Teacher Packs in Experimental Science

BIO Pack 2

Classifying organisms based on characteristics of the five kingdoms of living things

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Curriculum areas covered:

Year 1 Semester 1 unit 1.5 of Diploma in Basic Education Biology Curriculum for designated Science and Mathematics Colleges of Education in Ghana

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Title: **Classifying organisms based on characteristics of the five kingdoms of living things**.

Target group: Students of Colleges of Education
Also suitable for: Senior High School Students
Duration: 45 minutes plus Discussion time

Learning outcomes:

These are the learning outcomes expected after students have gone through this Pack

1. Knowledge and understanding
   KN1 explain why different kinds of organisms exist in nature.
   KN2 Show that organisms belonging to the same group have certain features in common.

2. Cognitive skills
   CS1 Group organisms based on the similarities and differences of their observable features.
   CS2 Assign an organism to a Kingdom based on its characteristics.

3. Key skills
   KS1 Observing skills to distinguish objects and organisms
   KS2 Classifying skills to group specimens.
   KS3 Sorting skills to put organisms into categories.

4. Practical skills
   PS1 Apply the skills of classifying to put organisms into Kingdom, Phylum, Class, and Order

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A. Teachers' Guide

This pack is to introduce students to the principles of classification of organisms.

- Present students with an array of organisms – preserved, fresh or in drawings.
- Provide each student with a hand lens, if possible.
- Provide each student with five A4 sheets.
- Ensure that students come to class with pencils, erasers and rulers.
- Distribute worksheets ruled in 5 columns, with each column titled one of the following: Kingdom Prokaryotae, Kingdom Protoctista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia.
- Instruct students to write the names of the organisms that fall into each kingdom, in the appropriate column.
- Let the students write one or two reasons for their groupings.

Note

Where it is difficult to obtain any of the materials listed, suitable substitutes may be used, provided they will enable the students to obtain the desired results.

Sample Assessment Questions and Answers

1. How are organisms in the same ecological community related? (KN1)
   (Answer: They are related by the common observable features and common characteristic behaviours they have)

2. What observable features are common to organisms in the Phylum Mammalia? (CS2)
   (Answer: Mammals have fur on their bodies; they also have opposable first toe on the foot; heterodont dentition.

3. Classify the following organisms into Kingdom, Phylum, Class and Order:
   Rat, toad, lobster, crab, sunbird, *Tilapia,* housefly, earthworm, *Talinum*, pepper plant, ginger, bat, wall gecko. Give reasons for your classification. (P)

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(Answer to Question 3)

Name of Organism	**Kingdom**	**Phylum**	**Class**	**Order**
Rat	Animalia	Chordata	Mammalia	Rodentia
Toad	Animalia	Chordata	Amphibia	Anura
Lobster	Animalia	Arthropoda	Crustacea	Decapoda
Crab	Animalia	Arthropoda	Crustacea	Decapoda
Sunbird	Animalia	Chordata	Aves	Passeriformes
Tilapia	Animalia	Chordata	Actinopterygii	Perciformes
House fly	Animalia	Arthropoda	Insecta	Diptera
Talinum	Plantae	Magnoliophyta	Caryophyllales	Magnoliopsida
Earthworm	Animalia	Annelida	Clitellata	Haplotaxida
Pepper plant	Plantae	Magnoliophyta	Magnoliopsida	Solanales
Bat	Animalia	Chordata	Mammalia	Chiroptera
Wall gecko	Animalia	Chordata	Reptilia	Squamata
Ginger	Plantae	Magnoliophyta	Monocotyledonae	Zingiberales

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B. **Students' Guide**

Introduction

In this activity you will be required to make critical observation of different organisms and identify any observable structural features and characteristic behaviours of the organisms. You will then group the organisms, based on common features and behaviour.

Background to the experiment

All living organisms are divided into five kingdoms: Kingdom Prokaryotae, Kingdom Protoctista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia. Each kingdom comprises organisms which share many general characteristics. Biological classification is the sorting of many living organisms into groups according to their common characteristics. This is necessary because of the great diversity of living organisms. One reason for classifying living organisms is to put every organism into a systematic group for easy identification and study.

