

**TANZANIA HEADS OF ISLAMIC SCHOOL COUNCIL (TAHISCO)**

**INTER ISLAMIC MOCK EXAMINATION**

**BIOLOGY 02**

**MARKING SCHEME 2026**

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1. (a) Homeostatic role of urinary system:

- Water balance: Kidney as part of urinary system play a role in urine formation, through these they maintain water level in a body.
- Blood pressure regulation – Kidney enable/support in rising blood pressure when it is too low, by producing a blood vessel constricting protein (angiotensin) which also enable retention of sodium and water in a body.
- Both constriction of blood vessel and water mineral retention ensure help to restore normal blood-pressure
- Regulation of pH of blood – Kidney as part of urinary system excrete hydrogen ion (H<sup>+</sup>) through urine at the same time conserve hydrogen carbonate which are important buffer of hydrogen ions in blood.
- Regulation of ionic composition of blood – It regulate quantities of ions in a blood. Some ions regulated by kidney are sodium ions, chloride ion, calcium ions.

**Any 04 points @ 01 mark = 04 marks**

**Any 04 explanation @ 01 mark = 04 marks**

(b) Adaptation of Renal corpuscle

(It consist of Glomerulus and Bowman's capsule)

- Bowman's capsule consist of PODOCYTES which are highly modified/specialized filtration cells
- Consist of network of fibres such as collagen fibres with space between them which allow passage of small solute molecule in filtrate (restrict passage of blood cells)
- Glomerulus consists of endothelial cells with fenestrae (pores)
- Glomerulus being highly coiled it generate hydrostatic pressure since allow move blood enter via afferent vessel and blood leaves via efferent vessel.

**Any 03 points @ 02 marks = 06 marks**

Adaptation of Distal convoluted tubule (DCT)

- Have microwell lining the inner surface membrane to increase surface area for absorption of material (water and salts) on epithelial cell.
- Have mitochondria in epithelial cell supply energy for active transport

- DCT are much coiled to increase surface area for absorption
- DCT tubule are surround/contract with blood vessel to ensure easily absorption of material

**Any 03 points @ 02 marks = 06 marks**

2. (a) Population explosion refers to increase of population of a given species in an area leading to strain on natural resources. **(01 mark)**

- **CAUSES OF POPULATION EXPLOSION**

- Population explosion can be caused by (NATALITY, MORTALITY, IMMIGRATION & EMMIGRATION)
- Natality (birth rate) and immigration increases population size while
- Mortality and emigration causes decreases of population size
- Population explosion overgrowth enameete from increased food production and distribution, Improved public services such as (water, sanitation), improved medical technology and communication.

**Any 04 points @ 01 mark = 04 marks**

- **BIOLOGICAL CONSEQUENCES OF POPULATION EXPLOSION**

- Competition for available natural sources such as food and space (mostly experienced in area inhabited like
- In human refugees population (explain) cause, social impact like poverty, famine
- Rapid spread of Epidemic diseases such as cholera where the chance of being infected increases with increase of over crowding
- Introduction of exotic species has often caused Ecological disturbance as the introduced species struggle and adapt to new environment

**Any 03 points @ 01 ½ mark = 04 ½ marks**

- **ENVIROMNETAL CONSEQUENCES OF POPULATION EXPLOSION**

- May lead to POLLUTION in which water, soil and air are negatively affected (since population increase rapidly this may cause introduction of substance/contaminant and make environment unfit for use)
- DEPLETION of ozone layers, The emission of chloroform ozone layer depletion
- Can cause OVER EXPLOITATION OF NATURAL RESOURCES due to increased need of the resources by increased population.

