1.	The waste-handling strategy that utilizes a broad range of reduction techniques and disposal options is:		
A)	composting	D)	integrated waste management
B)	surface impoundment	E)	sludge disposal
C)	land application		

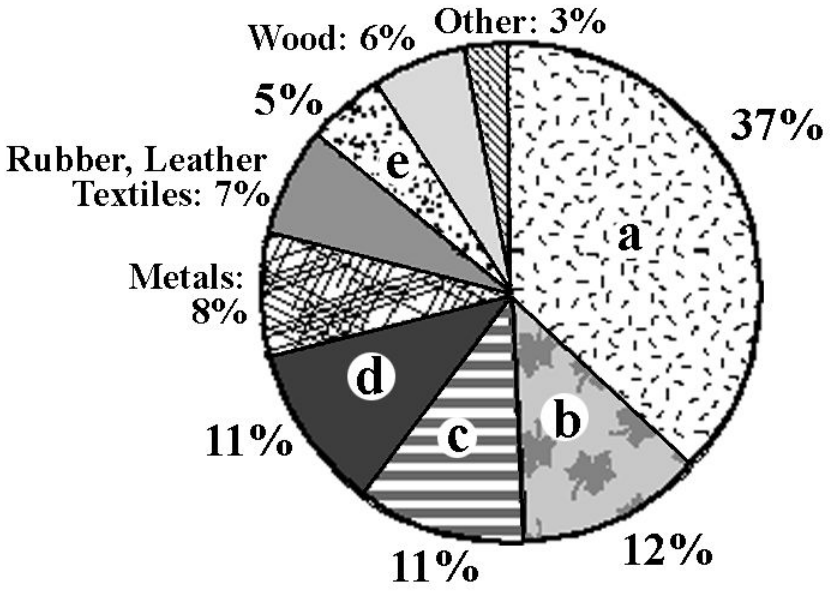
2.	Disposal of biodegradable chemical waste by dispersal is called:		
A)	composting	D)	integrated waste management
B)	surface impoundment	E)	sludge disposal
C)	land application		

3.	Disposal of vegetable and animal waste by natural decomposition is called:		
A)	composting	D)	integrated waste management
B)	surface impoundment	E)	sludge disposal
C)	land application		

4.	The treatment of sewage (including waste water and human waste) involves particular challenges in a concentrated, industrialized society like the U.S. and Canada. Which of the following, according to the textbook, complicates safe treatment and recycling of this waste:
A)	infectious agents that resist treatment
B)	sewage water can <u>never</u> be reintroduced into the environment
C)	the large volumes of sewage
D)	toxic substances that may be present in the waste water
E)	hydrocarbons in the waste water

5.	Of the following disposal options, which one would be most appropriate (or least objectionable) for hazardous liquid chemicals?		
A)	sanitary landfill	D)	composting
B)	deep well disposal	E)	ocean dumping
C)	open dump		

6.	The figure below indicate the types of material that went into landfills in 2001. Which piece of the landfill pie (a, b, c, d, or e) represents paper and paper products?



	A) a B) b C) c D) d E) e

7.	Reducing waste volumes through the combination of more sustainable use of materials and resource consideration is called:		
A)	ecological engineering	D)	materials management
B)	integrated waste management	E)	industrial ecology
C)	green manufacturing		

8.	Which of the following, among other things, first established the fund for cleaning up the worst abandoned hazardous waste sites (the fund is known as "Superfund"):
A)	Superfund Amendment and Reauthorization Act (SARA) of 1986
B)	Hazardous Waste Liability Act (HWLA) of 1965
C)	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980
D)	Toxic Waste Funding Act (TWFA) of 1992
E)	Resource Conservation and Recovery Act (RCRA) of 1976

9.	The study of the relationships among industrial systems and their links to natural systems is called:		
A)	ecological engineering	D)	materials management
B)	integrated waste management	E)	industrial ecology
C)	green manufacturing		

10.	Leachate is a major environmental hazard associated with solid waste disposal sites. How is leachate most commonly produced?
A)	leachate is gas that leaks from a hazardous waste disposal site
B)	nuclear decay of otherwise harmless material in a dump site
C)	leakage from deep-well disposal sites
D)	chemical reaction between waste material and the bedrock
E)	chemical reaction between wastes and water percolating through the dump

11.	Why is e-waste considered to be a problem?
A)	reclamation of raw materials can be hazardous to the health of recycling workers
B)	e-waste may contain toxic materials
C)	in the U.S., e-waste cannot be recycled profitably without charging the people who dump them a large fee
D)	all of these
E)	reclamation of raw materials can be hazardous to the health of recycling workers and e-waste may contain toxic materials

