Name: _____ Class: _____ Date: _____ ID: A

Glaciers and Mass Movements Short Study Guide

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. Which of the following statements is NOT true about the factors affecting mass movement?
a. Sudden mass movements are usually started by triggers such as earthquakes.
b. After a heavy rain, sediment moves along with the water.
c. A small amount of water may make the slope more stable.
d. An important force that determines a material's resistance to downhill movement is friction.

____ 2. Which of the following statements is true about wind transport?
a. Wind, like water, can only move materials downhill.
b. Wind and water have the same relative ability to erode materials.
c. Wind transport and erosion primarily occur in areas with little vegetative cover.
d. Generally, wind can carry particles as large as those transported by moving water.

____ 3. Which of the following statements is NOT true about valley glaciers?
a. Flow rates are the same within the various portions of the glacier.
b. The speed of the glacier is affected by the slope of the valley floor.
c. They widen V-shaped stream valleys in U-shaped glacial valleys.
d. Movement is usually less than a few millimeters a day.

____ 4. Which of the following is NOT an indication that creep has occurred?
a. Parallel grooves form in bedrock.
b. Vertical structures become tilted.
c. Trees become bent.
d. Underground pipelines break.

____ 5. Slumps are common after a rainfall because the water ____.
a. reduces friction between soil grains
b. breaks the underlying rock
c. causes snow to melt
d. washes away the vegetation cover

____ 6. Which of the following causes deflation?
a. glacial erosion
b. deposition by meltwaters
c. wind deposition
d. wind erosion

____ 7. Glaciers covered 30 percent of the earth during the last ice age that began about ____.
a. 10 000 years ago
b. 1.6 million years ago
c. 2000 years ago
d. 50 million years ago

____ 8. Which of the following is NOT true about glaciers?
a. Glaciers can form along the equator.
b. Glaciers carve U-shaped valleys.
c. Only valley glaciers flow.
d. Glaciers produce moraines.

____ 9. When two cirques on opposite sides of a valley meet, they form a(n) ____.
a. arête
b. drumlin
c. moraine
d. avalanche

____ 10. A landslide that occurs on steep slopes in mountainous area is called a(n) ____.
a. rockslide
b. slump
c. avalanche
d. mudflow

Matching

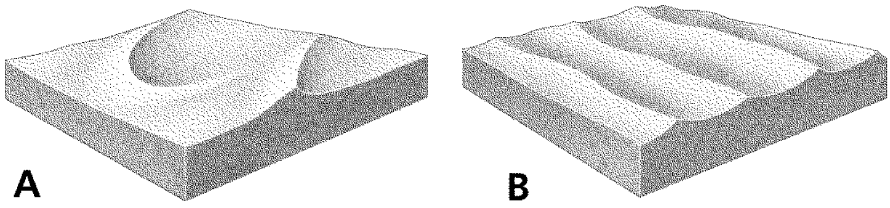
Match each item with the correct description below.

a. slump
b. creep
c. water
d. mudflow
e. landslide

____ 11. The slow, steady, downhill flow of loose, weathered earth materials
____ 12. Swiftly moving mixture of mud and water that causes many deaths
____ 13. A rapid, downslope slide of earth materials
____ 14. A landslide in which the material rotates and slides along a curved surface
____ 15. This acts as a lubricant between grains of soils and sediments

Short Answer

16. Explain the importance of gravity in all mass movements.
17. Compare and contrast the conditions that produce a valley glacier with those that produce continental glaciers.
18. Name and describe the four main classifications of mass movements.
19. What are eskers and how do they form?
20. Explain how and where valley glaciers form. Why do they move?
21. Explain how water can both limit and increase a material's potential for movement on a slope.
22. Compare and contrast erosion by wind and by glaciers.
23. Identify the landforms shown in the diagrams below. Then compare and contrast them.

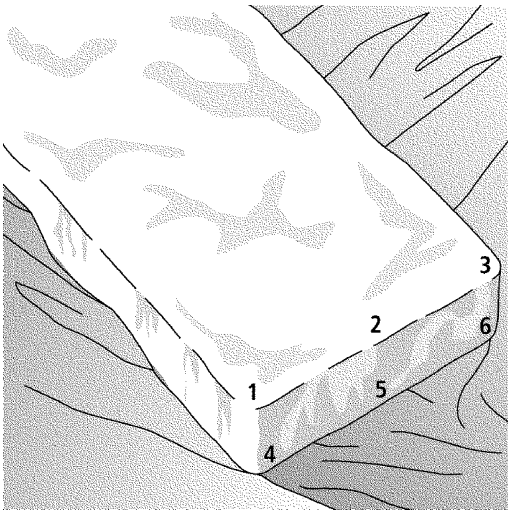


24. A family has decided to build their dream house on a dune on the shore of Lake Michigan. Their plans call for the natural vegetation to be dug up and construction begun. What are some possible consequences of their actions? What would you do differently to minimize these consequences?
25. "People impact mass movement just as mass movement impacts people." Do you agree or disagree with this statement? Explain your answer.

