

310 Exam Questions

- 1) Discuss the energy efficiency, and why increasing efficiency does not lower the amount of total energy consumed.
- 2) What are the three main aspects that make an energy source sustainable?
- 3) Draw the Rankin Cycle and label the different parts of the process.
- 4) What is the Coal Combined cycle and how does it impact the efficiency of a power plant?
- 5) How is coal appraised and tested?
- 6) What are the main roadblocks to increasing the nuclear power in the United States?
- 7) Discuss the status of current energy sources (gas, coal, etc), their advantages, disadvantages, and projected growth.
- 8) What are the current obstacles to the increased production of nuclear energy?
- 9) What makes hydrogen an attractive energy source and how might it be implemented?
- 10) Discuss the future of carbon emissions. If restrictions were to be imposed, where would the greatest difference be made, who would need to be restricted, what are the options for carbon sequestration, and how would that contribute to energy costs?
- 11) Discuss the function of the moderator in a nuclear reactor.
- 12) What are the four components of proximate analysis and what do they measure?
- 13) Why is hydrogen not a feasible energy source? Discuss safety, storage, production, etc.
- 14) Explain what gasification is and its purpose.
- 15) In your opinion, what kind of energy should we be investing in for the future and why?
- 16) How much would individual energy conservation help and what are some ways we might do it?
- 17) Discuss the pros and cons of Wind Power. Where in the U.S. is it used?

- 18) What does “enriching” uranium mean and why do we need to enrich the uranium that we mine? Also, discuss the different methods for enriching uranium.
- 19) Why are electric vehicles not in widespread use? Also, compare fossil fuel powered vehicles to electric powered vehicles.
- 20) If you were to build a power plant, which type (fuel) would you build? Why? (Include at least 6 benefits and disadvantages to your power plant type)
- 21) In 100 years, where do you think our primary energy will come from? Why?
- 22) The government mandates that you get 15% of your home’s energy from renewables. What do you do?
- 23) What is the purpose of calculating heating and cooling days?
- 24) Why do people use fossil fuels, instead of alternative fuels if alternative fuels are supposed to be better for the environment?
- 25) If nuclear power is so great, why aren’t countries building more nuclear power plants?
- 26) Name the three top coal-producing countries. (China, USA, Australia)
- 27) Name three factors in predicting how long oil will last. (Consumption, innovation, exploration, recovery, production, uncertainty, efficiency, price increases, economics)
- 28) Name three of the most important pollutants. (smoke and soot particles, SO₂, O₃, Pb, NO_x, CO)
- 29) Explain how a combined cycle gas turbine (CCGT) plant works.
- 30) Explain one constraint against increasing wind power generation.
- 31) How is coal formed?
- 32) What would be the likely path of the U.S. energy future? What sources of fuel would come to the forefront instead of Coal?
- 33) Why is wind power growing so rapidly?
- 34) How could the U.S. become more energy self-sufficient?
- 35) Name 10 factors affecting the real price of solar energy.

- 36) If a developing country wished to leapfrog the U.S., what fuel scenario would they arrive at?
- 37) Give a realistic energy scenario for the United States in 2030.
- 38) Bonus Question: Why does nuclear power rock so much?
- 39) In the United States we have the highest pre capita energy usage of any country. While there are many valid reasons for this what can and should we do to lower our energy usage? List pros and cons of each strategy.
- 40) What should be the role of government in pollution reduction?
- 41) Describe your ideal power grid. Include where the energy sources come from, primary usages, impact, and cost. Comment on what it would take for your dream to be realized.
- 42) What energy sources should we pursue and why? Which ones should we stay away from and why?
- 43) What is meant by a hydrogen economy? In your opinion, how feasible is this idea?
- 44) What are three differences between coal and petroleum? (don't just say chemical structure, describe how they are different.)
- 45) What is a major reason for France's decision to pursue nuclear power? Why has nuclear not been as popular in the US?
- 46) Describe what the octane number means and why it is important to use the right octane number for you car.
- 47) Discuss what happened. in Chernobyl. Include in the discussion how it happened, why it was so bad, and what has been done to prevent similar disasters.
- 48) Discuss the differences between non-renewable, renewable solar, renewable non-solar.
- 49) Discuss the issues regarding nuclear power.
- 50) There is only a finite amount of oil in the world. What are some alternatives transportation fuels that may be used when oil runs out?
- 51) Explain why energy prices are on the rise.

- 52) Discuss the factors that currently prevent renewable energy sources such as wind or biomass from contributing a greater percentage of primary energy consumption.
- 53) Explain why Hydrogen may or may not be a viable substitute for conventional energy sources.
- 54) What are the technologies that are currently used to mitigate pollution from coal fired power plants?
- 55) How is oxygenate used? What are some common oxygenates?
- 56) List three methods of carbon sequestration, and explain how they work.
- 57) How does the ignition in a diesel engine differ from that of a gasoline engine?
- 58) What renewable energy source has the potential for the most growth in the next 50 years in the United States? Will this growth cause this source to have a significant impact on the distribution of energy production?
- 59) If all coal-powered plants were to close, what energy source would replace coal as the main generator of electricity?
- 60) What further methods or regulations should be taken for the US to adhere to CO₂ emission guidelines outlined in the Kyoto Protocol?
- 61) What is an oxygenate and why is it needed? What are some commonly used oxygenates?
- 62) What are heating and cooling degree days and how are they useful?
- 63) Why is the condenser required in the rankine cycle?
- 64) In what ways would a drought affect renewable energy sources? (PLEASE limit your responses to 5 reasons or fewer)
- 65) Explain the impact of politics and public opinion on the cost of oil, coal, solar, and biomass.
- 66) How did the industrial revolution impact the finding/usage of various energy sources, especially wood, coal, and oil?
- 67) What is a realistic energy profile for the future? Can renewables play a significant percentage of energy consumption? To what degree will dependence on fossil fuels be maintained?

