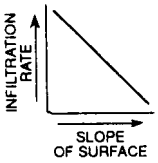
1. When rain falls on an area of sandy soil, infiltration will usually be greater than surface runoff if the
   1) soil surface has a steep slope
   2) soil is saturated
   3) rate of precipitation is low
   4) surface is impermeable

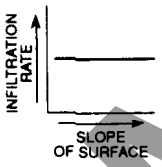
2. Which type of soil would water infiltrate most slowly?
   1) silt
   2) pebbles
   3) fine sand
   4) fine clay

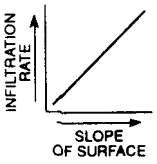
3. As the temperature of the soil decreases from 10ºC to –5ºC, the infiltration rate of ground water through this soil will most likely
   1) decrease
   2) increase
   3) remain the same

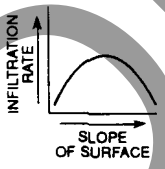
4. Most infiltration of precipitation will occur when the Earth's soil is
   1) unsaturated and impermeable
   2) unsaturated and permeable
   3) saturated and impermeable
   4) saturated and permeable

5. Which graph best represents the relationship between the surface slope of a dry, sandy soil and the infiltration rate of rain?

   1)
   

   3)
   

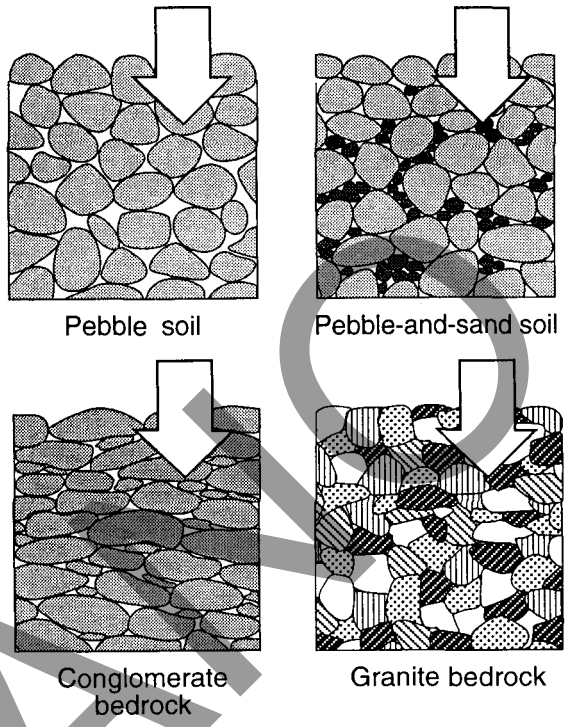
   2)
   

   4)
   

6. Why does water move very slowly downward through clay soil?
   1) Clay soil is composed of low-density minerals.
   2) Clay soil is composed of very hard particles.
   3) Clay soil has large pore spaces.
   4) Clay soil has very small particles.

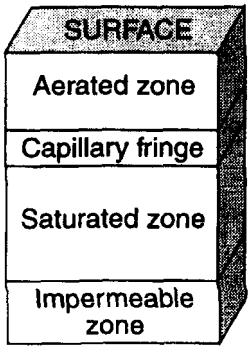
7. Water can pass through a sandstone sample because the sample is
   1) permeable
   2) organic in origin
   3) composed of pebble-sized particles
   4) well compacted and cemented

8. Base your answer to the following question on the diagram below, which represents samples of soil and bedrock at Earth's surface. The arrows represent possible infiltration of rainwater.



