

SMARTWIZ

GRADE12 LIFE SCIENCE EXAM

MARKS: 150

TIME: 2.5 HOURS

SCHOOL _____

CLASS (eg. 4A) _____

SURNAME _____

NAME _____

MARKS	
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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: THE HUMAN NERVOUS SYSTEM (50 MARKS)

QUESTION 1: Structure and Function (25 marks)

1.1 Name the three main parts of the human brain and give one function for each. (6)

1. _____

Function: _____

2. _____

Function: _____

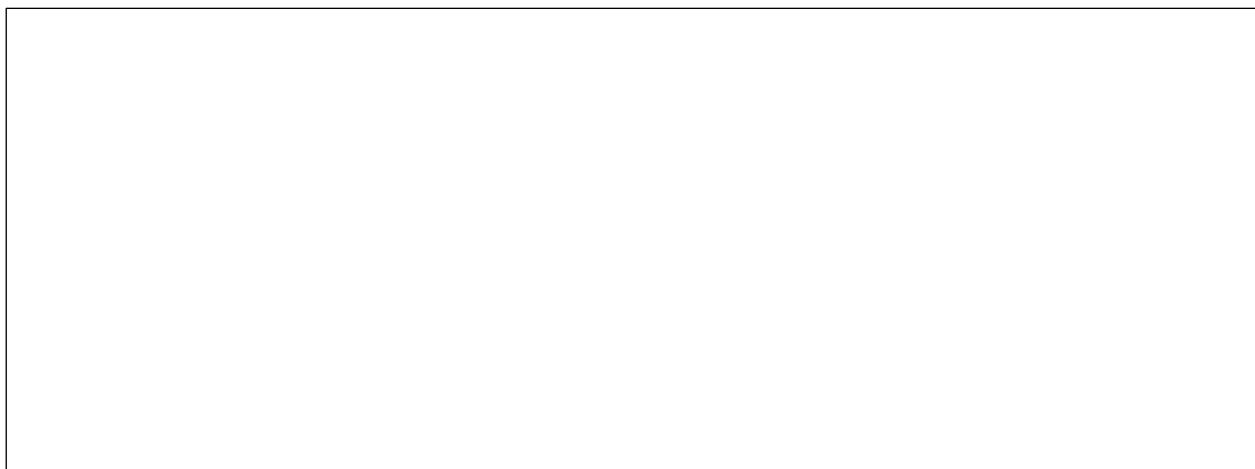
3. _____

Function: _____

1.2 Define a reflex arc. (2)

1.3 Draw and label a reflex arc showing:

- Receptor
- Sensory neuron
- Interneuron
- Motor neuron
- Effector (5)



1.4 Describe how the structure of a motor neuron is suited for its function. (4)

1.5 Differentiate between the central nervous system (CNS) and peripheral nervous system (PNS). (4)

1.6 Explain the role of neurotransmitters in nerve transmission. (4)

QUESTION 2: Disorders and Injuries (25 marks)

2.1 Explain what happens when the spinal cord is damaged. (3)

2.2 State two effects of drug abuse on the nervous system. (2)

2.3 Name and briefly describe two common nervous system disorders. (4)

2.4 Discuss the function of the meninges and cerebrospinal fluid. (4)

2.5 What is multiple sclerosis and how does it affect nerve function? (4)

2.6 Suggest two ways to protect your nervous system. (4)

SECTION B: HUMAN EVOLUTION (50 MARKS)

QUESTION 3: Evidence of Human Evolution (25 marks)

3.1 List three types of evidence used to study human evolution. (3)

3.2 Name three hominid species that show transitional features between apes and humans. (3)

3.3 Describe three skeletal changes that occurred during human evolution. (6)

3.4 Explain how bipedalism gave early humans an evolutionary advantage. (4)

3.5 Define the terms:

a) Hominid

b) Fossil record (4)

3.6 Compare the skull features of *Homo habilis* and modern *Homo sapiens*. (5)

QUESTION 4: Human and Primate Comparison (25 marks)

4.1 Give four similarities between humans and modern apes. (4)

4.2 Name and describe one difference in reproductive behaviour between apes and humans. (2)

4.3 Describe how the foramen magnum has shifted over time and what it indicates. (3)

4.4 Describe two cultural developments unique to *Homo sapiens*. (4)

4.5 Why is mitochondrial DNA useful in tracing maternal lineage? (3)

4.6 Briefly explain the “Out of Africa” hypothesis. (4)

4.7 Give two reasons why fossil evidence is incomplete. (2)

SECTION C: HOMEOSTASIS IN HUMANS (50 MARKS)

QUESTION 5: Homeostasis Concepts (25 marks)

5.1 Define homeostasis and explain its importance. (4)

5.2 Describe the role of the liver in homeostasis. (4)

5.3 State two ways the body responds to overheating. (2)

5.4 Explain the feedback mechanism that controls blood glucose levels. (6)

5.5 What is negative feedback? Give one example. (3)

5.6 How does the hypothalamus contribute to homeostasis? (3)

5.7 List two consequences of failure in homeostasis. (3)

QUESTION 6: Water and Temperature Regulation (25 marks)

6.1 Describe how the kidneys regulate water balance in the human body. (5)

6.2 What is ADH and how does it function in water regulation? (4)

6.3 Name two conditions caused by kidney failure. (2)

6.4 Explain how sweating helps maintain body temperature. (3)

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6.5 Give two functions of the skin in thermoregulation. (2)

