Year 12 Biology UNIT 3

DNA Extended Response

DO NOT WRITE ON THIS PAPER

Answer the following question on the paper provided.

Put your name on all sheets submitted.

If you include a draft clearly mark it as such.

Use only blue or black pen for your answers.

Answers may be presented in different ways provided they communicate your ideas effectively. You may choose to:

* present a clearly labelled diagram;
* write notes beside a clear diagram;
* write lists of points, with sentences which link them;
* write concisely worded sentences;
* use some other appropriate way to present ideas.

**Question 1:** TOTAL 30 MARKS

DNA is said to be the molecule of life as it has the ability to replicate itself.

a) Draw a large, fully labelled diagram of a DNA molecule. (8 marks)

b) Explain how the structure of the molecule enables the process of replication to happen efficiently so that there are two identical copies.

(9) marks)

c) Replication is necessary for cell division. The two types of cell division are mitosis and meiosis. Outline differences between these two types of cell division. (7 marks) (

d) Name and describe the purpose of the 3 main enzymes involved in DNA replication

(6 marks)

ANSWERS: **TOTAL 30 MARKS**

**a)  TOTAL 8 MARKS**

Base Pair Rule 1

3’ – 5’ 1

b) Double strand - allows a template and a coding strand 1 mark

* Semi-conservative copying – there is always one strand of the original molecule to preserve the code long term (must explain s-c) 1 mark

Hydrogen Bonds - hold strands together 1 mark

* Weak so strands can be easily separated for replication by Helicase 1 mark

Sugar Phosphate backbone 1 mark

* Stable and strong so strands stay intact over repeated copying. 1 mark

Complimentary base pairs – cytosine/guanine and thymine/adenine 1 mark

* Base pairing rule means strands are copied exactly 1 mark
* Pairing determined by size of bases/number of rings/purine-pyrimidine 1 mark
* Or number of hydrogen bonds between base pairs GandC have 3, AandT have 2.

1 mark

Coiling of Double Helix

**TOTAL 9 MARKS**

c) One mark for each comparison. Must be explained well **TOTAL 7 MARKS**

|  |  |
| --- | --- |
| MITOSIS | MEIOSIS |
| Occurs in somatic cells | Occurs in germ (reproductive) cells |
| Growth, repair and asexual reproduction | Sexual reproduction |
| 2 daughter cells | 4 daughter cells |
| Daughter cells identical | Daughter cells can vary |
| Diploid daughter cells | Haploid daughter cells |
| Chs number identical to parent cell | Chs number half of parent cell |
| One nuclear division | Two nuclear divisions |
| Chl line up singly during metaphase. | Homologous pairs line up during metaphase 1 |
| Chromatids separate during anaphase | Homologous pairs separate during Anaphase 1 and chromatids separate during Anaphase 2 |

d) **Helicase** – unwinds / unzips the DNA ,separating the 2 strands of the double helix

**DNA polymerase** – attaches the matching base pairs according to the base pair rule and so constructs the new strand

**Ligase –** joins Okazaki fragments into a continuous length

**1 mark** **for naming, 1 mark for purpose 6 MARKS**