Midterm review questions – ENVIR 100 Winter 2011

Below are some sample questions that should give you a good sense of the type and scope of questions that will appear on the midterm. You can also look at past midterms and finals on the class website (in the section on Grades and Exams). *All class material from lectures, guest speakers, discussions and activities in section, and readings are fair game for the exam.*

1) Explain briefly how increasing carbon dioxide concentrations in the atmosphere affect the earth's "temperature balance" and lead to climate change. *You must draw a picture.*
2) (4 points) Has the earth's climate ever changed significantly before? If so, give an example and explain what scientists believe caused the change.
3) (4 points) "Scientists know that climate change caused Hurricane Katrina [or the floods in Pakistan/fires in Russia]." Circle one (True False) and briefly elaborate.
4) (3 points) Over the next few decades, global warming is expected to increase global average temperatures by about _____ °F per decade, or equivalently by about _____ °C per decade.
5) (2 points) Explain the difference between *climate* and *weather*. If you remember the jokes about this from class you can use one of those, but you don't have to."
6) (2 points) In 1896 Arrhenius estimated that doubling CO2 concentrations would increase global average temperatures by 5 °C. How much is this in °F? (It may help to recall that x °C equals $(9x/5) + 32$ °F, e.g., 0 °C = 32 °F and 100 °C = 212 °F).
7) What is the IPCC? Say what the acronym stands for and briefly describe what the organization is and what it does. What did the IPCC win in 2007?
8) How has the IPCC scientific consensus about anthropogenic climate change changed since the 1st Assessment Report in 1990?
9) What are the two main reasons for uncertainty about how much global temperatures will rise this century?
10) What is the most important human activity other than burning fossil fuels that affects climate change?
11) Give one example of a significant greenhouse gas other than carbon dioxide.
12) Give an example of a positive feedback loop relating to global temperatures, and of a negative feedback loop relating to global temperatures.
13) In their most recent Assessment Report in 2007, the IPCC's conclusion was that "(Circle one: *Some / Most / Almost all*) of the observed increase in global average temperatures since the mid-20th century is (circle one: *likely / very likely / definitively*) due to the observed increase in anthropogenic greenhouse gas concentrations."
14) For the ocean acidification lecture you watched a video on the Italian island of Ischia. What is interesting about this island, i.e., how is it connected to ocean acidification?
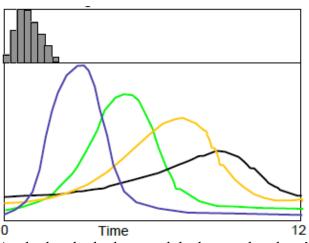15) Ocean acidification is a direct threat to marine organisms (like foraminifera) that have [   ], an indirect threat to *all* marine organisms because of connections in the [   ], and a special threat to [   ], a marine ecosystem that harbors more than 25% of the ocean's biodiversity. (Fill in the blanks.)

16) Complete this sentence: CO_2 dissolves in water and combines with H_2O to form carbonic acid, which immediately splits into H^+ and bicarbonate ions. The H^+ then combines with carbonate ions, leaving less carbonate for [   ].

17) The Lutz article on population growth ("Towards a world of 2-6 billion...") notes that population projections involve "stocks" and "flows". In the context of projecting populations from (say) 2010 to 2050, what is the "stock" and what is the "flow"? In the context of the carbon cycle, what is an example of a "stock" and what is an example of a "flow"?

18) What is the basic idea of "iron fertilization"?

19) Based on the Tilman et al. article ("Beneficial biofuels—the food, energy, and environment trilemma"), give an example of a "good biofuel" and a "bad biofuel", in each case giving an argument about what makes it good or bad.

20) Name one biogeochemical cycle and draw a diagram that uses at least three fluxes.

21) (6 points total) Draw a partial diagram of the carbon cycle; label the atmosphere plus two other *pools*, and label photosynthesis plus two other *fluxes*. (Make sure the fluxes include arrows. For half credit you can draw the nitrogen or water cycle.)

