D1.1 DNA replication (HL)

What the Cell · DP Biology · worksheet · HL statements D1.1.6–9

Name _____ **Date** _____ **Total** _____ / 40

About 40 minutes, or one section at a time. The number of marks shows how many separate points to make.

Section A: Recall

9 marks

1 **State** which end of a growing DNA strand new nucleotides are added to. D1.1.6 **[1]**

2 **Define** Okazaki fragment. D1.1.7 **[1]**

3 **State** the role of DNA primase. D1.1.8 **[1]**

4 **State** the role of DNA ligase. D1.1.8 **[1]**

5 **State** the role of helicase. D1.1.8 **[1]**

6 **State** how many RNA primers are needed on the leading strand at one replication fork. D1.1.7 **[1]**

7 **Name** the enzyme that proofreads new DNA in prokaryotes. D1.1.9 **[1]**

8 **State** why DNA polymerase III cannot start a new strand without a primer. D1.1.6 **[2]**

Section B: Understanding

15 marks

9 **Explain** why DNA polymerases can only build DNA in the 5′ to 3′ direction. D1.1.6 **[3]**

10 **Compare** how DNA is copied on the leading and on the lagging strand. D1.1.7 **[3]**

11 **Outline** the order of events that makes a continuous lagging strand. D1.1.8 **[4]**

12 **Explain** how proofreading reduces the number of mutations. D1.1.9 **[3]**

13 **Explain** why eukaryotic chromosomes have many origins of replication. D1.1.7 **[2]**

Section C: Working with evidence

10 marks

All data in this section are invented for practice. The patterns are realistic.

14 D1.1.7, D1.1.8

Growing bacteria were given radioactive DNA nucleotides for 5 seconds, then non-radioactive ones. At intervals, new DNA was separated by length, and the percentage of the radioactivity found in short fragments (under 2000 nucleotides) was measured. The experiment was done with normal bacteria and with mutants lacking working DNA ligase.

Time after the start / s	**5**	**15**	**30**	**60**	**120**
Normal bacteria / %	52	40	22	8	3
Ligase mutants / %	53	52	51	50	50

a **Describe** the results for normal bacteria. **[2]**

b **Explain** why some new DNA first appears as short fragments. **[2]**

c **Explain** the results for the ligase mutants. **[2]**

d **Suggest** why only about half of the new DNA was in short fragments at 5 s. **[2]**

e **Predict** the results for mutants lacking working DNA polymerase I, with a reason. **[2]**

Section D: Longer answer

6 marks

15 **Explain** how DNA is replicated at a replication fork in a prokaryote. D1.1.7, D1.1.8 **[6]**