1.4 Genetic Information, Variation and Relationships: 10-minute Pack

AQA 7402 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question is about semi-conservative DNA replication.

(a) Name the enzyme that unwinds the DNA double helix at the start of replication and state the type of bond it breaks. **(2)**

(b) Describe the role of DNA polymerase in semi-conservative replication. **(3)**

(c) Meselson and Stahl grew bacteria in a medium containing only heavy nitrogen (15N) so that all their DNA became heavy. The bacteria were then transferred to a medium containing only light nitrogen (14N) and allowed exactly one round of DNA replication. Predict, with a reason, the density of DNA that would be found after this one round of replication if DNA replication is semi-conservative. **(3)**

(Total for Question 1 is 8 marks)

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Mark scheme · 1.4 Genetic Information, Variation and Relationships: 10-minute Pack

Question 1

(a) DNA helicase **B1**

(a) breaks hydrogen bonds (between complementary base pairs) **B1**

(a) Answer: DNA helicase; breaks hydrogen bonds between base pairs.

(b) aligns free (activated) nucleotides against the exposed bases on each template strand by complementary base pairing **B1**

(b) catalyses formation of (phosphodiester) bonds between adjacent nucleotides, building the new sugar-phosphate backbone **B1**

(b) works in one direction only, so synthesis on one template strand (the lagging strand) is discontinuous, e.g. as Okazaki fragments **B1**

(b) Answer: DNA polymerase adds complementary nucleotides and joins them via phosphodiester bonds, working directionally.

(c) DNA of intermediate density would be found (a single band, between the heavy and light bands) **B1**

(c) because each new DNA molecule contains one original (heavy, 15N) strand and one newly made (light, 14N) strand **B1**

(c) this differs from the conservative model, which would predict two separate bands (one fully heavy, one fully light) instead of one intermediate band **B1**

(c) Answer: A single band of intermediate density DNA, because each molecule is a hybrid of one old heavy strand and one new light strand.

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