

# 42 Lecture - PHY101

## Important Subjective

**What is the principle of relativity?**

**Answer:** The principle of relativity states that the laws of physics are the same for all observers in uniform motion relative to one another.

**What is the difference between Galilean relativity and special relativity?**

**Answer:** Galilean relativity is based on the principle of relativity, but it does not take into account the constant speed of light. Special relativity includes the constant speed of light as a fundamental aspect of the theory.

**What is time dilation?**

**Answer:** Time dilation is the effect that occurs when the time interval between two events is perceived to be different by two observers who are moving relative to one another.

**How does time dilation arise in special relativity?**

**Answer:** Time dilation arises from the fact that the speed of light is always constant, regardless of the motion of the observer. As a result, time appears to be slower for a moving observer than for a stationary observer.

**What is the twin paradox?**

**Answer:** The twin paradox is a thought experiment that involves two identical twins, one of whom travels at high speed in space while the other stays on Earth. When the space-traveling twin returns, he or she will have aged less than the twin who stayed on Earth.

**What is length contraction?**

**Answer:** Length contraction is the effect that occurs when the length of an object is perceived to be shorter in the direction of motion by an observer who is moving relative to the object.

**What is the Lorentz factor?**

**Answer:** The Lorentz factor is a quantity that appears in special relativity and is defined as  $1/\sqrt{1-v^2/c^2}$ , where  $v$  is the velocity of an object and  $c$  is the speed of light.

**How does the concept of simultaneity change in special relativity?**

**Answer:** In special relativity, the concept of simultaneity is relative to the observer's frame of reference. Two events that are simultaneous in one frame of reference may not be simultaneous in another frame of reference.

**What is the energy-momentum relationship in special relativity?**

**Answer:** The energy-momentum relationship in special relativity is given by the equation  $E^2 = (pc)^2 + (mc^2)^2$ , where  $E$  is the energy of a particle,  $p$  is its momentum,  $m$  is its mass, and  $c$  is the speed of light.

**What is the significance of the speed of light in special relativity?**

**Answer:** The speed of light is a fundamental constant in special relativity and plays a crucial role in determining the behavior of objects moving at high speeds. It is the ultimate speed limit in the universe, and nothing can travel faster than it.