1.	The reservoirs and pathways that any chemical element follows through the Earth's system is called the:
a)	carbon cycle
b)	nitrogen cycle
c)	hydrologic cycle
d)	geological cycle
e)	biochemical cycle
	Ans: e Difficulty: Easy Link to: 5.1

2.	Processes that are responsible for the destruction of the lithosphere refer to the:
a)	carbon cycle
b)	nitrogen cycle
c)	hydrologic cycle
d)	geological cycle
e)	biochemical cycle
	Ans: d Difficulty: Easy Link to: 5.5

3.	Which of the following cycles involves the movement of water from the surface of the Earth through the atmosphere back to the surface of the Earth?
a)	carbon cycle
b)	nitrogen cycle
c)	hydrologic cycle
d)	geological cycle
e)	biochemical cycle
	Ans: c Difficulty: Easy Link to: 5.5

4.	The case study of Lake Washington in the Environmental Science text illustrates how phosphorous in the effluent of sewage treatment plants caused an unnatural growth of algae in the lake. Before the unnatural algae growth, phosphorous was the _____ in the growth of the algae
a)	chemical factor

b)	selected factor
c)	limiting factor
d)	validating factor
e)	aspiring factor

Ans: c
Difficulty: medium
Link to: Case study

5.	Which of the following is not true about the first law of thermodynamics?
a)	energy is the material that makes up our physical and biological environments
b)	energy cannot be created or destroyed
c)	the total amount of energy in the universe does not change
d)	energy can change from one form to another
e)	all of the statements are false

Ans: a
Difficulty: medium
Link to: 5.1 A Closer Look

6.	Within any one of the biogeochemical cycles, "flux" refers to:
a)	a pool or stock of material
b)	movement of material from one reservoir to another
c)	the dynamic equilibrium between different reservoirs
d)	a state of disequilibrium
e)	the rate of transfer from one reservoir to another

Ans: e
Difficulty: medium
Link to: 5.2 A Closer Look

7.	Based on the classification in the Environmental Science textbook, iron, potassium, magnesium, and calcium are examples of:
a)	nonmetallic minerals
b)	the "big six" macronutrients
c)	other macronutrients
d)	micronutrients
e)	by-products of nitrogen fixation

	Ans: c Difficulty: easy Link to: 5.3

8.	The following chemical equation describes which process: $6CO_2 + 6H_2O \text{ ---> } C_6H_{12}O_6 + 6O_2$	
a)	photosynthesis	
b)	oxidation	
c)	pyrolysis	
d)	respiration	
e)	carbonation	
	Ans: a Difficulty: easy Link to: 5.3 A Closer Look	

9.	Many higher organisms have evolved symbiotic relationships with nitrogen-fixing microorganisms. This is because:	
a)	the microorganisms protect them from the harmful effects of nitrogen compounds like ammonia	
b)	the nitrogen keeps parasites and predators away	
c)	there is no nitrogen in the natural ecosystems of higher organisms	
d)	the microorganisms transform nitrogen into forms useful to the higher organisms	
e)	the microorganisms can utilize the nitrogen to produce energy, which is "harvested" by the higher organisms	
	Ans: d Difficulty: Hard Link to: 5.7	

10.	The reason that some higher organisms have symbiotic relationships with nitrogen-fixing microorganisms is because:	
a)	ammonia and molecular nitrogen are toxic to most life forms; the microorganisms remove it from the local environment	
b)	fixing the nitrogen adds coherence to the soil and reduces soil erosion	
c)	the nitrogen acts as a natural pesticide	
d)	nitrogen is necessary for life, and the microorganisms make the nitrogen available to the symbiont	
e)	the organisms get lonely	

	Ans: d Difficulty: Hard Link to: 5.7

11.	The original source of energy that drives the hydrologic cycle is:
a)	rain
b)	thermal energy
c)	solar energy
d)	gravity
e)	photosynthesis
	Ans: c Difficulty: easy Link to: 5.5

12.	Which of the following examples shows an ionic bond?
a)	SiO_2
b)	H_2O
c)	FeO
d)	NaCl
e)	none of the above
	Ans: d Difficulty: easy Link to: 5.1 A Closer Look

13.	All of the following are macronutrients **except**:
a)	carbon
b)	nitrogen
c)	selenium
d)	oxygen
e)	phosphorous
	Ans: c Difficulty: easy Link to: 5.3

