

Unit 1 – Our Dynamic Universe

Section 5 - Special Relativity

- 2012 Revised** 5. The length of a spaceship at rest is L . This spaceship passes a planet at a speed of $0.95c$.

Which row in the table gives the measured lengths of the spaceship according to an observer on the spaceship and an observer on the planet?

	<i>Length measured by observer on spaceship</i>	<i>Length measured by observer on planet</i>
A	L	L
B	L	less than L
C	less than L	L
D	less than L	less than L
E	greater than L	less than L

- 2014 Revised** 4. A spaceship is moving with a constant speed of $0.6c$ towards the Earth. The spaceship emits a beam of light towards the Earth. An astronaut in the spaceship and an observer on Earth both measure the speed of the emitted light.

Which row in the table shows the speed of the emitted light as measured by the astronaut and by the observer on Earth?

	<i>Speed of emitted light as measured by astronaut</i>	<i>Speed of emitted light as measured by observer on Earth</i>
A	$0.4c$	$1.6c$
B	c	c
C	c	$1.6c$
D	$1.6c$	$0.4c$
E	$1.6c$	c

- 2012 Revised** 6. A spacecraft travels at a constant speed of $0.70c$ relative to the Earth.

A clock on the spacecraft records a flight time of 3.0 hours.

A clock on Earth records this flight time to be

- A 1.6 hours
- B 2.1 hours
- C 4.2 hours
- D 5.5 hours
- E 5.9 hours.

- 2015** 7. A spacecraft is travelling at a constant speed of $0.60c$ relative to the Moon. An observer on the Moon measures the length of the moving spacecraft to be 190 m. The length of the spacecraft as measured by an astronaut on the spacecraft is

- A 120 m
- B 152 m
- C 238 m
- D 297 m
- E 300 m.

2017 4. A spacecraft is travelling at a constant speed of $2.75 \times 10^8 \text{ m s}^{-1}$ relative to a planet. A technician on the spacecraft measures the length of the spacecraft as 125 m. An observer on the planet measures the length of the spacecraft as

- A 36 m
- B 50 m
- C 124 m
- D 314 m
- E 433 m.

2018 6. A spacecraft is travelling at $0.10c$ relative to a star. An observer on the spacecraft measures the speed of light emitted by the star to be

- A $0.90c$
- B $0.99c$
- C $1.00c$
- D $1.01c$
- E $1.10c$.

2018 7. A spacecraft is travelling at a speed of $0.200c$ relative to the Earth. The spacecraft emits a signal for 20.0 seconds as measured in the frame of reference of the spacecraft.

An observer on Earth measures the duration of the signal as

- A 19.2 s
- B 19.6 s
- C 20.0 s
- D 20.4 s
- E 20.8 s.

2019 8. A spacecraft is travelling at a constant speed relative to a nearby planet. A technician on the spacecraft measures the length of the spacecraft as 275 m. An observer on the planet measures the length of the spacecraft as 125 m. The speed of the spacecraft relative to the observer on the nearby planet is

- A $1.54 \times 10^4 \text{ m s}^{-1}$
- B $2.22 \times 10^8 \text{ m s}^{-1}$
- C $2.67 \times 10^8 \text{ m s}^{-1}$
- D $3.00 \times 10^8 \text{ m s}^{-1}$
- E $7.14 \times 10^{16} \text{ m s}^{-1}$.