COMPETENCE BASED ASSESSMENT BIOLOGY PRACTICAL WORK BOOK

"SCENARIO BASED PRACTICAL GUIDE"

BASED ON THE NEW LOWER SECONDARY CURRICULUM

By

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Preface

This Competence Based Assessment Biology Practical Work Book has been written to satisfactorily meet the demand of learners going through the Competency Based Curriculum at the New Ordinary Level in Preparation for their excellence in Uganda Certificate of Education{UCE} biology practical examination. It will also be helpful to teachers especially those who want to familiarize them selves with the new assessment of biology practicals in the new curriculum.

This practical work book consists of concise and precise notes in simple language and several examinable questions intended to reinforce and test the understanding of basic biology skills, all based on the requirement of the new biology syllabus and encompases all that is required for ordinary learners.

Teachers in various schools will have to provide learners with necessary chemical reagents and specimens required so as they can navigate through all the practical items in this work book.

Proper utilization of this work book by learners will obviously make practical examinations easier to handle and enjoyable.

Lwanga Books Ltd feels confident that this Book will be of immense value to both the learners and the teachers.

Any suggestions for improvement of this book are most welcomed, thanks.

"It is not what We do for you but what We will teach you to do for and by yourselves that will eventually make you successful beings in the society"

Acknowledgement

Lwanga Books Limited is deeply indebted to all those who participated in the development of **Lwanga William S1-S4 Competence Based Assessment Biology Practical Work Book.**

Special thanks go to **Mr. Lwanga William**, CEO of Lwanga Books Ltd for his valuable insights and advice on all publishing matters.

We would like to express our sincere appreciation to all those who worked tirelessly towards the production of this CBA Biology Practical Work Book.

First and foremost, we would like to thank our families and friends for supporting all our initiatives both financially and spiritually, Lwanga William's parents; **Mr. William Lwanga** and **Mrs. Harriet Lwanga,** his brother; Mr. Nsubuga Grace.

The initiative and guidance of the publishing partners, Ministry of Education and Sports (MoES) and National Curriculum Development Centre (NCDC) in development and implementation of the New Lower Secondary Curriculum are highly appreciated.

We thank God for the wisdom He has given us to produce this volume of work.

May the Almighty God bless all the students that will use this book with knowledge to encounter all CBA Scenario Items incorporated in this Competence Based Assessment Biology Practical Work Book…….**AMEN**.

We welcome any suggestions for improvement to continue making our service delivery better.

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Introduction to Competence Based Assessment Biology Practicals

The Competence Based biology Assessment has two papers that is, 553/1(theory paper) and 553/2&3(practical paper).

In this guide, we are to focuss more on the practical paper.

CBA biology practical paper will comprise of ***two compulsory*** examination scenario items with Item 1 ***coded*** out of **23** and Item 2 ***coded*** out of **17,** thus the whole paper is ***coded*** out of **40**.

The duration of the paper will be strictly **two(2) hours** and **30 minutes.**

Drawings should be made in the spaces provided. Use **sharp pencils** for your drawings.

Coloured pencils or crayons should **not** be used.

Answer **all** the items in the spaces provided.

❖ **RECALL: TAXONOMY OF THE PSYCHOMOTOR DOMAIN**

Level	Description of major categories	Illustrative verbs
1	Imitation-early stages in learning a complex skill	Assemble, attempt, calibrate, construct, dissect, repeat, sketch, and try.
2	Manipulation-individual continues to practice a given skill	Same as above- add acquire, complete, conduct, execute, operate, perform, manipulate
3	Precision- skill has been attained	Conduct, execute, operate, refine
4	Articulation-Involve a higher level of precision. Skills are well developed	Adapt, alter, revise, re-arrange
5	Naturalization- response is automatic. Individual begins to experiment, creating new ways ofmanipulating material.	Arrange, combine, construct, create design, refine

Task:

For item 1, the task is mainly to carry out a scientific investigation on the issue at hand (based on scenario given) and therefore the learner's write up (report) must include the following:

- ✓ Title(not a must)
- ✓ Aim
- ✓ Hypothesis
- ✓ Variables
- ✓ Materials
- ✓ Procedure(s)
- ✓ Results/ presentation of data
- ✓ Analysis/Discussion(explanation)
- ✓ Conclusion and recommendations

STRUCTURE OF BIOLOGY PAPER 2 &3

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Structures And Functions Of Living Organisms Items

As discussed earlier that the biology practical paper for the NLSC focuses on two elements of construct that is element six and element seven.

Here we are to focuss on element 7 that is, " the learner appreciates structures and functions of living organisms" and this forms item 2 of the paper.

