

ENRG3310: Introduction to Energy and Sustainability

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Midterm I

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Name: _____

Last

First

Student ID Number: _____

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

1. Match the fuel with the country in which it is discussed in *Switch* (you may use items in the fuel list more than once).

5 points

_____ NORWAY

_____ DENMARK

_____ CANADA

_____ SPAIN

_____ QATAR

A. None of the below

B. Shale oil

C. Wind power

D. Hydropower

E. Photovoltaic solar

F. Thermal solar

G. Nuclear power

H. Oil shale

I. Natural gas liquids

K. Shale gas

2. Match the items in the left column with their description in the right column (you may use items in the right column more than once).

5 points

_____ AREVA

_____ ERCOT

_____ TRRC

_____ CCS

_____ IEA

A. None of the below

B. Manager of long-distance power lines in Texas

C. Energy information agency in US Department of Energy

D. Major regulator of the oil industry in Texas

E. Major nuclear power company in France

3. Define proved oil reserves.

5 points

List three changes that could expand the proved oil reserves of a country:

(1)

(2)

(3)

4. Why is a rise in temperature of 2 °C important to those who study climate change? *5 points*

What is the key distinction between “weather” and “climate”?

5. Define net energy. *5 points*

Give one example from the notes of a fuel with a low net energy.

6. What is the definition of “Sustainable Development” put forward in the Brundtland Report? *5 points*

7. In the conclusion to *Switch*, Scott Tinker outlines a transition he thinks is needed in our energy mix. What is the basic turning point he identifies? *2 points*

How far into the future does he look for this “switch” in our fuel mix? *1 point*

What does he consider our current “foundation fuels”? *2 points*

What change does he foresee for these foundation fuels?

1 point

When this switch is complete, what does he foresee for the following:

Renewable fuels

1 point

Nuclear power

1 point

Natural gas

1 point

Energy efficiency

1 point

8. Using the definition of sustainability in the Brundtland Report, do you think that the fuel mix resulting from the long-term switch between today and 2064 described in Tinker's conclusion will be sustainable? Explain your answer.

20 points

9. A very sparsely furnished room has one lightbulb (60 W), one small fridge (300 W), and a TV (100 W). Assuming that the fridge works 12 hours each day, TV 4 hours, and lightbulb 8 hours, calculate the total daily energy consumption of this room in kilowatt-hours and joules.

11 points

10. In 2014, US consumed 19,035,000 barrels of oil in an average day, which represented an increase of 0.5% relative to the year before. In the same year, China consumed 11,056,000 barrels of oil in average day, which was 3.3% higher than in 2013. In which year will China overtake the US in terms of average daily oil consumption, assuming these trends hold?

10 points

11. What is the maximum theoretical efficiency of a heat engine that uses steam heated to 450 °C?

10 points

12. List standard SI units for the following physical quantities:

3×3 points = 9 points

force

speed

length

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

5×5 points = 25 points

Human Development Index

Power (as a physical quantity)

Kilowatt-hour (kWh)

Perpetuum Mobile of the Second Kind

Newton (as a physical unit of measurement)

GROUP PROJECT PROPOSAL

Turn this in separately.

25 points