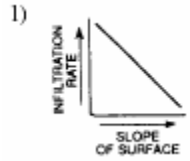
Water in the Ground Answers

1. **(3) rate of precipitation is low** - If rain is coming down slowly there is more time for the ground absorb it. The other choices would all cause more runoff to occur. If the slope is steep, saturated, and/or impermeable, there would be less infiltration and more runoff.

2. **(4) fine clay -** The smaller the grain size, the slower water will infiltrate because the soil is less permeable. According to the ESRT, clay is the smallest particle size. The smaller particles themselves act as obstacles slowing down the flow of water, but also the pore spaces are smaller and slow down the flow of water as well.

3. **(1) decrease** – If the temperature drops below 0°C, the ground becomes frozen and stops the flow of water into the ground.

4. **(2) unsaturated and permeable** – To get infiltration, the ground must be permeable (have the ability to allow water to flow through). Also, the ground must be unsaturated. If the ground was saturated (full), there would be no room for more water; it would just runoff.

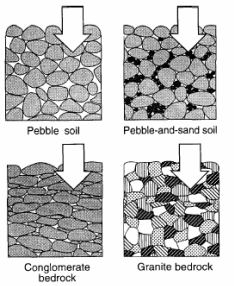
5. 1) 

If the slope is steep, there is a greater tendency for water to runoff – this causes less water to infiltrate (this is why the roofs of houses are pitched).

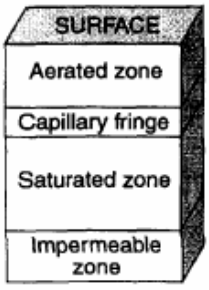
6. **(4) clay soil has very small particles** – This is a question of permeability. Since clay-sized particles are very small (ESRT reminds you of this), the pore spaces are small causing it to be less permeable.

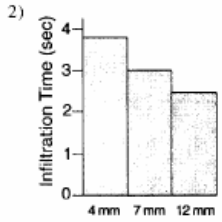
7. **(1) permeable** – This is basically a definition question. The definition of permeability it the ability of a rock or soil to allow water to pass through. If sandstone lets water through, it must be permeable.

8. **(4) granite bedrock** – Granite bedrock has angular interlocking crystals as shown by the diagram. This causes it to have basically no pore space and therefore be impermeable. That's why granite is great for countertops – it doesn't allow liquid to get in and stain the rock. The other three diagrams show that each sample has porosity and therefore would let water infiltrate.



9. **(3) saturated zone** – Water will infiltrate into the ground until it reaches an impermeable layer. Therefore, the deepest water can go to is the saturated zone. As more water infiltrates into the ground (especially after heavy rains), the bigger the saturated zone gets.



10. 

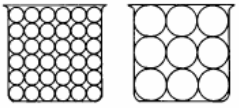
Always be careful s to whether the question is about TIME or RATE. Since this question is about TIME, choice 2 is the answer because it shows that water takes less time to travel through larger particles. This happens because larger particles have more permeability.

11. **(3) 22mL** – Use the information in the chart. If it took 145 mL of water to cover the beads, and after the water was released from the tube only 123 mL was retrieved, 22 mL of water must still be trapped in the tube.

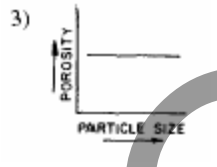
12. **(1) porosity** – Since the amount of water needed to cover the beads is basically the same the porosity of each sample must be the same. Remember: grain size does not affect porosity.

13. **(4) clay** – Clay has very small particles and very small pores and therefore less permeability. This would mean that water would travel through it at the slowest rate (speed) and take the most time.

14. **(3) less permeability and greater capillarity** – Smaller particles allow water to rise up better (good capillarity), but do not let water pass downward through it as quick (poor permeability). Also, since both samples have the same porosity, all other choices are incorrect.



15. **(3) have a large percentage of pore space** – This is just a question about the definition of porosity is. A rock/soil sample with good porosity has a lot of pore space (empty space between the grains).

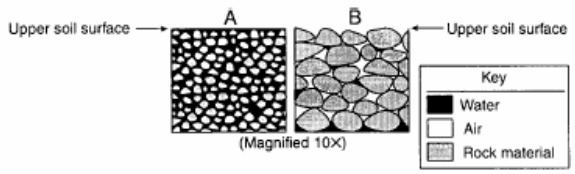
16. 

Particle size does not affect porosity.
As particle size increases, porosity remains the same – an unaffected relationship

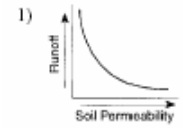
17. **(1) capillarity** – The only property given that increases when particle size is smaller is the capillarity. Infiltration and permeability would decrease in a soil sample with smaller particles, and porosity would be the same as in the bigger particles.

18. **(2) runoff** – When there is construction in an area, the streets and buildings cover what used to be more permeable soil. A paved surface will have less permeability (water can't infiltrate as much), and therefore cause more runoff.

19. **(1) steep slope, heavy rain, and frozen ground –** All three parts of this allow for the most runoff. Water will roll down steep slopes more than gentler (flatter) ones. When the rain is heavy, it comes down too fast for the ground to absorb, so a lot of it becomes runoff. When the ground is frozen, it becomes more of a solid barrier and does not allow water to move downward.

