

Fundamentals of Quantum Mechanics

Quantum Physics · Answer Key · 12 Questions

1. Which experiment demonstrated the wave-particle duality of light by showing an interference pattern when electrons are fired at a screen with two slits?

- A) The Michelson-Morley experiment
- B) The Double-slit experiment**
- C) The Stern-Gerlach experiment
- D) The Millikan oil-drop experiment

2. According to the Heisenberg Uncertainty Principle, which pair of physical properties cannot be simultaneously measured with absolute precision?

- A) Mass and velocity
- B) Temperature and pressure
- C) Position and momentum**
- D) Charge and spin

3. What is the term for the smallest discrete amount of any physical entity involved in an interaction?

- A) Quark
- B) Quantum**
- C) Lepton
- D) Boson

4. In quantum mechanics, what does the wave function (represented by the Greek letter psi, ψ) describe?

- A) The trajectory of a particle
- B) The probability amplitude of a particle's state**
- C) The exact heat capacity of a system
- D) The mass-energy equivalence of a particle

5. Which fundamental force is carried by the particle known as the gluon?

- A) Electromagnetism
- B) Gravity
- C) Weak nuclear force
- D) Strong nuclear force**

6. What is the name of the phenomenon where two or more particles become linked such that the state of one instantly influences the state of the other, regardless of distance?

A) Quantum entanglement

B) Superposition

C) Quantum tunneling

D) Wave-function collapse

7. Which of these particles is classified as a fermion?

A) Photon

B) Gluon

C) Electron

D) Higgs boson

8. What is the theoretical particle that mediates the electromagnetic force?

A) Neutrino

B) Photon

C) Graviton

D) Muon

9. According to the Pauli Exclusion Principle, no two electrons in an atom can have the same set of what?

A) Quantum numbers

B) Orbital velocities

C) Mass values

D) Spin directions

10. What occurs when a particle passes through a potential energy barrier that it classically should not be able to cross?

A) Quantum decoherence

B) Quantum tunneling

C) Pair production

D) Photoelectric effect

11. Which physicist proposed that particles such as electrons exhibit wave-like properties, with a wavelength inversely proportional to their momentum?

A) Max Planck

B) Louis de Broglie

C) Niels Bohr

D) Richard Feynman

12. What is the value of the spin quantum number for all fermions, such as electrons and protons?

A) Integer (0, 1, 2)

B) Half-integer ($1/2$, $3/2$)

C) Always zero

D) Irrational numbers