Physics   Name:

Wksht 10.1 - Special Relativity Supplimentary Questions/Problems

Questions:

1. Give two examples of inertial and of non inertial reference frames.

2. What is Hubble's Law? How do scientists use it to find the age of the universe?

3. In view of the 1st postulate of special relativity does the earth *really* move around the sun, or is it just as valid to say that the sun goes around the earth?

4. If you were on a space ship traveling at 0.50c away from a star, at what speed would a stationary observer see the starlight passing your ship?

5. Will two events occurring in the same f.o.r at the same time for one observer be simultaneous for a second observer moving with respect to the first?

6. Does time dilation imply that time **actually** passes more slowly from the point of view of the people in the moving reference frames? Explain.

7. In the future, we construct subway trains that travel near the speed of light, how would riding on them affect the aging process of passengers? How would affect getting to meetings on time?

8. A young woman astronaut has just arrived home from a space voyage. She rushes to an old, gray-haired man and in the ensuing conversation she refers to him as her son! How might this be possible?

9. If you were traveling at 0.75c away from the earth would **you** notice a change in your heartbeat? Would your height, mass, or waistline change? How would **observers on earth** describe you (be specific)?

10. Do mass increase, time dilation, and length contraction occur at normal speeds (~75 mph)? Explain.

11. Explain the statement, "The sun is losing mass" according to special relativity?

12. Explain the concepts of rest mass and rest energy.

Problems:

1. An astronaut travels at 0.93c. As one hour passes for her how much time passes for an observer on Earth?

2. A spaceship passes you at 0.90c. You note its length to be 80.0 m. How long is it when at rest?

3. At what speed will an object's mass be twice its restmass?

4. Ideally, how much energy could be obtained from a 500 g golf ball? How long could that energy run a 150 W light bulb (remember, P=E/t)?

5. Two dragsters approach each other in a game of "chicken" at 80.0 mph, what is the speed of each with respect to the other?   Two space dragsters play a similar game at much higher speeds, they approach each other at speeds of 0.60c. What speed is each going with respect to the other?

6. The nearest star, Proxima Centauri, is 4.3 light years away. How fast would you have to go to make the trip seem like a distance of 100 Earth-Sun distances?

7. A farm boy studying physics believes he can get a 12-m-long pole into a 10-m-long barn if he runs fast enough (carrying the pole of course). Can he do it? Explain. How does your answer deal with the fact that when he is running the barn looks even shorter to him?