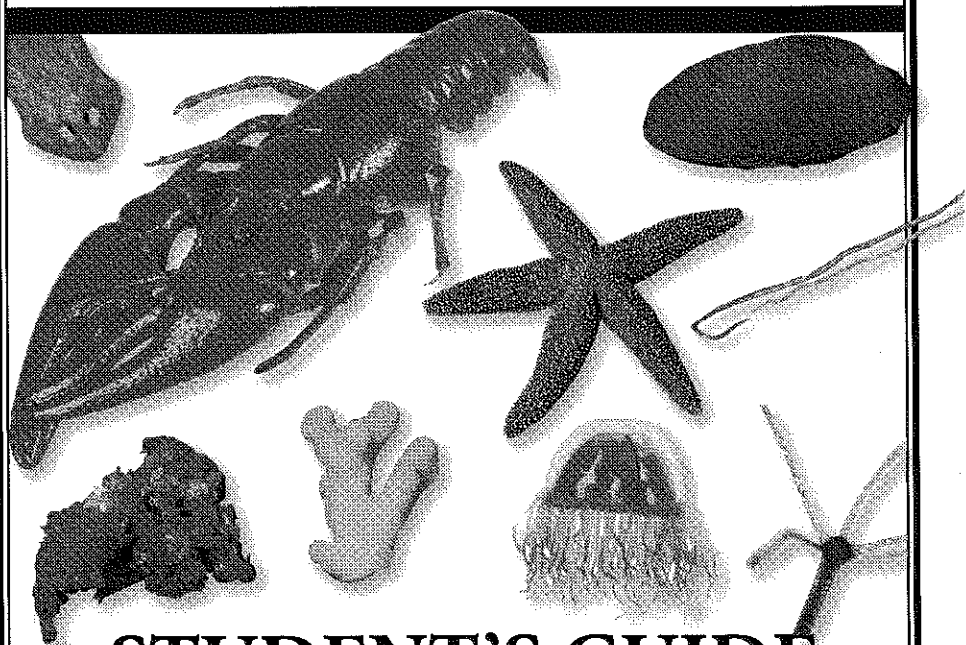


BioQuest[®]



OBSERVE • QUESTION • MEASURE • THINK • PREDICT

HANDS-ON INVERTEBRATE STUDY KIT



STUDENT'S GUIDE

Information:

Students of all ages are fascinated by the amazing world of animals. Animal species can be identified by examination of their numerous body parts while noting their different sizes and shapes.

Biologists use the term **biodiversity** to describe the variations of body structure that exist from one animal species to another. In the 1700s, a science called **taxonomy** was developed by Carolus Linnaeus for the classification of organisms by species. This system used Latin words for names of organisms. In addition, other Latin names were used to rank the organisms into groups for further identification. The group names provided various titles to identify the different levels associated with the taxonomic classification of organisms. Classification levels include (from the largest to the smallest groups): **kingdom, phylum, class, order, family, genus, species**, and subspecies.

According to the system of modern classification (Linnaeus), the final two subdivisions, or rankings, provide every living organism with an exact identification called **binomial nomenclature** (a two-word name).

The invertebrates, or animals without backbones, are among the most numerous animals in nature. It has been suggested that 95% of all of the animal species in the world are in this group. The invertebrates have greater diversity among their members than do members of the vertebrate animals. Scientists suggest that a million or more known animal species are divided into 26 groups, or **phyla**, which have important characteristics in common. Only eight of the more common phyla will be used for this study. The Latin phyla names used have English word meanings which are very descriptive and help identify the different characteristics used to name the classification groups.

Purpose:

1. To learn about a study of classification called taxonomy.
2. To learn that classification names are based upon characteristics associated with different animals.
3. To learn that invertebrate animals are different from vertebrates.
4. To learn about the modern system of classification developed by Linnaeus to give all living organisms a two-word name.
5. To learn how different structural characteristics in the invertebrates illustrate biodiversity in the animal kingdom.

Materials:

13 specimens in individually labeled bottles in NASCO-Guard® preservative; teacher's guide; 15 illustrated student guides with activity sheets; 15 hand magnifiers; an Invertebrate Study Set key sheet; 20 review questions for upper elementary, middle, and high school levels; and an illustrated guide to invertebrate animals (phyla guide).

Procedure and Observation:

Students will follow the directions of the instructor, and may work alone or in groups. The Invertebrate Study Set includes 13 different bottles which contain specimens for eight different invertebrate phyla. A number key sheet listing the names of organisms may be used to associate the specimen name with the correct phyla. As you examine each of the numbered bottles, look for characteristics that help with the identification of the invertebrate animals in them. The structure of the animal will determine which organism fits the particular classification for the phyla to which they belong.

