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

Prof. Joseph A. Pratt & Prof. Ognjen Š. Miljanić September 19, 2013

Name: _____ Student ID Number: _____

Last First

Use the space provided on the first four pages to answer 9 of the first 10 questions. (Put an X through the blank space under the question from numbers 1-10 that you choose to skip. Note: If you do not clearly mark the question you choose to omit, the first nine questions will be graded.) Use the fifth page to answer EITHER Question A or B. Then continue to questions 11–14 on pages 6 and 7. *Total number of points is 200.*

1. How did the Brundtland report define "sustainable development"?

5 points

When was it written and who sponsored it?

2 points

The excerpt from the Everett text posted on Blackboard Learn defines three key requirements of energy in a sustainable world. What are they?

3 points total

(1)

(2)

(3)

2. **List the three components of the "triple bottom line"** and give one example of how the shell sustainability report discusses each of the three.

6 points

(1)

(2)

(3)

Describe two policies supported by the Mitchell Foundation's "sustainable natural gas" initiative.

4 points

(1)

(2)

3. Most of the excerpt from Everett's text examines three different perspectives on sustainability supported by a "community of champions." LIST THE THREE PERSPECTIVES (*3 points*) AND BRIEFLY SUMMARIZE THE FOCUS OF EACH (*3 points*). WHAT DOES EACH ASSUME ABOUT THE FUTURE OF FOSSIL FUELS? (*3 points*)

(1)

(2)

(3)

Which perspective is closest to you own?

1 points

4. According to the article "What are the major sources and users of energy in the united states," what percentages of total primary energy consumption in the U.S. in 2012 came from coal, oil, natural gas, and nuclear power? What percent of total global energy consumption came from the same fuels? What was the largest single market in the U.S. for each of the fuels?

10 points

	US %	World %	Major market for this fuel in US
Coal:			
Oil:			
Natural gas:			
Nuclear:			

5. Name one key problem that each of the industries listed below have tried to address with technological innovations. What technology was applied?

2 points for each fuel = 10 points total

COAL:

OIL:

NATURAL GAS:

NUCLEAR:

SOLAR or WIND:

6. Identify the organizations that maintain the five major web sites for energy-related data we examined in class. What is the primary focus of each?

10 points total

Organization	Primary focus of web sites
(1)	
(2)	
(3)	
(4)	
(5)	

7. List the three largest oil exporting nations in the world in 2012

3 points

Which three nations were the largest importers of oil in 2012:

3 points

Which two nations are the largest consumers of coal? *2 points*

Largest:_____ Second:_____

Which are the largest consumers of oil? *2 points*

Largest:_____ Second:_____

8. According to the Pratt article on the changing energy mix, what is the major difference in the "Texas approach" and the "California approach" to energy and environmental policies? (*4 points*) What would be the primary role of government in each? (*2 points*)

In the author's opinion, is a consensus likely between these two approaches? Why or why not?

4 points

9. What does Pratt's article mean by the "primacy of price" and how has it shaped the nation's energy mix?

5 points

In the past, what has been excluded from this price?

2 points

Does Pratt USE THE PRIMACY OF PRICE to explain the energy transition from traditional renewable to coal?

3 points

10. Name three key advantages of coal over traditional renewable fuels in the 19th century?

3 points

What were three major advantages of oil over coal in the 20th century?

3 points

Explain the statement "Natural gas had been regulated into scarcity in the 1960s and then legislated out of direct competition with coal in markets for industrial fuel in the 1970s."

4 points

REMINDER: Place a big X through the question from 1–10 you choose to omit.

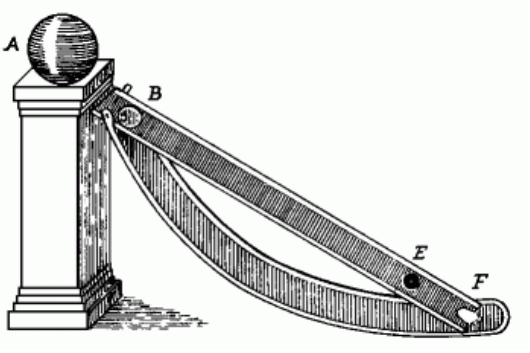
On this page, write a concise paragraph on one (1) of the following issues. CIRCLE THE QUESTION YOU PLAN TO ANSWER BEFORE YOU BEGIN.

A. Discuss what you consider the WEAKEST point in the conclusion to the Pratt article on the changing energy mix in the United States. CHOOSE ONE POINT and discuss it.

or

B. What do you consider the single most significant lesson from history for policy makers who hope to hasten the substitution of renewable fuels for fossil fuels in the United States in the coming decades? CHOOSE ONE LESSON and discuss it.

11. Examine this proposed *perpetuum mobile*, designed by Bishop John Wilkins (1614–1672), who was a founder and first secretary to the British Royal Society. It consists of two tilted ramps, an iron ball, and a magnet fastened at the top. The magnet at the top (A) should pull the ball (E) up the straight ramp, where it would fall through the hole (B) to the lower ramp, roll down, and—through another hole (F)—return to the straight ramp where it would be pulled up again. This process would continue indefinitely without any energy input—a perpetuum mobile. Explain why this machine does not work in reality?



25 points

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

4×5 points = 20 points

Power

2nd Law of Thermodynamics

Primary Energy

Kilowatt-hour (kWh)

13. An energy-efficient refrigerator consumes energy at the rate of 280 W when it's actually running, but it's so well insulated that it runs only about one-sixth of the time. You pay for that efficiency up-front, since such a refrigerator costs $950. A conventional refrigerator costs $700, but it consumes 400 W when running, and it runs one-fourth of the time. Calculate the total energy used by each refrigerator over a 10-year lifetime and then compute the total costs—purchase price plus energy cost—assuming electricity costs 10 ¢ per kWh. Which of the two refrigerators is a better deal? Show your work.

30 points

14. In 1965, the world's population was about 3.4 billion and was growing at about 2 percent annually. In 1985, the population was 4.9 billion, growing at 1.7 percent, and in 2000 it was 6.1 billion, growing at 1.2 percent. In which of these three years did the actual number of people increase by the greatest amount? Show by calculating the number in each case.

25 points

NOTHING WRITTEN ON THIS PAGE WILL BE GRADED