

Milestones in Advanced Physics

Advanced Physics · Answer Key · 20 Questions

1. Which particle was the first to be discovered using a cloud chamber by C.T.R. Wilson, later winning him the 1927 Nobel Prize?

- A) The positron
- B) The neutron
- C) The alpha particle**
- D) The neutrino

2. In 1932, who provided the first experimental proof of the transmutation of lithium into helium nuclei using accelerated protons?

- A) John Cockcroft and Ernest Walton**
- B) Ernest Rutherford and Niels Bohr
- C) Enrico Fermi and Leo Szilard
- D) Hans Bethe and George Gamow

3. The term 'black hole' was popularized by John Wheeler in 1967, but who originally derived the solution for a non-rotating singularity in 1916?

- A) Arthur Eddington
- B) Karl Schwarzschild**
- C) Subrahmanyan Chandrasekhar
- D) David Finkelstein

4. Which scientist is credited with the first experimental observation of the Mössbauer effect in 1957, demonstrating recoilless gamma-ray resonance?

- A) Rudolf Mössbauer**
- B) Samuel Goudsmit
- C) George Uhlenbeck
- D) Luis Alvarez

5. The discovery of the muon in 1936 by Carl Anderson and Seth Neddermeyer was initially mistaken for which other particle?

- A) The pion**
- B) The tau lepton
- C) The kaon
- D) The positron

6. In 1919, Arthur Eddington led an expedition to Príncipe to confirm which prediction of General Relativity?

- A) Frame-dragging
- B) Gravitational redshift
- C) Bending of starlight by gravity**
- D) Existence of neutron stars

7. Who was the primary developer of the 'matrix mechanics' formulation of quantum mechanics in 1925?

- A) Erwin Schrödinger
- B) Werner Heisenberg**
- C) Paul Dirac
- D) Max Born

8. The parity violation in weak interactions was experimentally confirmed by Chien-Shiung Wu in 1956, based on a proposal by which two physicists?

- A) Lee and Yang**
- B) Feynman and Gell-Mann
- C) Salam and Weinberg
- D) Glashow and Iliopoulos

9. In 1934, which physicist predicted the existence of the meson as a force-carrying particle for the strong nuclear force?

- A) Hideki Yukawa**
- B) Enrico Fermi
- C) Wolfgang Pauli
- D) Hideki Shirakawa

10. The first observation of the 'Lamb shift' in 1947 provided experimental evidence for which theory?

- A) Quantum Electrodynamics**
- B) General Relativity
- C) Standard Model
- D) Grand Unified Theory

11. Which experiment, conducted in 1887, failed to detect the 'aether wind' and provided a foundation for special relativity?

- A) Davisson-Germer experiment
- B) Michelson-Morley experiment**
- C) Stern-Gerlach experiment
- D) Frank-Hertz experiment

12. What did the 1922 Stern-Gerlach experiment demonstrate regarding silver atoms passing through an inhomogeneous magnetic field?

- A) Quantum entanglement
- B) Space quantization**
- C) Wave-particle duality
- D) Nuclear spin

13. In 1964, who published the paper describing the mechanism of spontaneous symmetry breaking that leads to the mass of gauge bosons?

- A) Peter Higgs**
- B) Sheldon Glashow
- C) Abdus Salam
- D) Steven Weinberg

14. Which physicist was the first to propose that the energy of a quantum oscillator is proportional to its frequency ($E=hf$)?

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

15. The discovery of the neutron in 1932 by James Chadwick relied on the bombardment of which element with alpha particles?

- A) Beryllium**
- B) Boron
- C) Nitrogen
- D) Uranium

16. In 1927, which two researchers discovered electron diffraction, proving the wave nature of matter?

- A) Davisson and Germer**
- B) Franck and Hertz
- C) Compton and Simon
- D) Curie and Becquerel

17. The 'Einstein-Podolsky-Rosen' (EPR) paradox, published in 1935, was intended to challenge which aspect of quantum mechanics?

- A) The uncertainty principle
- B) The completeness of the wavefunction description**
- C) The existence of quarks
- D) The speed of light

18. Which team first observed the 'Z boson' at CERN's UA1 detector in 1983, confirming electroweak theory?

A) Carlo Rubbia and colleagues

- B) CERN staff
- C) Richard Feynman
- D) Julian Schwinger

19. In 1911, Ernest Rutherford's team performed the gold foil experiment, which led to the discovery of what?

A) The atomic nucleus

- B) The electron
- C) The neutron
- D) The proton

20. Who was the first person to receive two Nobel Prizes in Physics, specifically for the transistor and the theory of superconductivity?

A) John Bardeen

- B) Marie Curie
- C) Linus Pauling
- D) Frederick Sanger