1.	Which of the following terms refers to recovery of petroleum by pumping from a well – without steam, lubricants, or other elaborate steps necessary to mobilize the oil:
a)	hydrocarbon
b)	strip mining
c)	allowance trading
d)	primary production
e)	oil shale
	Ans: d Difficulty: Easy Link to: 18.2

2.	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
	Ans: a Difficulty: Easy Link to: 18.2

3.	Which of the following is a method for reducing air pollution by mandating maximum industrial emissions for an entire region or country, not for individual polluters:
a)	hydrocarbon
b)	strip mining
c)	allowance trading
d)	primary production
e)	oil shale
	Ans: c Difficulty: Easy Link to: 17.3

4.	The Alaska National Wildlife Refuge (ANWR) has made headlines because of:
a)	it is the leading source of coal in North America
b)	proposals to explore for oil there

c)	it is the proposed site for disposal of high-level nuclear waste
d)	the Exxon Valdez oil spill occurred there
e)	further oil migration there is blocked by a trap

Ans: b
Difficulty: Easy
Link to: A Closer Look 18.1

5.	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

Ans: e
Difficulty: Medium
Link to: 18.2

6.	According to the Environmental Science text, the estimated peak oil production will about 50 billion bbl per year and it will arrive sometime between 2020 and 2050. In 2004 the growth rate for oil was 3.4% . What will happen when the peak production occurs and demand is not met?
a)	the price of oil will increase
b)	disruption to society is likely to happen
c)	a gap between demand and production will occur
d)	all of these
e)	the predicted peak production will never take place because there are many unknown reserves to be discovered

Ans: d
Difficulty: Medium
Link to: Case Study

7.	All of the following correctly describe fossil fuels except:
a)	a form of stored solar energy
b)	created from incomplete biological decomposition of dead organic matter
c)	long-term energy reserves
d)	a renewable energy resource
e)	organic material, dead and buried

	Ans: d Difficulty: Easy Link to: 18.1

8.	Which of the following is the strongest argument in favor of pollution allowance trading:	
a)	it involves the greatest change in the existing marketplace	
b)	it is the best way to reduce or eliminate all local pollution problems	
c)	it is the option favored by the Sierra Club and other wilderness groups	
d)	individual businesses are given a range of options for complying with the law	
e)	allowance trading creates the greatest government control of pollution emissions	
	Ans: d Difficulty: Medium Link to: 18.3	

9.	Oil production, refining, and transportation have been associated with all of the following environmental problems except:	
a)	disturbance of the land surface	
b)	land subsidence	
c)	acid mine drainage	
d)	release of harmful gases	
e)	pollution of groundwater	
	Ans: c Difficulty: Easy Link to: 18.2	

10.	All fossil fuels require a certain amount of energy input to get them out of the ground and process them into useful forms. Which of the following energy sources generally requires the most energy before it can be used as a fuel:	
a)	oil	
b)	low-sulfur coal	
c)	natural gas	
d)	oil shale	
e)	high-sulfur coal	

	Ans: d Difficulty: Easy Link to: 18.4

11.	Which of these sets of adjectives all describe the formation of oil, gas, and coal?
a)	inorganic, subducted, not oxidized
b)	organic, buried, not oxidized
c)	inorganic, buried, oxidized
d)	organic, eroded, reduced
e)	acidic, subducted, oxidized
	Ans: b Difficulty: Easy Link to: 18.2, 18.3

12.	Problems with exploiting oil shale and tar sand deposits as an alternative to crude oil include all of the following except:
a)	the deposits are usually deeply buried and difficult to extract
b)	the conversion process to fuel requires a lot of energy
c)	the mining and conversion process requires a lot of water
d)	mining would involve widespread disruption of the land surface
e)	large volumes of the deposit yield small volumes of liquid fuel
	Ans: a Difficulty: Easy Link to: 18.4

13.	The purpose of enhanced (or "secondary) production of petroleum is to:
a)	refine crude oil into gasoline, plastics, and petrochemicals
b)	recover natural gas from oil wells
c)	drill for oil in deeper water than conventional production allows
d)	recover heavier and denser oil than flows to the surface under natural pressure or pumping
e)	mitigate the environmental effects of primary production
	Ans: d Difficulty: Medium Link to: 18.2

14.	In some ways, natural gas is considered a better fossil fuel than oil. This is primarily because:

a)	gas is found at shallower depths than oil
b)	gas is easier to transport over long distances than oil
c)	gas is a renewable resource
d)	once a reservoir is located, gas commands a higher price than oil
e)	burning natural gas is cleaner than burning oil

