SMARTWIZ

GRADE11 LIFE SCIENCE EXAM

MARKS: 100

MARKS	

TIME: 2 HOURS

SCHOOL _____

CLASS (eg. 4A) _____

SURNAME _____

NAME _____

Instructions for Learners:

- Read all instructions carefully before you begin the exam.
- Write your full name and student number clearly on the answer sheet/book.
- Answer all questions unless otherwise instructed.
- Show all your work/calculations where necessary.
- Write neatly and clearly.
- Use only a blue or black pen. Do not use correction fluid or tape.
- Electronic devices (calculators, cell phones, etc.) are not allowed unless explicitly permitted.
- Raise your hand if you have any questions.
- Do not talk to other learners during the exam.
- Any form of cheating will result in immediate disqualification from the exam.

This exam consists of six pages, including the cover page.

SECTION A: SHORT QUESTIONS (20 MARKS)

QUESTION 1: MULTIPLE CHOICE (5 × 1 = 5 marks)

Choose the correct option (A–D):

1.1 DNA is found in the:
A) Ribosome
B) Cell membrane
C) Nucleus
D) Mitochondria

1.2 What determines the sex of a human child?
A) X chromosome from mother
B) Y chromosome from father
C) Number of autosomes
D) Dominant alleles

1.3 What is natural selection?
A) Random mutation of genes
B) A change in environment
C) Survival of the best-adapted individuals
D) Artificial breeding

1.4 Which of the following is an example of a genotype?
A) Blue eyes
B) Bb
C) Tall plant
D) Curly hair

1.5 What does biodiversity refer to?
A) Differences in cell structures
B) Variations in one species only
C) Variety of ecosystems and species
D) Only genetic changes

QUESTION 2: MATCHING ITEMS (5 × 1 = 5 marks)

Match the concept in Column A with the correct definition in Column B.

Column A	Column B
2.1 Phenotype	A. Inherited characteristics visible in an organism
2.2 Mutation	B. All DNA in a cell
2.3 Evolution	C. Sudden change in genetic material
2.4 Genome	D. Change in species over time
2.5 Homologous structures	E. Similar structure, different function

QUESTION 3: DEFINE (5 × 2 = 10 marks)

3.1 Allele

3.2 Genetic variation

3.3 Fossil

3.4 Artificial selection

3.5 Speciation

🟡 SECTION B: APPLICATION, DATA & DIAGRAMS (30 MARKS)

QUESTION 4: PUNNETT SQUARE (10 marks)

A heterozygous tall pea plant (Tt) is crossed with a short plant (tt).

4.1 Use a Punnett square to show the cross.
(Draw a 2x2 Punnett square)

4.2 What is the genotype ratio?

4.3 What is the phenotype ratio?

4.4 What percentage of offspring will be short?

4.5 Is this an example of dominant-recessive inheritance? Explain.

QUESTION 5: FOSSILS AND EVOLUTION (10 marks)

Study the diagram showing skulls of three hominids from different time periods:

5.1 What trend is shown in skull size over time?

5.2 How does this support the theory of evolution?

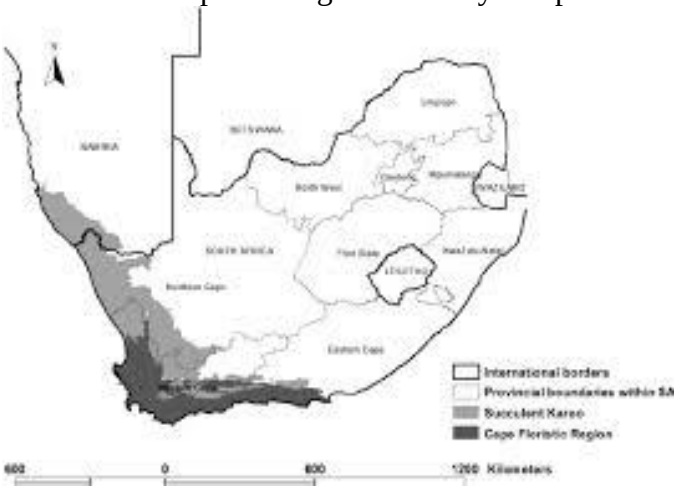
5.3 Which species shows the most complex brain structure?