**Any 03 points @ 01 ½ mark = 04 ½ marks**

(b) Biotic components Interaction of Ecosystem:

- Competition – Organization in Ecosystem struggle for scarce of resources e.g. male gazelle compete for mate
- Predation – Is the relationship between predator and prey
- Grazing – Is the interaction between herbivores when feed on primary producers
- Symbiosis – Is the relationship between two or more organism of different species they live together

**Any 4 points = 01 mark = 04 marks**

**Any 04 explanation @ 00 ½ = 02 marks**

3. Life cycle of plasmodium

It involves three stages which are:

PRE-ERYTHROCYTIC stage

ERYTHROCYTIC stages

SPOROGENIC stage

Pre-erythrocyte stage Is the first stage of life cycle of plasmodium

- It involve from when a female mosquito take a blood meal to human host and inject the sporozoites into human blood
- The sporozoite travel within blood stream and then invade the liver cell (Hepatol cycle)
- Inside liver cell the sporozoite from of plasmodium eat, grow, divided and produce many haploid form called Merozoites or schizonts in liver cells.
- The merozoite is liver break/lysis, exit and reenter blood stream again to start another stage called Erythrocytic.

**04 marks**

Erythrocytic stage This stage occur immediately after preerythrocytic stage when the merozoite entered blood stream invade Red blood cell (Erythrocyte).

- Merozoite in RBC multiply mitosis (asexual production) where they develop schizont (feeding stage)
- Schizont rupture the cells releasing newly formed merozoite which invade other red blood cells, but
- Some of merozoite infect RBC leave cycle of asexual replication
- Instead these few merozoite develop into sexual forms of parasite called male and female gameto cytes where they are sucked again by female mosquito when take blood meal this is another stage called sporogenic

