FINAL EXAM STUDY GUIDE: HINTS, EXAMPLES, & READING SUMMARIES
The final exam is on Monday at 1:30 pm. The exam length will be a little bit longer than other exams, probably about 60 minutes. It is worth 20% of your grade.

HINTS:
• The exam will cover everything since Spring Break. However, there will be a greater emphasis on materials covered since our last quiz; those materials are shown below with an asterisk:
  Carbon (including ANWR debate)
  Outdoor air pollution
  *Indoor air pollution
  *Environmental Health and Toxicology
  *Soils
  *What's Working Reports (main points of each presentation are eligible)
• The format of the final exam will be similar to that of prior exams and quizzes.
• While studying, make sure that you can answer all of the "what to know" questions handed out with the reading assignments as well as understand the listed "vocabulary" topics. For your convenience, I've listed all these questions and vocabulary topics in summary form below. Although the exam will draw heavily on these, it is not limited to them. Other topics discussed in class, in the readings, and on videos are fair game.
• Be sure to do all the reading (especially for soils) and study Quiz 2.
• Note that soil erosion notes are given below to help emphasize certain portions of the reading.

EXAMPLE QUESTIONS
Good examples of questions for carbon and outdoor air pollution can be found in Quiz 2. Make sure you understand all the questions on this quiz.

1. The concentration of DDT is greater in herbivores than in plants. This is an example of:
   a. synergism
   b. biomagnification
   c. genetic tolerance
   d. pollution
2. In Ethiopia, soil erosion worsens every year because:
   a. farmers are only allowed to plant rice
   b. soils are glacial dust which is being carried away by the wind
   c. animal dung is sold and used as fuel instead of spread on the fields
   d. humus content is abnormally high in Ethiopian soils
3. Name four components of a soil:
4. Dioxin is an example of a(n)
   a. synthetic organic compound
   b. particulate
   c. toxic heavy metal
   d. methylmercury
5. If you wanted to know the concentration of a toxin at which fifty percent of a population would be affected, you would be looking for the toxin's:
   a. threshold effect
   b. ED - 50
   c. LD - 50
   d. acute effect
SOIL NOTES
To help you on the Exam, I am including a few notes below on soil erosion that emphasize key points raised in your reading and in the soil erosion video.

E. Soil erosion
Definition: A natural process driven by wind & water, enhanced by human activity.

1. What slows erosion?
   i. vegetation cover (roots hold soil in place)
   ii. organic matter in soil (binds soil together)

2. Agricultural practices that increase soil erosion:
   i. intense tillage
      - vegetation cover destroyed,
      - breaks up root systems
      - no living plants on soil for part of year, exposes soil to wind & water
   ii. overgrazing
      - removes vegetation cover
      - depletes organic matter inputs
   iii. clear cutting (deforestation, especially bad on steep slopes)
      - removes vegetation cover, roots
      - depletes organic matter inputs
   iv. Harvest without organic matter replenishment
      - depletes clay - humus complex
      - soils become less fertile, might have to be abandoned

3. US soil erosion
   1/3 of topsoil in lower 48 states lost since 1880! (US soil conservation service)

4. Consequences of soil erosion
   i. cultivated land area reduced by 6 million hectares/yr, about the size of W. Virginia
      hectare = 100m x 100m area
   ii. siltation of dams
      ex. Soviet built dam on Yellow river, Aswan dam on Nile

5. Soil erosion reduction strategies
   contour plowing
   terracing
   no-till agriculture
   windbreaks
   checkdams

6. Soil erosion can be an important component of "Desertification"
Definition of Desertification = deterioration of land in arid, semi-arid, & dry sub-humid areas due to changes in climate and human activity.
   - Affects 1/6 of human population
   - Causes include bad farming practices, overgrazing, poor forestry practices, conversion of rangelands to croplands in marginal areas
## Carbon

**Assigned Reading:**  
1) *Env. Sci.*: 62-66, and 325-340

**What to know**  
* the major chemical forms of carbon (limited list for purposes of this class)  
* where in the earth system you find the different major chemical forms of carbon  
* relative sizes of lithosphere, vs. atmosphere ocean and biosphere reservoirs of carbon  
* the 3 main types of fossil fuels  
* the origin and generation of coal, oil, and gas  
* the difference between a petroleum source rock and a reservoir rock  
* the lowest and highest grades of coal  
* what countries major coal reserves are found in (know 3)  
* environmental impacts of coal mining and use  
* what countries are major oil producers (know 4)  
* at least five different products made out of petroleum  
* at least four environmental consequences of the use of petroleum or petroleum-based products

