1.	Which of the following terms refers to centralized collection device for generating power from the Sun is called (a)n:
a)	power tower
b)	alternative energy
c)	fuel cell
d)	biofuel
e)	renewable energy
	Ans: a Difficulty: Easy Link to: 19.2

2.	Which of the following terms refers to a device that generates electricity by chemical reactions involving hydrogen or methane or some other material:
a)	power tower
b)	alternative energy
c)	fuel cell
d)	biofuel
e)	renewable energy
	Ans: c Difficulty: Easy Link to: 19.3, A Closer Look 19.1

3.	Which of the following terms refers to energy produced from any source other than fossil fuels:
a)	power tower
b)	alternative energy
c)	fuel cell
d)	biofuel
e)	renewable energy
	Ans: b Difficulty: Easy Link to: 19.1

4.	Fuel cells produce _____ using _____.
a)	electricity; hydrogen or methane
b)	heat; electricity
c)	carbon dioxide; biofuel
d)	light; heat

e)	electricity; light
	Ans: a Difficulty: Easy Link to: 19.3, A Closer Look 19.1

5.	Hydrogen fuel can be produced by _____ and can be used to generate electricity in a _____.
a)	fission; photovoltaic cells
b)	distillation of coal; fusion reactor
c)	combustion of natural gas; cogenerator
d)	fusion; internal combustion engine
e)	electrolysis of water; fuel cell (or by direct combustion)
	Ans: e Difficulty: Medium Link to: 19.3, A Closer Look 19.1

6.	The world's largest solar-electric installation is located in
a)	the Coachella Valley, California
b)	Bavaria, Germany
c)	North Dakota
d)	Saudi Arabia
e)	the Mojave Desert, California
	Ans: b Difficulty: Easy Link to: Case Study

7.	One of the principal advantages of photovoltaic cells is that they:
a)	convert 80-90% of solar energy into electricity
b)	are made from "Earth-friendly" materials
c)	can be used for power in remote locations
d)	can be produced inexpensively, although costs are rising
e)	do emit CO_2, but they do not emit the SO_2 that leads to acid rain
	Ans: c Difficulty: Medium Link to: 19.2

8.	All of the following are <u>renewable</u> energy sources except:
a)	nuclear fission

b)	wind
c)	solar
d)	biofuel
e)	hydroelectric

Ans: a
Difficulty: Easy
Link to: 19.1

9.	Which of the following is the greatest environmental impact of using biofuels:
a)	destruction of ozone in the stratosphere
b)	accumulation of large volumes of waste material
c)	acid rain
d)	air pollution
e)	creation of toxic byproducts

Ans: d
Difficulty: Medium
Link to: 19.7

10.	Wind power is a clean energy source, but according to its detractors in some locations, it is associated with _____ pollution.
a)	thermal
b)	noise
c)	air
d)	particulate
e)	water

Ans: b
Difficulty: Easy
Link to: 19.6

11.	What is geothermal energy?
a)	a thermal spring
b)	heat energy in the core of the earth
c)	the rate of temperature increase with depth in the Earth
d)	heat derived from a geothermal power plant
e)	useful conversion of natural heat from the interior of the Earth

Ans: e
Difficulty: Easy
Link to: 19.8

12.	Use of overhangs that block sunlight in summer but allow the sunlight in winter to warm up the building is an example of:
a)	solar pond technology
b)	passive solar energy
c)	Greek and Roman temple architecture
d)	photovoltaics
e)	power tower systems
	Ans: b Difficulty: Easy Link to: 19.2

13.	Heating and cooling buildings by exchange with shallow groundwater systems is considered a form of _____ energy.
a)	solar
b)	kinetic
c)	tidal
d)	potential
e)	geothermal
	Ans: e Difficulty: Easy Link to: 19.8

14.	The future growth of large-scale hydropower plants in the developed world probably will be limited because:
a)	the release of impounded water alters streamflow patterns
b)	most economical sites are already used
c)	reservoirs eventually fill with sediment
d)	the addition of reservoirs mean that more water is lost to evaporation
e)	all of these
	Ans: e Difficulty: Easy Link to: 19.4

15.	"Biodiesel" is a biofuel sometimes used to power cars and trucks. One potential source of biodiesel is:
a)	used engine oil
b)	the seafood industry
c)	dairy farms

d)	urban landfill runoff
e)	waste frying oil from restaurant kitchens
	Ans: e Difficulty: Medium Link to: 19.7, Critical Thinking Issue