**04marks**

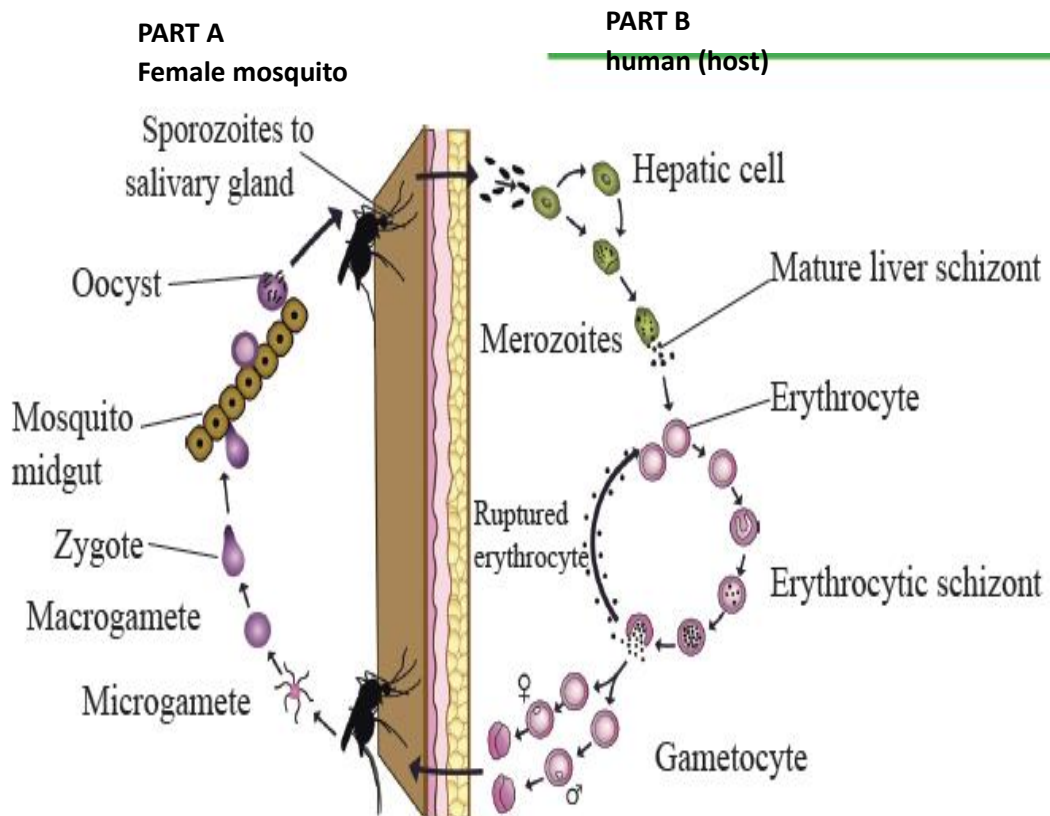
### **SPOROGENIC STAGE**

- The sporogenic stage occur when the male and female gametocyte are sucked by mosquito (female) when take bite to human host
- To male and female gametocyte of plasmodium travel to the stomach mid got where they fuse upto form diploid zygote which develop into moving ookinete.
- The ookinete burrows in the mid got wall of mosquito forming oocysts, on the other side
- Oocysts form produce numerous active form of haploid cell called sporozoite
- After 8 days to 15 days (depending on the species) the oocysts burst thus releasing sporozoite into body carity of mosquito
- The sprozoite travel to and invade the salivary gland of female mosquito

**06 marks**

NB: The cycle of human infection will restarts when the mosquito taking a blood meal and infects the sporozoite from salivary glands into human blood stream.

## DIAGRAM OF LIFE CYCLE OF PLASMODIUM



**CA = 01 mark**

**CD = 01 mark**

**LABELLING any 8 parts@001/2 mark = 04 marks**

### 4. Features of Genetic code

- Code is triplet The group of 3 letter bases they specify one amino acid corresponding are called CODE, These codon are three letter found in MRNA
- Code is Punctuated – Genetic code has start signal and stop signal where start signal are found for initiation of polypeptide chain and stop signal/termination codon are found destination of polypeptide chain
- Code is degenerate Are single amino acid can be coded by more than one codon means some codons are synonyms. Example amino acid called Threonine can be coded by ACU, or ACC or ACA
- Code is non-overlapping The code is read in groups of three letter without overlapping
- Universal

**Any 4 features/point @ 01 mark = 04 marks**

**Any 4 explanation @ 00 ½ mark = 02 marks**

(b) Phenotype ratio are:

$\frac{418}{36}$  red       $\frac{106}{36}$  purple       $\frac{36}{36}$  white

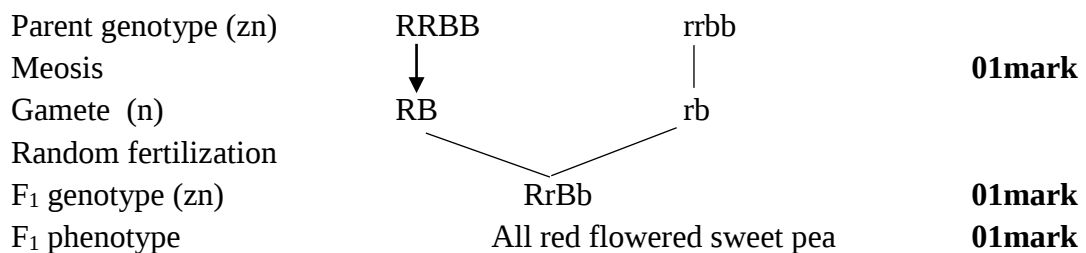
12 red      3 purple      1 white      **01mark**

The ratio indicates principle of inheritance is DOMINANT EPISTASIS **01mark**

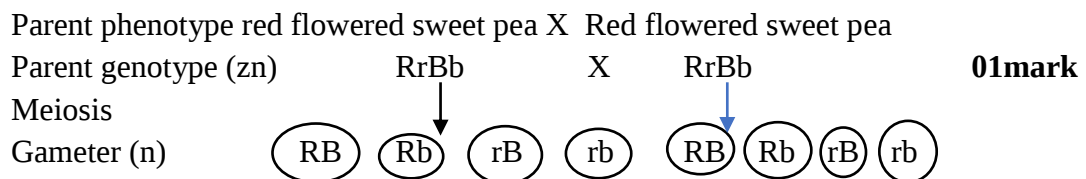
Let

Allele of Gene for be      R  
 Allele of gone for purple be      B      **01mark**  
 Allele of gone for white be      b

Parent phenotype X Red flowered plant X White flowered plant of sweet pea  
 of sweet pea      **01mark**



(b) In order foget F<sub>2</sub> generation the F<sub>1</sub> generation were self crossed:-



