SMARTWIZ

GRADE12 LIFE SCIENCE EXAM

MARKS: 150

MARKS	

TIME: 2. 5 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 dishonesty will result in immediate disqualification from the exam.

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

SECTION A: EVOLUTION AND SPECIATION (40 marks)

QUESTION 1 (20 marks)

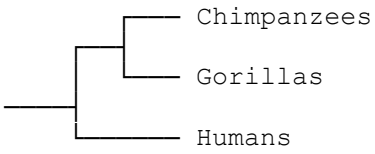
1.1 Define the following:
a) Speciation

b) Gene pool

c) Adaptive radiation

1.2 Distinguish between allopatric and sympatric speciation. (4)

1.3 Study the simplified evolutionary tree diagram below and answer the questions:



a) Which species is the most closely related to humans? _____ (1)

b) What is a common ancestor? (2)

c) Explain how molecular evidence (like DNA) supports the relationships in the tree. (3)

1.4 Describe two factors that can lead to the formation of new species. (4)

QUESTION 2 (20 marks)

2.1 What is genetic drift? (2)

2.2 Explain the founder effect and give an example. (4)

2.3 Define *punctuated equilibrium*. (2)

2.4 How do fossils provide evidence for evolution? (4)

2.5 Explain the role of variation in natural selection. (4)

2.6 How do homologous structures provide evidence for common ancestry? (4)

SECTION B: ENVIRONMENTAL STUDIES & HUMAN IMPACT (50 marks)

QUESTION 3 (25 marks)

3.1 Define *urbanisation* and describe its effects on the environment. (4)

3.2 Discuss how deforestation affects biodiversity. (4)

3.3 Describe how eutrophication occurs and its impact on aquatic ecosystems. (5)

3.4 Suggest two ways in which waste management can be improved in urban areas. (4)

3.5 Explain what is meant by *carbon footprint*. (2)

3.6 List two strategies to reduce a household’s carbon footprint. (2)

3.7 Name one international agreement that addresses climate change and explain its purpose. (4)

QUESTION 4 (25 marks)

4.1 Define *biological control*. (2)

4.2 Give one advantage and one disadvantage of using biological control. (2)
Advantage: _____
Disadvantage: _____

4.3 Explain the difference between renewable and non-renewable resources. (3)

4.4 Describe how alien plant species affect South African ecosystems. (4)

4.5 Outline three ways to conserve water in agricultural practices. (6)

4.6 What is an Environmental Impact Assessment (EIA), and why is it important? (4)

SECTION C: HUMAN ENDOCRINE SYSTEM & REPRODUCTIVE TECHNOLOGIES (60 marks)

QUESTION 5 (30 marks)

5.1 Define a hormone and state one example. (3)

5.2 Name the gland that secretes insulin. (1)

5.3 Explain how insulin regulates blood glucose levels. (5)

5.4 Describe the symptoms of diabetes mellitus. (4)

5.5 Explain the role of the thyroid gland and the effect of its underactivity. (5)

5.6 Distinguish between endocrine and exocrine glands. (4)

5.7 Give two reasons why hormones are specific in their function. (4)

4.8 List two ways the body maintains homeostasis. (4)

QUESTION 6 (30 marks)

6.1 Define assisted reproductive technologies (ARTs). (2)

6.2 Describe the process of in vitro fertilisation (IVF). (5)

6.3 List two ethical concerns around the use of IVF. (2)

6.4 Define contraception and give two types. (4)

6.5 Explain the importance of sex education in schools. (4)

6.6 Describe how hormonal contraceptives prevent pregnancy. (5)

6.7 Compare natural and artificial contraceptive methods. (4)

6.8 What is surrogacy, and in what case might it be used? (4)

TOTAL : 150

MEMO

SECTION A: EVOLUTION AND SPECIATION (40 marks)

QUESTION 1 (20 marks)

1.1
a) Speciation – The formation of a new species through the process of evolution. (2)
b) Gene pool – The total genetic information present in a population. (2)
c) Adaptive radiation – The rapid evolution of different species from a common ancestor to fill various ecological niches. (2)

1.2

- Allopatric: Speciation due to geographical isolation.
- Sympatric: Speciation occurs within the same geographical area due to ecological or genetic differences. (4)

1.3
a) Gorillas ✅ (1)
b) A common ancestor is an earlier species from which two or more species evolved. (2)
c) DNA comparisons show similarity in genetic material. The more similar the DNA, the more closely related the species are. (3)

1.4

- Geographic isolation
- Mutation
- Natural selection
- Reproductive isolation
  (Any 2, well explained = 2 marks each) (4)