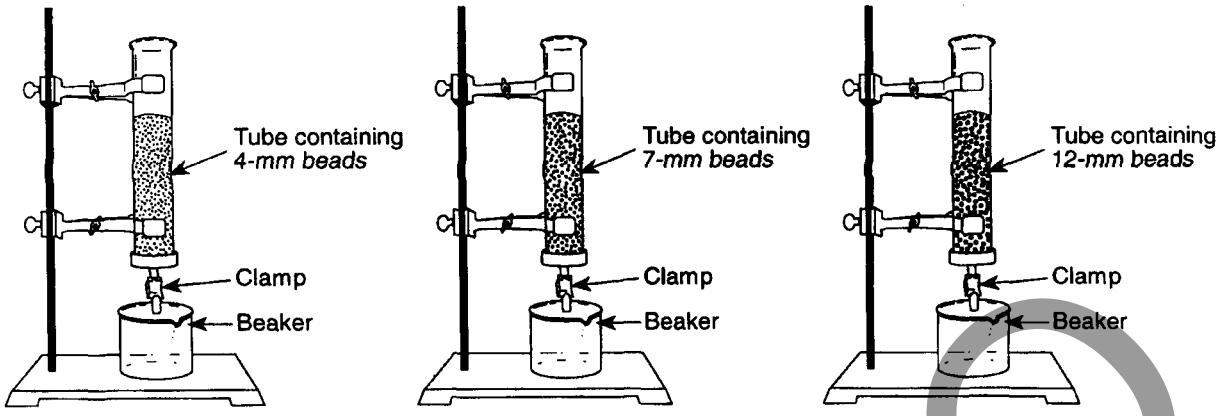
   The least amount of rainwater will infiltrate the surface of the
   1) pebble soil
   2) pebble-and-sand soil
   3) conglomerate bedrock
   4) granite bedrock

9. The diagram below represents zones within soil and rock. The zones are determined by the kinds of movement or lack of movement of water occulting within them.



   What is the deepest zone into which water can be pulled by gravity?
   1) aerated zone
   2) capillary fringe
   3) saturated zone
   4) impermeable zone

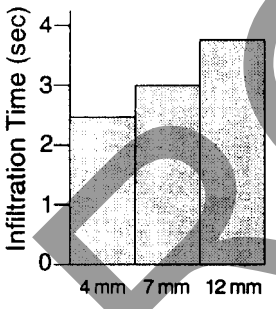
Base your answers to questions **10** through **13** on the diagram, data and information below. The diagram below represents part of the laboratory setup for an activity to investigate the effects of particle size on permeability, porosity, and water retention. Three separate tubes were used, each containing 300 milliliters of beads of uniform size. Bead sizes were 4 millimeters, 7 millimeters, and 12 millimeters in diameter, respectively.

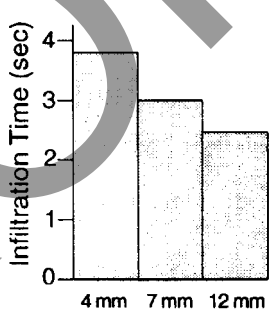


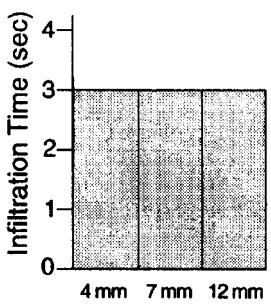
The amount of water added to each tube to cover the beads was determined. The clamp was then removed, the flow of the water was timed, and its volume was measured. Data are shown in the table below. (The amount of water retained on the 7-millimeter beads has been omitted.)

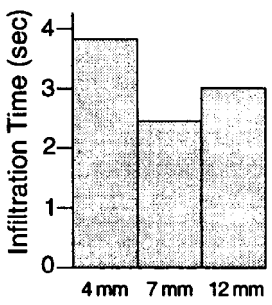
	Particle Size		
	4 mm	7 mm	12 mm
Infiltration Time (seconds)	3.7	3.0	2.4
Amount of Water Needed To Cover All Beads (mL)	147	145	147
Water Recovered from Tube After Clamp Was Removed (mL)	111	123	135
Water Retained on Beads (mL)	36		12

10. Which graph best represents the infiltration times for these three particle sizes?

1)


2)


3)


4)


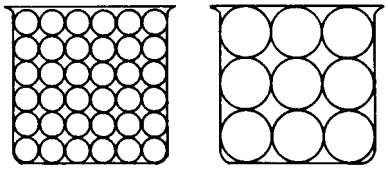
11. What was the total amount of water retained on the 7-millimeter beads after the tubing was unclamped and the water flowed out?
    1) 8 mL 2) 12 mL 3) 22 mL 4) 36 mL

12. The data table shows that all three tubes of beads had approximately the same
    1) porosity 2) water retention 3) permeability time 4) capillarity

13. Soil composed of which kind of particles would have the longest infiltration time? [Assume that all particles allow some water to pass through.]
    1) pebbles 2) sand 3) silt 4) clay

WATER IN THE GROUND

14. The diagrams below represent two identical containers filled with nonporous uniform particles. The containers represent models of two different sizes of soil particles.