Therefore, ***Item II*** is assessed basing on element of construct 7 and the following are the areas assessed;

- ✧ Lower plants
- ✧ Flowers
- ✧ Fruits
- ✧ Leaves
- ✧ Arthropods
- ✧ Bones and teeth

There are mainly three questions from this item and they always follow the order below;

- ➢ Identification of the specimen using observable features
- ➢ Suitability of the parts to the survival of the specimen
- ➢ Drawing skills

NB

The maximum number of specimens set for **item II** is always **4**

The Dichotomous Key

CLASSIFICATION OF LIVING THINGS

INTRODUCTION:

The branch of Biology that is confined to the classification of living things is referred to as taxonomy. It deals with the grouping of organisms basing on their observable features. Practical classification at this level of education will entirely focus on the use of observable features of specimen organisms to classify them. This is what modern biology refers to as phenetic classification.

The importance of systematics in Biology

- It helps us to develop a system of dealing with the increasing complexity of nature.
- It is important in establishing relationships between organisms as well as the ancestral information of organisms.
- It eases the study of living things when they are organized according to their relationships.
- Taxonomy simplifies the study of living things.

THE HIERACHY OF BIOLOGICAL CLASSIFICATION.

You have already discussed with your teacher the branches of taxonomy namely; nomenclature and systematics.

Green and Taylor in their book; Biological Science define systematics as the branch of taxonomy that deals with the placement of organisms in groups while nomenclature is the branch of taxonomy that deals with naming of organisms. We shall start by understanding the business of systematics. Biological classification deals with organisms at seven different levels of complexity. This constitutes what is referred to here in as the taxonomic hierarchy.

The highest level of classification hence the largest group of related living things is called the kingdom. The kingdom consists of organisms with a common ancestor hence they are related. The relationship draws closer and closer as we go down the hierarchy. Kingdoms are divided into phyla (singular phylum), phyla into classes, classes into orders, orders into families, families into genera (singular genus) and genera into species. These biological groupings are called taxa (singular; taxon)

The species therefore is the smallest group of closely related organisms that can freely interbreed and give rise to viable offspring. The number of organisms at each level of classification is shown by the length of the bars in figure 2.

Kingdom
Phylum
Class
Order
Family
Genus
Species

Figure 2

At each level of classification shown above, the close relationship among organisms at that level is represented by the size of the bars.

A candidate is therefore required to utilize the above hierarchy in classifying a particular organism. This must be accompanied by observable features as reasons for your classification.

BIOLOGICAL NOMENCLATURE

Since the genus and the species make the last two levels of classification, a name of an organism is therefore derived from these two groups to which it belongs.
Biological nomenclature is based on the resolution of the international committee of zoological and botanical nomenclature that an organism is assigned a Latin name with two parts hence the Binomial system.
The first part of the name is the generic (or general/ genus) name while the last part of it is the special/ specific or species name. Some examples are given in below.

Examples of organisms with their biological names

Organism's common name	**Biological name**
Man	*Homo sapiens*
Dog	*Canis familaris*
Cat	*Felis domestica*
Frog	*Rana temporalia*
Bean plant	*Phaseolus vulgaris*
Muvule tree	*Chlorophora excelsa*
Mutuba tree (used for making bark cloth)	*Ficus natalensis*
Coakroach	*Periplaneta americana*
Grass snake	*Natrix natrix*

NOTE: The Biological name of an organism is written starting with an upper case (capital) letter on the generic name while the specific name starts with a lower case letter. When typing, the name should be written in italics as shown above but when writing, the two are underlined separately e.g. Canis familaris.

METHODS OF CLASSIFICATION

THE DICHOTOMOUS KEY

The word dichotomous is an adjective of the noun dichotomy that stems from a Greek word dikhotomia that means "cutting in two" (dikho- "apart, in two" + temnein "to cut").
Dichotomy according to the students' dictionary:
Separation of different or contradictory things: a separation into two divisions that differ widely from or contradict each other.
The dichotomous key is the classical method of classifying biological specimens. It is based only the observable characteristics of organisms.
The steps followed in constructing a dichotomous key are given below.

- A clear observation of the specimens provided is made. The characteristics of the specimens are listed in a table. Colour and size of specimens are not used as characteristics.
- A flow chart is drawn illustrating the subdivisions of the group. At each level of division a number is designated to represent the stage of classification.
- A set of specimens with similar characteristic features is selected and the opposite of the very feature referred to in the first category is used to describe the second group.
- The two broad groups created are each subdivided into two smaller groups. The smaller groups are subdivided until a single specimen remains on the branch of the chart.
- The numbered stages on the flow chart now consist of contrasting features of specimens which are bound by the similarity described at the very beginning of the tree.
- A pair of such contrasting features is referred to as a couplet on the dichotomous key.