14.	The nitrogen cycle is one of the most important biogeochemical cycles. However, molecular nitrogen (N_2) in the atmosphere is not a significant element for life because:
a)	almost all nitrogen is in the atmosphere and therefore unavailable to life

b)	organisms use either CO_2 or O_2 but not nitrogen
c)	N_2 is relatively inert and must be transformed in order to be useful
d)	where nitrogen is insufficient, organisms can use other, more plentiful nutrients
e)	nitrogen is an important nutrient, necessary for life
	Ans: c Difficulty: Difficult Link to: 5.7

15.	How does erosion affect the global carbon cycle?
a)	exposed soil reacts with CO_2 and removes it from the atmosphere
b)	loose soil releases methane, a greenhouse gas
c)	erosion removes mountainous topography, which reduces snowfall worldwide
d)	it releases buried organic matter that oxidizes and produces CO_2
e)	erosion releases CO trapped in pores in bedrock
	Ans: d Difficulty: medium Link to: 5.7

16.	Which of the following examples represents a chemical reaction?
a)	carbon dioxide release when a soda can is opened
b)	sugar dissolving in coffee
c)	water evaporating
d)	iron rusting
e)	all of these
	Ans: d Difficulty: medium Link to: 5.1

17.	The tectonic cycle refers to the creation, destruction, and recycling of:
a)	the crust of the Earth
b)	fossil fuels
c)	surface water
d)	volcanic magma and lava
e)	mineral ores

	Ans: a Difficulty: easy Link to: 5.7

18.	The hydrologic cycle refers to the recycling of:
a)	surface
b)	groundwater
c)	rain water
d)	ocean water
e)	all water
	Ans: e Difficulty: medium Link to: 5.5

19.	Fluxes of nitrogen both into and out of the atmosphere are controlled predominantly by:
a)	the activity of microscopic bacteria
b)	evaporation and precipitation
c)	chemical exchange with the oceans
d)	transpiration by plants
e)	geological activity
	Ans: a Difficulty: medium Link to: 5.7

20.	The two major pathways by which molecular nitrogen is converted to forms more useful to living organisms are:
a)	evaporation and precipitation
b)	freezing and thawing
c)	biological activity and ultraviolet radiation
d)	biological activity and lightning
e)	ultraviolet radiation and volcanic activity
	Ans: c Difficulty: medium Link to: 5.7

21.	An element with a gaseous phase under conditions at the surface of the Earth tends to _____ much more rapidly than an element without a gas phase.

a)	recycle
b)	be depleted
c)	be polluted
d)	accumulate in excess
e)	undergo radioactive decay

Ans: a
Difficulty: medium
Link to: 5.5

22.	The rock cycle depends on the _____ cycle to lift mass above sea level and the _____ cycle to supply the force of erosion.
a)	solar; oceanic
b)	tectonic; hydrologic
c)	nuclear, biogeochemical
d)	solar; hydroelectric
e)	tectonic; carbon

Ans: b
Difficulty: Difficult
Link to: 5.5

23.	The substance with the greatest significance for the global carbonate-silicate cycle is:
a)	limestone
b)	carbon dioxide
c)	quartz minerals
d)	water
e)	fossil fuels

Ans: b
Difficulty: easy
Link to: 5.7

24.	In the context of biochemical cycles, "flux" refers to:
a)	the loss of water vapor through the pores of plants
b)	loss of matter or energy from the Earth system
c)	a state of disturbance from natural conditions
d)	the transfer of material or energy from one reservoir to another
e)	the development of a biotic community

	Ans: d Difficulty: medium Link to: 5.2 A Closer Look

25.	The pathway by which carbon is transferred from living biota to the atmosphere is called:
a)	photosynthesis
b)	transpiration
c)	evaporation
d)	respiration
e)	transportation
	Ans: d Difficulty: easy Link to: 5.7

26.	Phosphorus, an important nutrient, enters living plants from:
a)	groundwater
b)	surface water
c)	soil
d)	air
e)	solar radiation
	Ans: c Difficulty: easy Link to: 5.7

27.	Compared to elements that do not, elements that have a gaseous phase and a residence time in the atmosphere tend to:
a)	be more easily depleted and removed from the global system
b)	take less time to recycle
c)	have a lower flux between reservoirs
d)	be less accessible to life
e)	be less easily affected by human activity
	Ans: b Difficulty: medium Link to: 5.3

28.	The nitrogen cycle, which is one of the most important biochemical cycles, may cause environmental problems because too much nitrogen can:

a)	result in acid rain
b)	deplete the ozone shield
c)	contribute to the greenhouse effect
d)	reduce earthshine
e)	cause eutrophication in bodies of water

