Multiple Choice

10.1 Postulates of Special Relativity 18.

What was the purpose of the Michelson–Morley experiment?

a. To determine the exact speed of light
b. To analyze the electromagnetic spectrum
c. To establish that Earth is the true frame of reference
d. To learn how the ether affected the propagation of light

19.

The dwarf planet Pluto is about 5.9 billion kilometers from the Sun. Estimate to three significant figures the speed of light arriving at Pluto from the Sun.

a. 5.09×10^7 m/s
b. 1.97×10^8 m/s
c. 3.00×10^8 m/s
d. 1.78 x 10^9 m/s

20.

How far does light travel in 1.00\,\text{min}?

a. 1.80 \times 10^7\,\text{km}
b. 1.80 \times 10^{13}\,\text{km}
c. 5.00 \times 10^6\,\text{m}
d. 5.00 \times 10^8\,\text{m}

21.

Explain what is meant when a physicist states that "simultaneity is not absolute."

Describe what is meant by the sentence, "Simultaneity is not absolute."

a. Events may appear simultaneous in all frames of reference.
b. Events may not appear simultaneous in all frames of reference.
c. The speed of light is not the same in all frames of reference.
d. The laws of physics may be different in different inertial frames of reference.

22.

In 2003, Earth and Mars were aligned so that Earth was between Mars and the sun. Earth and Mars were 5.6×10^7 km from each other, which was the closest they had been in 50,000 years. People looking up saw Mars as a very bright red light on the horizon. If Mars was 2.06×10^8 km from the sun, how long did the reflected light people saw take to travel from the sun to Earth?

a. 14 min and 33 s
b. 12 min and 15 s

c. 11 min and 27 s
d. 3 min and 7 s

10.2 Consequences of Special Relativity 23.

What does this expression represent: $\frac{1}{\sqrt{1-\frac{u^2}{c^2}}}$

a. time dilation
b. relativistic factor
c. relativistic energy
d. length contraction

24.

What is the rest energy, E_0, of an object with a mass of 1.00 g ?

a. 3.00×10^5 J
b. 3.00×10^{11} J
c. 9.00×10^{13} J
d. 9.00×10^{16} J

25.

The fuel rods in a nuclear reactor must be replaced from time to time because so much of the radioactive material has reacted that they can no longer produce energy. How would the mass of the spent fuel rods compare to their mass when they were new? Explain your answer.

a. The mass of the spent fuel rods would decrease.
b. The mass of the spent fuel rods would increase.
c. The mass of the spent fuel rods would remain the same.
d. The mass of the spent fuel rods would become close to zero.