

Solutions

Each answer shows the steps, then the **result**.

2.1

- a phosphate group; a (5-carbon/pentose) sugar; a nitrogen-containing base

2.2

(a)

- 2

(b)

- 3

3.1 C

- The strands are antiparallel and complementary; bases pair by hydrogen bonds, and phosphodiester bonds are within each backbone

3.2 B

- $\%C = \%G = 20$, so $C+G = 40$; $A+T = 60$, so $\%A = 30$

3.3

(a)

- each new DNA molecule contains one original (old) strand and one newly made strand

(b)

- DNA polymerase can only add nucleotides in the 5'
- 3' direction, so on the strand running the “wrong” way it must work in short pieces away from the fork, later joined by ligase

3.4

- guanine = 360, so cytosine = 360; $C+G = 720$, so $A+T = 1200 - 720 = 480$; adenine = $480/2 = 240$

3.5

(a)

- **A T G C C T A G T T A**; complementary base pairing — adenine always pairs with thymine and cytosine with guanine

(b)

- A nucleotide is a deoxyribose sugar, a phosphate group and one of four nitrogenous bases. Nucleotides join by **condensation** between the phosphate on carbon 5 of one sugar and the hydroxyl on carbon 3 of the next, giving a sugar–phosphate backbone linked by phosphodiester bonds

(c)

- Each new double helix contains **one** original strand and one newly made strand. DNA helicase unwinds the helix and breaks the hydrogen bonds between the base pairs, separating the two strands; free nucleotides then pair with the exposed bases; DNA polymerase joins those nucleotides together by forming the phosphodiester bonds of the new backbone

(d)

- Adenine pairs only with thymine, so thymine is also 22%; $A + T = 44\%$, leaving 56% for $C + G$; C and G are equal, so guanine is 28%