GLG 110: Ch 16 Study Sheet - Energy Resources **Name** _____

Warning. This is the longest topic in GLG 110 but probably the most important.
For Tuesday, complete pages 1-2. For Thursday, complete pages 3-4.

Case History

1. How is our use of oil and coal like our use of whale oil and wood?

2. How is it different?

3. The author writes, "… the time necessary for the transition from oil [to renewable energy sources] is likely to be closer to 100 years than 30." Do you agree? Explain… with data.

16.1 Worry Over Energy Sources Is Nothing New

4. What specific measures did the Romans take to deal with peak wood? (No laughing!)

16.2 Peak Oil

5. According to figure 16.2, US peak production oil occurred in _____ (year). Why didn't we run out of oil then?

6. What is one obvious lesson of "peak wood" and "peak whale oil"?

7. In figure 16.4B, which trend line do you predict we will follow? Why?

In 2012-ish, US oil production changed dramatically - not included in the graphs. We will discuss in class.

8. According to figure 16.5 list the 6 major sources of power and EJs in the USA in 2007. (This has changed.)

_____ ___, _____ ___, _____ ___, _____ ___, _____ ___, _____ ___

9. According to your text, the largest single use of energy in the USA is for _____

16.3 Energy Supply and Energy Demand

10. From 1950 to 2007, US energy consumption increased from _____ EJ (or Qs) to _____ EJ

11. Table 16.1 provides some energy policy options. Explain which policies you support and why.

12. Explain which policies you NOT support or which do you not prefer and why.

12.5. How are you? Are you having a nice day?

16.4 Fossil Fuels - Coal

13. Explain how coal forms. A drawing may help.

14 What changes occur when going from lignite -> subbituminous -> bituminous -> anthracite?

15. If you were forced to burn coal for energy by an evil professor, which type of coal would you choose and why?

16. Arizona has the _____ type of coal. It this good, bad or ??? Explain.

17. Why don't we burn Arizona's coal in Maricopa County?

18. What is the issue with burning coal that is greater than 1.67% sulfur?

19. How is the western US "lucky" in regards to the coal we have for a fuel?

20. What is the problem with the burning coal found in the eastern USA? What has to be done?

21. How long is coal projected to last and how might this change?

22. This is the Dry Fork coal power station near Gillette, WY. Wander. Where do they get the coal? What kind of mine is used?

23. This is mountain top removal in West Virginia. Explain what is done and where the waste goes.

24. What is *overburden* and why is it important?

25. Federal regulations require that strip mines restore the land to a condition roughly equal to that before mining. Why might mining companies fight "oppressive government regulation"?

26. Look around the Black Mesa coal mine in northern Arizona. Do you see reclaimed areas? Thoughts?

27. Four environmental problems related to the mining and burning of coal include…

A B

C D

16.4 Fossil Fuels - Hydrocarbons: Oil & Natural Gas

28. Why are oil and natural gas called hydrocarbons?

29. Natural gas is mostly _____ and had the chemical formula _____

30. Oil and gas start forming in _____ formations and are formed from _____.

31. In figure 16.13, why don't gas and oil start to from until 3 km of depth?

32. _____ is good source rock for oil & gas is because _____

33. In figure 16.14, _____ rock *contains* the oil while _____ rock *traps* the oil beneath.

34. Contrast figure 16.15 from 2009 data in your book with this figure from 2017. What changes do you notice?

35. Describe 2 advantages and 2 disadvantages of using more methane.

	ADVANTAGES	DISADVANTAGES
1		
2		

36. Fossil fuel companies have touted tight gas as a clean energy source. Is this accurate? Explain.

37. Where is methane hydrate found and what is it good for?

38. Is drilling in ANWR worthwhile? Defend your answer.

39. List one PRO and one CON of petroleum from oil sands and from oil shale

	PRO	CON
OIL SANDS		
OIL SHALE		

16.5 Future of Oil

39 ½: Quick Summary: Fossil fuels are finite, non-renewable, polluting, and a cause of climate change. Done.

16.6 Fossil Fuel and Acid Rain

40. What is acid rain and how is it formed?

41. What does fossil fuel burning have to do with acid rain? Are those hippies just whining again?

42. Three effects of acid rain are…. A)

B) C)

43. Is the Phoenix area affected by acid rain? Why? (This will require thought. Sorry.)

16.7 Nuclear Energy

44. What are 3 sources of the uranium for nuclear power plants? Is uranium naturally-occurring?

45. Explain how a nuclear power plant works and the fuel it uses.

46. Describe 2 PROS & 2 CONS of using nuclear fission to create electricity.

	PRO	CON
1		
2		

47. Describe what occurred at *<u>either</u>* Chernobyl or Three Mile Island.

48. Radioactive waste exists. What should be done with it? Make a choice and defend your answer.

49. How is fusion different from what is done in nuclear power plants?

50. Two advantages of nuclear fusion are… A B

51. Why don't we use nuclear fusion for power?

16.8 Geothermal Energy

52. What IS geothermal energy?

53. Is there enough geothermal energy to power the USA? Explain.

54. Describe 2 PROS & 2 CONS of using geothermal energy to create electricity.

	PRO	CON
1		
2		

16.9 Renewable Energy Sources

55. Is there enough sunlight hitting earth to meet our power needs? Explain.

56. How can houses be built to take advantage of passive solar energy? A drawing might be nice.

57. How do solar collectors work? A drawing might be nice.

58. Describe 2 PROS & 2 CONS of using hydroelectric power. (Read the "Water Power and the Environment" section.)

	PRO	CON
1		
2		

59. Describe 2 PROS & 2 CONS of using tidal power to create electricity.

	PRO	CON
1		
2		

60. Describe 2 PROS & 2 CONS of using wind power to create electricity.

	PRO	CON
1		
2		

61. Use the web to determine if wind turbines really do kill many birds. How many compared with other power sources?

62. Your textbook says the US was the world leader in electricity from wind power. Is this still true? Explain

63. Do you support the use of biofuels as discussed in the text? Explain

16.10 Conservation Efficiency, Cogeneration

Uh…. don't waste. We'll look at this in the lab.

16.11 Sustainable Energy Policy

64. Explain what you think about the approach of Amory Lovins.

acid rain	alternative energy	biofuel	coal	coal-bed methane
cogeneration	conservation	efficiency	fossil fuel	fuel cell
geothermal	natural gas	nuclear energy	oil / petroleum	peak oil
solar energy	tidal power	tight gas	water power	wind power
sustainable energy policy				

Ideas - Gasland, Deepwater Horizon