



GLACIER REVIEW SHEET

PURPOSE

This worksheet will help to prepare students for a final assessment covering glacier concepts. An assessment that uses PowerPoint in a game-like fashion has been developed to compliment the material in this 2-week unit.

GRADES

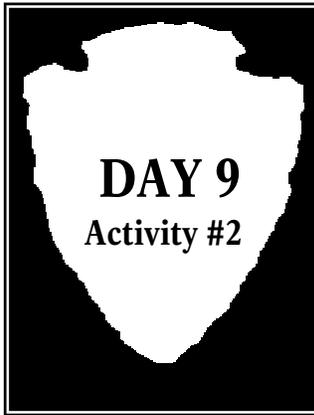
Middle or High school students

DURATION

- This review sheet is intended to be started on Day 9 of the 2-week glacier unit, and then finished as homework. *However*, it can also be given out as homework on Day 8, and then finished on Day 9 after the Glacier Artists activity.

MATERIALS

- Glacier Review worksheet
- Work completed during the glacier unit will assist the students in answering the questions on the review sheet.



GLACIER REVIEW SHEET

NATIONAL EDUCATION STANDARDS

Science:

NS.5-8.4 Earth and Space Science

- Structure of the earth system

NS.5-8.6 Personal and Social Perspectives

- Populations, resources, and environments

NS.5-8.7 History and Nature of Science

- Science as a human endeavor
- Nature of science

NS.9-12.4 Earth and Space Science

- Geochemical cycles

NS.9-12.5 Science and Technology

- Understandings about science and technology

NS.9-12.6 Personal and Social Perspectives

- Natural resources

NS.9-12.7 History and Nature of Science

- Science as a human endeavor
- Nature of scientific knowledge

◆ Glaciers Unit Review Sheet ◆

1. What are the 3 criteria for being a glacier?
 - a.
 - b.
 - c.
2. What are the 2 features of ice crystals that are significant to glaciers?
 - a.
 - b.
3. What are 2 ways that glaciers move?
 - a.
 - b.
4. Describe how basal sliding is directly influenced by the density of water.
5. What is the most significant heat source that a glacier receives?
6. Describe how latitude affects where glaciers are found.
7. Describe how altitude affects where glaciers are found.
8. How is aspect important to the existence of glaciers?
9. What are the 2 best ways for differentiating glaciers (how best do you tell them apart?)
 - a.
 - b.
10. What is the difference between ice sheets and ice caps?

11. What are the 2 main components of ice sheets and ice caps?
 - a.
 - b.
12. What is an ice shelf?
13. Describe the surface of an icefield.
14. Where are 2 places that a valley glacier might come from?
 - a.
 - b.
15. Describe a cirque glacier.
16. Where is ice thickest in a glacier?
17. Describe the movement of the ice flow within a glacier at the center and at the edges.
18. What is the difference between the pattern of flow in the accumulation zone and the ablation zone?
19. What is the difference between an extended flow and a compressive flow?
20. What is an icefall?
21. Describe glacial scouring:

22. List 4 commercial uses for glacier ice:

- a.
- b.
- c.
- d.

23. How does meltwater from glaciers affect electric power generation?

24. List 5 recreational uses for glaciers:

- a.
- b.
- c.
- d.

25. How can a retreating glacier benefit wildlife species living in the area?

26. Describe a glacier that is surging and advancing.

27. What is a major hazard from a glacier-caused outburst flood?

28. Where is the threat from an ice avalanche most apparent?

29. Where is most of the world's glacier ice held **and** how much of the planet's freshwater is held in these places?

30. What are 3 main consequences of rising sea levels?

- a.
- b.
- c.

31. Define the following glacier terms:

a. Accumulation

b. Accumulation Zone

c. Ablation

d. Ablation Zone

e. Abrasion

f. Arête

g. Cirque

h. Equilibrium Line

i. Firn

j. Firn Line

k. Fjord

- l. Glacial Basin

- m. Glacial Runoff

- n. Hanging Valley

- o. Horn

- p. Plucking

- q. Roche Moutonnée

- r. Tarn

- s. Terminus

- t. Truncated Spur

- u. U-shaped (or Glacial) Valley

- v. Whaleback

◆ Glaciers Unit Review Sheet ◆

ANSWER KEY

1. What are the 3 criteria for being a glacier?

- a. **MADE OF ICE**
- b. **FORM ON LAND**
- c. **GLACIERS MOVE**

2. What are the 2 features of ice crystals that are significant to glaciers?

- a. **STRUCTURE**
- b. **DENSITY**

3. What are 2 ways that glaciers move?

- a. **INTERNAL DEFORMATION**
- b. **BASAL SLIDING**

4. Describe how basal sliding is directly influenced by the density of water.

WATER IS LESS DENSE AS A SOLID THAN AS A LIQUID, SO THIS ALLOWS A GLACIER TO SLIDE OR FLOAT ON TOP OF MELTED WATER THAT HAS FORMED AT ITS BASE.