16.	Which of the following statements describe "pump storage" in generating electricity:
a)	off-peak energy is used to store water in an elevated reservoir, and that water is used to generate hydroelectricity during peak hours
b)	generating electricity by impounding ocean water during different tides
c)	hydroelectricity from many small reservoirs
d)	taking advantage of temperature contrasts between shallow groundwater and the surface
e)	storing pumps until they are needed later
	Ans: a Difficulty: Medium Link to: 19.4

17.	All of the following are factors that limit expanded use of photovoltaic cells **except**:
a)	high cost
b)	limited efficiency
c)	direct generation of electricity is not yet technologically possible
d)	cells incorporate hazardous materials
e)	large output requires large areas of land
	Ans: c Difficulty: Easy Link to: 19.2

18.	The primary sources of biofuel in India, an example of a developing country, are:
a)	wood and coal
b)	oil and coal
c)	methanol and cattle dung
d)	nuclear and wood
e)	wood and cattle dung

	Ans: e Difficulty: Medium Link to: 19.7

19.	Direct conversion of electricity using sunlight, without using an intermediate fluid medium, is accomplished by:
a)	solar collectors
b)	power towers
c)	passive solar systems
d)	thermal conversion
e)	photovoltaic cells
	Ans: e Difficulty: Easy Link to: 19.2

20.	Photovoltaic systems utilize solar energy by:
a)	heating water with solar radiation
b)	mirrors focus sunlight on a central collector unit
c)	generating electricity directly from sunlight
d)	heating water which runs a steam turbine
e)	electrolyzing water into its component hydrogen and oxygen
	Ans: c Difficulty: Easy Link to: 19.2

21.	Wind velocity increases over mountains because of:
a)	turbulence
b)	horizontal convergence of the wind
c)	decreasing pressure with increasing temperature
d)	vertical convergence of the wind
e)	decreasing moisture content with increasing temperature
	Ans: d Difficulty: Easy Link to: 19.6

22.	How does a fuel cell generate power?
a)	by combining fuel and oxygen in an electrochemical reaction
b)	by producing electricity
c)	by splitting uranium

d)	by combining hydrogen atoms
e)	by combusting gasoline

Ans: a
Difficulty: Medium
Link to: 19.3, A Closer Look 19.1

23.	What one factor, more than others, determines the suitability of tidal power for a coastal site?
a)	the cost of building the plant
b)	sediment supply and transport
c)	the frequency of tides
d)	large tidal range
e)	size and frequency of storm events

Ans: d
Difficulty: Easy
Link to: 19.5

24.	Groundwater geothermal systems and heat pumps operate by taking advantage of:
a)	hot, shallow water
b)	water colder than the surrounding environment
c)	relative temperature differences
d)	shallow magma bodies
e)	geopressured water

Ans: c
Difficulty: Medium
Link to: 19.8

25.	Wind velocity in mountain passes decreases because of:
a)	horizontal turbulence
b)	horizontal convergence of the moving air
c)	narrowness of the pass
d)	heights of the surrounding hills
e)	wind velocity increases in mountain passes, not decreases

Ans: e
Difficulty: Easy
Link to: 19.6

26.	Which of the following is a good use of low-temperature geothermal sources:
a)	generating electricity for individual homes
b)	heating swimming pools
c)	powering cars and trucks
d)	agricultural pest control
e)	low-T geothermal energy cannot be utilized economically
	Ans: b Difficulty: Easy Link to: 19.8

27.	All the following materials are generally considered examples of biofuels except:
a)	wood
b)	coal
c)	cattle dung
d)	peat
e)	methane
	Ans: b Difficulty: Easy Link to: 19.7

28.	Which of the following is **not** among the potential adverse environmental impacts of generating geothermal energy?
a)	emission of gases
b)	thermal water pollution
c)	induced seismicity
d)	depletion of ^{235}U resources
e)	land subsidence
	Ans: d Difficulty: Easy Link to: 19.8

29.	All of the following are environmental problems associated with geothermal energy **except**?
a)	on-site noise
b)	emissions of gas
c)	disturbance of the land at the drilling site
d)	pipelines
e)	radiation threat

	Ans: e Difficulty: Easy Link to: 19.8

30.	Wind velocity generally increases:	
	I.	over hilltops and mountains
	II.	in mountain passes
	III.	over sea cliffs
a)	I only	
b)	II only	
c)	I and II	
d)	II and III	
e)	I, II and III	
	Ans: e Difficulty: Easy Link to: 19.6	

31.	All of the following are environmental problems associated with wind power except:
a)	wind mills kill birds
b)	noise pollution
c)	large extend of the area needed to generate power
d)	degradation of an area's scenic resources
e)	release of harmful electromagnetic resonance
	Ans: e Difficulty: Easy Link to: 19.6

