

April 29, 2008

Name: _____

Please answer five out of the following six questions. Please indicate clearly which question you want to skip. If you answer all six questions only the first five will count towards your score.

1. Long-term controls on atmospheric CO₂

- a) What are the main long-term sources and sinks of atmospheric CO₂?
- b) How does silicate weathering control atmospheric CO₂ concentrations?
- c) Describe a feedback mechanism that achieves long-term atmospheric CO₂ regulation.

2. Short-term carbon storage

- a) Name five reservoirs of carbon and rank them by size, starting with the largest.
- b) Which processes control atmospheric CO₂ concentrations on
- annual
 - decadal
 - millennial timescales ?

3. How to deal with global warming

- a) What is the difference between adaptation to global warming and mitigation of global warming? Which strategy is better?
- b) Describe two strategies that allow us to adapt to global warming.
- c) Describe two strategies that mitigate global warming.

4. Photosynthetic Feedback

One potential benefit of global warming is the idea that higher CO₂ levels may promote more vigorous plant growth.

- a) How is this so-called photosynthetic feedback supposed to work
- b) What would be the results of the photosynthetic feedback on the earth's climate / ecosystems ?
- c) Is it likely to work? Why, or why not ?

5. Biofuels

Some people argue that ethanol (or any biofuels) have a negative energy balance (i.e. the production of one gallon of ethanol requires more energy than is released when the same gallon is burned later)

- a) Discuss the energy balance of ethanol and similar biofuels.
- b) Assume the energy balance of ethanol is positive - is the production of biofuels a good idea? What are the advantages and disadvantages of biofuels for the U.S., for the world ?

6. Global Warming Crooks

- a) How did the earth's temperature change over the past 150 years. Make sure to draw a detailed sketch!
- b) Which parts of your temperature record from a) are likely due to anthropogenic greenhouse emissions?
- c) What other forcings may affect global temperatures over the past 150 years?