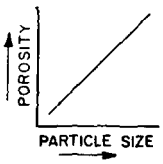
Compared to the model containing larger particles, the model containing smaller particles has

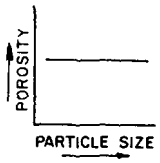
1) less permeability and greater porosity
2) greater porosity and greater capillarity
3) less permeability and greater capillarity
4) greater permeability and greater porosity

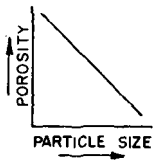
15. A rock with a high porosity will probably

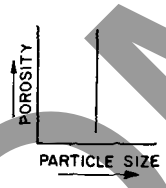
1) be resistant to weathering
2) be composed of large grains
3) have a large percentage of space between particles
4) have a small percentage of rounded particles

16. Which graph best represents the relationship between porosity and particle size for soil samples of uniform size, shape, and packing?

1)


3)


2)


4)


17. Which property of loose earth materials most likely increases as particle size decreases?

1) capillarity
2) infiltration
3) permeability
4) porosity

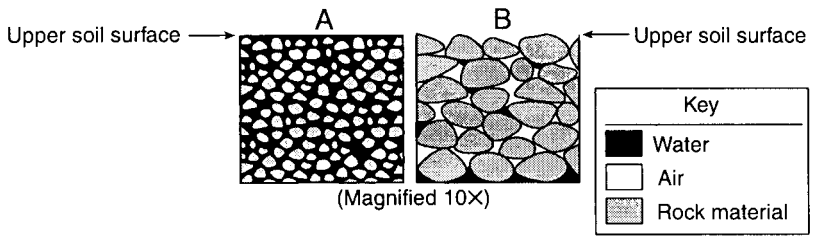
18. Apartment buildings and parking lots completely cover an area that was once an open, grass covered field. What factor most likely increased because of this construction?

1) capillarity
2) runoff
3) infiltration into the ground
4) the level of the local water table

19. Which conditions produce the most surface water runoff?

1) steep slope, heavy rain, and frozen ground
2) steep slope, gentle rain, and unfrozen ground
3) gentle slope, heavy rain, and frozen ground
4) gentle slope, gentle rain, and unfrozen ground

20. During a heavy rainstorm, soil samples *A* and *B* both became saturated with water. However, 10 minutes after the storm ended, the soils appeared as shown below.



Which statement best explains the observed change in the water content of the soil samples?

1) The permeability of *B* is greater than the permeability of *A*.
2) The porosity of *B* is greater than the porosity of *A*.
3) The capillarity of *B* is greater than the capillarity of *A*.
4) The surface runoff at *B* is greater than the surface runoff at *A*.

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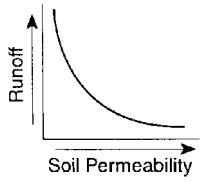
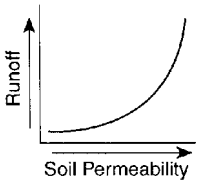
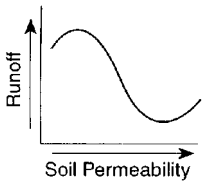
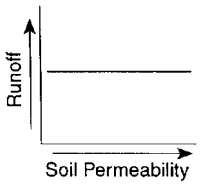
21. Which graph shows the effect of soil permeability on the amount of runoff in an area?

1)


3)


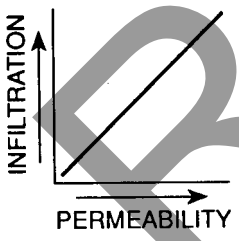
2)


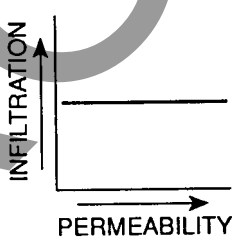
4)


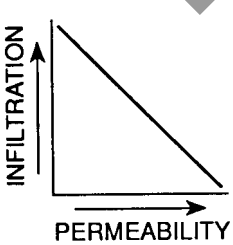
22. Soil with the greatest porosity has particles that are

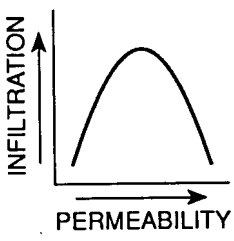
1) poorly sorted and densely packed
2) poorly sorted and loosely packed
3) well sorted and densely packed
4) well sorted and loosely packed

23. Which graph best represents the relationship between soil permeability rate and infiltration when all other conditions are the same?

