SMARTWIZ

GRADE12 LIFE SCIENCE EXAM

MARKS: 150

MARKS	

TIME: 2. 5 HOURS

SCHOOL _____

CLASS (eg. 4A) _____

SURNAME _____

NAME _____

Instructions for Learners:

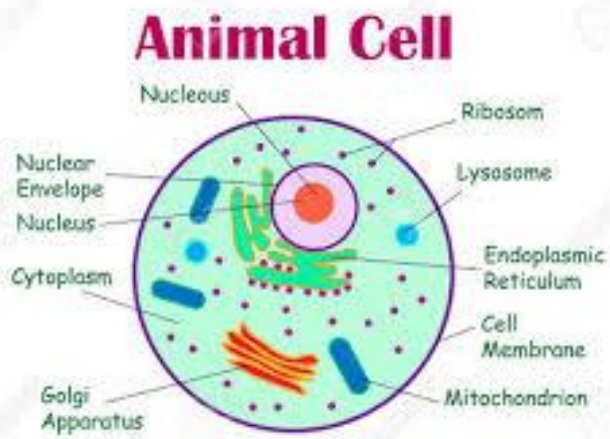
- Read all instructions carefully before you begin the exam.
- Write your full name and student number clearly on the answer sheet/book.
- Answer all questions unless otherwise instructed.
- Show all your work/calculations where necessary.
- Write neatly and clearly.
- Use only a blue or black pen. Do 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: CELL BIOLOGY AND MICROBIOLOGY (50 marks)

QUESTION 1 (20 marks)

1.1 Study the diagram below of an animal cell and answer the questions:



a) Which organelle is responsible for energy production in the cell?

_____ (2)

c) Explain the function of the nucleus.

_____ (3)

d) Describe the role of the cell membrane in maintaining homeostasis.

_____ (4)

e) What process occurs in the mitochondrion? Briefly explain.

_____ (6)

QUESTION 2 (15 marks)

2.1 Define the following terms:

a) Binary fission:

_____ (3)

b) Pathogen:

_____ (2)

2.2 Explain how bacteria can develop resistance to antibiotics.

_____ (5)

2.3 Outline two ways viruses differ from bacteria.

_____ (5)

QUESTION 3 (15 marks)

3.1 Describe the structure and function of the bacterial cell wall.

_____ (6)

3.2 Explain how vaccines help control viral diseases.

_____ (5)

3.3 List two human diseases caused by viruses and state one symptom for each.

_____ (4)

SECTION B: PLANT PHYSIOLOGY AND ECOLOGY (50 marks)

QUESTION 4 (20 marks)

4.1 Define photosynthesis.

_____ (2)

4.2 Write the balanced chemical equation for photosynthesis.

_____ (3)

4.3 Describe the role of chlorophyll in photosynthesis.

_____ (5)

4.4 Explain how stomata help in gas exchange and water regulation in plants.

_____ (6)

4.5 List two environmental factors that affect the rate of photosynthesis.

_____ (4)

QUESTION 5 (15 marks)

5.1 Explain how plants adapt to survive in arid (dry) environments.

_____ (8)

5.2 Define the term transpiration.

_____ (2)

5.3 Describe the importance of transpiration in plants.

_____ (5)

QUESTION 6 (15 marks)

6.1 Define the term niche in an ecosystem.

_____ (2)

6.2 Explain the difference between mutualism and parasitism.

_____ (6)

6.3 Describe the role of decomposers in an ecosystem.

_____ (7)

SECTION C: HUMAN REPRODUCTIVE SYSTEM AND GENETICS (50 marks)

QUESTION 7 (20 marks)

7.1 Draw and label the male reproductive system.
(Space for drawing)

7.2 Describe the function of the testes.

_____ (4)

7.3 Explain the role of testosterone in male reproduction.

_____ (5)

7.4 List two common reproductive health issues in males.

_____ (3)

QUESTION 8 (15 marks)

8.1 Define the terms homozygous and heterozygous.

_____ (4)

8.2 In pea plants, the allele for tall plants (T) is dominant over short plants (t). Cross a homozygous tall plant with a homozygous short plant and answer:

a) Write the genotypes of the parents:
_____ (2)

b) Write the genotypes and phenotypes of the F1 offspring:

_____ (3)

8.3 Explain what happens in a test cross and its purpose.

_____ (6)

QUESTION 9 (15 marks)

9.1 Explain the process of meiosis and its importance in sexual reproduction.

_____ (10)

9.2 Distinguish between mitosis and meiosis.

_____ (5)

TOTAL : 150

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SECTION A: CELL BIOLOGY AND MICROBIOLOGY

QUESTION 1

1.1 Label the diagram:

- A: Nucleus
- B: Mitochondrion
- C: Cell membrane
- D: Cytoplasm
- E: Ribosome (or Endoplasmic Reticulum, depending on diagram)

1.2 Organelle responsible for energy production:

- Mitochondrion

1.3 Function of the nucleus:

- Controls all cellular activities
- Contains genetic material (DNA)
- Regulates cell division and protein synthesis

1.4 Role of the cell membrane:

- Regulates movement of substances in and out of the cell (selective permeability)
- Maintains internal balance (homeostasis)
- Provides protection and structural support

1.5 Process in mitochondrion:

- Cellular respiration
- Breakdown of glucose with oxygen to produce ATP (energy), carbon dioxide, and water

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QUESTION 2

2.1 Definitions:

- Binary fission: Asexual reproduction process where one bacterial cell divides into two identical daughter cells.
- Pathogen: A microorganism that causes disease.

