

Advanced Physics Historical and Quantitative Milestones

Advanced Physics · Answer Key · 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