Problem

Glaciers are similar to great rivers of ice. Glaciers certainly move slower, but they experience changes in flow rate much like rivers do. In order to determine a glacier's flow rate, measurements are taken by a variety of methods. Some include the measurement of the movement of stakes placed in the ice, while other methods might include the observation of crevasses in the ice.

The table below contains measurements taken over 5 years. Two measurements were taken each year, one in April and the other in October. Measurements 1–3 are from the top of the glacier. Measurements 4–6 are from the bottom of the glacier. The numbers, in millimeters, represent the movement since the last measurement. Positive numbers mean the glacier is advancing. Negative numbers mean the glacier is retreating.



		Top of Glacier			Bottom of Glacier		
		Point 1	**Point 2**	**Point 3**	**Point 4**	**Point 5**	**Point 6**
Year 1	April	141	164	139	132	147	130
	October	–8	–22	–7	–12	–18	–13
Year 2	April	163	173	162	139	156	138
	October	8	11	7	3	5	2
Year 3	April	–2	–3	–1	–14	–15	–15
	October	–34	–46	–31	–55	–59	–54
Year 4	April	0	–5	–1	–3	–6	–3
	October	–14	–19	–13	–32	–49	–31
Year 5	April	80	106	78	68	92	68
	October	2	7	3	1	4	1

26. What general statement can you make about the movement of the top of the glacier relative to that at the bottom of the glacier? Explain why this might happen.

27. Make a general statement about the movement of the glacier over the 5 years of measurements. Explain your results.

28. Why might scientists wish to measure and track the movement of a glacier?

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Answer Section

MULTIPLE CHOICE

1. B
2. C
3. A
4. A
5. A
6. D
7. B
8. C
9. A
10. C

MATCHING

11. B
12. D
13. E
14. A
15. C

SHORT ANSWER

16. All mass movement occurs on slopes. Without gravity, the material would remain in place and not move.
17. Valley glaciers are formed in high, mountainous areas and flow downslope like a thick liquid. Continental glaciers are formed under the same climatic conditions as valley glaciers, but continental glaciers are thickest in the center, which forces the rest of the glacier to flatten out in all directions.
18. Creep is the slow, steady downhill flow of loose, weathered earth materials. Flows are the slow to rapid flow of earth materials like thick liquids. Slides are a rapid downslope movement of earth material. Falls are downhill movements of loose rock at high elevations, in steep road cuts, and on rocky shorelines.
19. Eskers are winding ridges of layered sediment. They are deposited by streams flowing under glaciers that are melting.
20. Valley glaciers form in mountainous areas when accumulated snow packs down to recrystallize into ice. This ice becomes too heavy to maintain its rigid shape and begins to flow like a heavy liquid.

21. Too little water may prevent sediment grains from holding together, thus increasing the material's potential for movement. Too much water can increase the weight of soils and sediments, thus making them unstable and increasing their potential for movement. Water can also act as a lubricant between grains, reducing friction and increasing movement downhill. In contrast, a small amount of water can help hold the soil particles together, making them more stable and thus inhibiting the movement downslope.
22. Both wind and glaciers pick up and carry loose sediment. Wind transports sediment by rolling motion, suspension, and saltation and erodes rocks by abrasion. Wind erosion results in deflation blowouts and ventifacts. Like wind, glaciers also erode by abrasion, as well as by plucking. Glacial erosion results in striations, grooves, cirques, arêtes, and horns.
23. A shows a barchan dune, and B shows a transverse dune. Both are piles of sand deposited by wind. Barchan dunes are crescent-shaped dunes that form in flat areas where there is little sand or vegetation. Transverse dunes form in a series of long ridges perpendicular to the wind direction where there is plenty of sand, little or no vegetation, and strong, steady winds.
24. Dunes grow and migrate. This natural dune growth would be disrupted. After construction is completed, dune migration could bury and block off the structures and property. Also, dune vegetation helps anchor the sand. Removing the sand may increase beach erosion, and the area may suffer nearshore flooding. To minimize these consequences, one should disturb the dunes as little as possible and dig up as little vegetation as possible.
25. Students should recognize the truth in this statement. People do impact mass movement because their activities can contribute to factors that cause mass movement. Construction can make slopes unstable. Septic leaks can trigger slides, and excessive logging can promote mass movement. Mass movement also impacts people in several ways. It can cause damage to property. Villages can be buried, and homes and forests can be destroyed. Mass movement can also result in loss of lives.

PROBLEM

26. The bottom of the glacier moves slower than the top of the glacier. Friction occurs on the bottom of the glacier where it comes in contact with the ground. This friction slows down the ice.
27. The glacier does not move in a uniform manner from year to year. In some years, there is no movement or a retreat, while in other years there is an advance. The advance or retreat of a glacier is highly dependent upon the amount of snowfall and temperatures during the winter and the summer, and this varies from year to year, making the movement of this glacier unpredictable.
28. Scientists measure glacial movements as indicators of climate change. Advancing glaciers may also pose a threat to property downslope.