QUESTION 2 (20 marks)

2.1
Genetic drift: A random change in allele frequency in a small population. (2)

2.2
Founder effect: Occurs when a few individuals colonise a new area, carrying only a small portion of the original gene pool. Example: Amish population and polydactyly. (4)

2.3
Punctuated equilibrium: Evolution occurs in short bursts of rapid change followed by long periods of stability. (2)

2.4

- Fossils show a record of organisms over time.
- Transitional forms show links between groups.
- Older fossils are simpler; newer are more complex. (4)

2.5

- Variation allows for some individuals to survive environmental changes.
- Those with advantageous traits are more likely to survive and reproduce. (4)

2.6
Homologous structures have similar structure but different functions (e.g., human arm and whale flipper) and indicate a common ancestor. (4)

SECTION B: ENVIRONMENTAL STUDIES & HUMAN IMPACT (50 marks)

QUESTION 3 (25 marks)

3.1
Urbanisation: Expansion of cities into rural areas.
Effects: Loss of biodiversity, pollution, habitat destruction. (4)

3.2
Deforestation removes habitats → leads to extinction, reduced gene pool, imbalance in ecosystems. (4)

3.3
Eutrophication: Fertilizer runoff increases nutrients → algae bloom → blocks sunlight → aquatic life dies → oxygen depletion. (5)

3.4

- Improve recycling
- Composting
- Educating communities
  (Any 2 valid points) (4)

3.5
Carbon footprint: Amount of greenhouse gases produced by individual or group activities. (2)

3.6

- Use energy-efficient appliances
- Reduce car travel
  (Any 2) (2)

3.7
Paris Agreement: International treaty to limit global warming to below 2°C. Encourages countries to reduce emissions. (4)

QUESTION 4 (25 marks)

4.1
Biological control: Use of natural predators to control pests. (2)

4.2
Advantage: Environmentally friendly
Disadvantage: May become invasive or ineffective (2)

4.3
Renewable: Can be replenished (e.g., solar)
Non-renewable: Finite supply (e.g., coal) (3)

4.4
Alien plants outcompete indigenous species, reduce water availability, alter fire regimes, and decrease biodiversity. (4)

4.5

- Drip irrigation
- Mulching
- Plant drought-resistant crops
  (Any 3, well explained) (6)

4.6
EIA: Assesses environmental effects of a proposed project.
Importance: Prevents harm, informs decisions, involves public participation. (4)

SECTION C: HUMAN ENDOCRINE SYSTEM & REPRODUCTIVE TECHNOLOGIES (60 marks)

QUESTION 5 (30 marks)

5.1
Hormone: Chemical messenger produced by endocrine glands.
Example: Insulin, adrenaline, oestrogen (3)

5.2
Pancreas (1)

5.3
Insulin lowers blood sugar by:

- Stimulating uptake of glucose into cells
- Promoting conversion of glucose to glycogen in liver/muscles (5)

5.4
Symptoms: Frequent urination, excessive thirst, fatigue, blurred vision. (4)

5.5
Thyroid: Produces thyroxine
Regulates metabolism
Underactivity: Slowed metabolism, weight gain, fatigue (5)

5.6
Endocrine: Secrete hormones into blood
Exocrine: Secrete substances into ducts (e.g., sweat, saliva) (4)

5.7

- Hormones bind to specific receptors
- Only target cells respond due to receptor compatibility (4)

5.8

- Thermoregulation
- Blood glucose regulation
  (Any 2) (4)

QUESTION 6 (30 marks)

6.1
ARTs: Techniques used to assist reproduction, especially in infertile couples. (2)

6.2
IVF process:

- Eggs and sperm collected
- Fertilisation in lab
- Embryo cultured
- Implanted into uterus (5)

6.3
Ethical concerns:

- Embryo disposal
- Accessibility and cost (Any 2) (2)

6.4
Contraception: Prevention of pregnancy
Types: Hormonal pills, condoms, IUD, sterilisation (Any 2) (4)

6.5
Importance of sex education:

- Promotes informed decisions
- Prevents STIs and unplanned pregnancies
- Encourages responsible behaviour (4)

6.6
Hormonal contraceptives prevent ovulation, thicken cervical mucus, and thin uterine lining. (5)

6.7
Natural: Rhythm method, withdrawal
Artificial: Pill, condoms, implants
Natural less reliable; artificial more effective (4)

6.8
Surrogacy: Woman carries baby for another
Used when biological mother cannot carry pregnancy (4)

✅ TOTAL: 150 MARKS