PSC-320 Final, Name _____

1. The portion of *Global Electricity* supplied by *solar and wind combined* is closest to:
   2% 10% 25% 50% 75%

2. We presently estimate that we've already used about what % of remaining *accessible global* oil reserves?
1% 5% 20% 50% 75% 85% 95% 99%

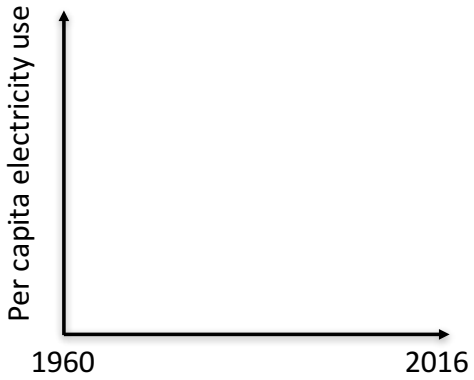
3. The USA average *per person* CO_2 emission is closest to:
50 mg, 10 kg, 1 Ton, 15 Tons, 25 kiloTon, 85 kiloTon, 1 MegaTon, 10 MegaTon, 30 MegaTon, 3 GigaTon,

4. The power output of an average coal, NG, or nuclear facility is closest to:
Watt, milliWatt, kilowatt, MegaWatt, GigaWatt, 100 GigaWatt, TeraWatt, 17 TeraWatt

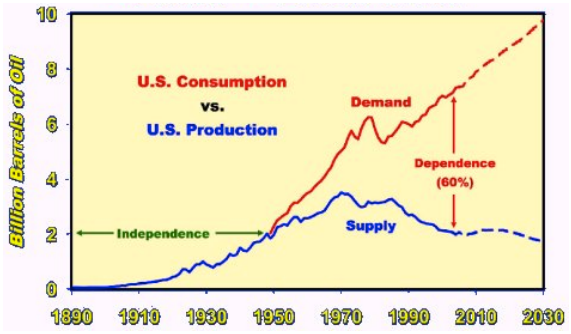
1) On the axis at right:
   a) Please make two lines on this graph: one of US electricity use per person, and another line for Californians.

   b) Please explain why these two lines are different. What happened? How did it happen?
      For these two answers, most people talked about how California is implementing renewable energy. While this is true and lovely, that's not what this question is about. Note that the graph at right has to do with the *amount of electricity* that each person uses… not the *source* of this electricity or environmental impact of the electricity.

   c) What does this difference say about possible energy/economic development?



2) Please look at the graph at right, likely made around 2006. The dotted lines are what they back in 2006 *expected* to happen.
   a) However, something different happened. Please explain what happened between 2006 and 2016 and extend the consumption (demand), and production (supply) curves *only* to 2016.
   b) Then between 2016 and 2018, explain what happened, and extend these two dotted lines until 2018.
      Folks didn't do so well with this. Please see this document from the US EIA: https://www.eia.gov/energyexplained/index.php?page=oil_imports for details. In order to get full credit, I wanted to see some mention of the price of oil driving the changes in both demand and assessed national oil reserves.



3) You have a 100 W incandescent light bulb that you leave on constantly, 24/7. ***Clearly show your work***

a) How much electrical energy do you use in a month (720 hours)?
b) About how much does this cost you in electricity per month?
c) About how much CO_2 does this put in the atmosphere per month if you live in California?
d) You can buy a $1.00 LED light bulb that gives off the same amount of light as the 100 W incandescent light bulbs, consuming only 10 W. Estimate the financial pay back time – how long will it take you to make back your initial investment?

4) In the above question, let's say that instead of buying an LED, you keep the 100 W bulb and instead install an extra solar panel on your grid-connected roof-top solar system to offset the 100 W. ***For credit: clearly show your work***

a) About what wattage solar panel is necessary to offset your electricity use? ***People got efficiency mixed up with duty cycle (capacity factor) here. We are asking about how much electrical power needs to come from the panels. The sun doesn't shine 24 hours per day.***
b) What is the size of this solar panel in square meters? *This is where efficiency comes into play.*
c) About how much will this solar panel cost to buy?
d) What else would you have to pay for to have your grid-connected PV? And about what would be the total cost?
e) Estimate the payback time for this investment.

5) Solar Energy: Consider CSP or STE (Concentrated Solar Power or Solar Thermal Electric), PV (Photovoltaic,) and Passive Solar. Please distinguish these four *briefly* and state at least one advantage for each.

a) CSP, STE

Particular Advantage

b) PV

Particular Advantage

c) Passive Solar

Particular Advantage

6) California: Some people are telling California's leadership to become a global leader in renewable energy and sustainability, while others say that the **economy** is more important. What advice do you have? Can we have both? If so, how? If not, which is more important and why?

7) a) What's "permaculture" (or wholistic design) in the context of studying it in an energy class.

b) explain an advantage of wholistic design.

c) explain a disadvantage… I mean if it's so good, why doesn't everyone do it?

8) Describe each: Ozone Hole | Climate Change

a) What "pollutants" cause each of these two "problems"?

I put the lines on this page so that you could separate climate change from ozone hole. Many people didn't do that.

b) Describe the mechanism that causes each of these two problems. I recommend drawings.

c) What is the *biological* effect of each of the problems?

d) What are the solutions to each of these two problems?

e) To what degree has society "solved" each of these two problems?

f) How has the global youth engaged with each of these two problems?

g) …and what do you see as *your* role? "*nothing*" is an acceptable answer if you support it.

9) Why are temperatures in the arctic regions rising at about 4 times the rate of temperatures in warm areas?