5.4 Define the term "transitional fossil."

5.5 Give ONE environmental factor that could have driven this evolutionary trend.

QUESTION 6: BIODIVERSITY HOTSPOTS (10 marks)

Refer to the map showing biodiversity hotspots in South Africa:



6.1 Name TWO of the hotspots shown.

6.2 Why are these regions considered hotspots?

6.3 Give TWO threats to biodiversity in these areas.

6.4 Suggest TWO ways biodiversity can be conserved.

6.5 Why is biodiversity important for human survival?

🔵 SECTION C: ESSAY (30 MARKS)

QUESTION 7: ESSAY – GENETIC ENGINEERING & ETHICS

Topic:
"Discuss the uses, benefits and ethical concerns of genetic engineering in modern biology. Provide at least two examples."

Include:

- Definition of genetic engineering
- Real-life uses (e.g., GMOs, medicine)

- Advantages to agriculture/medicine
- Possible risks (e.g., biodiversity loss, human impact)
- Ethical concerns and public opinion
- Your own informed opinion

🛑 END OF EXAM
TOTAL: 100 MARKS

MEMO

🟢 SECTION A: SHORT QUESTIONS (20 MARKS)

QUESTION 1: MULTIPLE CHOICE (5 × 1 = 5 marks)

1.1 C – Nucleus
1.2 B – Y chromosome from father
1.3 C – Survival of the best-adapted individuals
1.4 B – Bb
1.5 C – Variety of ecosystems and species
✅ **[5 marks]**

QUESTION 2: MATCHING ITEMS (5 × 1 = 5 marks)

2.1 A – Phenotype
2.2 C – Mutation
2.3 D – Evolution
2.4 B – Genome
2.5 E – Homologous structures
✅ **[5 marks]**

QUESTION 3: DEFINITIONS (5 × 2 = 10 marks)

3.1 **Allele:** An alternative form of a gene found at the same locus on a chromosome.
3.2 **Genetic variation:** Differences in DNA among individuals or populations.
3.3 **Fossil:** Preserved remains or traces of ancient organisms.
3.4 **Artificial selection:** Breeding of organisms by humans to achieve desired traits.
3.5 **Speciation:** The formation of new and distinct species through evolution.
✅ **[10 marks]**

🟡 SECTION B: APPLICATION, DATA & DIAGRAMS (30 MARKS)

QUESTION 4: PUNNETT SQUARE (10 marks)

4.1 Punnett Square:

```
lua
Copy code
```

```
     T   t
   ---------
t  | Tt  | tt
t  | Tt  | tt
```

(2 marks)

4.2 Genotype ratio = 2 Tt : 2 tt OR 1:1
(1 mark)

4.3 Phenotype ratio = 2 tall : 2 short OR 1:1
(1 mark)

4.4 50% of offspring will be short
(1 mark)

4.5 Yes, because one allele (T) is dominant over the other (t), which is recessive
(2 marks)

✅ **[Total: 7 marks + 3 for correct Punnett diagram = 10 marks]**

QUESTION 5: FOSSILS AND EVOLUTION (10 marks)

5.1 Increase in skull size over time
(1 mark)

5.2 Shows gradual change (evolution) and increased brain development
(2 marks)

5.3 Homo sapiens
(1 mark)

5.4 **Transitional fossil:** A fossil that shows traits of both ancestral and derived species
(2 marks)

5.5 Environmental change, competition, need for tool use or communication
(2 marks)

✅ **[10 marks]**

QUESTION 6: BIODIVERSITY HOTSPOTS (10 marks)

6.1 Cape Floral Kingdom, Succulent Karoo (any two)
(2 marks)

6.2 High species richness and endemism, but under threat
(2 marks)

6.3 Habitat destruction, climate change, pollution, poaching (any two)
(2 marks)

6.4 Conservation areas, education, sustainable use, law enforcement (any two)
(2 marks)

6.5 Biodiversity supports ecosystems, medicine, food security, water purification
(2 marks)

✅ **[10 marks]**

🔵 SECTION C: ESSAY – GENETIC ENGINEERING & ETHICS (30 MARKS)

Mark Allocation:

Component	Marks
Definition of genetic engineering	3
Two or more examples (e.g., GMOs, insulin, crops)	6
Benefits (e.g., food production, disease treatment)	6
Risks (e.g., environmental impact, resistance)	5
Ethical concerns (e.g., unnatural, accessibility)	5
Own opinion and conclusion	3
Logical flow, language, correct use of terminology	2

✅ **Total: 30 Marks**

TOTAL: 100 MARKS