

Advanced Physics Historical and Quantitative Milestones

Advanced Physics · Practice Test · 20 Questions

1. In which year did Subrahmanyan Chandrasekhar publish his seminal paper calculating the maximum mass of a stable white dwarf star?

- A) 1931
- B) 1935
- C) 1939
- D) 1942

2. What is the exact value of the Fine-Structure Constant, alpha, rounded to four decimal places?

- A) 0.0071
- B) 0.0073
- C) 0.0075
- D) 0.0077

3. The discovery of the muon, the first elementary particle discovered with no counterpart in classical atomic theory, occurred in which year?

- A) 1932
- B) 1936
- C) 1940
- D) 1944

4. What is the numerical value of the Bohr magneton in SI units (J/T) to two significant figures?

- A) 9.1×10^{-24}
- B) 9.3×10^{-24}
- C) 9.5×10^{-24}
- D) 9.7×10^{-24}

5. In 1928, Paul Dirac published his equation for the electron. What is the dimension of the square matrices in the standard representation of this equation?

- A) 2x2
- B) 4x4
- C) 6x6
- D) 8x8

6. How many fundamental forces are accounted for in the Standard Model of particle physics, including the Higgs field interaction?

- A) 2
- B) 3
- C) 4
- D) 5

7. The Cosmic Microwave Background radiation, discovered by Penzias and Wilson, has a blackbody temperature of approximately how many Kelvin?

- A) 1.7 K
- B) 2.7 K
- C) 3.7 K
- D) 4.7 K

8. What is the approximate mass of the top quark in GeV/c^2 ?

- A) 125 GeV
- B) 173 GeV
- C) 191 GeV
- D) 205 GeV

9. The parity violation in weak interactions was experimentally confirmed by Chien-Shiung Wu in which year?

- A) 1954
- B) 1955
- C) 1956
- D) 1957

10. How many independent components does the Riemann curvature tensor have in 4-dimensional spacetime?

- A) 16
- B) 20
- C) 24
- D) 28

11. What is the approximate value of the Stefan-Boltzmann constant, σ , in $\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-4}$?

- A) 5.67×10^{-8}
- B) 6.67×10^{-8}
- C) 7.67×10^{-8}
- D) 8.67×10^{-8}

12. In 1913, Niels Bohr published his model of the atom. How many postulates did he explicitly outline for the atomic structure?

- A) 2
- B) 3
- C) 4
- D) 5

13. The first controlled nuclear chain reaction took place at the University of Chicago on December 2 of which year?

- A) 1940
- B) 1941
- C) 1942
- D) 1943

14. The Schwarzschild radius of a non-rotating black hole is defined by the formula involving G , M , and c . What is the power of ' c ' in the denominator?

- A) 1
- B) 2
- C) 3
- D) 4

15. How many spin states does a particle with spin $3/2$ possess?

- A) 2
- B) 3
- C) 4
- D) 5

16. The Lamb shift, which provided evidence for quantum electrodynamics, was first measured in which year?

- A) 1945
- B) 1947
- C) 1949
- D) 1951

17. What is the approximate value of the elementary charge ' e ' in Coulombs?

- A) 1.602×10^{-19}
- B) 1.602×10^{-20}
- C) 1.602×10^{-18}
- D) 1.602×10^{-21}

18. The existence of the neutrino was first postulated by Wolfgang Pauli in which year?

- A) 1928
- B) 1930
- C) 1932
- D) 1934

19. In the context of General Relativity, how many independent variables are contained in the metric tensor in 4 dimensions?

- A) 6
- B) 8
- C) 10
- D) 12

20. The 'God particle' or Higgs boson was officially announced as discovered by CERN in which year?

- A) 2010
- B) 2011
- C) 2012
- D) 2013