Ponnet square to who gamete fusion in F<sub>2</sub> generation

| Gamete | Gamete |       |      |      |
|--------|--------|-------|------|------|
|        | RB     | Rb    | rB   | rb   |
| RB     | RRBB   | RRBb  | RrBB | RrBb |
| Rb     | RRBb   | RRbb  | RrBb | Rrbb |
| rB     | Rr BB  | Rr Bb | RrBB | RrBb |
| Rb     | Rr Bb  | Rr bb | rrBb | rrbb |

**04marks**

| Key | Phenotype | Ratio |
|-----|-----------|-------|
| √   | Red       | 12    |
| X   | Purple    | 3     |
| •   | White     | 1     |

**01 mark**

5. (a) Weakness of Lamark's Theory

- It is not true that, the use or disuse of body organs (parts) determine their existence or disappearance

- It does not explain how characteristics are inherited from one generation to another
- Organisms do not form new organs simply by their will or environment
- Lamarck did not include knowledge of genetics

**Any 04 points @ 02 marks = 08 marks**

(b) Mechanism responsible for natural arising of a new speciation (speciation)

- Mutation is the sudden heritable change in genetic makeup of organism. Normally mutation is beneficial to make organism best adapted to their environment and many survive then results in the formation of new species. Mutation commonly gamete/reproductive cell.
- Genetic recombination is the process whereby traits from different organisms are combined to give a particular trait
- The mixture of traits formed may be good from organism to adapt environment. The organisms formed under natural selection are naturally selected to survive and produce new species which have suitable traits to environment
- Natural selection is the mechanism which keeps species on changing without being complicated in order to match the need of environment. In this case nature selects only those best traits whose better adapted to environment and able to survive in that environment
- Natural selection chooses only species with best features.
- Reproductive isolation is the process of separating one species from other species. Here organisms are prevented to mate and reproduce
- Selective breeding artificial selection
- Genetic drift Sewall Wright effect
- Geographical isolation

**Any 04 points @ 01 mark = 04 marks**

**Any 04 explanation @ 02 mark = 08 marks**

**= 12 marks**

6. (a) Mitosis is the type of nuclear division where a mother cell divides to form daughter cells with same numbers of chromosomes.

Mitosis involves four stages which are preceded by preparation phase called interphase

- INTERPHASE
- The cell organelles replicate and the cell increases in size
  - Increase of energy stored in the cell
  - Centrioles if present replicate.
  - Replication of genetic materials (DNA and RNA)
  - Chromosomes exist as a pair of chromatids joined by centromere

**Any 3 points 00 ½ mark = 01 ½ marks**

**Any 1 mark for diagram**

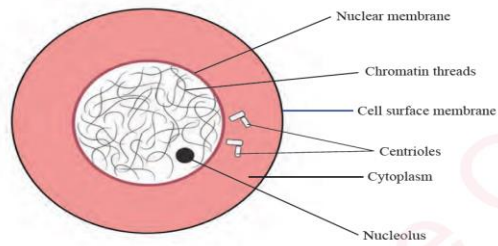


Figure 2.2 Interphase stage of mitosis

The four stages are

(i) Prophase (ii) Metaphase (iii) Anaphase (iv) Telophase

- PROPHASE**
- Nuclear membrane/envelop start directorate/breakdown
  - Spindle fibre start forming from centriole
  - Chromosome become visible as chromatid condense and shorten
  - Centriole migrate to opposite pole
  - Nucleolus start to disappears

**Any 3 points 00 ½ mark = 01 ½ marks**

**Any 1 mark for diagram**

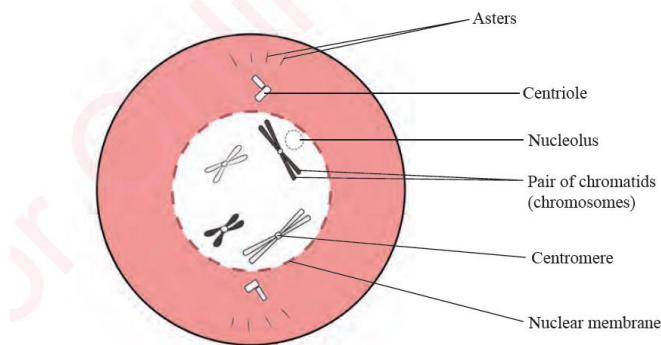


Figure 2.3 Prophase stage of mitosis

## METAPHASE

- Chromosome line up at the middle (equator) of the cell
- Spindle fibre hold the chromosome at centromeres
- Nuclear membrane decompose completely
- Spindle fibre form completely

