THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 BIOLOGY 1

Time: 3 Hours **ANSWERS** **Year: 2013**

Instructions

1. This paper consists of section A, B and C.
2. Answer all questions in section A and two questions from section B and C.

1. State six ways in which a Biologist can avoid accidents in a laboratory.

One way a biologist can avoid accidents is by wearing appropriate personal protective equipment, such as gloves and goggles, to shield against chemical splashes or biological hazards.

Another method is ensuring proper labeling and storage of chemicals, which prevents mix-ups and reduces the risk of spills or reactions.

Maintaining a clean and organized workspace helps prevent tripping hazards or contamination, ensuring a safe environment for experiments.

Following standard operating procedures, such as handling glassware carefully, minimizes the risk of breakage or injury during practicals.

Regular inspection and maintenance of equipment, like microscopes, ensure they function safely and reduce the likelihood of malfunctions.

Lastly, providing safety training and emergency drills equips biologists to respond effectively to incidents like chemical fires or spills.

2. (a) What is the role of T-cell in the immune response?

(b) Give short explanation on how the skin protects the body against infection.

(a) What is the role of T-cell in the immune response?

T-cells play a crucial role in the immune response by recognizing and attacking infected or abnormal cells. They activate other immune cells, such as B-cells, to produce antibodies and coordinate the body's defense against pathogens like viruses.

(b) Give short explanation on how the skin protects the body against infection.

The skin acts as a physical barrier, preventing the entry of pathogens by its outer layer of dead, keratinized cells. It also secretes antimicrobial substances, like sweat, which inhibit bacterial growth, and contains immune cells that detect and neutralize invaders.

3. (a) Briefly explain what would happen if group A blood is transfused into a person with group B or O blood.

(b) Name the two types of mutation.

(a) Briefly explain what would happen if group A blood is transfused into a person with group B or O blood.

Transfusing group A blood into a person with group B or O blood would trigger an immune reaction. The recipient's antibodies, present in group B (anti-A) or O (anti-A and anti-B), would attack the A antigens on the donated red blood cells, leading to agglutination, clot formation, and potentially life-threatening complications.

(b) Name the two types of mutation.

The two types of mutation are point mutation, which involves a change in a single nucleotide base, and chromosomal mutation, which affects larger segments of DNA or entire chromosomes.

4. Give three differences between glycolysis and fermentation.

One difference is that glycolysis occurs in the cytoplasm and produces pyruvate, yielding a net gain of 2 ATP, while fermentation also occurs in the cytoplasm but converts pyruvate into products like lactate or ethanol without additional ATP.

Another difference is that glycolysis requires glucose and does not require oxygen, serving as a universal energy pathway, whereas fermentation is an anaerobic process that follows glycolysis only when oxygen is absent.

Lastly, glycolysis feeds into the Krebs cycle in aerobic conditions, producing NADH for further energy, while fermentation regenerates NAD+ for glycolysis to continue, without entering oxidative phosphorylation.

5. List six major components of a Biology teacher's guide.

One component is the lesson objectives, which outline what students should learn, such as understanding photosynthesis.

Another is the teaching strategies, providing methods like group discussions to engage learners on topics like cell division.

The guide includes content outlines, detailing topics such as respiration to ensure comprehensive coverage.

It contains assessment tools, like quizzes on genetics, to evaluate student progress.

Resource suggestions, such as diagrams or videos for ecology, are included to enhance teaching.

Finally, it offers time allocation, guiding teachers on how long to spend on each lesson, like 40 minutes for osmosis.

6. Give three properties that account for the DNA's suitability as a material heredity.

One property is the double-helix structure, which allows DNA to store genetic information stably and be replicated accurately during cell division.

Another is the complementary base pairing (A-T, G-C), enabling precise copying and repair mechanisms to maintain genetic integrity.

Lastly, its chemical stability, due to the sugar-phosphate backbone, ensures that DNA can persist across generations without degradation under normal cellular conditions.

7. Compare anaerobic respiration in yeast cell and lactic fermentation in vertebrate muscle cell during strenuous activity.

Anaerobic respiration in yeast cells produces ethanol and carbon dioxide as end products, occurring during fermentation when oxygen is scarce, such as in bread making.

Lactic fermentation in vertebrate muscle cells produces lactate as the end product during strenuous activity, providing energy when oxygen supply is limited, leading to muscle fatigue.

Both processes regenerate NAD+ to sustain glycolysis, but yeast fermentation contributes to alcoholic beverages, while lactic fermentation causes temporary muscle soreness in humans.

8. Outline six things that are likely to occur if a Biology teacher goes into a class to teach Biology without preparations.

One outcome is disorganized teaching, as the lack of a plan may lead to skipping key topics like cell structure.

Another is student confusion, as unclear explanations on photosynthesis may leave learners disoriented.

The teacher may lose credibility, as unpreparedness on genetics could undermine student trust.

