PHET GLACIER SIMULATION

Name _____Period ___

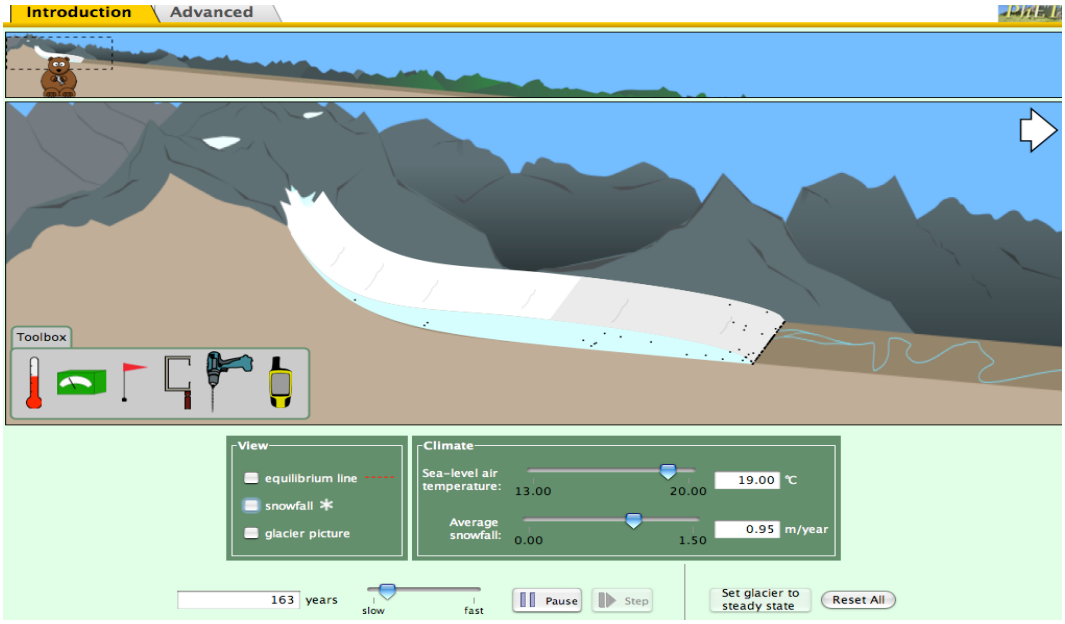
Objectives:

- Determine the factors that affect the motion of glaciers, and calculate the speed of glacier movement.
- Discover what a glacier budget means for the growth and destruction of a glacier, and describe the features it leaves behind.

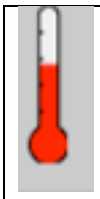
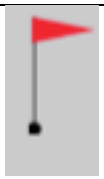
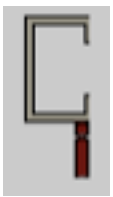
Google "Phet glaciers" and click on the first link

Procedure:

1. Open https://phet.colorado.edu/en/simulations/glaciers
2. Click the play button
3. Select "run cheerpj browser compatible version
4. Play with simulation for 5 minutes. Grab the bear and change viewpoints, try to make the glacier grow/shrink. If the glacier disappears hit the "**Reset All**" button.



5. Looking at the toolbox, identify each tool and describe what it can be used for to measure.

1. In general, what happens when you increase air temperature?

   _____

2. In general, what happens when you decrease air temperature?

   _____

3. In general, what happens when you increase snowfall?

   _____

4. What happens to the glacier if you hit the STEADY STATE button?

   _____

5. What are the black particles in the glacier?

   _____

6. Where did these black particles originate?

   _____

7. When are these particles deposited?

   _____

8. Grow the glacier out a ways, then put the bear toward the middle. Warm up the temperature and watch the glacier recede. What happens to the black particles?

   _____

9. What is the squiggly river that was under the glacier called? _____

10. Set the air temp to 65.9 and snowfall to 3.7. Put the bear out at the terminus of the glacier (the end). Pause the simulator then change the snow to 3.6. What is happening at the terminus?

    _____

11. Play around with the snowfall and watch the black dots. Increase and decrease the snow in such a way as to make a ridge or even a couple of ridges. What is the name of the final ridge of till that forms at the foot of a glacier?

    _____

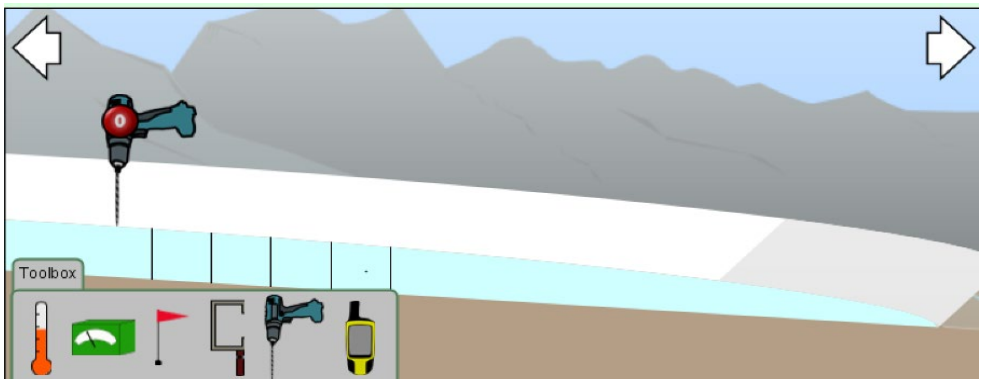
12. In the background, why are the mountains spiked?

