

***Human Biology ATAR – Task 8:* Test**

***DNA and Cell division (6%)***

|  |  |  |  |
| --- | --- | --- | --- |
| Name: MARKING KEY | | | |
| Time allowed: 60 Minutes | | | |
| **Section** | Your Mark | Marks available | Percentage of Investigation |
| **Multiple Choice (A)** |  | 20 | 40% |
| **Short Answer (B)** |  | 40 | 60% |
|  |  | **60** | **100%** |

**Declaration of Authenticity**

I (Student Name) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ declare that this work is my own and I have not plagiarised from any source.

Signature:  
  
Date:

***Section A – Multiple Choice (20 marks)***

*Answer all questions by clearly circling the letter ONLY. Use only a BLUE or BLACK pen. If you make a mistake, place a CROSS through the letter; do not erase or use correction fluid, and circle your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.*

1. During mitosis, there are several clearly visible stages. During which stage do the spindle fibres pull the new chromosomes to opposite poles of the cell?
2. Interphase
3. Prophase
4. Metaphase
5. Anaphase
6. How many haploid cells are produced in the first meiotic division of meiosis?
7. 1
8. 2
9. 3
10. 4
11. Differentiation is best described as:
12. Different characteristics appearing in organisms
13. A permanent change in the genome of individuals
14. The process by which specialised cells develop special characteristics
15. The process by which organs become specialised for specific functions
16. Which of the following is the start codon?
17. AUC
18. ATG
19. AGU
20. AUG
21. Which of the following is correct for DNA replication?
22. DNA polymerase creates a new strand in a 5’ to 3’ direction
23. DNA ligase creates a new strand in a 5’ to 3’ direction
24. DNA polymerase creates a new strand in a 3’ to 5’ direction
25. DNA primase creates a new strand in a 5’ to 3’ direction
26. During cell division, the DNA molecule replicates itself. The reason for this is so:
27. if the cell makes a mistake there is enough DNA to go around
28. the daughter cells end up with the same genetic information as the parent cell
29. the DNA can move out of the nucleus into the cytoplasm
30. there are enough chromosomes for each cell produced

**Question 7 – 8 refers to the following diagram:**



1. This process is called:
2. Non-disjunction
3. Crossing Over
4. Random Assortment
5. Random Fertilisation
6. If this occurs in the first meiotic division of meiosis. How many chromosomes are found in each daughter cell?
7. Two daughter cells with 4 chromosomes, two daughter cells with 2 chromosomes
8. Two daughter cells with 2 chromosomes, two daughter cells with no chromosomes
9. Four daughter cells with 1 chromosomes in each
10. Two daughter cells with 1 chromosomes, two daughter cells with 2 chromosomes
11. Which of the following is NOT a property of cancer cells?
12. Can metastasise
13. Cannot differentiate
14. Undergo Apoptosis
15. Do not communicate with other cells
16. Where does transcription take place:
17. Mitochondria
18. Cytoplasm
19. Nucleus
20. Endoplasmic reticulum
21. If an individual has trisomy 21 this means:
22. They have one less chromosome 21
23. They have one extra chromosome 21
24. They have no chromosome 21
25. They are missing part of chromosome 21
26. Which of the following statements about epigenetics is correct?
27. Acetylation is when acetyl groups are added to histone proteins, enhancing gene expression.
28. Acetylation is when acetyl groups are added to histone proteins, inhibiting gene expression.
29. Methylation is when methyl groups are added to the CpG sites on the DNA molecule to enhance gene expression.
30. Methylation is when methyl groups are added to CpG sites on the histones to inhibit gene expression.
31. During which of the following stages of the mitotic cycle can the arrangement of chromosomes at the equator of the spindle be observed at a cell?
32. Prophase
33. Telophase
34. Anaphase
35. Metaphase
36. Where in human cells is DNA located?
37. In the nucleus.
38. In the nucleus and in the mitochondria.
39. In the nucleus and in the ribosomes.
40. In the nucleus and in the Golgi body.
41. A DNA molecule is bound to special proteins that assist them coil into a smaller area. These proteins
42. Nucleotides
43. Chromatin
44. Genes
45. Histones
46. Messenger RNA leaves the nucleus and attaches to a
47. Ribosome
48. Golgi apparatus
49. Mitochondrion
50. Cell membrane
51. Which of the following is in the correct order for the main stages of mitosis?
52. prophase, metaphase, anaphase then telophase.
53. metaphase, prophase, anaphase then telophase
54. prophase, anaphase, metaphase then telophase
55. prophase, metaphase, telophase then anaphase
56. In a DNA molecule, adenine pairs with
57. adenine.
58. guanine.
59. thymine.
60. uracil.
61. Which structure is responsible for moving the chromosomes during mitosis:

1. nucleus
2. nucleolus
3. spindle fibres
4. cytoplasm
5. Anticodons pair with
6. amino acids.
7. mRNA codons.
8. DNA codons.
9. ribosomes.

**END OF MULTIPLE CHOICE**

***Section B – Short Answer***

Answer all questions in the spaces provided. Use only BLUE or BLACK pen.