### Vocabulary

<table>
<thead>
<tr>
<th>carbon dioxide</th>
<th>methane</th>
<th>carbon monoxide</th>
<th>bicarbonate</th>
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</thead>
<tbody>
<tr>
<td>carbonate ion</td>
<td>calcium carbonate</td>
<td>coal</td>
<td>petroleum</td>
</tr>
<tr>
<td>natural gas</td>
<td>photosynthesis</td>
<td>respiration</td>
<td>dissolution</td>
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<tr>
<td>precipitation</td>
<td>combustion</td>
<td>peat</td>
<td>lignite</td>
</tr>
<tr>
<td>bituminous</td>
<td>anthracite</td>
<td>graphite</td>
<td>hydrocarbon</td>
</tr>
<tr>
<td>methane</td>
<td>volatile organic carbons (VOCs)</td>
<td></td>
<td>source rock</td>
</tr>
</tbody>
</table>
Air Pollution (Outdoor & Indoor)

Assigned Reading:
Env. Sci. p. 466-479, 485 - 493, and 496-507

Outdoor Air Pollution- What to know
- four possible effects of air pollution on vegetation
- four possible health effects of air pollution on human beings and other vertebrate animals
- what a synergistic effect is, and one example
- the difference between stationary sources and mobile sources and examples of each
- the difference between primary and secondary air pollutants and examples of each
- the dominant anthropogenic source of: sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons
- the size range of particulate matter which is causes greatest damage to the lungs, and four examples of particulate matter in this size range
- why an atmospheric (thermal) inversion creates a potentially worse environment for air pollution
- four factors which determine the potential for severe/mild urban air pollution, and two examples of urban areas with severe air pollution problems
- why air pollution problems can potentially be worse in developing countries than in developed countries
- at least one main problem in establishing uniform air quality standards

Outdoor Air Pollution - Vocabulary
synergistic effect stationary source mobile source fugitive source
primary pollutant secondary pollutant particulate matter pollutants
sulfur dioxide carbon monoxide nitrogen oxides ozone
unburned reactive hydrocarbons (RH) photochemical smog
atmospheric inversion

Indoor Air Pollution - What to know
- why it is that concentrations of indoor air pollutants are often greater than the same pollutant outdoors, and three examples
- why it is that home energy conservation and indoor air quality are often counteractive
- where radon gas comes from, its adverse health effect, why it is of concern inside buildings (where inside buildings?) and not outside of buildings
- mediation strategy for radon gas
- indoor sources of asbestos, (know at least two) and asbestos health risks
- indoor sources of formaldehyde (know at least two)
- indoor sources of volatile organic carbons (know at least three)
- strategies for reduction of indoor air pollution (know at least two)

Indoor Air Pollution - Vocabulary
biological aerosols formaldehyde asbestos radon
sick building syndrome volatile organic compounds (VOCs)
**Environmental Health and Toxicology**

**Assigned Reading:** Environmental Science, Ch. 14 p. 286 – 306

**What to know**
- at least five of the categories of pollutants
- two examples of voluntary exposure to toxins and potentially harmful chemicals
- the form of mercury most hazardous to human health
- the concept of dose response, and why it is that there are few known thresholds (points D, E, and F) to toxins
- the difference between LD-50 and ED - 50, and how they are used in toxicology
- the concepts of physiological and genetic and behavioral tolerance
- the difference between acute and chronic effects
- the four steps of risk assessment
- at least two examples of uncertainties in the risk assessment process which could be challenged to weaken the final assessment

**Vocabulary**

<table>
<thead>
<tr>
<th>Term</th>
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</thead>
<tbody>
<tr>
<td>Contamination</td>
<td>pollution contamination carcinogen synergism</td>
</tr>
<tr>
<td>Biomagnification</td>
<td>threshold effect dose-response LD - 50</td>
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<tr>
<td>Ecological gradient</td>
<td>physiological tolerance behavioral tolerance</td>
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<tr>
<td>Genetic tolerance</td>
<td>toxicology acute effect chronic effect</td>
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<tr>
<td>Risk assessment</td>
<td>EMF dioxin methylmercury</td>
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**Soils**

**Assigned Reading**
- Blue Planet: 129-130
- Environmental Science 207-224

**What to Know**
- Four components of a soil
- General Soil horizons, including A horizon needed for growing crops
- Factors affecting soil formation, with some examples
- How agricultural practices increase soil erosion
- Why soil erosion affects crop yield
- Soil conservation strategies to reduce soil erosion
- Leading causes of desertification
- At least three global effects of agriculture
- Four principles of Integrated Pest Management (IPM)

**Vocabulary**

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<td>Regolith</td>
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<tr>
<td>Humus</td>
<td>terracing</td>
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<td>Loess</td>
<td>contour plowing marginal land</td>
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<td>Desertification</td>
<td>narrow spectrum pesticide</td>
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<tr>
<td>Organic matter</td>
<td>broad spectrum pesticide</td>
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<td>Secondary pest outbreaks</td>
<td>Crop rotation</td>
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<td>Salinization of soils</td>
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