

TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION

Biology 2

133/2

(for both School and private candidates)

MARKING SCHEME

RM

1. (9) The main problems associated with the transition from an aquatic to terrestrial.

→ Desiccation. Air is a drying medium and water is essential for life for many reasons. Means of obtaining water and conserving it are required.

→ Delicate sex cells must be protected and motile male gametes require water if they are to reach the female gametes.

→ Air offers no support to the plant body

→ Environmental Variables. Water provides a very constant environment. A terrestrial environment is much more subject to changes in important factors such as temperature, light intensity, ionic concentration and pH.

→ Difficulties in obtaining water and nutrients as major raw materials in food production.

Any 6 points @ 2 = 12 marks.

(b) Adaptations of seed-bearing plants to life on land.

- The gametophyte generation is much reduced.

- Fertilization is not dependent on water

1(b) - The fertilized ovule (seed) is retained for some time on the parent sporophyte from which it obtains protection and food before dispersal.

- Many seed plants show secondary growth with production of large amount of wood.

Any four points @ 2 = 8 marks

2 (a) The significance of excretion and osmoregulation

- Removal of unwanted by-products of metabolic pathways
- Removal of toxic wastes.
- Regulation of ionic concentration of body fluid.
- Regulation of water content of body fluids.
- Regulation of pH of body fluid.
- Detoxification of harmful materials.
- Useful in water balance of the body.

Any 7 points @ 02 = 14 marks

b) Adaptation of the proximal convoluted tubule to its functions.

- Presence of microvilli and basal channels to increase the surface area for reabsorption.
- Presence of numerous mitochondria for energy production used in active reabsorption of materials.
- Close proximity between proximal tubule and blood capillaries which ensure continuous uptake of materials.

Any 3 points @ 02 = 06 marks.

3. a) Three phases of growth in multicellular organisms.

(i) Cell division - An increase in cell number as a result of mitosis.

(ii) Cell enlargement - An irreversible increase in cell size as a result of the uptake of water or synthesis of living materials.

(iii) Cell differentiation (specialization) -

The specialization of cells to perform specific function.

3 points @ 01 = 03 marks.

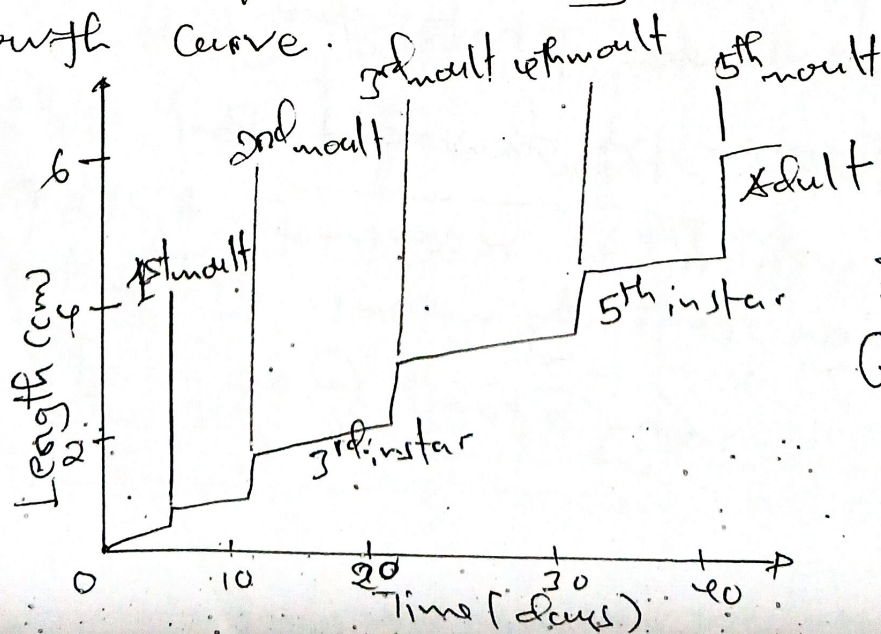
3 (b) Importance of mitosis.

- Genetic stability - mitosis produces two nuclei which have the same number of chromosomes as parent cell.
- Growth - The number of cells within an organism increases by mitosis and this is the basis of growth in multicellular organism.
- Cell replacement - Cells are constantly dying and being replaced through the process of mitosis.
- Regeneration of body parts - For some animals such as Lizards can regenerate a tail when it is accidentally cut. The cells in remaining part divide by mitosis and reform the lost part.
- Asexual reproduction - Binary fission in bacteria as a means of asexual reproduction involves mitosis of one bacteria into two.
- Repair of damaged part of the body - The wound is recovered by the production of new cells by means of mitosis.

∴ Any 5 points @ 02 = 10 marks

3 b(ii) Growth Pattern of arthropods.

- Arthropods such as cockroach exhibit a type of limited growth known as discontinuous or intermittent growth pattern.
- Arthropods often moult periodically to grow because their hard inelastic exoskeleton does not expand to allow growth.
- Two hormones known as a juvenile (neotenin) and ecdysone hormone control the process of moulting.
- Moulting is followed by a sharp increase in body size often before exoskeleton hardens and limit growth.
- Therefore, in arthropods growth occurs in spurts resulting in a step-like growth curve.



