

Foundations of Quantum Physics

Quantum Physics · Answer Key · 10 Questions

1. Who published the first theoretical derivation of the blackbody radiation law that introduced the concept of the energy quantum, h ?

- A) Max Planck**
- B) Albert Einstein
- C) Niels Bohr
- D) Louis de Broglie

2. Which 1927 experiment conducted by Davisson and Germer provided the first direct experimental evidence of the wave-particle duality of electrons?

- A) Stern-Gerlach experiment
- B) Photoelectric effect measurement
- C) Electron diffraction on nickel crystals**
- D) Cloud chamber observation

3. The first successful quantum mechanical model of the hydrogen atom, which quantized angular momentum, was proposed by whom in 1913?

- A) Werner Heisenberg
- B) Erwin Schrödinger
- C) Niels Bohr**
- D) Wolfgang Pauli

4. In 1935, which physicist proposed a thought experiment to illustrate the 'incompleteness' of quantum mechanics, involving a cat?

- A) John Bell
- B) Erwin Schrödinger**
- C) Richard Feynman
- D) Max Born

5. Which invention, developed by Gerd Binnig and Heinrich Rohrer at IBM in 1981, utilizes the quantum tunneling effect to image surfaces at the atomic level?

- A) Transmission Electron Microscope
- B) Atomic Force Microscope
- C) Scanning Tunneling Microscope**
- D) Quantum Cascade Laser

6. Who was the first to mathematically formulate the uncertainty principle, stating that position and momentum cannot be simultaneously measured with arbitrary precision?

A) Werner Heisenberg

B) Paul Dirac

C) Enrico Fermi

D) Julian Schwinger

7. Which 1922 experiment by Otto Stern and Walther Gerlach provided the first experimental proof of space quantization of angular momentum?

A) Neutron diffraction

B) Spin-orbit coupling in silver atoms

C) Photo-ionization of gases

D) Blackbody radiation spectra

8. The first practical implementation of a quantum logic gate was demonstrated in 1995 using which physical system?

A) Superconducting qubits

B) Trapped calcium ions

C) Quantum dots

D) Diamond nitrogen-vacancy centers

9. Who formulated the first relativistic wave equation for the electron, which predicted the existence of antimatter?

A) Wolfgang Pauli

B) Richard Feynman

C) Paul Dirac

D) John Wheeler

10. The first experimental demonstration of quantum entanglement between two photons was achieved in 1972 by which researchers?

A) Aspect and Grangier

B) Freedman and Clauser

C) Bell and Aspect

D) Zeilinger and Pan