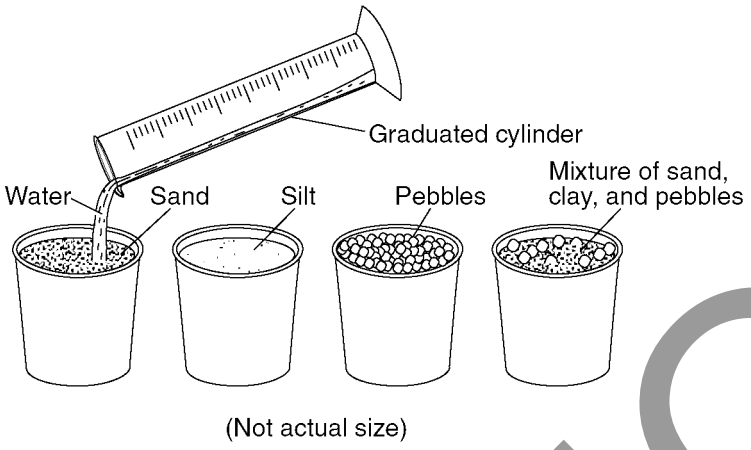
1)


3)


2)


4)


24. A student performed a laboratory activity in which water was poured slowly into four cups containing equal volumes of loosely packed sediment samples, as shown in the diagram below. All particles were spherical in shape and uniform in size within a container. After the water level reached the surface of each sample, the student determined the amount of water that had been added.



The results of the activity should have indicated that approximately equal amounts of water were added to the cups of

1) silt and pebbles, only
2) sand, silt, and pebbles, only
3) pebbles and the mixture, only
4) sand, pebbles, and the mixture, only

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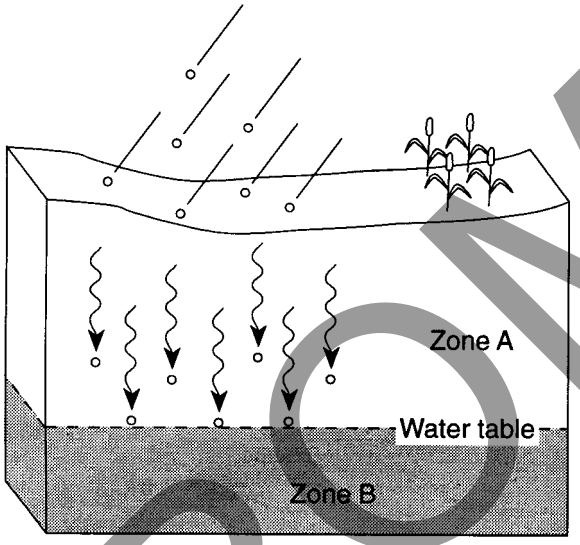
25. The diagram below is a cross-sectional view of rain falling on a farm field and then moving to the water table.



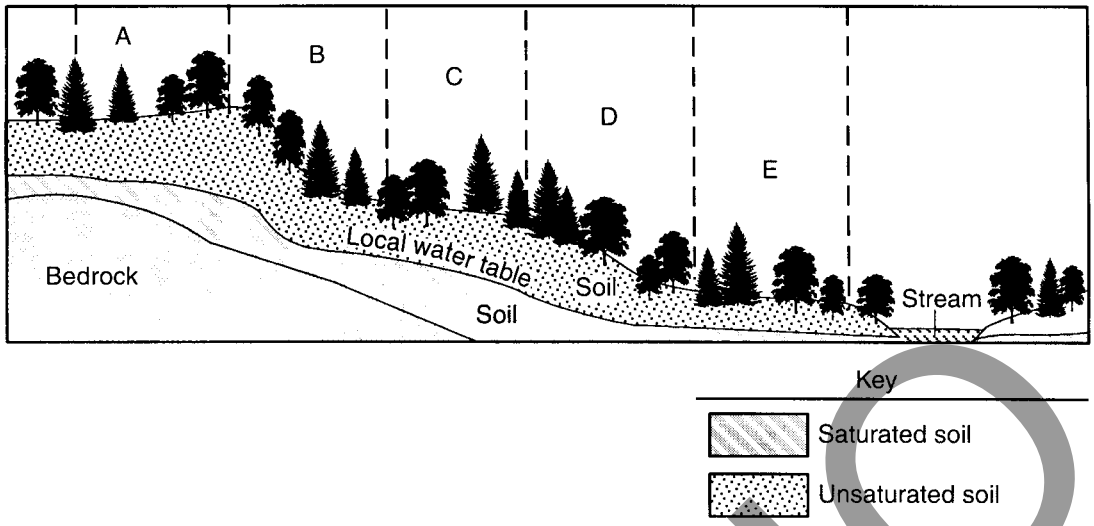
Which word best describes the movement of the rainwater through zone *A*?

