ANSWER KEY.

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Discovery of DNA's Structure

Biology | ANSWER KEY

Directions: Answer each question in the space provided. Show your work for every calculation. For Claim, Evidence, Reasoning (CER) questions, write all three parts.

1. Match each scientist or team to the evidence they provided. Write the letter on the line.

____ 1. Griffith

____ 2. Avery, MacLeod, and McCarty

____ 3. Hershey and Chase

____ 4. Chargaff

____ 5. Franklin, Gosling, and Wilkins

____ 6. Watson and Crick

a. Built a double helix model that fit the other evidence

b. Measured the bases: A is about T and G is about C

c. Radioactive labels showed that DNA entered the bacteria

d. Heat-killed S bacteria changed live R bacteria

e. X-ray patterns showed a helix and gave its size

f. Destroying DNA stopped the change, but destroying protein did not

1 = d, 2 = f, 3 = c, 4 = b, 5 = e, 6 = a

2. A mouse injected with live R bacteria lived, and a mouse injected with heat-killed S bacteria lived. A mouse injected with both died. Explain what this result showed.

The mixture killed the mouse even though neither part did alone. Live S bacteria were found in the mouse, so a substance from the dead S bacteria changed the harmless R bacteria into disease-causing ones and the trait was passed on.

3. In the Hershey-Chase experiment, why was the protein labeled with radioactive sulfur and the DNA with radioactive phosphorus?

Protein contains sulfur but DNA does not, and DNA contains phosphorus but protein has very little. Each label marks only one of the two molecules, so the scientists could tell which one entered the bacteria.

4. A sample of double-stranded DNA is 21% guanine. Find the percent of C, A, and T. Show your work.

C = 21% (G pairs with C). G + C = 42%. A + T = 100 - 42 = 58%. A = T = 29%.

Answer: C 21%, A 29%, T 29%.

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5. The table shows illustrative results from a Hershey-Chase style experiment. Write a Claim, Evidence, Reasoning response: which molecule is the genetic material?

Label	% in supernatant	% in pellet (bacteria)
Protein (S-35)	85	15
DNA (P-32)	25	75

Claim: DNA is the genetic material.

Evidence: 75% of the DNA label was in the pellet, but only 15% of the protein label. 85% of the protein label stayed in the supernatant.

Reasoning: The pellet holds the bacteria, so material found there entered the cells. The molecule that enters and directs the making of new viruses carries the genetic information.

6. Two samples were analyzed (percent of bases). Which sample is consistent with Chargaff's pattern? Explain.

Sample	% A	% T	% G	% C
Sample X	27	26	24	23
Sample Y	33	21	17	29

Sample X. In X, A (27) is close to T (26) and G (24) is close to C (23). In Y, A (33) is far from T (21) and G (17) is far from C (29), so Y does not follow the pattern.

7. Name two things that X-ray patterns of DNA told scientists, and name two people who made these patterns.

The patterns showed that DNA is a helix and gave measurements such as its width and the length of one full turn. Rosalind Franklin (with Raymond Gosling) and Maurice Wilkins studied DNA with X-ray diffraction.

8. Explain how pairing A with T and G with C explains Chargaff's data.

If every A is paired with a T and every G is paired with a C, then the number of A must equal the number of T and the number of G must equal the number of C. This is the pattern Chargaff measured.

9. Put these in order from earliest to latest by writing 1 to 4: ____ Watson and Crick's model ____ Griffith's mouse experiment ____ Hershey-Chase experiment ____ Avery, MacLeod, and McCarty's tests

1 Griffith (1928), 2 Avery, MacLeod, and McCarty (1944), 3 Hershey-Chase (1952), 4 Watson and Crick's model (1953).

10. Explain why no single scientist solved the structure of DNA alone. Use two examples.

Sample answer: Different scientists supplied different kinds of evidence. Hershey and Chase showed DNA carries genetic information, Chargaff measured the base ratios, and Franklin, Gosling, and Wilkins made X-ray patterns that showed a helix. The double helix model fit all of these.

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