Classroom management may suffer, with unprepared activities causing disruptions during lab work.

Learning outcomes may not be achieved, as unaddressed concepts like respiration hinder assessment success.

Finally, time may be wasted, with inefficient pacing on topics like evolution reducing lesson effectiveness.

9. Briefly explain six uses of scheme of work in teaching and learning.

A scheme of work provides a timeline, ensuring topics like cell division are covered within the academic term.

It guides lesson planning, helping teachers prepare detailed sessions on osmosis based on weekly goals.

It ensures curriculum coverage, guaranteeing all areas, such as ecology, are addressed systematically.

It aids assessment scheduling, allowing tests on respiration to align with completed units.

It facilitates resource allocation, ensuring materials for dissections are available when needed.

Lastly, it supports teacher collaboration, enabling consistent teaching across classes on genetics.

10. Analyze the importance of a syllabus as one of the curriculum material in teaching and learning Biology.

A syllabus provides a clear framework, outlining topics like photosynthesis to guide teachers and students.

It ensures consistency, standardizing content across schools for subjects like cell biology.

It aids in assessment design, aligning tests on respiration with intended learning outcomes.

It supports resource planning, helping teachers gather materials for practicals like microscopy.

It offers a progression guide, structuring lessons from basic to advanced topics like genetics.

Finally, it enhances accountability, ensuring all required biology content is delivered effectively.

11. Describe seven methods that can be used in conservation of the endangered species in the ecosystem.

One method is habitat restoration, replanting forests to provide safe habitats for species like the giant panda.

Another is captive breeding, raising endangered animals like the whooping crane in zoos for release into the wild.

Legislation and enforcement protect species, such as banning ivory trade to save elephants.

Public education raises awareness, encouraging conservation efforts for species like the tiger.

Controlled hunting limits prevent overexploitation, protecting deer populations from extinction.

Reintroduction programs release bred animals, like the California condor, back into their natural habitats.

Finally, monitoring populations with technology, such as tracking devices, helps manage species like the snow leopard.

12. (a) State four rules of binomial nomenclature.

(b) Explain six economic importance of bacteria in our daily life.

(a) State four rules of binomial nomenclature:

The first rule is that the scientific name consists of two parts, the genus and species, like Homo sapiens.

The second rule is that the genus name is capitalized, while the species name is lowercase, as in Canis lupus.

The third rule requires the name to be italicized or underlined when handwritten, such as Escherichia coli.

The fourth rule mandates that the name be universally accepted and based on Latin or Latinized terms, ensuring consistency.

(b) Explain six economic importance of bacteria in our daily life:

Bacteria aid in food production, fermenting milk into yogurt using Lactobacillus.

They are used in antibiotic production, with Penicillium notatum yielding penicillin to treat infections.

Bacteria assist in waste decomposition, breaking down organic matter in sewage with Bacillus species.

They enhance agriculture through nitrogen fixation, enriching soil with Rhizobium for plant growth.

Bacteria are involved in biotechnology, producing insulin via genetically modified E. coli.

Finally, they contribute to vitamin synthesis, like Bifidobacterium producing vitamin K in the gut.

13. (a) What is protein denaturation?

(b) Describe the four structures of protein.

(a) What is protein denaturation?

Protein denaturation is the process where a protein loses its natural shape and function due to external factors like heat or pH changes, disrupting its hydrogen bonds and other interactions.

(b) Describe the four structures of protein:

The primary structure is the linear sequence of amino acids linked by peptide bonds, determining the protein's identity, like insulin's chain.

The secondary structure involves local folding into alpha helices or beta sheets, stabilized by hydrogen bonds, as seen in keratin.

The tertiary structure is the three-dimensional folding of the polypeptide, shaped by disulfide bonds, as in hemoglobin's globular form.

The quaternary structure is the arrangement of multiple polypeptide chains, like the four subunits in hemoglobin, forming a functional unit.

14. Elaborate in any five causes and two control measures of drug abuse among adolescents in Tanzania.

One cause is peer pressure, where adolescents in Tanzania may use drugs to fit in with friends experimenting with substances.

Another cause is family dysfunction, such as parental neglect, driving teens to drugs for emotional escape.

Curiosity about drug effects leads some adolescents to try them, often without understanding the risks.

Poverty increases vulnerability, as some teens engage in drug trade or use cheap substances like glue for relief.

Lack of education about drug dangers, due to limited awareness programs, contributes to initial use among youth.

One control measure is public education campaigns, teaching adolescents about drug harms to prevent initiation.

Another measure is community support programs, providing counseling and rehabilitation to help affected teens recover.

15. (a) Answer the following questions in this section.

Standard acids in the laboratory are provided with concentrated acids. If 100 cm^3 conical flask and a measuring cylinder, show the procedures you will use to prepare 0.1M HCl for 200 students, where each student is allotted 5 cm^3. Commercial sample of cone. HCl has density of acid mixture = 1.8g/cm^3.