    _____

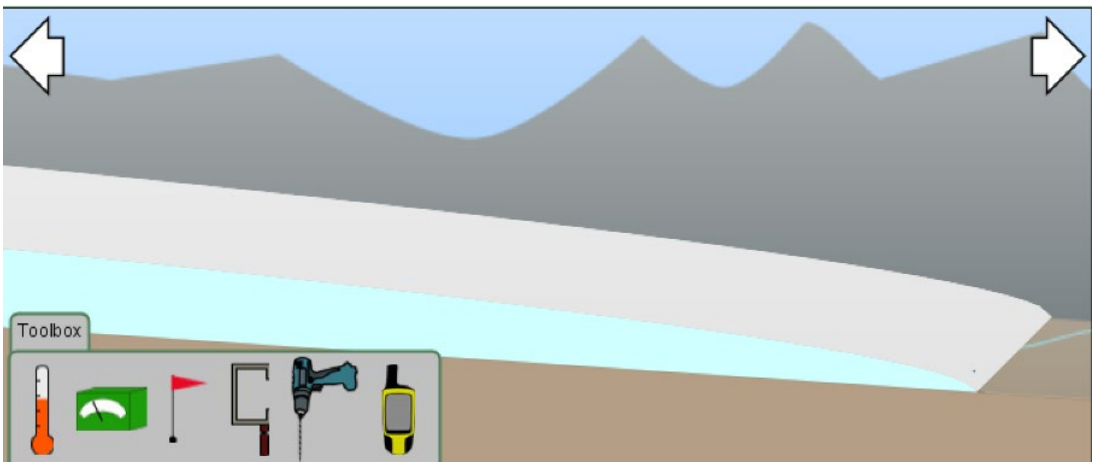
GLACIER SPEED

Using the toolbox, you will determine the speed of a glacier and observe what parts of a glacier move faster than others.

Drilling: Set to the temperature and snowfall to an amount that creates a decent sized glacier. Press the "STEADY STATE" button and Pause the motion of the glacier. Drill several vertical holes through the glacier as shown here.



13. Press play and allow the glacier to move for several years. Pause again, and draw a sketch of how the drill holes changed as a result of the glacier moving.



14. Explain why your drawing appears this way. What is the cause of this phenomenon?

_____

Click on the "Ice Flow Vectors" in the Advanced section. A flow vector is an arrow representing the speed and direction of the glacier.

15. Why are the Ice Flow Vectors larger on the top of the glacier compared to the bottom?

_____

To determine the speed of the glacier, two quantities are needed: distance and time.

Pause the glacier. Click "ice flow vectors." Place a flag on the glacier at a known distance. Record the initial horizontal position of the flag in the chart below and initial time (in years) in the table below.

	Position (meters)		Time (years)
Initial Position		Initial Time	
Final Position		Final Time	
Final – Initial			

16. Subtract the positions to see how many meters it moved. Subtract the years to see how much time it took. Using the formula below, calculate the speed.

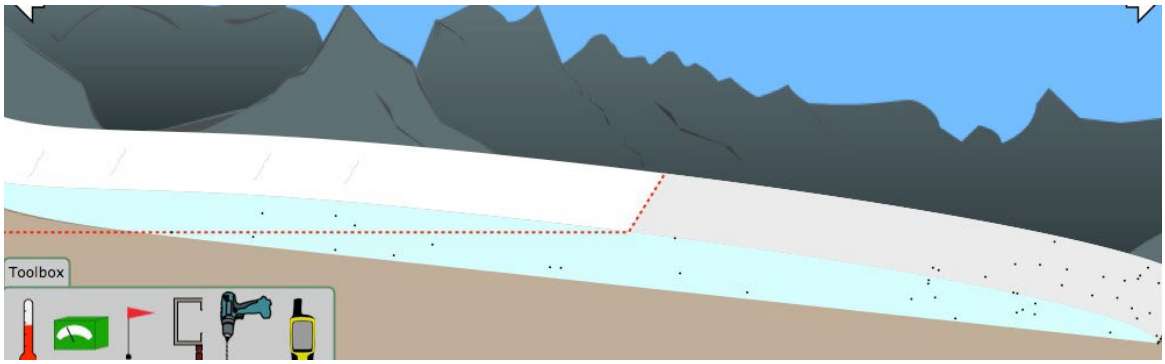
Speed = distance / time

_____

GLACIER BUDGET

Glacier Budget = Accumulation – Ablation

Reset and set the glacier to steady state. You will notice a small glacier. Using the green box (budget-meter), place the meter on the glacier in 3 locations; the far left, the middle, and the far right.



17. Where on the glacier is ablation the greatest?

_____

18. Where on the glacier is ablation the least?

_____

19. Look at the budget near the terminus. What do you notice about this number?

_____

20. What is the budget like near the head? What do you notice about this number?

_____

21. Using the depth meter, determine the thickest/deepest section of your glacier. Why do you think this section of the glacier is the thickest/deepest?

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