

2024 END-OF-SEMESTER EXAMS – BIOLOGY 2 SOLUTION

BIOLOGY

SHS ONE

1. (a)(i) Define the scientific method The scientific method is a systematic approach used by scientists to investigate natural phenomena, solve problems, and acquire new knowledge. It involves a series of steps designed to ensure objectivity, consistency, and reliability in the process of inquiry.

(ii) List the steps in the scientific method

1. **Observation** and formulation of a question: This is the initial step where an observation is made about a natural phenomenon, and a question is formulated based on that observation.
2. **Data Collection and Hypothesis:** Relevant data is collected, and a hypothesis is formulated to explain the observed phenomenon. The hypothesis is a tentative explanation that can be tested through experimentation.
3. **Testing** the hypothesis: The hypothesis is tested through controlled experiments or observations to determine its validity. The aim is to gather empirical evidence to support or refute the hypothesis.
4. **Analysis and Conclusion:** The data collected from experiments is analyzed using statistical and scientific methods to draw conclusions. Based on the analysis, the hypothesis is either accepted, rejected, or modified. Conclusions are drawn, and future avenues for research may be identified.

(b)(i) Complete the table below

Stain	Structure	Stained Colour
Starch	Cellulose	Blue
Eosin	Cellulose	Red
Haematoxylin	Nucleus	Blue
Leishman's stain	Blood cells	Pink

(b)(ii) What is locomotion? Locomotion refers to the ability of an organism to move from one place to another independently.

(b)(iii) State five reasons why animals locomote

1. Finding food: Animals need to move in search of food to meet their nutritional requirements.
2. Escaping from predators: Locomotion allows animals to flee from predators and avoid danger.
3. Reproduction: Animals may need to move to find mates for reproduction.
4. Migration: Many animals migrate seasonally to find better resources or suitable breeding grounds.
5. Environmental conditions: Animals may need to move to find suitable habitats with favorable environmental conditions such as temperature, humidity, or shelter.

2. a) Explain the following branches of biology:

(i) Botany: Botany is the branch of biology that focuses on the scientific study of plants. It encompasses various aspects of plant life, including their structure, growth, development, reproduction, metabolism, evolution, and ecological roles. Botanists study a wide range of plant types, from microscopic algae to towering trees, and investigate their interactions with the environment.

(ii) Entomology: Entomology is the branch of biology dedicated to the study of insects. It involves the scientific examination of insect anatomy, physiology, behavior, ecology,

taxonomy, and evolution. Entomologists play crucial roles in agriculture, public health, conservation, and forensic science by studying insect pests, disease vectors, beneficial insects, and their impact on ecosystems.

(iii) Pomology: Pomology is a specialized branch of botany that specifically deals with the study and cultivation of fruit-bearing plants. Pomologists focus on aspects such as fruit development, genetics, breeding, cultivation techniques, and post-harvest management. They contribute to the improvement of fruit quality, yield, and disease resistance in various fruit crops.

(b) (i) Give four (4) differences between autotrophic nutrition and heterotrophic nutrition:

Autotrophic Nutrition	Heterotrophic Nutrition
Organisms produce their own food	Organisms obtain food from external sources
Examples include plants, algae, and some bacteria	Examples include animals, fungi, and most bacteria
Energy source is typically sunlight	Energy source is organic matter
Primary producers in food chains/webs	Consumers in food chains/webs

(b) (ii) Name the locomotory structures in the following organisms:

Organism	Locomotory Structure
Euglena	Flagellum
Paramecium	Cilia
Fish	Fins
Birds	Wings
Bat	Wings

(b) (iii) Mention five (5) excretory products of plants:

1. Oxygen: Released during photosynthesis as a byproduct.
2. Water: Excreted through transpiration and guttation.
3. Organic acids: Released from root hairs during ion exchange processes.
4. Resins: Secreted by certain plants to deter herbivores or seal wounds.
5. Ethylene: A plant hormone involved in fruit ripening and senescence.

3. (a) Differentiate between (i) Transverse section and longitudinal section of an object

Transverse section: A transverse section is a cut made across the long axis of an object, resulting in a cross-sectional view. **While**

Longitudinal section: A longitudinal section is a cut made along the long axis of an object, resulting in a view of its internal structures along its length.

(ii) Radial symmetry and bilateral symmetry

Radial symmetry: is a type of symmetry where body parts are arranged around a central axis, similar to spokes on a wheel. **while**

Bilateral symmetry: is a type of symmetry where an organism can be divided into two equal halves along a single plane, resulting in mirror-image halves.

(b)(i) Define heterotrophic nutrition

- Heterotrophic nutrition is a mode of nutrition in which organisms obtain organic molecules as a source of energy and carbon by consuming other organisms or their organic products.

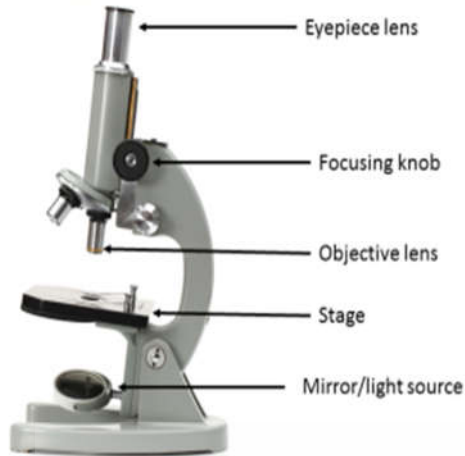
(ii) Mention three (3) types of heterotrophic nutrition and give an example of organism for each

1. Holozoic nutrition: Organisms ingest complex organic substances and digest them internally. Example: Humans (ingest food and digest it in the digestive system).
2. Saprophytic nutrition: Organisms feed on dead or decaying organic matter. Example: Fungi (decompose organic matter in the soil).
3. Parasitic nutrition: Organisms live on or inside other organisms (hosts) and obtain nutrients at the expense of the host. Example: Tapeworms (live in the intestines of vertebrates and absorb nutrients from the host's digested food).

(c). Mention five differences between plants and animals in the table below

Characteristic	Animals	Plants
Cell Wall	Typically absent (in most animal cells)	Present, composed of cellulose
Mode of Nutrition	Heterotrophic, rely on external sources for organic compounds	Autotrophic, capable of synthesizing organic compounds through photosynthesis
Locomotion	Most animals are capable of locomotion, either through muscle contractions or other means	Most plants are stationary and do not exhibit locomotion
Reproduction	Usually involves internal fertilization and live birth (in mammals) or laying eggs (in birds and reptiles)	Often involves both sexual and asexual reproduction; some plants can reproduce via seeds, spores, or vegetative propagation
Response to Stimuli	Generally exhibit rapid responses to stimuli, such as movement or behavioral changes	Responses to stimuli are often slower and may involve growth or tropisms, such as phototropism or gravitropism

4. (a) Name the parts labelled **I** to **IV** in **A** and **B**



(b) Calculate the magnification of the microscope if the eyepiece has a power of $\times 20$ and the objective has a power of $\times 60$.

- To calculate the total magnification of a microscope, you multiply the magnification of the eyepiece by the magnification of the objective lens.
- Total magnification = Eyepiece magnification \times Objective magnification
- Total magnification = $20 \times 60 = 1200$
- Therefore, the magnification of the microscope is 1200.

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