One of the major features used to classify living organisms is whether or not their cells have a distinct nucleus. The DNA of plants, animal and protists is contained within a membrane-covered nucleus. The term eukaryotic is used to describe such cells ("Eu" and "karyon" are Greek words meaning true and nucleus, respectively) but the DNA of cells of bacteria is not enclosed by membrane; it floats in the cytoplasm. The term prokaryotic is used to describe these cells.

Kingdom Prokaryotae

This is a group of organisms without membrane-bound nucleus. They are microscopic, unicellular, and occur in all natural environments (for example in the air, in water, in and on the bodies of other organisms and in the soil). Examples of Prokaryotae are bacteria.

Kingdom Protoctista

Members of this Kingdom are often unicellular organisms or collections of similar cells. These include plant-like forms like *Spirogyra*, which possess chlorophyll with which they carry out photosynthesis, animal-like forms such as *Amoeba* and *Paramecium* and forms which have both plant and animal features (e.g. *Euglena*).

Kingdom Fungi

They are large groups of eukaryotic organisms. They look like plants but have no roots, stems or leaves. They also lack chlorophyll and so cannot synthesize their own food. e.g. mushroom

Kingdom Plantae

The plant kingdom contains organisms which are multicellular and have cellulose cell wall. They contain chlorophyll which gives them their characteristic green colour. They photosynthesize and

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produce their own food and are generally non mobile. Generally, they have leaves, stems and roots. Examples are: neem tree (*Azadirachta sp*), moss, fern etc.

Kingdom Animalia

They are multicellular organisms which do not possess chlorophyll and so cannot produce their own food. Most of them are mobile. For example fish, bird, lizard, man etc.

Equipment/Materials

- Prepared slides/charts (where available) showing bacteria of different forms
- Slides showing *Spirogyra* or a sample of pond water containing *Spirogyra*
- Fungi grown on bread and "kenkey" (boiled fermented corn dough)
- Types of lower (simple) plants (e.g. mosses) and higher (complex) ones (e.g. shrubs, herbs)
- Drawings, diagrams, preserved specimens of the following organisms: Lizard/ wall gecko, snail, housefly, butterfly, crab, spider, fish, frog, scorpion, millipede etc.
- Forceps
- Hand lens
- Microscope

Other requirements

Note books, sketch books, pens, pencils, erasers and rulers.

Experimental Procedure

a. Display all the organisms you have on the working table.
b. Use the hand lens in your possession to observe the organisms for detailed features
c. List the features you can see
d. Put the organisms into five main groups based on their common features
e. Give reasons for the groupings
f. Write down the common characteristics of members of each group

Conclusion

What conclusion can you draw from the activities you have carried out?

Reflection on the experiment

Take some time to reflect on the activity carried out. Ensure that you have understood the procedure followed. If clarification is needed, discuss it with your teacher or colleagues.
Do you think this activity could be done in a different way? Give reasons for your answer.

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C. Assessment – Student's sheet

On completion of experiment, you should answer the following questions:

1. How are organisms in the same community related? (KN1)

2. List the five main Kingdoms into which living things can be classified. (CS2)

3. What observable features are common to organisms in the Phylum Mammalia? (CS1)

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4. Classify the organisms in the table below into Kingdom, Phylum, Class and Order, by completing the table below. Give reasons for your classification. (PS1)

Organism	Kingdom	Phylum	Class	Order
bat				
Reason				
Crab				
Reason				
Earthworm				
Reason				
Ginger				
Reason				
Housefly				
Reason				
Lobster				
Reason				
Pepper				
Reason				
Rat				
Reason				
Sunbird				
Reason				
Talinum				
Reason				
Tilapia				
Reason				

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Toad				
Reason				
wall gecko				
Reason				

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D. Extensions to experiment

Students should be able to use their knowledge of classification to predict the characteristics of organisms in the same group

E. Useful links

Abbey, T. K., Ameyibor, K., Alhassan, A., Essiah, J. W., Fometu E., & Wiredu. M. B. (2001) *Integrated Science for Senior Secondary Schools* Accra-North: UNIMAX MACMILLAN **.**

F. Health and Safety

The required instrument should be used to carry out the activities e.g forceps

. Remember to wash your hands after the activity

G. Evaluation

- What is your impression about this pack?
- What would you like to be incorporated in the pack?

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