

Answer Key

1. valley or alpine glacier
2. a. medial moraine
b. These were once lateral moraines which become medial moraines where two valley glaciers flow together.
c. till; unsorted rocky materials eroded from the valley walls
3. a. ogives
b. away (notice the curvature of the flowing ice lying perpendicular to the sides of the glacier)
4. hanging glacier (could be called an "ice apron")
5. terminus
6. ablation zone or zone of wastage
7. drift, outwash deposits
8. outwash plain or pro-glacial lake
9. cirque
10. a. horn
b. Horns are pyramidal peaks that form when several cirques chisel a mountain from three or more sides.
11. arête
12. alpine or valley glacier
13. a. roche moutonnee
b. The action of plucking on rock mounds when combined with glacial abrasion produces this feature.
14. a. erratic
b. Glacial erratics are large rocks transported away from their source areas by moving glacial ice sheets and deposited when the glacier melted.
15. a. drumlin
b. The narrow end of the drumlin points to the general direction of glacial advance; the steep end is the general direction that the glacier came from.
16. a. kettle lake
b. When glaciers are retreating, numerous blocks of ice become detached from the main body of the glacier. If glacial drift is then surround the ice, a depression on the surface called a kettle hole can be created when the ice melts. Those reaching below the water table can form kettle lakes.

17. a. moraine or till
b. till deposited along the edge of a glacier released when a glacier melts
18. cross-bedded drift; outwash deposit
19. a. Those in Figure 11 are well-sorted, fine, and deposited in well-defined layers or strata.
b. Those in Figure 10 are poorly-sorted, large, with little obvious layering.
20. These sediments were deposited by meltwater streams in the outwash plain;
21. continental
22. Transantarctic Mountains
23. An ice sheet covers a very large area of land; an ice shelf is attached to an ice sheet but covers an area covered by water.
24. Valley glaciers are bound by valley walls and flow in the direction of the valley; an ice sheet is on a larger scale and flow in all directions; valley glaciers are thinner and smaller than ice sheets;
25. An ice sheet flows in all directions; a valley glacier flows in the direction of the valley.
26. Draw a straight line between 0° and 18° longitude and another between 90° W and 90° E latitude. The point where they cross is the South Pole.
27. 4000-4499 meters
28. continental glaciers
29. outwash plain, kame, esker
30. drumlins, recessional moraine, terminal moraine, and ground moraine
31. terminal moraine
32. A terminal moraine is a deposit that marks the farthest advance of a glacier. Moraine deposits created during halts in the retreat of the glacier are called recessional moraines. Moraines form when the glacier pauses for a period of time (accumulation = ablation). As it melts it deposits till, but the glacier acts like a conveyor belt bringing more sediments to add to the moraine.
33. The glacier flows more rapidly at its center than at its sides due to less friction between the hard rock and ice at its sides
34. retreating
35. less accumulation and greater ablation
36. global warming+++++
37. 55 ± 5 meters/year
38. horn
39. a. arête

- b. the closely-spaced contours on two sides indicates steep walls; there are cirques on both sides of this high feature
40. a. cirque
b. tarn
 41. Description: a river at the center; gentle upslope from river on both sides; then much steeper walls. (U-shaped)
 42. It decreased. In 1979 it was less than one-third the size it was in 1901.
 43. Much greater ablation than accumulation.
 44. The climate is becoming considerable warmer.
 45. The glacial ice is still flowing forward although it is melting as it approaches the glacier's terminus.
 46. a. eccentricity – shape of orbit
b. obliquity – tilt of Earth's axis (and a third: precession – wobble of axis)
 47. Minute "pockets" of ancient atmosphere became trapped within the glacial ice. These small amounts of atmospheric gases were carefully analyzed.
 48. Pleistocene
 49. Decreases in CO₂ were accompanied by decreases in temperature; as CO₂ increases, temperature increases;
 50. a. roughly 10,000 years ago (10,000 – 12,000 yrs)
b. very similar c. approximately 120,000 years
 51. four
 52. a. Glaciers will become smaller and smaller. b. Present coastal areas will become inundated with water.

This exam was written by and submitted for publication on The Wright Center website by Gary Vorwald, P.J. Gelinas JHS, Setauket, NY. In 1993, a team of 6 teachers from New York and Washington State were chosen to participate in a three-week summer program to study of the Juneau Icefield Research Project. They spent three weeks at a remote field camp on an arête located between the Lemon and Ptarmigan glaciers.

The "**Glaciers and Climate**" chapter included on the TASA Graphic's **Earth's Dynamic Surface CD** presents a comprehensive study of the 2006 topic of the Dynamic Planet event for use with both Divisions C and D. Participants are guided through each concept with full color animations, illustrations, and photographs while listening to the author's narration. A review section at the end of the chapter reinforces the concepts covered. Interactive activities encourage participation and problem solving.