Ans: e
Difficulty: Medium
Link to: 18.2

15.	The cap rock which helps to form a trap for natural gas and oil is usually:
a)	coarse-grained sandstone
b)	fine silt or clay
c)	limestone
d)	basalt
e)	organic-rich

Ans: b
Difficulty: Easy
Link to: 18.2

16.	A petroleum source rock generally is:
a)	coarse-grained and organic rich
b)	a fractured limestone
c)	highly porous
d)	rich in organic material and densely cemented
e)	fine-grained and organic-rich

Ans: e
Difficulty: Easy
Link to: 18.2

17.	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
	Ans: b Difficulty: Medium Link to: 18.4

18.	One problem with petroleum as an energy source is that the resource is not distributed evenly about the Earth. The largest proven reserves of oil are located in:
a)	the North Sea
b)	the Gulf of Mexico
c)	South America
d)	the Middle East
e)	the Far East and Australia
	Ans: d Difficulty: Easy Link to: 18.2

19.	Today, the most abundant economic fossil fuel resource is:
a)	oil
b)	gas
c)	coal
d)	oil shale
e)	hydroelectric
	Ans: c Difficulty: Easy Link to: 18.3

20.	In what environment did most of the Earth's coal deposits originally form?
a)	ocean trench
b)	desert
c)	swamp
d)	mountain peaks
e)	river
	Ans: c Difficulty: Easy Link to: 18.3

21.	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
	Ans: a Difficulty: Medium Link to: 18.2

22.	All of the following are options to reduce the air pollution caused by coal combustion except:
a)	scrubbing
b)	boiler designs that allow combustion at lower temperatures
c)	cleaning coal prior to combustion
d)	consumer education about energy conservation and efficiency
e)	use of more high-sulfur coals
	Ans: e Difficulty: Medium Link to: 18.3

23.	Which of the following is usually associated with the most intense disruption of the surface environment?
a)	strip mining
b)	scrubbing
c)	natural gas production
d)	allowance trading
e)	petroleum combustion
	Ans: a Difficulty: Easy Link to: 18.3

24.	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

Ans: c
Difficulty: Medium
Link to: 18.3

25.	Where are methane hydrates (a white, ice like compound) found:
a)	in permafrost areas
b)	beneath the sea floor
c)	in Africa and Australia
d)	in formerly glaciated valleys
e)	in permafrost areas and beneath the sea floor

Ans: e
Difficulty: Medium
Link to: 18.2

26.	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

Ans: b
Difficulty: Medium
Link to: 18.4

27.	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

	Ans: b Difficulty: Easy Link to: 18.2

28.	Oil is:
a)	organic matter transformed into liquid and gaseous hydrocarbons
b)	inorganic matter transformed into liquid hydrocarbons
c)	bituminous coals transformed into liquid and gaseous hydrocarbons
d)	a variety of natural gases compressed by pressure
e)	organic particles in water
	Ans: a Difficulty: Easy Link to: 18.2

29.	According to the Environmental Science text, coal is classified according to its:
a)	energy and nitrogen content
b)	energy and hydrogen content
c)	energy and oxygen content
d)	energy and sulfur content
e)	energy content
	Ans: d Difficulty: Easy Link to: 18.3

30.	What is the major environmental benefit from burning coal-bed methane:
a)	methane releases a greater amount of energy than conventional fossil fuels
b)	the combustion produces a lot less CO_2 than conventional fossil fuels
c)	CO is not produced
d)	coal bed methane wells are drilled in shallow depth
e)	nitrogen oxides (NO_x) are chemically bound to soot
	Ans: b Difficulty: Medium Link to: 18.2

31.	Of the four common classes of coal, which is generally the highest sulfur content?

a)	lignite
b)	anthracite
c)	subanthracite
d)	subbituminous
e)	bituminous

Ans: d
Difficulty: Easy
Link to: 18.3

32.	Geopressured gas is:

I.	natural gas buried deeply into the earth
II.	dissolved in pore waters
III.	under great pressure

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

Ans: e
Difficulty: Medium
Link to: 18.2

33.	The source rocks for natural gas and crude oil are:

I.	organic-rich
II.	volcanic
III.	coarse-grained sediment

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

Ans: a
Difficulty: Easy
Link to: 18.2

34.	A petroleum reservoir rock generally is:

a)	fine-grained and folded
b)	overlain by a rich source rock
c)	coarse-grained and highly porous
d)	organic rich and densely cemented
e)	a large open cavity in the crust

Ans: c
Difficulty: Easy
Link to: 18.2

35.	'Slurry pipelines' are pipelines for the transport of:
a)	raw sewage to wastewater treatment plants
b)	oil to refineries
c)	coal over a limestone bed in a furnace
d)	pulverized coal by water
e)	water to keep oil wells under production pressure