Explanation = 5 marks
Graph = 2 marks

4

Solution

(i) Interpretation of results.

- According to Mendel's Second Law, each characteristic in a dihybrid cross behaves independently of the other. Thus treating each characteristic separately we have:-

- Considering position of the flowers

Axial

338 + 304

642

193

Terminal

109 + 34

143

193

01 marks

00 1/2 marks

00 1/2 marks

00 1/2 marks

2 marks

= 3

1

00 1/2 marks

- The ratio 3:1, is a basic monohybrid ratio obtained in a cross between two heterozygous individuals.

- From this ratio, axial flowers are dominant over terminal flowers.

- Considering colour of the flower

Purple

304 + 109

413

413

1

White

338 + 84

422

413

1

00 1/2 marks

00 1/2 marks

00 1/2 marks

00 1/2 marks

2 marks

4 (i) The ratio 1:1 is a monohybrid test cross ratio obtained from a cross between heterozygous dominant and homozygous recessive.

- Therefore Purple was recessive and white was dominant.

Let: Axial be A

terminal be a

white be W

Purple be w

02 marks

- Since the parents in the first cross were all pure breeding ($AAWW \times aaww$) the product obtained were all $AaWw$. Therefore the second cross involves the product in first cross ($AaWw$) and Axial purple flower of unknown which is now known as ($Aaww$).

P₂ Phenotypes: Axial white X Axial purple

P₂ Genotypes: $AaWw \times Aaww$

Meiosis

Gametes AW, Aw, aW, aw

Aw, aw

007 2 marks
007 2 marks
007 2 marks
007 2 marks

4(c) Punnett Square.

$\begin{matrix} \sigma \\ \phi \end{matrix}$	AW	Aw	aW	aw
Aw	AAWw	AAww	AaWw	Aaww
aw	AaWw	Aaww	aaWw	aaww

0.25 marks

The phenotypes are in the following proportions

$\frac{3}{16}$ Axial white $\frac{1}{2}$ marks
 $\frac{3}{16}$ Axial purple $\frac{1}{2}$ marks
 $\frac{1}{16}$ Terminal white $\frac{1}{2}$ marks
 $\frac{1}{16}$ Terminal purple $\frac{1}{2}$ marks

(ii) The first cross involved pure terminal purple (aaWW) and axial white (AAww)

P₁ phenotype: terminal purple x Axial white.

P₁ genotype: aaWW x AAww - $\frac{1}{2}$ marks

Meiosis

Gametes

aw

AW

$\frac{1}{2}$ marks

$\frac{1}{2}$ marks

Fertilization

F₁ genotypes: AaWw $\frac{1}{2}$ marks

F₁ phenotypes: All Axial white flowers $\frac{1}{2}$ marks

5 (9) Neo-Darwinism, is the theory of organic evolution by natural selection of genetically determined characteristics. 1 mark.

- According to this theory, the origin of species by natural selection is brought about by changes in the gene frequency or genotypes in large population.

As a result, some of the genotypes tend to be naturally selected for and others are selected against, and hence eliminated from the population.

- The following are evidences that support Neo-Darwinism.

① Genetic recombination

- During gamete formation, the exchange of genetic materials in prophase of meiosis I results in the formation of new characters which may be good for the organism to adapt to its environment. This is then passed to the next generation.

- In this way, organisms that are formed are best adapted to their environment and nature tends to favour their existence.

(iv) Genetic drift or Sewall Wright effect.

- Genetic drift refers to the elimination of genes of certain traits when a section of the population migrates or dies due to natural calamity.
- Genetic drift is the change or variation in the gene frequency as a matter of chance.

(v) Natural selection

- The role of natural selection is to ensure that favourable genes are maintained and unfit ones are eliminated.
- Examples includes industrial melanism in peppered moths and Pesticides resistance in insects when the change of environment favours better adapted genes and eliminating less adapted genes.

3 points @ 2 = 6 marks.

5 (b) Evidence of evolution.

- Palaeontology
- Geographical distribution
- classification
- Artificial selection (plants and animal breeding).
- Comparative embryology
- Comparative anatomy
- Adaptive radiation
- Comparative biochemistry

Any 7 points @ 2 = 14 marks.

6 (a) The shortfall of Pyramid of biomass.

(i) The determination of dry mass is destructive since it involves killing of organisms.

(ii) It is impossible to measure the biomass of all individuals in a population and therefore only a small sample of individuals is taken and this may not reflect the reality.

6 (i) (ii) It is more laborious and expensive in terms of time and equipment.

~~Notes~~ (iii) The seasons during which biomass is measured affects the results unless the biomass measurements are recorded during the same season.

Definition 2 marks.

Any 4 points @ 0.2 = 0.8 marks.

(b) Factors causes Zonation of living organism.

(i) Variation of physical environment such as sanitation, precipitation, wind, temperature etc.

(ii) Variation in population pressure.

(iii) Variation of chemistry of environment such as pH, salinity etc.

(iv) Competition

(v) Predation and

(vi) Parasitism and diseases.

Any 5 points @ 2 = 10 marks.