22) (3 points) "Human activity accounts for only a small percentage of global carbon-dioxide emissions, with the remainder generated by natural processes like plant decay." Is this claim plausible? Circle one (Yes No) and briefly explain why or why not. (Hint: Think about your answer to the previous question.)

23) Give an example of a "tragedy of the commons" problem that involves water. (Your example can come from the *Economist* survey on water—"For want of a drink"—but it doesn't have to.)

24) Almost 70% of the world's water goes to [   ].

25) The *Economist* survey on water ("For want of a drink") advocates "the spread of democratic self-management among informed farmers." Explain how this relates to the ideas of Garrett Hardin and Elinor Ostrom.

26) Write a caption for the figure below (from the section on biogeochemical cycles). The top chart is about rainfall, the bottom chart is about run-off.

27) Anybody who looks at a globe knows that there's a lot of water on the planet. So why are folks concerned about water scarcity when there's so much water around?

28) Which statement(s) are true? (It could be more than one.) Icecaps and glaciers:
   a. Account for most of the water on earth

b. Are all expected to melt in this century because of climate change
c. Account for most of the fresh water on earth
d. Used to cover Puget Sound

29) Briefly describe one process through which trees act as a sink for carbon. Your answer should be more than just one word.

30) Briefly describe *two* non-anthropocentric processes through which trees act as a source of carbon. One word answers are fine.

31) How much of the Earth's water is freshwater (rather than salt water)? Circle one:
0.1%   3%   18%   31%

32) Briefly describe two land use changes brought about by humans that affect the water cycle. One- or two-word answers are fine.

33) Air is about 78% nitrogen, but plants cannot directly use the nitrogen from the air. Explain why not in layperson's terms. Then describe two ways in which plants do get nitrogen…
a. One way that involves humans:
b. One way that does not involve humans:

34) "Burning dried plants is like recycling CO2." Explain briefly; make sure to compare with burning fossil fuels.

35) Elizabeth Kolbert ("The scales fall", about tuna) notes that "it is in 'everyone's interest' to take the steps needed to prevent [overfishing and other problems from leading to] an ocean-wide slide into slime." Does this mean that those steps will necessarily be taken? Circle one (Yes No) and briefly explain.

36) Give an example of geoengineering.

37) What is Garrett Hardin's solution to the tragedy of the commons? Given an example based on traffic congestion or examples from inside or outside of class.

38) Adam Smith's metaphor of the "invisible hand" argues that individual self-interest can lead to outcomes that are good for society as a whole.
a. Explain how the "invisible hand" can help conserve resources for future generations. In other words: what is the profit motive for conservation?
b. Give one example of how the "invisible hand" fails.

39) Yoram's cartoon book chapter ("The end of planet Earth?") ends with the statement "We're not worried about running out of fossil fuels; we're worried about *not* running out of fossil fuels." Explain both halves of this statement and relate them (as appropriate) to the tragedy of the commons and the invisible hand.

40) What is the main thrust of the article "Plenty of gloom"?

41) Briefly describe one example of "the tragedy of the commons" and explain what key features make your example fit that description. Then describe how you think this "tragedy" could be averted.

42) Describe the metaphors of "the tragedy of the commons", "the invisible hand", and provide one example of each. Then describe how they relate to the story of the bus with no driver that's heading towards the cliff.

43) Choose whether each of the following is an example of "mutual coercion, mutually agreed upon" (MCMAU), an "appeal to conscience" (ATC) or neither.
a. The U.S. Senate passes a law that taxes corporations for every ton of carbon emissions they produce above the 2000 average.

b.   The (undemocratically established) leader of Zimbabwe mandates that every household restrict their consumption of apples to one bushel a month in order to cut down on dependence on foreign exports.

c.   The governor of Arizona makes a speech asking that residents take shorter showers to reduce pressure on the local water system.

44) Give definitions for these words: bioaccumulation; food web; impervious surface; evapotranspiration; negative externality, total fertility rate, GDP per capita.

45) In his lecture on population and food webs, Tom Hinckley said that "green stuff determines all the rest." Explain this, using the 10% rule.

46) What was the main idea of the "Shifting Baselines" video?