32.	"Power tower" systems generate electricity by:
a)	mirrors that focus sunlight on a central collector and generator
b)	producing hydrogen from water
c)	an array of cells transform sunlight directly into electricity
d)	mirrors that heat oil which circulates and drives a turbine generator
e)	heating water for pools and household use
	Ans: a Difficulty: Medium Link to: 19.2

33. Tidal power systems are designed to generate electricity during:

I.	high tides
II.	low tides
III.	rising and falling tides

a) I only
b) II only
c) III only
d) I and III
e) II and III

Ans: c
Difficulty: Medium
Link to: 19.5

34. A tidal power station is constructed at the location shown in the figure on the left. Using the tide chart in the figure on the right, this facility would be generating power at _____ and would be idle at _____?

a) 6 am; noon
b) noon; 3 pm
c) noon; 6 am
d) noon; midnight
e) 3 pm; 9 am

Ans: b
Difficulty: Medium
Link to: 19.5

35. A tidal power station is constructed at the location shown in the figure below. Using the tide chart in the figure, name two times of day when the facility would be generating power and two times when it would be idle.

Ans: generating: during both rising and falling tides
idle: 3 am, 9 am, 3 pm, 9 pm

Difficulty: Medium
Link to: 19.5

36. Chapter 17 introduced the concepts of hard path and soft path energy strategies. For each of the energy sources listed below, name one example of the hard path and one example of the soft path. Follow the example given.

energy source	hard path example	soft path example
wind power		

Ans:

energy source	hard path example	soft path example
water power	large dam like Hoover dam	micro-hydro power
solar power	power tower	rooftop hot water s

Difficulty: Difficult
Link to: 19.1, 19.4, 19.6, Chap. 17

37. What are the basic elements of a power tower system for generating electricity? Make a sketch.

Ans: reflecting mirrors
central collector
turbine generator

Difficulty: Difficult
Link to: 19.2

38. How do groundwater geothermal systems work, and where are these geothermal energy sources effective?

Ans: by utilizing contrasts in temperature – useful in areas with large temperature variations

Difficulty: Medium
Link to: 19.8

39. What are the major limitations on widespread reliance on solar energy?

Ans: Solar energy is dispersed, and a large area of land is required to generate large amounts of electricity. On cloudy days it is not possible to collect solar energy

Difficulty: Medium
Link to: 19.2

40.	List three potential economic uses of low-temperature geothermal sources.
Ans:	space heating of buildings heating swimming pools heating soil to assist crop production
	Difficulty: Easy Link to: 19.8

41.	What factors would make one site more suitable for generating wind power than another site?
Ans:	topography climate (e.g., prevailing winds) surrounding human land use (effects of noise, aesthetics)
	Difficulty: Medium Link to: 19.6

42.	List the primary sources of biofuels in North America.
Ans:	forest products, agricultural products, combustible urban waste
	Difficulty: Easy Link to: 19.7

43.	Passive solar is one general class of solar energy systems. Name three other solar systems
Ans:	discussed in the Environmental Science text that utilize solar energy. active solar (e.g. water heaters) photovoltaic cells power towers [hydrogen conversion]
	Difficulty: Easy Link to: 19.2

44.	Name three specific features that can be designed into houses to help them utilize passive solar energy.

Ans:	overhangs to block high summer sun take advantage of deciduous shade trees use walls to capture solar heat and warm the interior
	Difficulty: Medium Link to: 19.2

45.	List the major alternative energy sources. Identify each one as renewable or nonrenewable.
Ans:	renewable: solar energy, wind power, water power, energy derived from biofuel nonrenewable: nuclear energy and arguable geothermal energy
	Difficulty: Easy Link to: 19.1

46.	List the potential adverse impacts associated with generating geothermal energy.
Ans:	on-site noise emission of gases disruption of surface at plant site thermal water pollution induced seismicity possible land subsidence
	Difficulty: Medium Link to: 19.8

47.	According to the Environmental Science text, where will future development of hydroelectric potential in the United States occur?
Ans:	small-scale, local sites – "micro-hydro"
	Difficulty: Medium Link to: 19.4

48. Select three sources of energy – one conventional (e.g. coal, petroleum, etc.) and two alternative – and list two advantages and two disadvantages of each in terms of cost, jobs lost or gained, environmental impact, or potential for supplying energy. Of the three, which energy source do you believe is the most desirable.

Ans:

e.g.,	coal	nuclear	wind
	plentiful	high-quality energy	renewable
	cheap	no carbon emissions	cheap
	polluting	nonrenewable	low-quality energy

Difficulty: Difficult
Link to: Chap. 18, 19.1, 19.6, etc.