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Activities

Einstein and Time Travel

Name: _____ Date: _____

Albert Einstein demonstrated how time can appear to speed up or slow down depending on one's frame of reference. In this Planet Diary activity, you'll do some virtual time traveling to see the surprising results of Einstein's ideas about time.

Directions

- Einstein called the speed of light "nature's speed limit." The more an object's speed approaches the speed of light, the more time slows down from its point of view. To see how this works, go to Time Traveler from NOVA's Einstein's Big Idea. Read the introduction. In this activity you'll visit Proxima Centauri, 4.2 light-years from Earth. You'll make the trip four times at different speeds. After each trip, you'll compare the ages of Captain Ein (the space traveler) and Major Stein (on Earth).
- Click Captain Ein and Major Stein to set their starting ages to 25. For the first trip, click the spaceship and set its speed to 10% the speed of light.
- Click Proxima Centauri (the star nearest the spaceship) to blast-off. Notice Ein and Stein's ages at the end of the journey. (Assume advanced medical technology gives them a long life!) Record their ages in the 10% row of the table for question 1 in the Workspace below.
- Reset their ages to 25. This time, set the spaceship speed to 50% the speed of light. Click Proxima Centauri to blast off again. Record their ages in the 50% row of the table. Repeat these steps at 75% then 99.99% the speed of light to complete the table.
- Use the results of your time travel to answer questions 2 through 4.
- To learn more about Einstein's ideas on time travel, scroll to *Why Does Time Change?* Use the information to answer question 5.
- Scroll to the *Twin Paradox*, then answer the last question.

Workspace

1.

Percent Speed of Light	**Ein's Age (on Earth)**	**Stein's Age (space traveling)**
10%		
50%		
75%		
99.99%		

2. What happens to Ein's age as his speed approaches the speed of light?

3. How does the difference between their ages change as the captain's speed increases?

4. What happens to time as your speed approaches the speed of light?

5. What is *time dilation*?

6. What is the *twin paradox*?

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