The Double Helix

While reading
Chapters 1–2
1 Add surnames from the box to complete the sentences.

Franklin  Bragg  Kalcar  Wilkins  Crick
Pauling  Perutz  Watson  Kendrew

a James ................. is a young American research student.
b Sir Lawrence ................. is a Nobel Prize winner and the head of the Cavendish Laboratory in Cambridge.
c Francis ................. was thirty-five years old.
d Max ................. led the unit where Crick worked.
e At King’s College in London, Maurice ................. was working on X-ray crystallography.
f Rosalind ................. worked with Maurice at King’s College.
g Linus ................. produced the model of the Alpha Helix.
h Herman ................. is a biochemist working in Copenhagen.
i John ................. helped Watson to move to Cambridge.

Chapters 3–4
2 Mark these sentences true (T) or false (F).

a Max Perutz told James Watson to read a book about crystallography.
b Max Perutz took James to see the beautiful buildings by the river.
c Sir Lawrence Bragg had a long white beard.
d Watson wrote to Washington saying he wanted to work with Roy Markham in Cambridge.
e Watson’s landlady told him to leave because he did not take off his hat when entering the house.
f Pauling’s discovery of the alpha helix was the result of complicated mathematics.
g Pauling had made molecular models that looked like children’s toys.
h Francis Crick had an argument with Max Perutz.
i Bill Cochran’s mathematical system was longer and more complicated than Crick’s.

Chapters 5–6
3 Match the two parts of each sentence.

a Rosy gave a talk in which she .....  
b Watson attended the talk but .....  
c Rosy thought that X-ray photography .....  
d She thought playing with models .....  
e Crick travelled to Oxford with Watson .....  
f Crick showed that very few structures .....  
1) and asked him about Rosy’s talk.  
2) was a waste of time.  
3) did not take any notes.  
4) was the only way to discover DNA structure.  
5) were possible with Rosy’s pictures.  
6) presented the results of her research.

4 Mark the statements true (T) or false (F).

a Watson and Crick knew they needed to try different models.
b They thought about different numbers of chains twisted into a circle.
c They tried three chains twisted into a helix.
d Maurice said that helical theory was totally new.
e Rosy said there was no evidence that DNA was helical.
f Bragg told Watson and Crick to stop their work on DNA.

Chapters 7–8
5 Complete the sentences with places from the box.

London  Oxford  Washington  Columbia  Scotland  Copenhagen

a Watson spent Christmas with friends in ................. .
b Watson received a letter from ................. .
c The letter said Watson was sacked because he had left ................. .
d Linus Pauling could not come to ................. because the US State Department took away his passport.
e With Pauling and Luria absent, Watson had to describe the US research to a meeting in ................. .
f Watson read about the chemical research into DNA by Erwin Chargaff at ................. University.
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Chapters 9–10
6 Match the two parts of each sentence.
   a Chargaff gave me a brief superior smile …..
   b The sensation of the meeting was the …..
   c Pauling’s talk, however was only …..
   d A garden party at a country house …..
   e All my belongings were stolen from …..
   f A few people continued to believe …..

1) a humorous restatement of published ideas.
2) brought the meeting to its end.
3) that Francis was just a laughing talking machine.
4) the train as I was sleeping.
5) when we passed each other in the Sorbonne.
6) unexpected appearance of Linus Pauling.

Chapters 11–12
7 Complete these sentences with to, so, because or why.
   a Rosy moved to Birbeck College …….. write her work for publication.
   b Maurice Wilkins was relieved …….. Rosy would be away for several months.
   c Bragg did not share his copy of Pauling’s letter …….. Watson tried to read Peter’s copy.
   d Watson could see that Pauling’s model was wrong but he didn’t know …….. it was wrong.
   e Crick and Watson realized they had about six weeks …….. solve the problem.
   f Watson thought a two chain structure was correct …….. he knew all important biological objects come in pairs.
   g Watson was excited by Wilkins’s print of the ‘B’ structure …….. it was unbelievably simpler than the ‘A’ form.

Chapters 13–15
8 Complete these sentences with the correct form of the word at the end in brackets.
   a I had …….. the wrong physical forms of G and T bases. [choose]
   b I did not dismiss Jerry’s …….. . [criticize]
   c Even more exciting, this type of double helix suggested a copying scheme much more …….. than my briefly considered like-with-like pairing. [satisfy]
   d I told Crick but he remained …….. for a few minutes. [doubt]
   e I felt slightly …….. when Francis rushed into the pub and told everyone we had found the secret of life. [comfort]
   f Francis’s …….. in DNA quickly became full time. [involve]
   g The following morning I felt …….. alive when I awoke. [marvelous]
   h Maurice said that his X-ray data …….. supported the double helix. [strong]
   i Rosy’s immediate …….. of our model amazed me. [accept]

