

ESYS10 Winter 2008

30 REPRESENTATIVE FINAL EXAM QUESTIONS FOR REVIEW (to be added to the questions from the midterm review sheet).

1. What is the current albedo (in %) of the Earth, and what aspect of the climate system is primarily responsible for this reflectivity?
2. How much has the strength of the sun varied over the course of the last 300 years? How do we know?
3. At the latitude of San Diego, how much does the zenith angle of the sun change throughout the year?
4. What are the three features of the climate system that can cause global temperature change?
5. The IPCC report predicts, by 2100, greater-than average warming of the earth in the high latitudes (polar regions). Explain the basis for this prediction.
6. Sketch the shape of the relationship between water holding capacity of the atmosphere and the temperature of air. Identify one way in which the predictions of future drought depend on this shape.
7. Explain the basis for water vapor feedback. How does it influence the predictions of global temperature increase?
8. Explain briefly (two sentences or fewer) why the behavior of clouds represents the biggest source of uncertainty in predictions of global warming.
9. This winter in the Northern Hemisphere has been one of the coldest winters over the last decade or so.  
This winter was also classified as a La Niña cold event in the tropical Pacific Ocean. Is there a connection between these two observations? Why or why not?
10. Researchers are now able to conclude with certainty that the pattern of warming of the last 25 years is the result of greenhouse gas increases. Explain how this conclusion can be reached.
11. Why are very cold conditions in the stratosphere required to produce an ozone hole? How are these cold conditions related to the warming of the surface of the earth.
12. The eruption of Mt. Pinatubo cooled the entire Earth for a period of more than a year. Why?

13. The air quality of Los Angeles has improved steadily over the last 30 years. What factor is mainly responsible for this improvement?
14. Explain why the concept of "social discounting" influences the following statement (taken from a CNN report on global warming) "Net valuations of benefits vs. costs will vary, but they are more likely to be negative if climate change is substantial and rapid, rather than if it is moderate and gradual."
15. List two reasons why the per capita energy consumption in Texas is the highest anywhere in the U.S.
16. Identify two ways in which carbon could be sequestered artificially.
17. What has been the principal change to the snowpack of the western U.S. over the past few decades? Explain one way in which this change presents a problem for water managers.
18. Hydroelectric energy is not likely to increase in relative importance over the next few decades, either in the U.S. or globally. Why?
19. Why do researchers believe that the melting of the Greenland ice cap might be especially likely over the next few hundred years? By how much would sea level rise globally if Greenland were to melt entirely?
20. What is the principal greenhouse gas in the present atmosphere?
21. Identify two regions of the world that experience drought during an El Niño warm event. Explain what is happening in the atmosphere to produce this drought.
22. Researchers worry about the stability of the "conveyor belt" circulation of the ocean. Identify the primary difference that it would make to the climate system if this circulation slowed (because of global warming).
23. Explain the phenomenon of "fishing down the food chain" and cite at least one possible way to slow or reverse this trend.
24. Give one historical example (from marine fisheries) of why it is important, for proper management, to understand the function of all organisms in a food chain, as well as the overall stocks.
25. How might the increased application of nitrogen-based fertilizers influence the coastal environment over the next few decades? How might it influence the atmosphere? Give one example for each case.

26. George W. Bush compared the efforts required to reduce greenhouse gas emissions to the efforts to stop ozone destruction. Outline at least two reasons why such a comparison is flawed or inappropriate.

27. Methane is a powerful greenhouse gas (it is said to have ~50 times the “global warming potential” of carbon dioxide) and it has risen in the atmosphere since the beginning of the industrial revolution. Cite one potential positive feedback that might exacerbate the current imbalance of methane in our atmosphere over the next few decades.

28. Describe two main human-induced stresses on the coral reef ecosystems globally. Some stresses are reversible, while others are probably not. In each case that you describe, state whether the stress is reversible.

29. The smog produced in Beijing, PRC does not influence North America, but the carbon dioxide emitted does. Why?

30. The upward trend in biofuel production worldwide is fairly clear (and bound to continue). Identify one potential environmental cost, one potential social cost and one potential economic cost to increased biofuel production.