5. What is the most significant heat source that a glacier receives?

SOLAR RADIATION

6. Describe how latitude affects where glaciers are found.

HIGHER LATITUDES RECEIVE LESS ANNUAL SOLAR RADIATION AND EXPERIENCE PROLONGED WINTERS, AND AS A RESULT, ARE ABLE TO SUSTAIN GLACIERS.

7. Describe how altitude affects where glaciers are found.

GLACIERS ARE FOUND AT SEA LEVEL AT THE SOUTH POLE BECAUSE IT IS COLD ENOUGH AT THE LOWER ALTITUDES TO SUSTAIN GLACIERS. CONVERSELY, GLACIERS ARE FOUND IN THE HIGHLANDS AT MID TO LOW LATITUDES BECAUSE LOWER ELEVATIONS ARE TOO WARM TO SUSTAIN GLACIERS.

8. How is aspect important to the existence of glaciers?

THE ORIENTATION OF THE GROUND SURFACE WITH RESPECT TO SOLAR RADIATION AFFECTS THE EXISTENCE OF GLACIERS BECAUSE THE SLOPES WITH THE LEAST SOLAR RADIATION WILL MORE EASILY SUSTAIN GLACIERS: STEEP, NORTH-FACING SLOPES IN THE NORTHERN HEMISPHERE RECEIVE THE LEAST DIRECT SOLAR RADIATION.

9. What are the 2 best ways for differentiating glaciers (how best do you tell them apart?)

- a. **TOPOGRAPHY**
- b. **TEMPERATURE**

10. What is the difference between ice sheets and ice caps?

ICESHEETS ARE LARGER THAN ICE CAPS

11. What are the 2 main components of ice sheets and ice caps?

- a. **ICE DOMES**
- b. **OUTLET GLACIERS**

12. What is an ice shelf?

A VERY THICK SHEET OF ICE THAT HAS BEEN SHOVED OUT OVER THE SEA FLOOR FROM A LAND BASED GLACIER.

13. Describe the surface of an icefield.

THE SURFACE IS APPROXIMATELY LEVEL

14. Where are 2 places that a valley glacier might come from?

- a. **ICEFIELD**
- b. **CIRQUE**

15. Describe a cirque glacier.

A SMALL ICE MASS GENERALLY WIDE IN RELATION TO ITS LENGTH THAT OCCUPIES CHARACTERISTIC ARMCHAIR-SHAPED BEDROCK HOLLOW.

16. Where is ice thickest in a glacier?

AT THE CENTER

17. Describe the movement of the ice flow within a glacier at the center and at the edges.

ICE FLOWS FASTER IN THE CENTER OF THE GLACIER THAN AT ITS EDGES.

18. What is the difference between the pattern of flow in the accumulation zone and the ablation zone?

**THE BASIC PATTERN OF FLOW IN THE ACCUMULATION ZONE IS DOWNWARD.
THE BASIC PATTERN OF FLOW IN THE ABLATION ZONE IS UPWARD.**

19. What is the difference between an extended flow and a compressive flow?

**IN AN EXTENDED FLOW, A GLACIER IS EXTENDED AND THINNED BECAUSE IT IS ACCELERATING AND DOES NOT HAVE THE OPPORTUNITY TO BUILD UP.
IN A COMPRESSIVE FLOW, THE FLOW IS SLOWER AND THE GLACIER HAS THE OPPORTUNITY TO BUILD UP, GET THICK, AND THEN COMPRESS UNDER ITS OWN WEIGHT.**

20. What is an icefall?

AN EXTREME EXTENDING FLOW

21. Describe glacial scouring:

GLACIAL SCOURING OCCURS WHEN MOVING GLACIERS CARVE OUT LARGE CHUNKS OF LAND AND ACT LIKE SANDPAPER AS THEY WEAR DOWN AND ERODE THE LANDSCAPE.

22. List 4 commercial uses for glacier ice:

- a. **USED FOR REFRIGERATION**
- b. **USED AS AN EXPENSIVE WAY TO COOL DRINKS**
- c. **SOLD AS PURE MINERAL WATER**
- d. **SOLD AS LOCAL SNOW CONES**

23. How does meltwater from glaciers affect electric power generation?

MELTWATER FROM GLACIERS ENHANCES ELECTRIC POWER GENERATION

24. List 5 recreations uses for glaciers:

- a. **SKIING**
- b. **MOUNTAINEERING**
- c. **SCENIC TOURS IN LARGE VEHICLES**
- d. **BOAT EXCURSIONS**

25. How can a retreating glacier benefit wildlife species living in the area?

AS A GLACIER RETREATS, AN INCREASED AMOUNT OF SEDIMENT IS PROVIDED TO THE WETLANDS. THIS MAY CAUSE THE DEVELOPMENT OF SMALL LAKES, WHICH IN TURN PROVIDES ADDITIONAL HABITAT FOR WILDLIFE SPECIES LIVING IN THE AREA.

26. Describe a glacier that is surging and advancing.

SURGING GLACIERS SUDDENLY AND DRAMATICALLY ACCELERATE, ADVANCING SEVERAL MILES IN A FEW MONTHS AND TRAVELING MANY TIMES THEIR NORMAL SPEEDS.