**Any 3 points 00 ½ mark = 01 ½ marks**

**Any 1 mark for diagram**

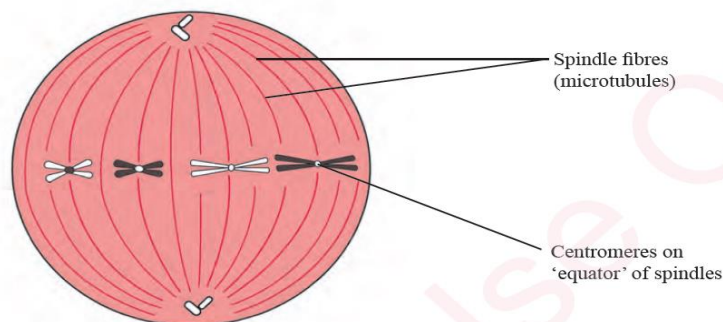


Figure 2.4 Metaphase stage of mitosis

## ANAPHASE

- Spindle fibre shorten and pull chromatid to opposite pole
- Sister chromatids from when chromosome split
- Chromatid migrate toward opposite pole

**Any 3 points 00 ½ mark = 01 ½ marks**

**Any 1 mark for diagram**

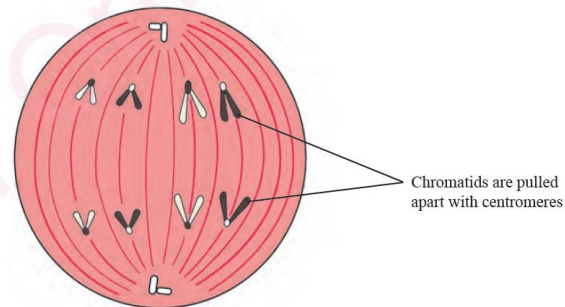


Figure 2.5 Anaphase stage of mitosis

## TELOPHASE

- Chromatids reach the pole and form chromosome
- Nuclear reforms
- Nuclear membrane reform around each set
- Chromosome start to uncoil
- Spindle fibre dis appear

**Any 3 points 00 ½ mark = 01 ½ marks**

**Any 1 mark for diagram**

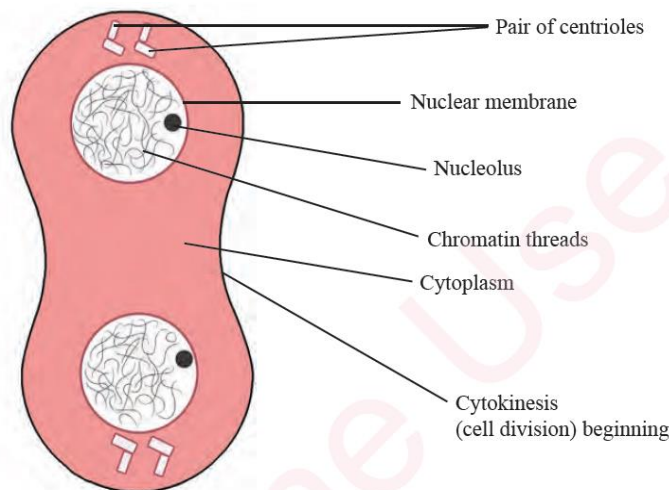


Figure 2.6 Telophase stage of mitosis

## Significance of mitosis

Maintain genetic stability because daughter cells are identical to parent

- Enhances growth through increase in the number of cells
- It is a means of healing of wound and replacement of worn out cells
- Enhances regeneration of parts of an organism example lizard tail
- Means asexual/basis of asexual reproduction to unicellular organism such as protozoan.

**Any 04 points @ 01mark = 04marks]]=**