Ans: e
Difficulty: medium
Link to: 5.3

29.	A 1000 liter fish tank has a pump to filter and recirculate the water. The water in the tank has an average residence time of two hours. What is the flux due to the pump?
a)	50 liters per hour
b)	500 liters/hour
c)	20 liters/hour
d)	200 liters/hour
e)	2000 liters/hour

Ans: b
Difficulty: Difficult
Link to: 5.2 A Closer Look

30.	Carbon is called the 'backbone' of our living environment because carbon:
a)	is used in the process of respiration to produce carbohydrates and oxygen
b)	is produced by organisms
c)	dioxide prevents the Earth from cooling down
d)	is a medium for the transfer of material or energy from one reservoir to another
e)	is the chemical building-block of the organic world

Ans: e
Difficulty: medium
Link to: 5.7

31.	The nitrogen cycle is one of the most important and most complex of the biogeochemical cycles. It is important because nitrogen:
a)	dilutes carbon dioxide and oxygen in the atmosphere
b)	is toxic to most forms of life
c)	is a greenhouse gas
d)	is the building-block of organic life

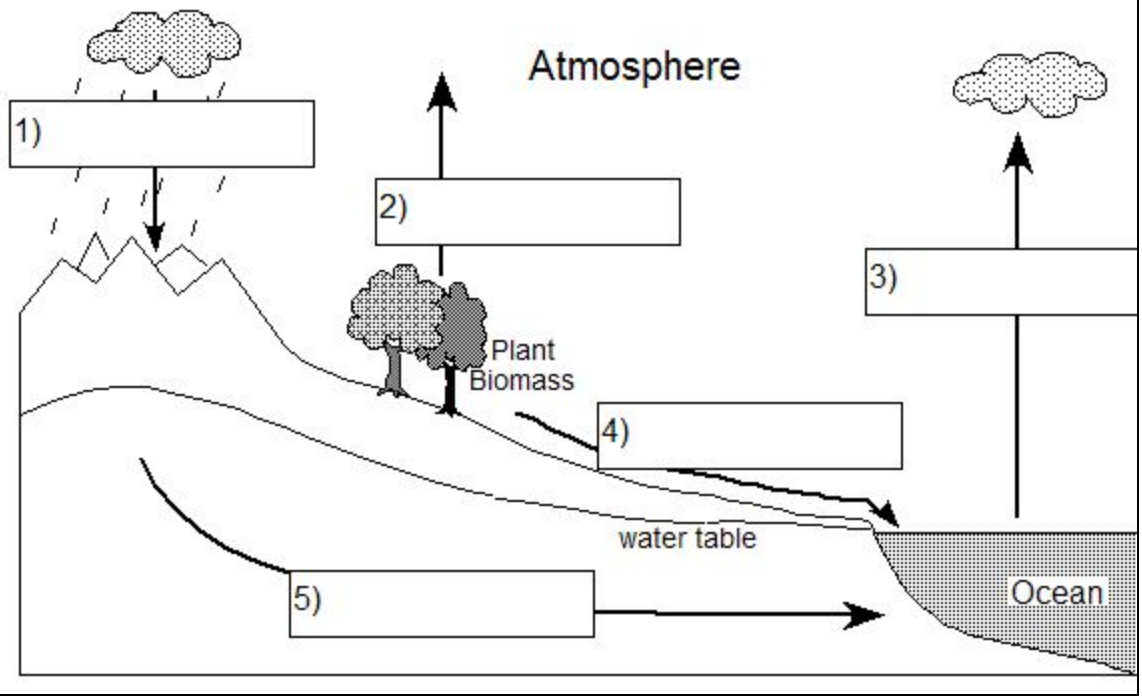
e)	is an important nutrient, necessary for life

Ans: e
Difficulty: medium
Link to: 5.7

32.	Assume that a lake contains 12,000,000 m^3 of water, the evaporation rate is 4000 m^3/day, and surface runoff is 4000 m^3/day. Calculate the average residence time of the water in the lake.
a)	3000 days
b)	82,000 hrs
c)	8.1 years
d)	82,000 hrs and 8.1 years
e)	3000 days and 8.1 years

Ans: e
Difficulty: Difficult
Link to: 5.2

33. The figure below illustrates the hydrologic cycle. The names of several of the major reservoirs are shown. Fill in the five blanks with the names of the important pathways of this cycle.