6.6 Describe what happens to the body during hypothermia. (4)

6.7 Explain vasodilation and vasoconstriction. (5)

✓ TOTAL: 150 MARKS



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SECTION A: THE HUMAN NERVOUS SYSTEM (50 MARKS)

QUESTION 1: Structure and Function (25)**1.1**

1. Cerebrum – Controls voluntary actions, memory, and reasoning. (2)
2. Cerebellum – Coordinates balance and muscle movement. (2)
3. Medulla oblongata – Controls involuntary actions (e.g., heartbeat, breathing). (2)

1.2

A reflex arc is the pathway taken by nerve impulses during a reflex action, bypassing the brain for quick response. (2)

1.3

Correct diagram showing and labelling:

- Receptor (1)
- Sensory neuron (1)
- Interneuron (1)
- Motor neuron (1)
- Effector (1)

(5 marks)

1.4

- Long axon allows fast transmission over distances
- Myelin sheath insulates for faster conduction
- Dendrites receive multiple impulses
- Axon terminals connect to effectors (4)

1.5

CNS: Brain + spinal cord; processes and coordinates responses.

PNS: All nerves outside CNS; transmits impulses to/from CNS. (4)

1.6

Neurotransmitters are chemicals released into synapses; they transmit impulses across the gap between neurons. (4)

QUESTION 2: Disorders and Injuries (25)

2.1

Spinal cord damage interrupts nerve transmission; can lead to paralysis or loss of sensation below injury site. (3)

2.2

- Slows reaction time
- Affects memory, coordination, and decision-making (2)

2.3

- Epilepsy: Abnormal brain activity causes seizures
- Parkinson's: Degeneration of neurons leads to tremors and stiffness (4)

2.4

- Meninges: Protect brain and spinal cord
- Cerebrospinal fluid: Cushions, provides nutrients, and removes waste (4)

2.5

MS is an autoimmune disease that damages the myelin sheath, slowing or blocking nerve impulse transmission. (4)

2.6

- Wear safety gear
- Avoid substance abuse
- Eat brain-healthy food
- Mental stimulation (Any 2 × 2 marks) (4)

SECTION B: HUMAN EVOLUTION (50 MARKS)

QUESTION 3: Evidence of Evolution (25)

3.1

- Fossil evidence
- DNA analysis
- Comparative anatomy (3)

3.2

- Australopithecus afarensis
- Homo habilis

- Homo erectus (3)

3.3

- Foramen magnum shifted forward
- Pelvis became shorter and broader
- Larger braincase (Any 3 × 2 marks) (6)

3.4

Bipedalism freed hands, allowed carrying tools and babies, improved view over tall grass. (4)

3.5

- a) Hominid: Member of the human lineage including great apes and humans (2)
- b) Fossil record: Preserved remains of ancient organisms showing evolutionary changes (2)

3.6

H. habilis: Smaller braincase, brow ridges, protruding jaw

H. sapiens: Larger braincase, flatter face, chin present (5)

QUESTION 4: Primate Comparison (25)

4.1

- Opposable thumbs
- Forward-facing eyes
- Rotating shoulder joints
- Social structures (Any 4) (4)

4.2

Humans form long-term pair bonds and have fewer offspring; apes mate seasonally or opportunistically. (2)

4.3

Shifted forward from back of skull to underneath; indicates upright posture and bipedalism. (3)

4.4

- Use of tools
- Development of language and art (4)

4.5

Mitochondrial DNA passes only from mothers, mutates slowly, useful for tracing maternal ancestry. (3)

4.6

All modern humans evolved in Africa and migrated outward, replacing local populations. (4)

4.7

- Not all organisms fossilise
 - Erosion or geological activity may destroy fossils (2)
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SECTION C: HOMEOSTASIS IN HUMANS (50 MARKS)

QUESTION 5: General Concepts (25)**5.1**

Homeostasis: Maintaining internal stability (e.g., temp, pH)

Important for enzyme function, survival (4)

5.2

Liver regulates:

- Blood sugar (glycogen storage)
- Detoxifies substances
- Deaminates proteins (4)

5.3

- Sweating
- Vasodilation (2)

5.4

- Blood glucose rises → pancreas releases insulin → glucose stored as glycogen
- Blood glucose drops → glucagon released → glycogen converted to glucose (6)

5.5

Negative feedback reverses a change to return body to normal.

E.g., body temp regulation. (3)

5.6

Hypothalamus monitors internal conditions and triggers hormonal or nervous responses. (3)

5.7

- Diabetes
 - Dehydration
 - Hypothermia (Any 2 × 1.5 marks) (3)
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QUESTION 6: Water and Temperature (25)**6.1**

- Kidneys filter blood
- Water reabsorbed in nephrons
- ADH increases permeability of collecting duct
- More reabsorption if dehydrated
- Less if overhydrated (5)

6.2

ADH = antidiuretic hormone

Secreted by pituitary

Increases water reabsorption in kidneys (4)

6.3

- Kidney failure
- Oedema
- Uraemia (Any 2) (2)

6.4

Sweating releases heat through evaporation → cools the skin (3)

6.5

- Hair raises/lowers
- Blood vessel diameter changes (vaso...) (2)


6.6

Body temp drops, metabolism slows, shivering begins, risk of organ failure if untreated (4)

6.7

Vasodilation: Blood vessels widen, more heat lost

Vasoconstriction: Blood vessels narrow, less heat lost (5)

 **TOTAL: 150 MARKS**