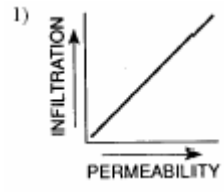


20. (1) The permeability of B is greater than the permeability of A. – This is the only true statement of the choices given. Basically what happens is this: it rained enough to saturate both samples. Ten minutes later, the water is able to move downward though B because it has larger grains and better permeability. The water has not moved down in A yet because the grains are smaller causing it to be less permeable and have slower infiltration.

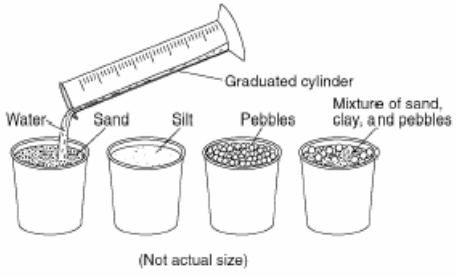
21. 

If soil is more permeable, there will be less runoff because more water is able to infiltrate into the ground.

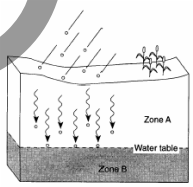
22. **(4) well sorted and loosely packed** – Well sorted means that the grains are all the same size. Well sorted soil samples have more porosity than poorly sorted samples (unsorted) – Remember, in unsorted samples the small grains fit in between the larger ones and reduces the overall porosity. Loosely packed soil also has better porosity. Packing down the soil with pressure squeezes out the air and reduces porosity as well.

23. 

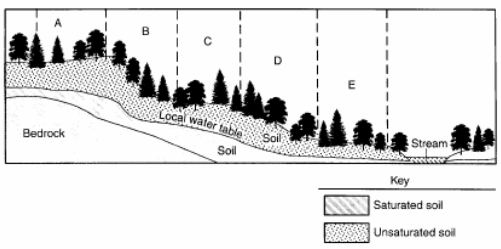
The more permeable soil is, the better it will allow water to infiltrate. This is a direct relationship.

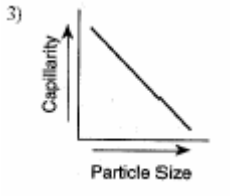
24. (**2) sand, silt, and pebbles, only** –


What you have to realize is that this is a question of porosity. It is not about how fast water can go through – it is about how much water each sample is able to hold in the space between the grains. Since grain size has not effect on porosity, the sorted sand, silt, and pebbles would have equal porosity and hold the same amount of water. The mixture would hold less – it is an unsorted sample.

25. **(3) infiltration** –
this diagram shows water seeping into the ground.


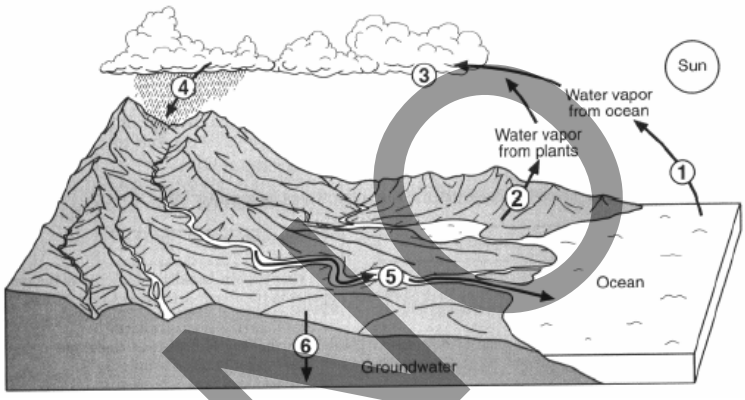
26. **(3) coarse-grained soil** – Coarse-grained soil has large grains.
Larger-grained soil has better permeability and would therefore have better infiltration.
The other choices would all reduce the amount of infiltration and actually cause more runoff.

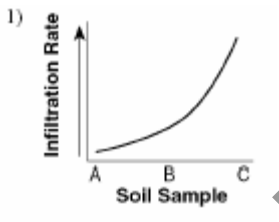
27. **(2) B and D** – These are the steepest zones and would have more runoff because of that.


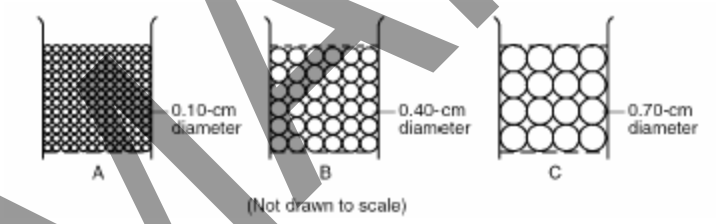
28. 3) 

As particle size decreases, capillarity increases.
This is an inverse relationship.

29. The Water Cycle:
    1. **evaporation**
    2. **transpiration**
    3. **condensation**
    4. **precipitation**
    5. **runoff**
    6. **infiltration**



30. 1) 



The larger the grain size, the better the soil's permeability and the better water will infiltrate into it. Sample A would have the slowest infiltration and Sample C would have the fastest.