1) runoff
2) saturation
3) infiltration
4) precipitation

26. Which soil condition allows the most infiltration of precipitation?

1) saturated soil
2) a steep soil surface
3) coarse-grained soil
4) an impermeable surface

27. The cross section below represents a forested area in New York State.



During heavy rainfall, the greatest amount of runoff should occur in which two sections of the forest?

1) *A* and *B* 2) *B* and *D* 3) *C* and *E* 4) *D* and *E*

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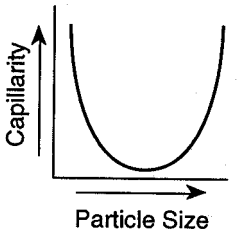
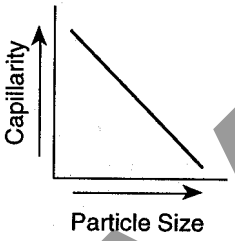
28. Which graph best represents the relationship between the particle size and the capillarity of a sample of soil?

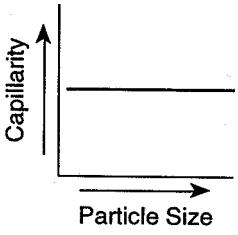
1)



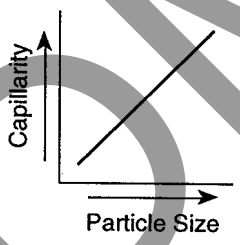
3)



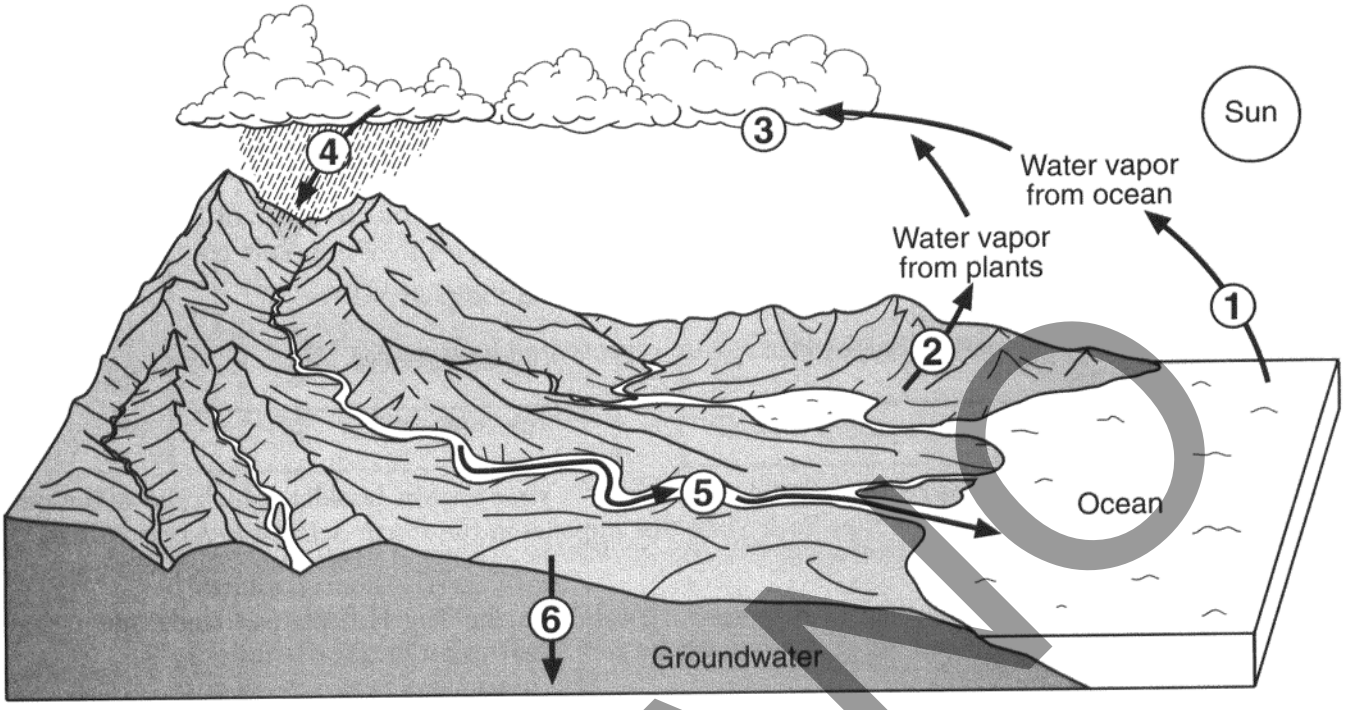
2)



