

DNA replication · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Replication · 1.1

Reasoning

After DNA replication, each daughter double helix contains one pre-existing strand and one newly synthesized strand. Copying a molecule is different from expressing its information. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Replication · 2.1

Reasoning

DNA replication is semi-conservative. Complementary base pairing supports copying of the base sequence: adenine pairs with thymine and cytosine with guanine. The strands have opposite orientations. Helicase separates paired strands, while DNA polymerase builds new DNA using a template and available nucleotides.

semi-conservative replication : DNA copying in which each daughter double helix retains one parental strand; DNA polymerase: An enzyme that synthesizes DNA using a template.

Replication · 3.1

Reasoning

New DNA is synthesized in the 5' to 3' direction. In a simplified fork model, one new strand can be synthesized continuously while the other is produced in fragments that are joined. Distinguish these molecular mechanisms from the later separation of chromosomes during cell division. Copying errors can occur despite proofreading and repair. Use labelled strand models or an attributed experimental diagram. Mark old and new material with both labels and colours so the meaning survives monochrome viewing. Track successive rounds using a stated starting population and assumptions. A classroom model illustrates predictions; it is not direct evidence about enzyme activity or a substitute for experimental results.

Replication · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: one double-stranded molecule contains two labelled original strands. After one complete round in unlabelled nucleotides, two molecules each contain one labelled strand. After two rounds, four molecules exist: two retain one labelled original strand and two contain only unlabelled strands. The fraction containing an original strand is $2/4=50\%$.

Replication · 4.2

Reasoning

One labelled double helix replicates for three complete rounds in unlabelled nucleotides. What percentage of the eight molecules contain an original strand? Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Replication · 5.1

Reasoning

Replication uses DNA as a template to make DNA; transcription uses a DNA template to make RNA. A predicted label distribution assumes complete rounds and no degradation or exchange of the labelled material. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Replication · 5.2

Reasoning

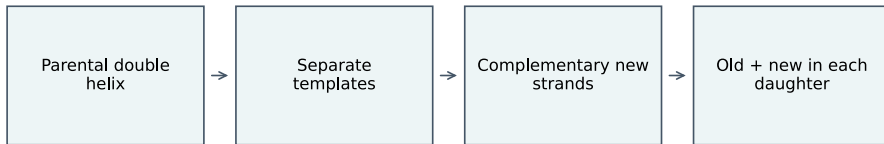
DNA replication and transcription both produce the same type of nucleic-acid product. This claim is false: Replication uses DNA as a template to make DNA; transcription uses a DNA template to make RNA. A predicted label distribution assumes complete rounds and no degradation or exchange of the labelled material.

Replication · 5.3

Reasoning

DNA replication: retain one strand in each daughter molecule: New DNA is synthesized in the 5' to 3' direction. In a simplified fork model, one new strand can be synthesized continuously while the other is produced in fragments that are joined. Distinguish these molecular mechanisms from the later separation of chromosomes during cell division. Copying errors can occur despite proofreading and repair.

Replication · diagram



- Original teaching diagram: DNA replication: retain one strand in each daughter molecule
- Use the labels and the stated model together.

Replication · original transfer

Your turn

One fully labelled double helix undergoes 4 complete rounds in unlabelled nucleotides. Find the fraction of molecules with any original strand and explain why original strands do not multiply.

Replication · transfer reasoning

Method and interpretation

Two original strands persist among 16 molecules: $1/8 = 12.5\%$. Templates are retained while new strands are synthesized; assume no degradation or strand exchange. This does not require unsupported SL fork detail.

Check yourself

- Explain DNA polymerase using the stated model.
- Explain semi-conservative replication using the stated model.
- Change one value in the original transfer; explain which assumption still matters.