What is the difference (in populations) between an S curve and a J curve?
- 10) Who was Thomas Malthus?
- 11) What was Malthus wrong about?
- 12) Explain the three preventative checks that Malthus came up with
 a. War
 b. Famine
 c. Pestilence
- 13) Explain how infectious agents co-evolve with humans.
- 14) Why are foreign diseases so devastating to isolated populations?
- 15) What does the word Pandemic mean?
- 16) Why do diseases spread more rapidly now than 1000 years ago?
- 17) Why has the trend for the human populations been only in one direction for the past 500 years or so?
- 18) How are the population graphs of developed countries difference from the developing countries?
- 19) What are the limiting factors for developing countries? What are they for developed countries?

Chapter 9 – Bye, Bye, Biome

1. How many species are there on Earth?
2. Give the estimated percentage of the following types of species:

| | |
|--------------------------|---------------|
| a) vertebrates | d) fish |
| b) mammals | e) arthropods |
| c) reptiles & amphibians | f) birds |
3. What is Megadiversity and where is it found?
4. Why are islands highly diverse?
5. What happened to Madagascar?
6. How did marsupials end up on Australia?
7. What happened to the Dodo bird, the Moa, the Elephant bird, and the Tasmanian Emu?
8. Why was the introduction of dogs, pigs, and rats to an environment a problem when Europeans settled a new region?
9. Why was it a problem when the US Army started to use processed Albatross eggs in their rations?
10. Much of this destruction was done to provide people with necessities – in the list below indicate whether it was for a necessity (N) or a Luxury (L) (before plastic and petroleum)

| | |
|---------------------------|--|
| a) Elephants for Ivory | f) Chamois |
| b) Whale-oil Lamps, | g) Deerskin |
| c) Tortoises | h) Ostrich, Flamingos, Egrets for feathers |
| d) Firewood & charcoal | i) Walrus-hide Bullet proof vests |
| e) Badger-Bristle brushes | |
11. What is Commercial Hunting? (how is it different from Subsistence hunters)
12. Why is Commercial Hunting considered unstable?
13. Who were among the first conservationists?
14. How much Spermaceti was exported in 1770?
15. How many deerskins were shipped from SC every year between 1706 – 1748?
16. In 1848 how many snowy egrets were exported from Venezuela?
17. In 1856 how many sea otter pelts were exported?
18. How many bison, beaver and prairie dogs were hunted?
19. Explain how the keystone of an arch is the same as a keystone species.
20. Why are beaver, alligators and prairie dogs considered keystone species?

21. What is competitive exclusion and how has it contributed to the loss of biodiversity?
22. What is the “Island Effect”?
23. What is an endangered species?
24. What are the general characteristics of endangered species?
25. What is the difference between an endangered species and a threatened species?
26. What is an indicator species?
27. Why are amphibians considered to be a good indicator species?
28. What is NPP?
29. How much NPP is now used by humans?
30. What will happen if the human population doubles in the next 50 years as expected?

Chapter 10 – Energy Web

1. What do the authors mean when they say that humans are the only animals that use non-food energy?
2. What is energy?
3. What was the only source of heat at first?
4. What is Biomass?
5. What was invented around 1700 that changed everything?
6. What was so different about it?
7. Explain thermodynamics.
8. What are the types of energy that might be converted from one to another.
9. Why is no conversion 100% efficient?
10. What was the practical effect of the steam engine?
11. What are Fossil Fuels?
12. Compare and contrast an energy network with a food web.
13. Why is electricity the king of consumption?
14. What are the advantages of electricity?
15. If we continue to consume oil at the present rate it will be gone by the year 2030 – would you call this an energy crisis? Why or why not?
16. What does it mean to say that energy consumption is unequal?
17. Explain the 3 possible areas of potential savings in an energy system.
18. What are the pros and cons of Nuclear power?
19. What are the pros and cons of the following alternative energy sources:

| | |
|------------------|---------------|
| a. Solar power | d. Biomass |
| b. Hydroelectric | e. geothermal |
| c. Wind | |
20. What is the technological solution to the energy problem?

Chapter 11 – Let’s Eat Again

1. What are most chemical fertilizers derived from?
2. Compare and contrast use of energy sources for agriculture in developed vs. developing countries.
3. Describe the technique of shifting cultivation. List a few countries where shifting cultivation is common according to the map on pg. 160.
4. List three characteristics of high input agriculture.

5. How does a developing country's lower per capita GNP influence "cash crop" production? How do you think this influences local food crop production?
6. List two positive outcomes and two problems associated with the "green revolution".
7. According to the chapter, food production on a global scale has increased, yet many people have had their standard of living decrease. List two reasons that might account for this trend.
8. According to the article, what might happen to phosphorus levels in 2050? Do you think that this is realistic given your knowledge of the phosphorus cycle, why or why not?
9. Why might intensive agriculture operations that only use one or two varieties be susceptible to problems?
10. Describe the energy efficiency of meat production? Do you think this trend is sustainable if the population of the planet continues to grow and rely heavily on a protein rich meat diet?
11. As a resident of an affluent country like the U.S. , do you favor keeping meat (chicken, pork, beef, etc.) as a major part of your diet and focus on population control globally , or do you think we should focus efforts globally on increasing agricultural efficiency production to support larger populations in the world? Why?
12. Describe the general state of fisheries production in relation to human population according to the chapter. How might aquaculture be used to enhance seafood supplies?
13. List two types of seafood you enjoy eating (taste, health benefits, cultural significance, generally yumminess, availability, etc.). Describe the type of and amount of energy that was required to get that from the ocean to your plate.
14. If you had a choice between tuna (for sushi rolls for example) caught sustainably that costs 25% more, or tuna that is cheaper but was harvested unsustainably, which would you buy/consume? Why? Would your opinion change if the price of tuna increased by 50% ten years into the future due to tuna population declines (i.e. the law of supply and demand inflates market price).

Chapter 12

1. Compare a sanitary landfill with an incinerator. What do you believe is the better solution to our solid waste problem and why?
2. What is source reduction?
3. How much water do typical americans use per day?
4. How can the impact of cities and buildings be lessened?

Chapter 13

1. Where is "Away?"
 - a. In Early life?
 - b. After the industrial revolution? Why does it change?
2. Who was Rachel Carson and what role did she play in environmental science?
3. When did the EPA come into existence and what is its job?
4. What are the important aspects of each of the following issues: smog, acid rain, ozone depletion, global warming?

Chapter 14

1. Describe Garrett Hardin's Tragedy of the Commons
2. What is a sustainable ecosystem? Is it possible with the existense of humans on a global scale?
 - If yes, then when do you think this will take place?
 - If no, then how much longer does humanity have?
3. What was your favorite part of this book and why?

