

## Unit 7: Homework

1. An organic chemical organized in rings or chains, including petroleum and natural gas is called:

- a) hydrocarbon
- b) strip mining
- c) allowance trading
- d) primary production
- e) oil shale

2. Formation of oil and gas involves:

- a) deposition of organic-poor material
- b) temperatures and pressures well below conditions at the Earth's surface
- c) migration of oil into the source rock
- d) secondary enrichment by escaping gases
- e) migration out of the reservoir rock blocked by a trap

3. Oil shale and tar sands are promising alternatives to crude oil because:

- a) oil shale and tar sand combustion is cleaner than oil
- b) these resources exceed proven global reserves of oil
- c) these resources are higher quality energy sources than oil
- d) oil shale and tar sand production is more environmentally benign than crude oil production
- e) production of known oil shale and tar sand deposits would do less environmental damage than exploration for new petroleum reserves

4. In what environment did most of the Earth's coal deposits originally form?

- a) ocean trench
- b) desert
- c) swamp

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- d) mountain peaks
- e) river

5. Allowance trading is a proposal to accomplish which of the following goals for pollution emissions?

- a) allow utilities to average their emissions over more than one year
- b) force utilities to reduce their emissions by at least a minimum amount
- c) allow legal and economic flexibility in reducing overall emissions
- d) reduce local emissions at all sites at the lowest overall cost
- e) reward utilities which reduce their emissions with tax breaks and other financial incentives

6. The total estimated resource of oil shale could yield approximately 2 to 5 trillion barrels of oil worldwide. This tremendous resource currently is not exploited because:

- a) current technology cannot separate the useful energy product from the rock
- b) the cost of extraction is not presently competitive with the cost of crude oil or other conventional fossil fuels.
- c) the oil from oil shale is very low grade
- d) the oil shale resource is too widespread to make extraction attractive
- e) the extraction process uses up all the energy in the oil and makes it useless

7. What is coal-bed methane:

- a) a gas associated with petroleum reserves
- b) a gas stored on the surfaces of organic matter in the coal
- c) a gas stored in structural coal bed traps
- d) a white solid associated with coal beds
- e) a gas associated with cattle ranching

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8. The energy retained by living tissue that has been exposed to radiation is called:

- a) radiation absorbed dose
- b) body burden
- c) Roentgens
- d) fallout
- e) bioluminescent energy

9. A gas-cooled reactor, known as pebble-bed reactor is being developed right now and may be available as early as 2006. What is special about this particular reactor?

- a) the reactor is able to breed its own fuel
- b) the core contains always just the right amount of fuel for optimal energy production
- c) the reactor uses water as a moderator
- d) the reactor uses hydrogen as fuel
- e) the reactor is able to breed its own fuel and the core contains always just the right amount of fuel for optimal energy production

10. Since the 1990s nuclear power plants in the U.S. have added over 23,000 mW of power. This increase is the result of:

- a) adding new power plants to the existing ones in the U.S.
- b) the invention of the pebble-bed reactor
- c) using hydrogen as a fuel source
- d) more efficient use of existing power plants
- e) centralization of nuclear power

11. The Energy Policy Act of 2005 considered the role of nuclear power in the U.S. energy mix. Its recommendation was to:

- a) resume building new nuclear power plants in the U.S.
- b) halt to construction of all new nuclear power plants in the U.S.
- c) temporarily hold construction of new nuclear power plants until the Yucca Mountain site is operational

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- d) transition from fission to fusion power
- e) replace all existing nuclear reactors in the U.S. by pebble-bed reactors by 2010

12. The series of different forms that a radioisotope takes during its lifetime is known as its:

- a) half-life
- b) radioactive decay
- c) chain reactions
- d) chain links
- e) decay chain

13. Petroleum is usually found in which of the following situations?

- a) a coarse and porous reservoir rock, overlain by an impermeable cap rock
- b) an anticline or other trap overlain by porous reservoir rock
- c) a fine-grained reservoir rock, overlain by an organic-rich cap rock
- d) a porous reservoir rock, overlain by an organic-rich source rock
- e) a dense organic-rich cap rock overlain by porous source rock

14. The worst accident in the history of commercial nuclear power happened in 1986 at Chernobyl, where a uranium fuel meltdown occurred. According to the Environmental Science text, in the next 20 to 30 years, there will be an increase in cancer:

- a) worldwide
- b) in the northern hemisphere
- c) in northern Europe
- d) within 100-200 km of the reactor site
- e) in workers at the plant the day of the accident