(b) Molor mass = 36.5g/mol.

(a) Answer the following questions in this section:

To prepare 0.1M HCl for 200 students, each needing 5 cm^3, the total volume required is 200 × 5 cm^3 = 1000 cm^3 (1 liter). The molarity (M) is calculated as moles of solute per liter of solution, so 0.1M HCl requires 0.1 moles of HCl in 1 liter. Given the molar mass of HCl is 36.5 g/mol, the mass needed is 0.1 × 36.5 = 3.65 grams. The density of concentrated HCl is 1.8 g/cm^3, and its concentration is approximately 37% (0.37) by weight. The mass of concentrated HCl solution needed is 3.65 / 0.37 ≈ 9.86 grams. The volume of concentrated HCl is 9.86 / 1.8 ≈ 5.48 cm^3. To prepare, measure 5.48 cm^3 of concentrated HCl using a measuring cylinder, dilute it with distilled water in a 1000 cm^3 volumetric flask to the mark, and mix thoroughly. For 200 students, prepare 1 liter and distribute 5 cm^3 portions using a pipette.

(b) Molor mass = 36.5g/mol:

This information confirms the molar mass of HCl as 36.5 g/mol, used to calculate the mass of HCl needed for the 0.1M solution. It ensures accuracy in determining the amount of solute required based on the molarity and volume.

16. Success of the Biology teaching and learning process depends on well stated instructional (specific) objectives.

(a) State five characteristics of a well stated instructional objective.

(b) Explain two roles of well stated specific objectives in teaching and learning Biology.

(c) Prepare three questions that need to be asked by a Biology teacher when thinking to write a lesson plan on the importance of studying Biology.

(a) State five characteristics of a well stated instructional objective:

A well-stated instructional objective is specific, clearly defining what students should achieve, like “identify the parts of a cell.”

It is measurable, allowing assessment through observable outcomes, such as “list three functions of the nucleus.”

It is achievable, setting realistic goals within the learners’ capacity, like “explain photosynthesis in simple terms.”

It is relevant, aligning with curriculum goals, such as “understand the role of enzymes in digestion.”

It is time-bound, specifying when the objective should be met, like “by the end of the lesson.”

(b) Explain two roles of well stated specific objectives in teaching and learning Biology:

Well-stated specific objectives guide lesson planning, ensuring teachers focus on key topics like respiration, making teaching structured and purposeful.

They provide a basis for assessment, allowing teachers to evaluate if students master concepts like cell division through targeted questions or activities.

(c) Prepare three questions that need to be asked by a Biology teacher when thinking to write a lesson plan on the importance of studying Biology:

What are the key reasons students should understand the relevance of Biology in daily life?

How can I design activities to demonstrate the importance of topics like ecology to student engagement?

What assessment methods will effectively measure students' grasp of Biology's societal impact?

17. (a) Describe four marking points to justify the essence of preparing a marking scheme for marking a Biology test.

(b) Enumerate four points to justify the essence of preparing a marking scheme for marking a Biology practical.

(a) Describe four marking points to justify the essence of preparing a marking scheme for marking a Biology test:

A marking scheme ensures consistency, providing uniform scoring for answers on topics like photosynthesis across all students.

It enhances fairness, reducing bias by setting clear criteria for evaluating responses on genetics.

It saves time, allowing quick and efficient marking of multiple-choice or essay questions on respiration.

It provides feedback, enabling teachers to identify common errors in cell division answers for future improvement.

(b) Enumerate four points to justify the essence of preparing a marking scheme for marking a Biology practical:

A marking scheme standardizes grading, ensuring all students are judged equally on dissection techniques.

It clarifies expectations, outlining points for correct identification of organs like the liver during practicals.

It improves reliability, reducing subjective judgments in assessing microscope slide preparations.

It supports training, helping new teachers learn to evaluate experiments on osmosis consistently.

18. (a) Explain four ways you can use to improve students' participation in Biology practical.

(b) Elaborate four importance of assessing student's progress in academic achievements.

(a) Explain four ways you can use to improve students' participation in Biology practical:

Encourage group work, allowing students to collaborate on dissections, fostering teamwork and engagement.

Provide clear instructions, explaining each step of a microscope activity to build confidence and participation.

Use hands-on materials, like fresh specimens for plant cell studies, to make practicals interactive and interesting.

Offer positive reinforcement, praising students for correct identification of structures, motivating further involvement.

(b) Elaborate four importance of assessing student's progress in academic achievements:

Assessment identifies strengths and weaknesses, showing mastery in topics like genetics for tailored support.

It tracks progress, ensuring students improve in understanding respiration over time.

Assessment motivates students, encouraging effort in practicals like osmosis experiments through visible improvement.

It informs teaching strategies, allowing adjustments based on test results in cell biology to enhance learning.