Ans: d
Difficulty: Medium
Link to: 18.3

36.	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

Difficulty: Medium
Link to: A Closer Look 18.1

37.	List three arguments that have been raised against of exploration and petroleum production in the Alaska National Wildlife Refuge (ANWR).
Ans:	some wilderness should remain wilderness any oil activity would have some impacts vehicular traffic may scar the surface oil production would bring large populations to the region

Difficulty: Medium
Link to: A Closer Look 18.1

38. Describe the properties of a petroleum reservoir rock.

Ans: Reservoir rocks are coarse-grained rocks with open spaces between the grains (e.g. coarse-grained sandstone, fissured limestone), where gas and oil can accumulate.

Difficulty: Easy
Link to: 18.2

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

	Energy Content Type of coal	Sulfur Content (%) (kJ/kg)	Low	Med	High
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

Ans: (a) subbituminous, (b) anthracite, (c) lignite, (d) bituminous

Difficulty: Medium
Link to: 18.3

40. Next to water, what is the most abundant fluid in the upper part of the earth's crust?

Ans: crude oil

Difficulty: Easy
Link to: 18.2

41. List four proposals for reducing gasoline consumption in the U.S.

Ans:	increased gasoline taxes increased vehicle fuel efficiency more use of alternative fuels (alcohol, natural gas, etc.) more use of alternative means of transportation (bicycles, mass transit) improving roads
	Difficulty: Medium Link to: 18.2

42.	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.
Ans:	acid mine drainage; acid rain
	Difficulty: Easy Link to: 18.3

43.	List the four different coal types in order from high energy capacity to low energy capacity.
Ans:	anthracite — high energy capacity bituminous coal subbituminous coal lignite — low energy capacity
	Difficulty: Medium Link to: 18.3

44.	Describe the properties of a petroleum source rock.
Ans:	Source rocks are fine-grained, organic rich sediment buried to a depth of at least several hundred meters.
	Difficulty: Easy Link to: 18.2

45.	Why is the sulfur content of coal of so much environmental concern?
Ans:	Low-sulfur coal causes less air pollution because of its low sulfur content.

	Difficulty: Medium Link to: 18.3

46.	Why are natural gas and crude oil not commonly found in geological very old rocks?	
Ans:	The light (compared to water) hydrocarbons have had ample time to migrate to the surface and volatilize, or be eroded away.	
	Difficulty: Medium Link to: 18.2	

47.	What are the different threats posed by strip-mining in a wet climate versus the same process in an arid climate?	
Ans:	wet - acid mine drainage, erosion, sediment pollution arid - dust, thin soils are easily disturbed, difficult to reestablish vegetation	
	Difficulty: Easy Link to: 18.3	

48.	Underground mining has a different range of environmental effects than strip mining. List three effects of underground mining.	
Ans:	spoil piles at surface, mine collapse, mine fires	
	Difficulty: Easy Link to: 18.3	

49.	Can you offer a plausible reason why the global food price index increased about 30% from 2007 to 2008.	
Ans:	The increased use of corn to produce biofuel (ethanol) has raised its price on the global market, and has caused much of the increase in global food costs.	
	Difficulty: Medium Link to: Critical Thinking Issue	

50.	Why is methane considered one of the main transitional fuels from fossil fuels to alternative energy sources.
Ans:	methane produces a lot less carbon dioxide, a major greenhouse gas production of methane gas prior to mining coal reduces the amount of methane that would be released into the atmosphere
	Difficulty: Medium Link to: 18.2

51.	Why is combustion of natural gas cleaner than burning oil?
Ans:	Gas emits much less CO_2 into the air.
	Difficulty: Easy Link to: 18.2

52.	Are tar sands and oil shales economic resources? Explain
Ans:	No - not at current prices, but as crude oil production reaches its peak and oil prices soar, oil shales and tar sands will become economical in the future
	Difficulty: Difficult Link to: 18.4

53.	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?
Ans:	yes – All the energy in fossil fuels is originally derived from the sun.
	Difficulty: Medium Link to: 18.1

54.	Coal mines abandoned before about 1960 generally pose a greater threat to the surrounding environment than more recent mines. Why?
Ans:	The mines generally were not reclaimed.
	Difficulty: Medium Link to: 18.3

55.	Name several environmental concerns associated with coal-bed methane.	
Ans:	disposal of water which is produced with the methane recovery migration of methane that may contaminate groundwater or migrate into residential areas	
	Difficulty: Medium Link to: 18.3	