

Advanced Biology Knowledge Challenge

Advanced Biology · Answer Key · 17 Questions

1. In what year did Rosalind Franklin's X-ray diffraction images of DNA, particularly 'Photo 51', provide crucial evidence for its double helix structure?

- A) 1948
- B) 1950
- C) 1952**
- D) 1955

2. The initial discovery of the CRISPR-Cas9 system's role in bacterial immunity is attributed to scientists including Emmanuelle Charpentier and Jennifer Doudna. In which journal was their seminal 2012 paper published detailing its potential as a genome-editing tool?

- A) Nature
- B) Science**
- C) Cell
- D) PNAS

3. Frederick Griffith's transformation experiment, conducted in 1928, demonstrated the 'transforming principle'. How many strains of *Streptococcus pneumoniae* did he use in his experiments?

- A) Two**
- B) Three
- C) Four
- D) Five

4. The human genome project, a collaborative international research project, was formally launched in 1990. By what year was the first draft of the human genome sequence published?

- A) 1998
- B) 2000
- C) 2003**
- D) 2006

5. Kary Mullis is credited with inventing the Polymerase Chain Reaction (PCR) in 1983. Approximately how many base pairs can the standard Taq polymerase enzyme extend per second at its optimal temperature?

- A) 10
- B) 50
- C) 100**
- D) 500

6. The discovery of the first antibiotic, penicillin, by Alexander Fleming occurred serendipitously in what year?

- A) 1909
- B) 1918
- C) 1928**
- D) 1938

7. Linus Pauling proposed the alpha-helix and beta-sheet as fundamental secondary structures of proteins. In what decade did he publish his work on these structures?

- A) 1930s
- B) 1940s**
- C) 1950s
- D) 1960s

8. The Calvin cycle, central to carbon fixation in photosynthesis, was elucidated by Melvin Calvin and his colleagues. In which year did they publish their findings using radiocarbon tracers?

- A) 1945
- B) 1950
- C) 1955**
- D) 1960

9. Otto Loewi's experiments in 1921 demonstrated chemical neurotransmission. What was the name of the chemical messenger he first identified, which he called 'Vagusstoff'?

- A) Acetylcholine**
- B) Dopamine
- C) Serotonin
- D) Norepinephrine

10. The Nobel Prize in Physiology or Medicine 1984 was awarded to Niels Jerne, Georges Köhler, and César Milstein for their development of monoclonal antibodies. How many distinct antibody-producing hybridoma cell lines can be generated from a single fusion of B cells and myeloma cells in this process?

- A) Tens
- B) Hundreds**
- C) Thousands
- D) Millions

11. The discovery of the T-cell receptor (TCR) by filtration experiments and later by molecular cloning was a significant event in immunology. By what year was the TCR gene sequence definitively identified and characterized by multiple research groups?

- A) 1975
- B) 1980
- C) 1985**
- D) 1990

12. Barbara McClintock's groundbreaking work on 'jumping genes' (transposable elements) in maize was initially published in the 1940s and 1950s but not widely accepted until much later. In what year was she awarded the Nobel Prize for this discovery?

- A) 1975
- B) 1983**
- C) 1991
- D) 2001

13. The concept of 'epigenetics' gained significant traction with research into heritable changes in gene expression that do not involve alterations to the underlying DNA sequence. While the term itself has older roots, what year is often cited for the publication of significant advancements in understanding DNA methylation patterns in gene regulation?

- A) 1970
- B) 1980**
- C) 1990
- D) 2000

14. The first successful artificial gene synthesis was achieved by H. Gobind Khorana and his team. In what year did they report the synthesis of a functional yeast alanine tRNA gene?

- A) 1965
- B) 1970**
- C) 1975
- D) 1980

15. The discovery of oncogenes, genes that can cause cancer when mutated or aberrantly expressed, is a cornerstone of cancer biology. In the early 1980s, the discovery of the Ras oncogene's human counterpart was a major breakthrough. Approximately how many amino acid substitutions were found in the mutant Ras protein that conferred transforming activity?

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

16. The technique of RNA interference (RNAi) was discovered by Andrew Fire and Craig Mello, for which they received the Nobel Prize in 2006. In what year was their seminal paper on RNAi in *C. elegans* published?

- A) 1995
- B) 1998**
- C) 2000
- D) 2002

17. The field of systems biology aims to understand complex biological systems as a whole. The formal establishment of the Systems Biology Institute at the California Institute of Technology occurred in what year, marking a significant institutional commitment to the field?

- A) 1998
- B) 2000
- C) 2002**
- D) 2004