47) What is the difference between linear growth and exponential growth? Draw graphs to support your answer.

48) (9 points) Draw a graph approximating the historic and *most likely future* path of world human population growth starting in 1800 and continuing to 2100. Your graph should have the following elements: Labels on the *x* and *y* axes (1 point); labels or arrows or other ways for your reader to determine the approximate (within 15%) human population in the year 2010 and in the year 2100 (2 points each); and an appropriate shape showing how populations are likely to change over that time period (4 points).

49) Consider the environmental impact equation $I = P \cdot A \cdot T$ (IPAT).

a.   Define the variables I, P, A, and T, both in general and in the context of world carbon emissions.

b.   Most experts think that P is very likely to increase significantly over the course of the 21st century. In approximate terms (i.e., within 15%), what is the "best guess" estimate for P in the year 2100?

c.   Most experts think that A is very likely to increase significantly over the course of the 21st century and that (with some qualifications) this increase is a good thing. Explain why an increase in A is considered by many to be a good thing, and then describe one of the qualifications, i.e., one reason why an increase in A might be problematic.

d.   Experts are unsure of what is going to happen to T over the course of the 21st century. If T decreases over this time period, does this mean world carbon emissions in 2100 will definitely be lower than they are today? Explain why or why not.

50) (4 points total) Some scholars argue that the IPAT equation indicates that we need either market-based solutions or top-down government-based solutions. Sara Curran described an alternative based on the work of Elinor Ostrom; explain this alternative (2 points) and give an example (2 points).

51) What is compost and why do farmers use it?

52) These questions are about the UW Farm.

a.   Give an argument for how urban agriculture/farming can make a city sustainable.

b.   Give two examples of principles/techniques used in sustainable agriculture.

53) Draw a trophic pyramid and label the four parts. Relate the pyramid to bioaccumulation and the 10% rule.

54) Briefly describe a trophic cascade. For full credit, describe the one in Ripple and Beschta 2004 ("Wolves and the ecology of fear: Can predation risk structure ecosystems?"). For partial credit, give a different example of a trophic cascade.

55) "Plenty of gloom" argued that the bus heading towards the cliff won't always go over the cliff.
   a. What metaphor explains why?
   b. In one sentence or less, give one example relevant to environmental studies, i.e., one case in which the "bus" didn't "go over the cliff" as predicted because of reasons related to the above metaphor.
   c. What common household object did Leonard Read use in his article elaborating on this metaphor?
   d. When the "bus" does "go over the cliff", what metaphor often explains why?
   e. In one sentence or less, give one *specific* example relevant to environmental studies, i.e., one case in which the "bus" *did* "go over the cliff" because of reasons related to the above metaphor. *Do not use climate change.*

56) Money in a savings account that grows at 5% per year is an example of (circle one) linear / exponential growth.

57) Human population growth over the preceding 2,000 years most closely resembles (circle one) linear / exponential growth.

58) What is the difference between an *empirical* claim and a *normative* claim? Between an *intrinsic* value and an *instrumental* value? Give an example of each.

59) What is "moral considerability"? Briefly discuss this in the context of Andrea Woody's lecture on environmental ethics.

60) Give three examples from the guest lecture by Jon Patz about the connection between climate change and human health.

61) What is the definition of an ecosystem?

62) "Today, life on earth faces the sixth great extinction event." How does the cause of this extinction event compare with the cause of previous extinction events?

63) Give examples of each of the following ecosystem services: provisional services, cultural services, supporting services, and regulating services.

64) Define biodiversity and give two examples of the value of biodiversity.

65) Biodiversity includes diversity at three different scales. List them and give an example of each.

66) (10 points total.) These questions are about DDT.
   a. (2 points) DDT is best described (in one word) as a/an _____.
   b. (2 points) DDT featured prominently in which famous book that was part of the reading list? Who wrote that book?
   c. (3 points) Give a *developed country* perspective on DDT. (In your answer, name a country that is an example of a developed country.)
   d. (3 points) Give a *developing country* perspective on DDT. (In your answer, name a country that is an example of a developing country.)