If there is a need to secure additional information on the characteristics associated with organisms for each phyla, you may want to review reference material to assist you with your questions. The individual phyla are: **porifera**, **coelenterata**, **platyhelminthes**, **nematoda**, **annelida**, **mollusca**, **echinodermata**, and **arthropoda**. The phyla are listed from the most simple structured organisms to those with a more advanced development. The order of arrangement for the phyla suggest the organism's development according to "increasing complexity."

On the activity sheet for exercise 1, there is an English description or word meaning for each of the Latin phyla names. There may be some clues to help with the identification of the eight different phyla names. For example, the phylum **Porifera** identifies an animal which has "pores" or openings that lead to and from the space inside the body. In addition, you are able to look for characteristics of the individual specimens from each of the 13 labeled bottles. Next, record **characteristics** for the animals that suggest information associated with a particular phylum. Briefly list the traits or characteristics in the space provided. Consult reference books to include a textbook and/or the Phyla Guide to verify or learn more about the characteristics which identify a certain phylum. Once you have completed your answer for the phylum **porifer**, continue to do the same for the remaining phyla, examining each of the specimens in the bottles. Finally, match the names for the animal species listed (a through h) with the correct phyla in the space provided under the heading of **examples**.

In Exercise 2, the teacher will arrange the 13 bottles conveniently so the specimens can be observed. Students should begin the investigation by examining the bottled specimens according to the directions of their teacher. Look at each of the bottled organisms starting with bottle #1. First, place the name of the organisms from the bottles in the blank space beneath each **phyla** name. Next, look for structural features or characteristics for the organism that will fit the special titles listed in columns across the top of the activity sheet. The individual headings for the titles are : **Body Covering**, **Symmetry**, **Body Plan**, **Appendages**, and **Other**. After completing the work for bottle #1, the phylum **porifera**, continue to examine the remaining bottles and list the answers as you investigate. Does the information you obtained from the reference material about the invertebrate phyla reflect what you have learned from your observation of each specimen?

Data:

In exercise #2, structural features should fit the description of the organisms, and can be listed under each of the five categories identified at the top of the activity sheet. This is a list of appropriate characteristics for use in completing the chart:

1. **Body Covering** may be a soft cuticle, a lime (calcium) shell, a spiny skin, or outer chitinous covering (exoskeleton). Animals in the phylum **Arthropoda** have an exoskeleton for body covering.
2. **Symmetry** identifies the body shape of an animal. Animals illustrate **bilateral** symmetry when the left and right sides are identical. **Radial** symmetry is observed when body parts of an animal radiate from the central disk like spokes from a bicycle wheel. An animal with **no** symmetry is identified as **asymmetric**. Certain species of simple sponges are asymmetric.
3. **Body Plan** suggests the general shape associated with an animal. Some organisms appear flat, while others may be cylindrical. In addition, bodies may have partitions and are **segmented** while others may appear **unsegmented**.
4. **Appendages** or extensions from an animal's body can be in the form of arms, legs, pinchers, or antennae.
5. **Other** represents an alternative category for structures identified which do not appear to fit any of the categories previously mentioned. (Tentacles are fleshy structures that extend from the body and are specialized for gathering food, locomotion, or defense, and are common to the **coelenterata** or **mollusca** phyla.)

Information or data already recorded on the activity sheets will serve to identify the typical characteristics for the respective phyla. This information will provide a symmetry of condensed information to suggest why an animal is classified in a particular phylum. Data on the summary chart will provide information to answer questions in the section of "questions for further study."

Questions for Further Study:

1. On a separate sheet of paper, make a list of terms which you encountered while you studied animal specimens in the different invertebrate phyla. Note that some terms may be common to all phyla, while others are just associated with only one phylum.
2. What characteristics do ALL invertebrates share?
3. The characteristics you observed while examining the specimens are **macroscopic**. What does this suggest?
4. How does the word **adaptation** apply to animals you have studied? List as many examples as you can of adaptations for **locomotion and food gathering** which were present among some of the invertebrate animals you studied.
5. Give examples of **bilateral symmetry** you observed on various animals. What advantage or purpose does bilateral symmetry provide to organisms in their environment?
6. You may have noted that animals in the phylum Arthropoda, such as crayfish or insects, had a chitinous exoskeleton. How is this helpful to them? Could the fact that they have an exoskeleton present a problem when it is time for them to grow? (Check the process of **molting**.)
7. Many animals with **radial symmetry** are not well adapted for locomotion. Can you think of other ways that this form of symmetry could be beneficial to an animal?
8. How do you think the use of **binomial nomenclature** in the modern system of classification is important in naming animals? In this system, when closely related animals are identified and named, **trinomial nomenclature** is also used. How would this principle apply to a person with the name John James in a large telephone directory?
9. From your study of the invertebrate animals in this study kit, why do you think it is important to have a classification system for the identification of animal species?
10. How does the phylum **arthropoda** illustrate **biodiversity**? Name and give examples of the five subdivisions or **classes** for this animal phyla.