- 68) Although nuclear energy is becoming more cost effective, what must be done (disposal, public understanding, politics) in order for it to become more feasible? Is it realistic that it can become a significant contributor to energy production?
- 69) Politics tend to direct energy production. As such, with a current focus on fuel cells and alternative sources of energy, discuss the realistic feasibilities of alternative sources of energy (fuel cells, hydrogen, renewables).
- 70) What are the limitations of Biofuels and why has the US supported Biofuels so much?
- 71) What are some ways to increase the efficiency of a large coal power plant?
- 72) If the US wants to decrease oil needs, what are the limitations on hybrid cars and fuel cell cars?
- 73) If you were asked by the President to choose only one source of energy to use in the future which one would you choose?
- 74) What factors affect the continual usage of oil at current rates?
- 75) Compare and contrast different source of non-continuous renewable energy.
- 76) Name three constraints which impede additional construction of wind power.
- 77) What options are available as the conventional oil reserves become depleted?
- 78) What is the purpose of a moderator in a nuclear reactor?
- 79) Briefly evaluate the plausibility of the following energy sources providing base load electricity demands: nuclear, wind, biomass.
- 80) Briefly discuss the major environmental concerns and advantages of nuclear power.
- 81) Why do cars in Europe have better average fuel economy than in the U.S.?
- 82) What will be the most prevalent energy source 20 years from now and why?
- 83) Why do people want to use ethanol? What is its real efficiency?
- 84) Give several examples of politics infuency the energy industry?
- 85) What are the barriers that prevent Nuclear power from being used?

- 86) How is geothermal energy captured? How big of a percentage of renewable energy is it?
- 87) How would the infrastructure of the US need to change to use only electric cars?
- 88) Why are energy use and economic growth linked? What are the implications of this link?
- 89) In the future, according to the paper, 80% of carbon emissions will come from the developing world. Discuss all the factors developing countries need to take into account when confronted with such problem.
- 90) Scientific evidence with regard to global warming remains inconclusive, what is your position in this respect and why?
- 91) What are the advantages and disadvantages of using nuclear power? Which country is using the nuclear power the most in the world?
- 92) What are the major pollutants cause the acid rain? And why acid rain is harmful?
- 93) Why are the nuclear wastes harmful?
- 94) Give 2 positives and 1 negative for the difficult energy sources we've talked about.
- 95) What do we use wind power for?
- 96) What is your opinion on the future of the US energy situation?
- 97) Renewable energy accounts for a mere 6% of total energy use in the United States. That fraction is not expected to grow in the next 30 years despite fears of exhausting fossil fuel reserves and political pressures for "green" energy. Please discuss why this is the case.
- 98) The United States imports a considerable fraction of its energy despite having large energy reserves. Please discuss how the US could reduce its dependence on energy imports. Are any of these methods economically feasible?
- 99) Wind energy requires significant amounts of empty land where wind blows regularly. Suppose a proposal is made to turn most of the state of Wyoming into a gigantic wind farm. Would you support the proposal? Please justify your answer.
- 100) What is the major benefit of reforming natural gas for hydrogen fuel, rather than burning the gas directly?

- 101) List both a positive and negative effect of nuclear fuel reprocessing.
- 102) Why are aromatics *not* used to increase octane in petroleum fuels?
- 103) Students of ChEn 310 have been described by some as “cynics” when it comes to global warming as a result of carbon emissions. The truth is, there are many in the world, including people of equal or greater education than those in ChEn 310, who believe that global warming is a legitimate concern. If you believe that carbon sequestration, and other similar steps, are not necessary to prevent global warming, then please describe the steps you would take to allay the concerns of the many who do. Include what you would say to educate others, or alternative steps you would take to protect the environment from the possible harm of carbon emissions. If you do believe carbon emissions are a cause for concern, please describe how you would address the ChEn 310 cynics.
- 104) In our class discussion on windmills, we talked about the timing problems involved with peak wind flow that make it difficult to replace continuous electricity plants like coal or natural gas plants. One concern is that energy would be wasted unless peak wind flow coincides with peak daily energy demand. As the resourceful engineer that you are, you think that the windmills should be built in the non peak areas anyway, why? What are you going to do with the energy?
- 105) After you long and illustrious career as an engineer, you are encouraged to take your extensive knowledge of the physical world into the political arena where you can have an affect on policy decisions. When faced with the question of which policy to set for the future direction of energy (i.e. which forms of energy you will encourage to be developed) in your city/state/country, describe what recommendations you will make to your constituents, and why.