2.2 How bacteria develop antibiotic resistance:

- Mutations or gene transfer lead to traits that neutralize or evade antibiotics.
- Overuse/misuse of antibiotics selects for resistant bacteria.
- Resistant bacteria survive, reproduce, and spread resistance genes.

2.3 Differences between viruses and bacteria:

- Viruses are acellular, require a host to reproduce; bacteria are cellular and reproduce independently.
- Viruses have DNA or RNA; bacteria have DNA and cellular machinery.
- Viruses are generally smaller than bacteria.

QUESTION 3

3.1 Bacterial cell wall:

- Made of peptidoglycan
- Provides shape and protection against osmotic pressure
- Important for survival in various environments

3.2 How vaccines control viral diseases:

- Stimulate immune system to produce memory cells
- Prepare body for future exposure without causing illness

3.3 Viral diseases and symptoms:

- Influenza: Fever, cough, sore throat
- HIV/AIDS: Immune deficiency, weight loss

SECTION B: PLANT PHYSIOLOGY AND ECOLOGY

QUESTION 4

4.1 Photosynthesis:

- Process by which green plants convert light energy into chemical energy, producing glucose and oxygen from carbon dioxide and water.

4.2 Balanced chemical equation:
$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

4.3 Role of chlorophyll:

- Absorbs light energy, especially blue and red wavelengths
- Converts light energy to chemical energy during photosynthesis

4.4 Stomata in gas exchange and water regulation:

- Open to allow CO_2 in and O_2 out for photosynthesis
- Close to reduce water loss through transpiration
- Regulate gas exchange and water balance

4.5 Environmental factors affecting photosynthesis:

- Light intensity
- Carbon dioxide concentration
- Temperature
- Water availability

QUESTION 5

5.1 Plant adaptations to arid environments:

- Thick waxy cuticle to reduce water loss
- Reduced leaf surface area or spines (e.g., cacti)
- Deep or widespread root systems
- Ability to store water in stems or leaves
- CAM photosynthesis to fix CO_2 at night, reducing water loss

5.2 Transpiration:

- Loss of water vapor from plant leaves, mainly through stomata

5.3 Importance of transpiration:

- Helps transport water and minerals from roots to leaves
- Cools the plant by evaporative cooling
- Maintains turgor pressure for structural support

QUESTION 6

6.1 Niche:

- The role and position a species has in its environment, including habitat, resource use, and interactions

6.2 Mutualism vs Parasitism:

- Mutualism: Both species benefit (e.g., bees and flowers)
- Parasitism: One benefits (parasite), the other is harmed (host) (e.g., tapeworm in intestines)

6.3 Role of decomposers:

- Break down dead organic matter
- Recycle nutrients back into the soil
- Maintain ecosystem nutrient cycles
- Help in decomposition of waste materials

SECTION C: HUMAN REPRODUCTIVE SYSTEM AND GENETICS

QUESTION 7

7.1 Male reproductive system drawing should include:

- Testes
- Epididymis
- Vas deferens
- Seminal vesicles
- Prostate gland
- Penis

7.2 Function of testes:

- Produce spermatozoa (male gametes)
- Produce testosterone (male sex hormone)

7.3 Role of testosterone:

- Development of male secondary sexual characteristics (facial hair, deeper voice)
- Stimulates sperm production
- Maintains male reproductive tissues

7.4 Common reproductive health issues:

- Prostate enlargement
- Testicular cancer
- Erectile dysfunction
- Sexually transmitted infections (STIs)

QUESTION 8

8.1 Definitions:

- Homozygous: Having two identical alleles for a gene (e.g., TT or tt)
- Heterozygous: Having two different alleles for a gene (e.g., Tt)

8.2 Cross:
a) Parents: TT (homozygous tall) × tt (homozygous short)
b) F1 genotypes: All Tt (heterozygous)
F1 phenotypes: All tall plants (dominant trait expressed)

8.3 Test cross:

- Crossing an individual with unknown genotype with a homozygous recessive individual
- Used to determine the unknown genotype based on offspring phenotypes

QUESTION 9

9.1 Meiosis and importance:

- A type of cell division producing four genetically diverse haploid gametes
- Involves two divisions (meiosis I and II)
- Reduces chromosome number by half
- Allows genetic recombination via crossing over
- Ensures genetic variation in offspring
- Essential for sexual reproduction

9.2 Difference between mitosis and meiosis:

Aspect	Mitosis	Meiosis
Number of divisions	1	2
Number of daughter cells	2 diploid	4 haploid
Genetic variation	Daughter cells identical	Daughter cells genetically different
Purpose	Growth and repair	Production of gametes

TOTAL : 150