After reading
9 Match the words with their meanings.
   X-ray ribonucleic acid (RNA) protein neutral molecule deoxyribonucleic acid (DNA)
   alpha chromosome carbon virus
   a …….. (n) a very simple life form containing only protein and nucleic acid that needs to infect a host cell in order to multiply
   b …….. (n) a nucleic acid similar to DNA with a different sugar in the nucleotide sub-unit, which is found in all living cells and many viruses
   c …….. (adj) neither positive nor negative; not taking any of the positions in an argument
   d …….. (n) the smallest unit of a chemical substance that can exist, consisting of a number of atoms bonded together
   e …….. (n) one of the two kinds of nucleic acid, which can form very long molecules and from which genes are made
   f …….. (n) a high-energy beam that can go through solid objects
   g …….. (n) a substance found in all living matter that can have a wide range of complex molecular forms based on carbon, and which performs many essential roles in the cell
   h …….. (n) the first letter of the Greek alphabet
   i …….. (n) an essential part of every living cell; this thread-like object, consisting of DNA and protein, contains the instructions, in the form of genes, for the development of all life forms
   j …….. (n) a chemical substance with the symbol C that occurs in all living matter and exists in pure form as diamond
Choose a, b or c to complete the sentences.
1 At the beginning of the story, James Watson was …..
   a) a young, long-haired, American research student working in Europe.
   b) an expert on the structure of DNA.
   c) a noisy, talkative English student who often had arguments.
2 Watson won the Nobel Prize together with …..
   a) Sir Lawrence Bragg
   b) Francis Crick and Rosalind Franklin
   c) Francis Crick and Maurice Wilkins
3 Together they …..
   a) invented DNA
   b) discovered the structure of DNA
   c) invented the double helix
4 DNA molecules contain …..
   a) genes which carry information about living organisms.
   b) bacteria and viruses which form living organisms.
   c) proteins and cells which keep people alive.
5 Watson became interested in DNA when …..
   a) he started to work with Herman Kalckar.
   b) he attended a meeting in Naples and saw an X-ray diffraction picture by Maurice Wilkins.
   c) Linus Pauling proposed the alpha helix as a possible structure for DNA.
6 When Watson first went to Cambridge …..
   a) he was impressed by the beautiful buildings.
   b) he often ate with Francis Crick at the Green Door.
   c) he lost all his clothes on a train.
7 Linus Pauling’s alpha helix was …..
   a) three chains twisted in the form of a helix.
   b) a single chain twisted in the form of a helix.
   c) a helix in the form of the letter alpha.
8 Rosalind Franklin …..
   a) did not think that DNA had a helix structure.
   b) thought that DNA structure would be discovered through chemistry.
   c) worked with Lawrence Bragg on X-ray crystallography.
9 Rosalind Franklin gave a talk about her research in which she suggested …..
   a) DNA structure was more complex than the alpha helix.
   b) that DNA contained a lot of water.
   c) that DNA chains were held together by phosphates.
10 Watson and Crick started to …..
    a) compare the DNA of bacteria and more complex organisms.
    b) make purine and pyrimidine bases.
    c) make models of possible structures for DNA.
11 After Bragg told Watson and Crick to stop work on DNA, …..
    a) Watson went to work at Birbeck College.
    b) Watson received a letter from Washington saying he was sacked.
    c) the US State Department withdrew his passport.
12 Watson started to study the structure of TMV and …..
    a) learnt how to take X-ray pictures.
    b) discovered that TMV was a double helix.
    c) worked with Bernal, Fankucken and Schramm.
13 Even though they were banned from working on DNA, Watson and Crick continued to …..
    a) work on DNA in secret.
    b) meet and discuss their ideas about DNA.
    c) make models of the structure of DNA.
14 Linus Pauling’s wife Ava Helen asked Watson to help her son, Peter, to …..
    a) get a passport to come to England.
    b) get a job working with John Kendrew.
    c) adapt to life at Cambridge University.
15 Peter Pauling tells Watson that his father is working on …..
    a) genetic recombination.
    b) coiled coils.
    c) bacterial reproduction.
16 Crick and Watson are convinced that the structure of DNA contains a number of chains, but they can’t work out how the chains …..
    a) are twisted into a helix.
    b) are made of A, G, T and C bases.
    c) are held together.
17 Lawrence Bragg and Peter Pauling receive letters from Linus Pauling in which he describes …..
    a) the ‘B’ form of DNA.
    b) a triple helix with a sugar phosphate backbone in the centre.
    c) a triple helix held together by hydrogen bonds.
18 When Watson saw Linus Pauling’s letter, he saw that Pauling’s model was …..
    a) unbelievably simpler than their own models.
    b) not an acid at all.
    c) had the backbone in the wrong position.