12.	An option for waste management that has the greatest negative impact on air quality is:
	A) composting B) recycling C) source reduction D) alchemy E) incineration

13.	Disposing of biodegradable toxic waste by land application is a cheap and efficient method because:
A)	the concept of dilute and disperse is adequate for toxic waste
B)	these materials are degraded by the microorganisms in the soil
C)	there is no limit to the amount of waste that can be applied to the soil
D)	the waste is a good fertilizer
E)	the practice is difficult to regulate and laws against it are difficult to enforce

14.	Which of the following is the most significant effect of improper disposal of hazardous waste:		
A)	pollution of air	D)	breeding of pests
B)	pollution of land	E)	aesthetic degradation
C)	pollution of groundwater		

15.	Why has Europe been more successful in recycling than the U.S.? I. landfill fees in Europe are much higher than in the U.S. II. the manufacturers are responsible for the disposal cost of packaging and industrial goods they produce III. recycling is required by law in almost all European countries
	A) I only B) II only C) III only D) I and II E) I, II and III

16.	Deep-well injection of hazardous chemical waste may be a suitable method of disposal where:

A)	extensive fractures penetrate to depth
B)	a deep, porous rock formation is isolated from surface and near-surface systems
C)	extensive seismic activity occurs
D)	impermeable material underlies porous, permeable rocks at depth
E)	deep groundwater systems are saline or brackish, and circulation is rapid

17.	The four main characteristics of hazardous waste that make it hazardous, according to the Resource Conservation & Recovery Act of 1979 include all of the following except:
	A) reactivity B) corrosivity C) ignitability D) toxicity E) infectiousness

18.	"Toxic" substances can have any of the following characteristics except:
A)	they can be carcinogenic
B)	they can be infectious
C)	they can cause birth defects
D)	they can cause genetic mutations
E)	all of these are characteristics of toxic material

19.	Potential dangers of deep-well injection of hazardous waste include all of the following except:		
A)	blow-out of over pressured wells	D)	earthquakes
B)	groundwater pollution	E)	land subsidence
C)	corrosion of the well		

20.	Love Canal, near Niagara Falls, New York, illustrates which of the following principles or problems?
A)	disposal of hazardous chemical waste in an uncontrolled site
B)	economic mineral reserves from sewage sludge
C)	wild species re-establishing themselves in an urban setting
D)	poor understanding of flood hazard
E)	the difficulty in finding new solid waste sites as old dumps are filled to capacity

21.	Microbial breakdown refers to:
A)	the use of living organisms to clean up hazardous substances in the environment
B)	the use of living organisms to perform chemical processing or to produce material such as animal food
C)	the concentration of toxic chemicals in an organism higher than are normally found in the environment
D)	the process of converting biomass into energy through fermentation
E)	a form of organic agriculture that relies on the use of biological pest controls

22.	The Resource Conservation & Recovery Act of 1979:
A)	defined hazardous waste by four characteristics
B)	established the Superfund for clean-up of toxic waste sites

C)	is an environmental protection organization founded in 1979
D)	placed limitations and controls on surface mining
E)	outlined land-use policy for the national parks and forests

23.	In a secure landfill for hazardous waste, an impermeable clay cap is often used to:
A)	prevent infiltration of surface water into the waste
B)	prevent leakage of leachate into underlying groundwater
C)	monitor surrounding soil for possible contamination
D)	collect all the throughflow of fresh surface water
E)	collect leachate for removal and treatment

24.	The major component of solid waste in United States is:		
A)	paper	D)	plastic
B)	garden (plant) waste	E)	construction debris
C)	food waste		

25.	“Integrated waste management” refers to:
A)	the principle of dilute and disperse
B)	national programs of source reduction
C)	proper disposal of household hazardous wastes
D)	handling problems of household, industrial, and sewage wastes all together
E)	reuse, recycling, and composting

26.	The most abundant components of solid waste are, in order from most abundant to least:		
A)	metals, textiles, paper products	D)	garden waste, metals, food waste
B)	food waste, paper products, textiles	E)	metals, garden waste, food waste
C)	paper products, food waste, textiles		

27.	Application of waste material to the soil surface is referred to as “land application”. Land application is a suitable means for disposal of:		
A)	toxic materials in low concentrations	D)	biodegradable waste
B)	low-level nuclear waste	E)	material with a high biopersistence
C)	agricultural waste		

28.	Which of the following approaches would be the most appropriate alternative for disposal of organic waste from residential gardens and kitchens?		
A)	secure landfill	D)	composting
B)	deep well disposal	E)	ocean dumping
C)	open dump		

29.	Of the following, which is the best order for methods to control the amount of solid waste (from most effective to least effective)?
A)	recycling, reuse, reduction, incineration, landfills