4)



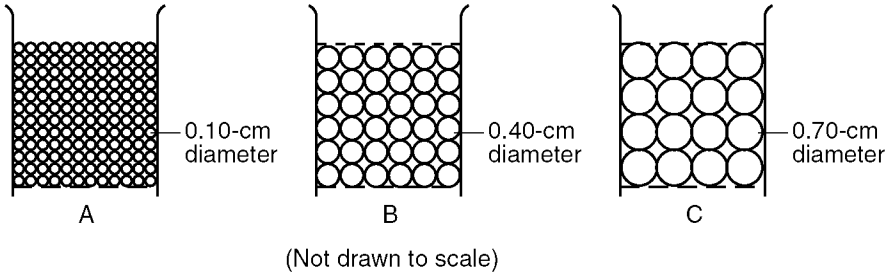
29. The diagram below shows a model of the water cycle. The arrows show the movement of water molecules through the water cycle. The circled numbers represent the processes that occur as the water molecules reach the different stages of the water cycle.



Complete the table by identifying the name of the water cycle process occurring at *each* number.

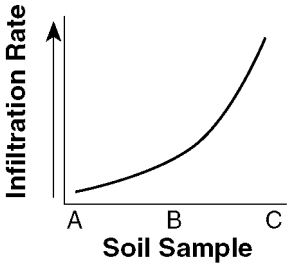
Number	Water Cycle Process
1	
2	
3	
4	
5	
6	

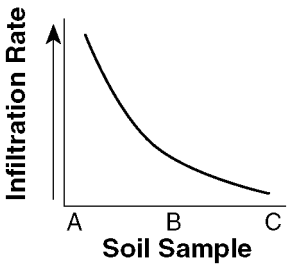
30. The diagrams below show the relative sizes of particles from soil samples *A*, *B*, and *C*. Equal volumes of each soil sample were placed in separate containers. Each container has a screen at the bottom. Water was poured through each sample to determine the infiltration rate.

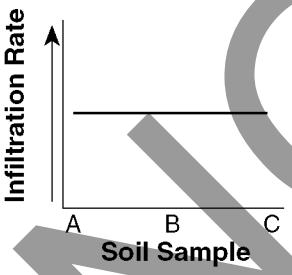


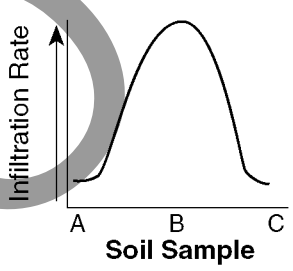
(Not drawn to scale)

Which graph best shows how the infiltration rates of the three soil samples would compare?

1)


2)


3)


4)


Answer Key

1. 3
2. 4
3. 1
4. 2
5. 1
6. 4
7. 1
8. 4
9. 3
10. 2
11. 3
12. 1
13. 4
14. 3
15. 3
16. 3
17. 1
18. 2
19. 1
20. 1
21. 1
22. 4
23. 1
24. 2
25. 3
26. 3
27. 2
28. 3
29.

Number	Water Cycle Process
1	evaporation
2	transpiration
3	condensation
4	precipitation
5	runoff

30. 1