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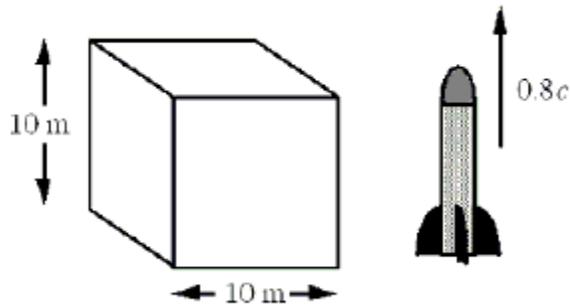
Physics_Questions_0035

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Question 1

2 / 2 points

A cubic asteroid with proper side length 10.0 m is stationary in an inertial reference frame S. A rocket ship moves along one side of the asteroid as shown in the figure with speed $0.80c$ relative to frame S. An astronaut in the rocket ship measures the volume of the asteroid. What volume does the astronaut measure?



- a) 1000 m³
- b) 600 m³
- c) 360 m³
- d) 300 m³
- e) 220 m³

Question 2

2 / 2 points

The starship *Enterprise* approaches the planet Risa at a speed of $0.8c$ relative to the planet. On the way, it overtakes the intergalactic freighter *Astra*. The relative speed of the two ships as measured by the navigator on the *Enterprise* is $0.5c$. At what speed is *Astra* approaching the planet?

- a) $0.92c$
- b) $0.3c$
- c) $0.6c$
- d) $0.99c$
- e) $0.5c$

Question 3

2 / 2 points

Mars rotates about its axis once every 88 642 s. A spacecraft comes into the solar system and heads directly toward Mars at a speed of $0.800c$. What is the rotational period of Mars according to the beings on the spaceship?

- a) 53 100 s
- b) 88 600 s
- c) 181 000 s
- d) 148 000 s
- e) 105 000 s

Question 4

2 / 2 points

The starship *Enterprise* approaches the Klingon home world with speed $0.6c$ relative to the planet. To announce its arrival, the *Enterprise* sends a message in a projectile that travels toward the planet with

speed $0.4c$ relative to the *Enterprise*. At what speed does a Klingon at the surface of the planet see the projectile approach?

- a) $0.2c$
- b) $0.5c$
- c) $0.4c$
- d) $0.8c$
- e) $0.6c$

Question 5

2 / 2 points

Which one of the following systems would constitute an inertial reference frame?

- a) a rocket undergoing uniform acceleration
- b) a weather balloon descending at constant velocity
- c) a roller coaster traveling around a corkscrew turn at constant speed
- d) a rotating merry-go-round
- e) an orbiting space station

Question 6

2 / 2 points

A spaceship leaves our solar system at a constant speed of $0.920c$ and travels to a point in the Andromeda galaxy. According to astronomers in an inertial reference frame on Earth, the distance to the galaxy is 2.081×10^{22} m. What distance does the crew on the ship measure on its journey?

- a) 8.16×10^{21} m
- b) 1.91×10^{22} m
- c) 9.07×10^{21} m
- d) 4.77×10^{22} m
- e) 9.85×10^{21} m

Question 7

2 / 2 points

Spaceship **A** travels at $0.400c$ relative to an earth observer. According to the same observer, spaceship **A** overtakes a slower moving spaceship **B** that moves in the same direction. The captain of **B** sees **A** pass her ship at $0.114c$. Determine the speed of **B** relative to the earth observer.

- a) $0.625c$
- b) $0.100c$
- c) $0.214c$
- d) $0.700c$
- e) $0.300c$

Question 8

2 / 2 points

Calculate the ratio of the relativistic kinetic energy to the classical kinetic energy, $KE_{\text{rel}}/KE_{\text{class}}$, for an electron (mass = 9.109×10^{-31} kg) moving with a constant speed of $0.75c$.

- a) 1.6
- b) 1.8
- c) 1.4
- d) 0.74
- e) 0.56

Question 9

2 / 2 points

Which one of the following statements concerning the *proper length* of a meter stick is true?

- a) The proper length is always one meter.
- b) The proper length depends upon the reference frame in which it is measured.
- c) The proper length is the length measured by an observer who is moving with respect to the meter

stick.

- d) The proper length depends upon the speed of the observer.
- e) The proper length depends upon the acceleration of the observer.

Question 10

2 / 2 points

Complete the following statement: To measure the proper length of an object moving relative to the surface of the earth, one must note the coordinates of points on the front and back ends

- a) at the same time with respect to a clock on the moving object.
- b) at different times with respect to a clock on the moving object.
- c) at the same time with respect to a clock at rest on the earth.
- d) at different times with respect to a clock at rest on the earth.
- e) at the same time with respect to a clock moving at the same speed on the surface of the earth.