

Name: _____ Date: _____

Answer Key: Stardust Architects: 3rd Grade Modern Physics Inquiry

Third graders design invisible worlds while analyzing how subatomic building blocks and light speed change our reality.

1. Imagine you are building a 'Quantum Playground.' If atoms are like a huge stadium, how big would the tiny center (the nucleus) be compared to the rest of the empty space?

Answer: A) A tiny marble in the middle of the field

Atoms are mostly empty space! The nucleus is incredibly small compared to the size of the whole atom, similar to a marble in a massive stadium.

2. When things move incredibly fast—almost as fast as a beam of light—time actually begins to _____, making a clock on a spaceship tick slower than one on Earth.

Answer: B) stretch out

According to Einstein's theories of relativity, high speeds cause 'time dilation,' which means time stretches or slows down for the moving object.

3. In the world of the very small (Quantum Mechanics), a particle can act like both a tiny solid ball and a wavy ripple in a pond at the same time.

Answer: A) True

This is called wave-particle duality. Light and small particles like electrons don't just act one way; they have properties of both waves and particles.

4. If you could place a heavy bowling ball on a stretchy trampoline, it curves the fabric downward. In Modern Physics, this is how we describe _____.

Answer: C) How gravity warps space

General Relativity teaches us that massive objects like stars or planets warp the 'fabric' of space, which is what creates the pull of gravity.

5. A special machine called an MRI uses powerful magnets and _____ physics to look inside the human body without using surgery.

Answer: C) quantum

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MRI machines rely on the quantum properties of atoms in our bodies to create detailed pictures for doctors.

6. Even if you had the most powerful engine in the universe, it is impossible to travel faster than the speed of light.

Answer: A) True

Modern physics shows us that the speed of light is the 'universal speed limit.' Nothing with mass can go faster than it.

7. Imagine a cat in a box that is both 'happy' and 'grumpy' until you open the lid to check. This paradox helps scientists explain that subatomic particles ____.

Answer: A) Can be in two states at once until measured

This refers to superposition, a quantum concept where particles exist in all possible states until someone observes them.

8. Solar panels on a roof work because of the ____ effect, where light hitting a surface 'knocks' electrons loose to create electricity.

Answer: A) photoelectric

The photoelectric effect proves that light carries energy in 'packets' called photons that can push electrons to make a current.

9. A 'Black Hole' is a place in space where gravity is so weak that objects float away into nothingness.

Answer: B) False

False. Black holes have gravity so strong that even light cannot escape from them!

10. In the future, we might use 'Entanglement' to send messages instantly. This means two particles are linked so that ____.

Answer: B) What happens to one happens to the other, no matter the distance

Quantum entanglement is a strange connection where two particles stay 'synced up' even if they are on opposite sides of the galaxy.