Ans:	1) precipitation (rain and snow) 2) transpiration (water directly from plants to the atmosphere) 3) evaporation 4) runoff (flow of water over the surface) 5) groundwater (or "subsurface") flow
	Difficulty: easy Link to: 5.5

34.	A lake contains 6,000,000 m^3 of water and the flux rate into and out of the lake is a constant 2000 m^3 / day. What is the average residence time of the water in the lake?
Ans:	$\frac{6{,}000{,}000\ m^3}{2{,}000\ m^3/day}$ = 3000 days = 8.3 years (approx.)
	Difficulty: Difficult Link to: 5.2 A Closer Look

35.	Although the total water on land represents only a small fraction of the water on Earth (about 1%), it is very important. Name at least three reasons why.
Ans:	The water on land is important in moving chemicals, sculpting landscape, weathering rocks, transporting sediments and providing our fresh water resources
	Difficulty: medium Link to: 5.5

36.	Name the important reservoirs and pathways of the hydrologic cycle.
Ans:	**reservoirs** - atmosphere, oceans, fresh surface water, groundwater, glaciers **pathways** - evaporation, precipitation, infiltration, transpiration, etc.
	Difficulty: medium Link to: 5.5

37.	List four main types of chemical bonding.
Ans:	covalent, ionic, Van der Waal, metallic

	Difficulty: easy Link to: 5.1 A Closer Look

38.	The two elements of a biogeochemical cycle are **reservoirs** and **pathways**. The following is a list of reservoirs and pathways in the global carbon cycle. Circle the *reservoirs*.

atmosphere	diffusion
soil	organic matter
oceans	sedimentary rock
photosynthesis	combustion
respiration	fossil fuels

Ans:	the atmosphere, soil, organic matter, the oceans, sedimentary rock, fossil fuels
	Difficulty: easy Link to: 5.3

39.	Phosphorus is an important macronutrient for life. Name three important sources of phosphorus for soil and plants.
Ans:	erosion of rock, guano from marine birds, mining phosphorus-rich deposits for fertilizer
	Difficulty: easy Link to: 5.7

40.	List three of the principal reservoirs of carbon significant to the global carbon cycle:
Ans:	sediments, ocean, soils, atmosphere, biomass, fossil fuels
	Difficulty: easy Link to: 5.7

41.	Name the important reservoirs and some of the important pathways that make up the carbon cycle.
Ans:	reservoirs: ocean, atmosphere, biomass, fossil fuels Pathways: respiration, photosynthesis, dissolution into water, combustion

	Difficulty: easy Link to: 5.7

42.	What substance that has major impact on global climate is recycled through the carbonate-silicate cycle?
Ans:	Carbon dioxide
	Difficulty: easy Link to: 5.7

43.	Defend or criticize the following statement: The nitrogen cycle is one of the most important of the biogeochemical cycles because nitrogen (N_2) in the atmosphere is utilized by most forms of life.
Ans:	false statement - Few forms of life utilize N_2 directly. It first must be converted to useful forms.
	Difficulty: Medium Link to: 5.7

44.	Carbon is a relatively minor component of the crust of the Earth. There are 13 elements more abundant than it. However the carbon cycle probably is the most important of the biogeochemical cycles. Why is carbon so important to us?
Ans:	Carbon is the basic building block of life; also, carbon dioxide is the principal gas involved in the Greenhouse Effect.
	Difficulty: medium Link to: 5.7

45.	Two of the most important reservoirs of carbon in the carbon cycle are life (biomass) and the atmosphere. Name the three important pathways that link these two reservoirs.
Ans:	photosynthesis, respiration, combustion
	Difficulty: medium Link to: 5.7

46.	List the "big six" macro nutrients that are necessary for almost all life.

Ans:	carbon, phosphorous, hydrogen, oxygen, nitrogen, sulfur
	Difficulty: easy Link to: 5.3

47.	Circle the right answers in the statement below: Of the total water supply on Earth approximately **1% / 2% / 97%** is in the ocean, **1% / 2% / 97%** is locked up in glaciers and ice caps and **1% / 2% / 97%** is in the entire atmosphere available for our needs.
Ans:	97%, 2%, 1%
	Difficulty: easy Link to: 5.7

48.	Why do farmers change the crops they cultivate in a field from year to year?
Ans:	They rotate the crops to prevent nitrogen depletion and improve crop yields.
	Difficulty: Medium Link to: 5.7

49.	What is a drainage basin and what does it do within the hydrologic cycle?
Ans:	A drainage basin is the area that contributes surface runoff to a particular stream or river.
	Difficulty: medium Link to: 5.7

50.	What happens to rocks during the process of physical weathering?
Ans:	The freezing of water in cracks of rocks expands, breaking the rock into smaller fragments.
	Difficulty: Easy Link to: 5.7

51.	What happens to rocks during the process of chemical weathering?

Ans:	Chemical weathering degrades geologic material into its components materials by a range of chemical reactions and processes.
	Difficulty: easy Link to: 5.7