The number of couplets is conventionally less than the number of specimens by one. If n represents the number of specimens; then (n-1) is the number of couplets supposed to appear on the dichotomous key.

- Each characteristic is used once in the dichotomous key.

Example: To construct a dichotomous key of arthropods.

You are provided with freshly killed:

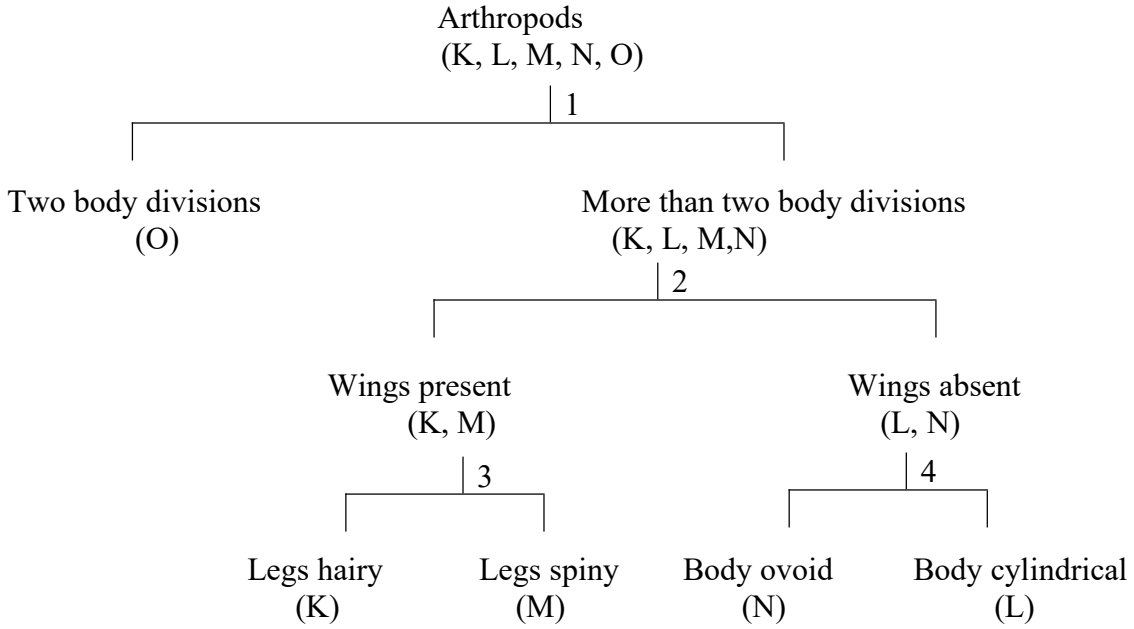
- Housefly labeled K
- Millipede labeled L
- Cockroach labeled M
- Bed bug labeled N
- Spider labeled O.

You are required to draw a dichotomous key for the above specimens.

Table of characteristics

Specimen	Characteristcs						
	Body shape	Wings	Antennae	Hairs on body	Mouth parts	Legs	Body divisions
K	Small, compact, elongated	1 pair (wings present)	1 pair, short, segmented	Fine, Sparse hairs especially on legs	Sponging/lapping for liquids	6 legs(3 pairs) Legs hairy	3 body segments
L	Long, cylindrical	No wings (wings absent)	1 pair, long and threadlike	Sparse hairs along body segments	Mandibles for chewing	2 pairs of legs per segment(many legs)	Many segments
M	Flattened, oval	2 pairs (wings present)	1 pair,long,segmented	Fine, bristle-like hairs	Mandibles for chewing	6 legs(3 pairs) Legs spiny	3 body segments
N	Oval (ovoid), flattened	No wings (wings absent)	1 pair,short,segmented	Small, fine hairs	Piercing-sucking mouthparts	6 legs(3 pairs)	3 body segments
O	Rounded cephalothorax, elongated abdomen	2 pairs (wings present)	2 pairs,long and segmented	Dense,short hairs on the body particulary on legs	Chelicerae(fangs for biting and injecting venom)	8 legs(4 pairs)	2 body segments

The flow chart



The dichotomous key

1a) Specimen with two body divisions……..…specimen O
b) Specimen with more than two body divisions…….go to 2

2a) Specimens with wings……..go to 3
b) Specimens with wings absent……go to 4

3a) Specimen with legs hairy…….... specimen K
b) Specimen with spiny legs……specimen M

4a) Specimen with body ovoid……..specimen N
b) Specimen with body cylindrical…….specimen L

NB: Dichotomous keys vary from one student to another. Everyone can have a starting point for comparison. Try using the above specimens and their features to come up with a dichotomous key of your own.

Learner's Responses

Arthropods Items

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