Concept Items

10.1 Postulates of Special Relativity 1.

Why was it once believed that light must travel through a medium and could not propagate across empty space?

a. The longitudinal nature of light waves implies this.
b. Light shows the phenomenon of diffraction.
c. The speed of light is the maximum possible speed.
d. All other wave energy needs a medium to travel.

2.

Describe the relative motion of Earth and the sun:

1. if Earth is taken as the inertial frame of reference and
2. if the sun is taken as the inertial frame of reference.
    a. 1. Earth is at rest and the sun orbits Earth.
       2. The sun is at rest and Earth orbits the sun.
    b. 1. The sun is at rest and Earth orbits the sun.
       2. Earth is at rest and the sun orbits Earth.
    c. 1. The sun is at rest and Earth orbits the sun.
       2. The sun is at rest and Earth orbits the sun.
    d. 1. Earth is at rest and the sun orbits Earth.
       2. Earth is at rest and the sun orbits Earth.

10.2 Consequences of Special Relativity 3.

A \beta particle (a free electron) is speeding around the track in a cyclotron, rapidly gaining speed. How will the particle's momentum change as its speed approaches the speed of light? Explain.

a. The particle's momentum will rapidly decrease.
b. The particle's momentum will rapidly increase.
c. The particle's momentum will remain constant.
d. The particle's momentum will approach zero.

4.

An astronaut goes on a long space voyage at near the speed of light. When she returns home, how will her age compare to the age of her twin who stayed on Earth?

a. Both of them will be the same age.
b. This is a paradox and hence the ages cannot be compared.
c. The age of the twin who traveled will be less than the age of her twin who remained behind.
d. The age of the twin who traveled will be greater than the age of her twin who remained behind.

5.

A comet reaches its greatest speed as it travels near the sun. True or false—Relativistic effects make the comet's tail look longer to an observer on Earth.

a. True
b. False