27. What is a major hazard from a glacier-caused outburst flood?

OUTBURST FLOODS CAN RESULT IN DENSE, VISCOUS DEBRIS FLOWS. THE MAJOR HAZARD OF DEBRIS FLOWS IS FROM BURIAL OR IMPACT.

28. Where is the threat from an ice avalanche the most apparent?

THE THREAT FROM ICE AVALANCHES IS THE MOST APPARENT IN DENSELY POPULATED MOUNTAIN RANGES WITH GLACIERS.

29. Where is most of the world's glacier ice held and how much of the planet's freshwater is held in these places?

77% OF THE WORLD'S GLACIER ICE IS HELD IN TWO LARGE SHEETS: ANTARTICA AND GREENLAND

30. What are 3 main consequences of rising sea levels?

- a. **A RISE IN SEA LEVEL WOULD ALTER THE POSITION AND MORPHOLOGY OF COASTLINES**
- b. **CREATE OR DESTROY COASTAL WETLANDS AND SALT MARSHES AND INDUCE SALT-WATER INTRUSION INTO ACQUIFERS.**
- c. **COASTAL EROSION**

31. Define the following glacier terms:

- a. Accumulation.....*THE ADDITION OF ICE AND SNOW TO A GLACIER.*
- b. Accumulation Zone.....*THE PART OF A GLACIER'S SURFACE WHERE MORE SNOW IS GAINED THAN LOST (MORE SNOW IS DEPOSITED THAN ABLATED).*
- c. Ablation..... *DECREASING A GLACIER THROUGH MELTING, EVAPORATION, SUBLIMATION, WIND EROSION, AND/OR CALVING.*
- d. Ablation Zone..... *THE PART OF A GLACIER WHERE ABLATION (LOSS) EXCEEDS ACCUMULATION OVER A YEAR.*
- e. Abrasion..... *THE MECHANICAL WEARING, GRINDING, SCRAPING, OR RUBBING AWAY (OR DOWN) OF A ROCK SURFACE BY FRICTION AND IMPACT FROM ROCKS OR ROCK FRAGMENTS FROZEN IN A GLACIER.*
- f. Arête..... *SHARP, ROCK RIDGES, BETWEEN TWO STEEP, GLACIALLY SCULPTED SLOPES.*
- g. Cirque..... *STEEP WALLED, GENTLE-FLOORED SEMICIRCULAR HOLLOW FOUND HIGH IN MOUNTAINOUS AREAS.*
- h. Equilibrium Line..... *THE BOUNDARY BETWEEN AREAS OF GAIN AND LOSS ON A GLACIER'S SURFACE DURING ONE YEAR. THIS IS WHERE ACCUMULATION MEETS ABLATION AND THE NET BALANCE OF SNOW IS ZERO.*
- i. Firn.....*AN INTERMEDIATE STAGE IN THE TRANSFORMATION OF SNOW TO GLACIER ICE. SNOW BECOMES FIRN WHEN IT HAS BEEN COMPRESSED SO THAT NO PORE SPACES REMAIN BETWEEN FLAKES OR CRYSTALS, A PROCESS THAT TAKES LESS THAN A YEAR.*
- j. Firn Line..... *THIS IS THE HIGHEST LEVEL TO WHICH WINTER SNOW COVER RETREATS ON A GLACIER.*
- k. Fjord..... *LONG, NARROW, DEEP ARM OF THE SEA FILLING A GLACIATED COASTAL VALLEY.*

- l. Glacial Basin..... *CLOSED BEDROCK BASIN CREATED BY LOCALIZED GLACIAL EXCAVATION.*
- m. Glacial Runoff.....*THE TERM USED TO DESCRIBE THE MELTED WATER THAT FLOWS DOWN OFF A GLACIER.*
- n. Hanging Valley..... *A GLACIER VALLEY THAT ENDS WHERE IT MEETS A DEEPER GLACIER VALLEY AND FORMS A CLIFF.*
- o. Horn.....*HIGH, SHARP, STEEP-SIDED PYRAMIDAL PEAK.*
- p. Plucking.....*THE MECHANICAL REMOVAL OF PIECES OF ROCK FROM A BEDROCK FACE THAT IS IN CONTACT WITH GLACIER ICE.*
- q. Roche Moutonnée.....*A GLACIAL LANDFORM THAT SHOWS BOTH ABRASION AND PLUCKING.*
- r. Tarn..... *A SINGLE GLACIAL BASIN LAKE.*
- s. Terminus.....*THE END OR LOWEST PART OF A GLACIER.*
- t. Truncated Spur.....*THE TOE OF A MOUNTAIN OR HILL THAT HAS BEEN ERODED AWAY BY A GLACIER.*
- u. U-shaped (or Glacial) Valley.....*A "U"-SHAPED VALLEY IS FORMED WHEN A GLACIER IS ABLE TO SCOUR ON ITS SIDES AS WELL AS ITS BASE. THIS VARIES FROM RIVER VALLEYS WHICH HAVE A MORE CHARACTERISTIC "V" SHAPE.*
- v. Whaleback.....*SMOOTH, GLACIALLY SCULPTED BEDROCK KNOB OF MODEST SIZE RESEMBLING THE BACK OF A WHALE.*