B)	reduction, reuse, recycling, incineration, landfills
C)	recycling, reduction, landfills, reuse, incineration
D)	incineration, recycling, landfills, reduction, reuse
E)	reuse, recycling, reduction, landfills, incineration

30.	Which of the following would be the best setting for deep-well injection of hazardous wastes?
A)	porous sandstone overlain by an aquifer
B)	tilted limestone layer overlain by sandstone
C)	faulted volcanic rocks
D)	a cavernous limestone aquifer
E)	porous sandstone, overlain by clay

31.	Adverse effects of deep-well injection of hazardous chemical wastes include:
A)	ground surface subsidence
B)	saltwater intrusion
C)	increased earthquake activity
D)	dilution of petroleum in subsurface reservoirs
E)	all of these are adverse effects of deep well injection

32.	All of the following are major classes of hazardous waste except:		
A)	acids	D)	sewage waste
B)	explosives	E)	radioactive waste
C)	combustible solvents		

33.	Permanent disposal of high-level radioactive waste is considered safest in:		
A)	densely populated areas	D)	the ocean
B)	impermeable bedrock	E)	the craters of active volcanoes
C)	oil- and gas-producing areas		

34.	Which of the following rock types is the best suited for subsurface storage of high-level radioactive waste?		
A)	faulted basalt	D)	welded tuff
B)	cavernous limestone	E)	sandstone
C)	salt diapers		

35.	Incineration of combustible material leaves:		
A)	no residue	D)	toxic residue
B)	gaseous emissions only	E)	a bad taste in your mouth
C)	noncombustible materials and ash		

36.	A secure landfill for hazardous chemical waste should include which of the following safety features:

A)	permeable liner
B)	porous clay cap
C)	system for discharging leaching into the local sewer system
D)	electronic systems to detect leaks
E)	self-destruct system

37. The Case Study in Chap. 29 outlined some of the issues and challenges associated with cell phones and other electronic devices. What kinds of problems arise when we dispose of these high-tech products?

38. For each of the options for disposing of solid waste listed below, list one advantage of that method and one disadvantage.

		advantage	disadvantage
	on-site disposal		
	composting		
	incineration		
	open dumps		
	sanitary landfills		

39. For the disposal of waste such as dredged spoil into the ocean, a cap of uncontaminated sediment can be used to isolate contaminated material from the marine environment. What is the main problem with this method?

40. List two possible solutions to the problem of chemicals, metals, and other environmental toxins that may be present is waste water (sewage).

41. Is there a connection between incineration of solid waste and acid rain?

42. Name four of five classes of hazardous waste.

43. Define the term “leachate.” What is an example of a source of this? What type of problems are associated with it?

44. What was the main purpose of the 1976 Resource Conservation and Recovery Act?

45. Why is monitoring the movement of groundwater particularly important at solid-waste disposal sites that have been filled and abandoned?

46. What makes a sanitary landfill sanitary?

47. The northwestern Hawaiian Island are very remote and unspoiled, yet enormous amounts of plastic trash can be found along the beaches of these islands. Why?

48.	Why are the best sites for waste disposal in arid regions?

49.	What are two main advantages of incineration of solid waste?

50.	There are four characteristics sufficient to designate waste as hazardous. One is ignitability. List two of the remaining three.

51.	What are the two major hazards from open dumps?

52.	There are four major options for hazardous waste management. One is disposal. List two of the other three.

53.	List four methods for disposal of hazardous waste.

Answer Key

1.	D
	Difficulty: Easy Link to: 29.3
2.	C
	Difficulty: Easy Link to: 29.8
3.	A
	Difficulty: Easy Link to: 29.5
4.	D
	Difficulty: Medium Link to: 29.3
5.	B
	Difficulty: Medium Link to: 29.8
6.	A
	Difficulty: Easy Link to: 29.5
7.	D
	Difficulty: Easy Link to: 29.4
8.	C
	Difficulty: Easy Link to: 29.7
9.	E
	Difficulty: Medium Link to: 29.8
10.	E
	Difficulty: Medium Link to: 29.5
11.	D
	Difficulty: Easy Link to: Case Study
12.	E
	Difficulty: Easy Link to: 29.5
13.	B
	Difficulty: Medium Link to: 29.8
14.	C
	Difficulty: Easy