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15. Hazardous radioactive materials produced by fission reactors include all of the following **except**:

- a) cesium-137
- b) krypton-85
- c) strontium-90
- d) plutonium-239
- e) helium-3

16. When radioactive uranium decays, it passes through a series of decay steps and ends up as:

- a) a stable radioactive isotope of uranium
- b) a stable non-radioactive isotope of lead
- c) hydrogen
- d) subatomic particles
- e) energy

17. The nucleus of an atom contains:

- A) electrons only
- B) neutrons only
- C) electrons and neutrons
- D) protons and neutrons
- E) electrons and neutrons

18. Most of the mass of the atom (99.9%) is found in the:

- A) electron
- B) neutron
- C) proton
- D) nucleus
- E) electron cloud

19. One environmental advantage of nuclear power is that it does not produce \_\_\_\_ pollution.

- A) water
- B) noise

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- C) air
- D) chemical
- E) radiation

20. Which of the following responses is a disadvantage of nuclear power:

- A) nuclear waste disposal
- B) thermal pollution of water
- C) health impacts of radiation
- D) limited supplies of uranium
- E) all of the above

21. All commercial nuclear reactors use:

- A) nuclear fusion
- B) nuclear fission
- C) breeder reactors
- D) supercooling
- E) magnetic confinement

22. One of the major air pollutants of coal combustion is:

- A) sulfur dioxide
- B) water
- C) methane
- D) ozone
- E) bromine

23. Sand deposits containing large amounts of combustible material known as bitumen are called:

- A) sandstone
- B) oil shale
- C) tar sand
- D) limestone
- E) shale oil

24. About \_\_\_\_% of the coal in the U.S. is used to generate electricity.

- A) 10
- B) 25
- C) 50
- D) 75
- E) 90

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25. Over half of the energy in the U.S. is consumed by:

- A) transportation
- B) residential use
- C) business and industry
- D) government
- E) recreational use

26. This organic mixture is a thick liquid and is a source for many fuel and nonfuel products:

- A) natural gas
- B) methane
- C) crude oil
- D) kerosene
- E) tar

27. This fuel is a mixture of low-molecular weight hydrocarbons, mostly methane:

- A) tar
- B) ethanol
- C) kerosene
- D) fuel oil
- E) natural gas

28. Which of the following is an environmental impact of coal extraction?

- A) Destruction of wildlife habitat.
- B) Soil erosion from mine sites.
- C) Aquifer depletion and pollution.
- D) Acid mine drainage.
- E) all of the above

29. Which of the following is an environmental impact of oil mining?

- A) Offshore leaks and blowouts causing water pollution.
- B) Soil erosion.
- C) Acid mine drainage.
- D) Black lung disease
- E) Underground mine accidents.

30. Coal in mountainous terrain is extracted using:

- A) strip mines
- B) surface mines
- C) underground mines

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- D) drilling
- E) dredges

31. This sedimentary rock contains the organic material kerogen:

- A) coal
- B) sandstone
- C) tar sand
- D) oil shale
- E) limestone

32. The production of synthetic oil from coal is called:

- A) coal gasification
- B) coal liquefaction
- C) cracking
- D) synthesis
- E) refining

33. Air pollution control technologies for coal burning do little to prevent global climate change because they do not reduce emission of this substance:

- A) nitrous oxide
- B) sulfur dioxide
- C) water
- D) carbon dioxide
- E) ozone

34. Most nuclear reactors today are powered by:

- A) U-235
- B) U-238
- C) Pu-239
- D) Helium
- E) heavy water

35. This form of radiation contains two protons and two neutrons:

- A) alpha particle
- B) beta particle
- C) gamma ray
- D) cosmic rays
- E) ultraviolet radiation

36. This form of radiation is equivalent to an electron except they are more energetic:

- A) alpha particle



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- B) beta particle
- C) gamma rays
- D) cosmic rays
- E) X-rays

37. Breeder reactors could extend the supply of fissionable nuclear material considerably since they can use:

- A) U-235
- B) U-238
- C) Strontium-90
- D) magnesium
- E) boron

38. \_\_\_\_\_ occurs when two hydrogen nuclei join to form a helium nucleus.