1. One in every two Australians will be diagnosed with cancer before the age of 85 **(7 marks)**
2. What is the difference between a malignant and a benign tumour? *(2 mark)*  
     
   Malignant tumours – Tumour cells are able to spread to other parts of the body  
   Benign tumours – tumour cells are not able to spread to other parts of the body
3. State two common carcinogens: *(2 marks)*  
     
   Any two of the following:

* UV Radiation
* X-rays
* Ionising radiation
* Viruses
* Chemicals

1. State three lifestyle changes that reduces risk of cancer: *(3 marks)*

Any three of the following:

* Do not smoke
* Slip, slop, slap
* Eat fruit and vegetables
* Consume only moderate amounts of alcohol
* Low fat diet
* Use protective clothing when dealing with carcinogens
* Avoid being overweight or obese

1. The coding strand of a DNA molecule has the following sequence of bases: **(5 marks)**

DNA: T-A-C-T-T-A-G-C-T-C-G-G-C-A-T-A-C-C

1. State the sequence of codons for the messenger RNA molecule transcribed from this part of the DNA: *(1 mark)*

mRNA: AUG-AAU-CGA-GCC-GUA-UGG

1. State the sequence of anticodons of the transfer RNA molecules that match each of the codons in part (a).  *(1 mark)*

tRNA: UAC-UUA-GCU-CGG-CAU-ACC

1. Using the chart below to state the sequence of amino acids that the DNA strand codes for. *(1 mark)*

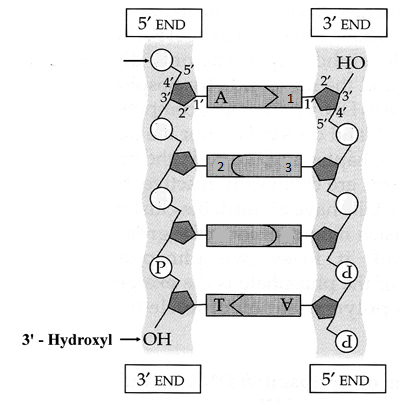
Protein: Met/start-Asn-Arg-Ala-Val-Trp



1. Explain the difference between the coding and template strand of the DNA molecule. *(2 marks)*

* Template strand – is the strand that is copied during protein synthesis to make mRNA
* Coding Strand – is not copied. Will have the same code as the mRNA strand.

1. Below is a diagram of a small section of DNA **(9 marks)**



4

4

1. Structure A is a nitrogenous base called adenine. Name the nitrogenous bases labelled 1, 2 & 3

*(3 marks)*

1 THYMINE – CYTOSINE – GUANINE

1. Name the term used to describe structure 4 (indicated parts in the box) and identify the two other molecules (besides the nitrogenous base) that make up this structure. *(3 marks)*

* NUCELOTIDE
* PHOSPHATE
* DEOXYRIBOSE

1. Explain how the process of DNA replication allows daughter cells to receive DNA copies that are exactly the same as the parent cell’s DNA. *(3 marks)*

* Parent DNA is zipped open – weak bonds between bases
* each section has half the original information, and serves as a template
* base pairs can only attach to their matched base – A/T G/C
* hence new half which forms is identical to the original

1. Describe two differences between DNA and mtDNA: **(2 marks)**

|  |  |  |
| --- | --- | --- |
|  | DNA | mtDNA |
| Where is it found in the cell? | Nucleus | Mitochondria |
| How is it stored? | DNA strands are bound to histone proteins. | As circular molecules not attached to proteins. |

1. Meiosis is an important type of cell division for the human body. **(12 marks)**
2. What type of cells does meiosis produce? *(1 mark)*  
     
   Gametes/ova-sperm

Identify the stages of meiosis shown below then describe what happens at that stage.

The parent cell that is undergoing division has four chromosomes.

*(6 marks)*

|  |  |  |
| --- | --- | --- |
| **Image** | **Stage of Meiosis** | **Description** |
|  | Anaphase I | Homologous chromosomes are pulled to opposite poles of the cell by the spindle/mitotic fibres. |
| mage result for meiosis | Metaphase II | Chromosomes line up along the mid-line of the cell, mitotic/spindle fibres attach to the centromeres. |
| mage result for meiosis | Telophase II | Chromosomes uncoil and a new nuclear membrane forms. |

1. For the parent cell that divided above how many daughter cells were produced?

*(1 mark)*

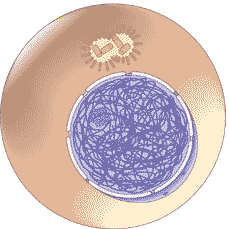
FOUR

1. Were the daughter cells haploid or diploid?

*(1 mark)*

HAPLOID

(e) The following diagram shows a cell in the period between cell division. Use the diagram to answer the questions below.



1. What is this period called? (1 mark)

**Interphase**

1. Name 2 important processes that occur during this period. (2 marks\_
2. **DNA Replication**

**ii) Normal cell functions e.g. protein synthesis, growth**

1. Complete the table below to contrast RNA with DNA.

**(3 marks)**

|  |  |  |
| --- | --- | --- |
| Characteristic | DNA | RNA |
| bases | A T C G | A U C G – uracil replaces thymine |
| location in cell | nucleus and mitochondria | cytoplasm, nucleus, mitochondria |
| types of | nuclear DNA  mitochondrial DNA | messenger RNA  transfer RNA |

1. Explain why the process of mitosis is essential to growth in organisms (e.g. Humans) ***(2 marks)***

* produces 2 identical cells from one
* hence organism increases in size

**END OF TEST**