	Link to: 29.8
15.	D
	Difficulty: Medium Link to: critical thinking issue
16.	B
	Difficulty: Medium Link to: 29.8
17.	E
	Difficulty: Easy Link to: 29.8
18.	B
	Difficulty: Easy Link to: 29.6
19.	E
	Difficulty: Easy Link to: 29.8
20.	A
	Difficulty: Medium Link to: A Closer Look, 29.3
21.	A
	Difficulty: Easy Link to: 29.8
22.	A
	Difficulty: Easy Link to: 29.7
23.	A
	Difficulty: Easy Link to: 29.5
24.	A
	Difficulty: Easy Link to: 29.5
25.	E
	Difficulty: Easy Link to: 29.3
26.	C
	Difficulty: Easy Link to: 29.5
27.	D
	Difficulty: Medium Link to: 29.8
28.	D
	Difficulty: Easy Link to: 29.5

<table>
<tr><td>29.</td><td>B</td></tr>
<tr><td></td><td>Difficulty: Easy
Link to: 29.3</td></tr>
<tr><td>30.</td><td>E</td></tr>
<tr><td></td><td>Difficulty: Easy
Link to: 29.8</td></tr>
<tr><td>31.</td><td>C</td></tr>
<tr><td></td><td>Difficulty: Medium
Link to: 29.8</td></tr>
<tr><td>32.</td><td>D</td></tr>
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<tr><td>33.</td><td>B</td></tr>
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<tr><td>34.</td><td>D</td></tr>
<tr><td></td><td>Difficulty: Easy
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<tr><td>35.</td><td>C</td></tr>
<tr><td></td><td>Difficulty: Easy
Link to: 29.5</td></tr>
<tr><td>36.</td><td>D</td></tr>
<tr><td></td><td>Difficulty: Medium
Link to: 29.3</td></tr>
<tr><td>37.</td><td>Technological waste such as computers, TVs, cell phones, iPods. Electronic waste contains plastic housing that when burned may produce toxic material. It also contains small amount of metals such a cadmium, mercury, tin and gold. All are potentially harmful to people.</td></tr>
<tr><td></td><td>Difficulty: Medium
Link to: Case Study</td></tr>
<tr><td>38.</td><td>
<table>
<tr><th></th><th>advantage</th><th>disadvantage</th></tr>
<tr><td>on-site disposal</td><td>convenient</td><td>difficult to monitor or control</td></tr>
<tr><td>composting</td><td>less waste into landfill</td><td>inconvenient</td></tr>
<tr><td>incineration</td><td>reduces volume of waste</td><td>air pollution</td></tr>
<tr><td>open dumps</td><td>cheap</td><td>danger to surrounding env.</td></tr>
<tr><td>sanitary landfills</td><td>surrounding env. protected</td><td>expensive</td></tr>
</table>
</td></tr>
<tr><td></td><td>Difficulty: Medium
Link to: Chap. 29</td></tr>
<tr><td>39.</td><td>The cap can erode quickly as a result of ocean-bottom currents.</td></tr>
<tr><td></td><td>Difficulty: Medium
Link to: 29.10</td></tr>
</table>

40.	separate household sewage from industrial waste water pretreat waste water from industrial sources smaller, local wastewater treatment facilities focused on domestic sewage
	Difficulty: Medium Link to: 29.6
41.	Incineration emits oxides of sulfur and nitrogen which lead to acid rain.
	Difficulty: Medium Link to: 29.5
42.	acids explosives combustible solvents toxic chemicals radioactive waste
	Difficulty: Easy Link to: 29.6
43.	Leachate is mineralized liquid capable of transporting bacterial pollutants.
	Difficulty: Easy Link to: 29.5
44.	cradle-to-grave monitoring of toxic waste
	Difficulty: Easy Link to: 29.7
45.	After the landfill is completed, subsidence may occur. Water may collect there, infiltrate and produce leachate.
	Difficulty: Medium Link to: 29.5
46.	Covering waste with compacted soil at the end of every working period, usually at the end of every day.
	Difficulty: Medium Link to: 29.5
47.	Plastics tend to accumulate in places of convergent ocean currents that concentrate the debris. One of those zones of convergence lies within the northwestern Hawaiian islands.
	Difficulty: Medium Link to: A Closer Look, 29.3
48.	Limited precipitation limits leachate production.
	Difficulty: Medium Link to: 29.4
49.	1) It converts a large volume of combustible waste to a much smaller volume 2) The incineration of waste can be used to supplement other fuels and generate electric power (cogeneration)
	Difficulty: Medium Link to: 29.5
50.	reactivity, toxicity, radioactivity
	Difficulty: Easy

	Link to: 29.6
51.	1) hazard to human health 2) pollution of groundwater and surface water
	Difficulty: Easy Link to: 29.5
52.	recycling, treatment, source reduction
	Difficulty: Easy Link to: 29.8
53.	incineration sanitary landfills land application deep-well injection ocean dumping
	Difficulty: Easy Link to: 29.8