

Name: _____ Date: _____

Answer Key: Shatter Classic Limits: A 10th Grade Modern Physics Quiz

Examine how GPS timing and LED technology rely on the strange mechanics of the subatomic world in this foundational assessment of post-Newtonian concepts.

1. Which constant is the fundamental 'speed limit' of the universe that remains the same for all observers, regardless of their own motion?

Answer: C) The speed of light in a vacuum

According to Special Relativity, the speed of light (approximately 300,000 km/s) is constant for all observers and represents the universal speed limit.

2. True or False: In modern physics, gravity is described as the physical 'curving' or warping of the fabric of space and time.

Answer: A) True

General Relativity suggests that mass (like a planet) tells space how to curve, and that curvature tells objects how to move, which we perceive as gravity.

3. The _____ principle suggests that we cannot simultaneously know the exact position and the exact momentum of a subatomic particle.

Answer: C) Heisenberg

The Heisenberg Uncertainty Principle is a cornerstone of quantum mechanics, stating that certain pairs of physical properties cannot be known to high precision simultaneously.

4. What does the 'm' stand for in Einstein's famous energy-mass equivalence equation, $E=mc^2$?

Answer: B) Mass

The equation $E=mc^2$ shows that energy and mass are interchangeable; 'm' represents the mass of the object being converted into energy.

5. In the world of the very small, light sometimes behaves like a continuous wave and other times like a stream of distinct particles called _____.

Answer: C) Photons

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Photons are the elementary particles or 'quanta' of light, demonstrating wave-particle duality.

6. True or False: According to Special Relativity, if you traveled near the speed of light, time would pass more slowly for you than for someone staying on Earth.

Answer: A) True

This phenomenon is known as 'time dilation,' where time slows down for objects moving at extremely high velocities.

7. Quantum mechanics is the study of physics at the scale of _____.

Answer: B) Atoms

While classical physics works for everyday objects, quantum mechanics is required to explain the behavior of atoms and subatomic particles.

8. Which modern technology relies on adjusting for both the speed of satellites and the Earth's gravity to provide accurate location data?

Answer: C) GPS (Global Positioning System)

GPS satellites must account for relativistic effects (time dilation) to keep their atomic clocks synchronized with receivers on the ground.

9. True or False: The 'Photoelectric Effect' is the principle that explains how solar panels convert sunlight into electricity.

Answer: A) True

The photoelectric effect occurs when light hitting a material causes it to emit electrons, a discovery that helped earn Einstein the Nobel Prize.

10. A _____ is an extremely dense region of space where gravity is so strong that even light cannot escape.

Answer: B) Black Hole

Black holes are predictions of General Relativity that occur when mass is concentrated into a small enough volume to create an inescapable gravitational pull.