- A) Nuclear fission
- B) Nuclear fusion
- C) Magnetic confinement
- D) Containment
- E) Kinetic energy release

39. Which of the following forms of energy provides the highest *energy quality*?

- A) geothermal
- B) biomass
- C) natural gas
- D) electricity
- E) manure

40. Nuclear chain reactions are driven by the release of \_\_\_\_\_ from the split nuclei of radioactive atoms.

- A) electrons
- B) neutrons
- C) protons
- D) cosmic rays
- E) X-rays

41. The average nuclear power plant produces \_\_\_\_\_ metric tons of waste per year.

- A) 5
- B) 10
- C) 15
- D) 20
- E) 25

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42. This source of radiation does not originate from naturally occurring unstable nuclei:

- A) alpha particles
- B) beta particles
- C) gamma rays
- D) X-rays
- E) cosmic rays

43. Current oil supplies are predicted to last only \_\_\_\_\_ years.

- A) 10
- B) 20
- C) 40
- D) 50
- E) 100

44. List three arguments that have been raised in favor of exploration and petroleum production in Alaska

Ans:    the Alaska National Wildlife Refuge (ANWR).  
           the U.S. needs the oil  
           drilling in the ANWR would stimulate the Alaskan economy  
           exploration can be done with few wells  
           roads can be constructed on winter ice  
           elevated pipelines allow animal migration  
           production can be done with a few, centralized wells  
           oil well brines can be re-injected in to the subsurface

45. List three arguments that have been raised against of exploration and petroleum production in the Alaska National Wildlife Refuge (ANWR).

46. Put the names of the four types of coal in the correct blanks in the table below.

Energy Content					
<u>Type of coal</u>	<u>Sulfur Content (%)</u>				
	<u>(kJ/kg)</u>	<u>Low</u>	<u>Med</u>	<u>High</u>	
a) _____	20,100-25,500	99.6	0.4	0.0	
b) _____	31,300-34,800	97.1	2.9	0.0	
c) _____	13,900-17,400	90.7	9.3	0.0	
d) _____	25,500-32,800	29.8	26.8	43.4	

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47. Next to water, what is the most abundant fluid in the upper part of the earth's crust?
48. List four proposals for reducing gasoline consumption in the U.S.
49. High sulfur coal is considered to be more environmentally damaging than the low sulfur varieties. Name one specific problem associated with high sulfur coal at the mine site and another problem associated with combustion of high sulfur coal.
50. List the four different coal types in order from high energy capacity to low energy capacity.
51. Describe the properties of a petroleum source rock.
52. Why is the sulfur content of coal of so much environmental concern?
53. Why are natural gas and crude oil not commonly found in geological very old rocks?
54. Can you offer a plausible reason why the global food price index increased about 30% from 2007 to 2008.
55. Why is methane considered one of the main transitional fuels from fossil fuels to alternative energy sources.
56. Why is combustion of natural gas cleaner than burning oil?
57. Are tar sands and oil shales economic resources? Explain

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58. It has been said that almost all forms of energy on Earth are forms of solar energy. Is this the case for fossil fuels? Why or why not?

59. Name several environmental concerns associated with coal-bed methane.

60. Name the two best known commercial nuclear accidents. Of the two, circle the one that was more severe.

61. What role does nuclear energy play in debates about acid rain and global warming?

62. Name the important steps in the nuclear fuel cycle.

63. The two major accidents to strike nuclear power facilities were the Three Mile Island and the Chernobyl accidents. Look at each of the following statements and determine whether the statement applies to Three Mile Island or Chernobyl.

Circle the correct response

Radiation exposure was in the vicinity  
**of the power plant only.**

**3-Mile Island**

**Chernobyl**

There were at least 31 fatalities.      **3-Mile Island**      **Chernobyl**

The reactor was graphite-moderated,  
**and the fuel ignited and burned.**

**3-Mile Island**

**Chernobyl**

The accident occurred in 1979.      **3-Mile Island**      **Chernobyl**

64. Nuclear energy has been called a "nonrenewable alternative energy source." Is this a contradiction in terms?

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65. One of the main public concerns about nuclear energy is the potential for exposure to radiation. List three or more natural sources of radiation in the environment.
66. What is meant by 'half life' of a radioactive atom?
67. Why are small reactors with a cooling system that works under influence of gravity thought to be much safer than big reactors with a pump cooling system?
68. Explain how a pebble-bed reactor functions.
69. What are the problems with or objections to building breeder nuclear reactors?
70. At the present time, how is high-level nuclear waste being disposed of in the United States?
71. What are the two ways that radioisotopes threaten the environment?
72. What happens during a core meltdown in a radioactive power plant?
73. What are the two nuclear processes that can be used to release energy? Define each one.
74. Describe briefly the difference between high-level nuclear waste and low-level nuclear waste

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