ENRG3310: Introduction to Energy and Sustainability **Midterm I**

Prof. Joseph A. Pratt & Prof. Ognjen Š. Miljanić February 6, 2014

Name: _____ Student ID Number: _____

Last First

Read directions very carefully. Write your answer legibly in the designated spaces. *Total number of points is 150.*

1. How is sustainable development defined in Our Common Future (The Brundtland Report)?

5 points

2. What is the central building block of the definition of Sustainability by the Sierra Club (as discussed in the readings on Blackboard)? How do the views of the Environmental Defense Fund differ?

5 points

3. List three key elements of Shell's efforts to reduce CO_2 emissions to combat climate change.

3 points

(1)

(2)

(3)

List two business ventures listed in Shell's report of "Our Activities" that will increase CO_2 emissions:

2 points

(1)

(2)

4. Using the readings on Blackboard, identify two key measures used in charting the pace of global warming and briefly describe what trend each of these measures has shown over the last century.

5 points

5. Define the term "proved reserves" as it applies to oil.

5 points

6. What public policy was used to reduce acid rain in the United States in the 1990s?

5 points

Why was this important in the future efforts of the Kyoto Protocol sponsored by the United Nation to reduce greenhouse gas emissions?

SHORT DISCUSSION

20 points

What is your working definition of "sustainability"?

Under your definition, do you consider the energy mix put forward by Scott Tinker in the conclusion of *Switch* to be sustainable? Explain and justify your opinion.
(By "energy mix" I refer to Tinker's chart at the end of *Switch* showing that by the 2060s the global consumption of coal and oil could "cross" the consumption line of natural gas, nuclear, and renewable energies. You might also discuss his argument that greater energy efficiency could sharply reduce the amount of energy needed.) **Continue on back if needed.**

7. One kilogram of gasoline can release approximately 44 MJ of energy when burned. If gasoline is used in an emergency generator—the kind you use after hurricanes—this energy content is converted into electricity with 25% efficiency. If you only have 200 g of gasoline (approx. one cup), for how long could you power a 500 W refrigerator? Assume that the refrigerator works only 50% of the time.

25 points

8. In 2012, US coal consumption was 430 million tonnes of oil equivalent, but dropping at a 5% annual rate. On the other hand, India consumed coal amounting to 300 million tonnes of oil equivalent, but its consumption is rising by 5% annually. In which year will India overtake the US in terms of coal consumption, assuming these trends hold?

15 points

9. Succinctly define, in your own words, the following concepts:

4×5 points = 20 points

Power

Watt

Perpetuum Mobile

Earth's Carbon Cycle

10. US annual energy consumption is approximately 100 Quads (each Quad is approximately 10^{18} J). What is the average American's rate of energy consumption in Watts? HINT: think about the example in class with the French.

15 points

GROUP PROJECT PROPOSAL

Use the form provided on Blackboard. Almost all of you turned this in on Tuesday.

25 points