SI Biology - Full Discipline Demo

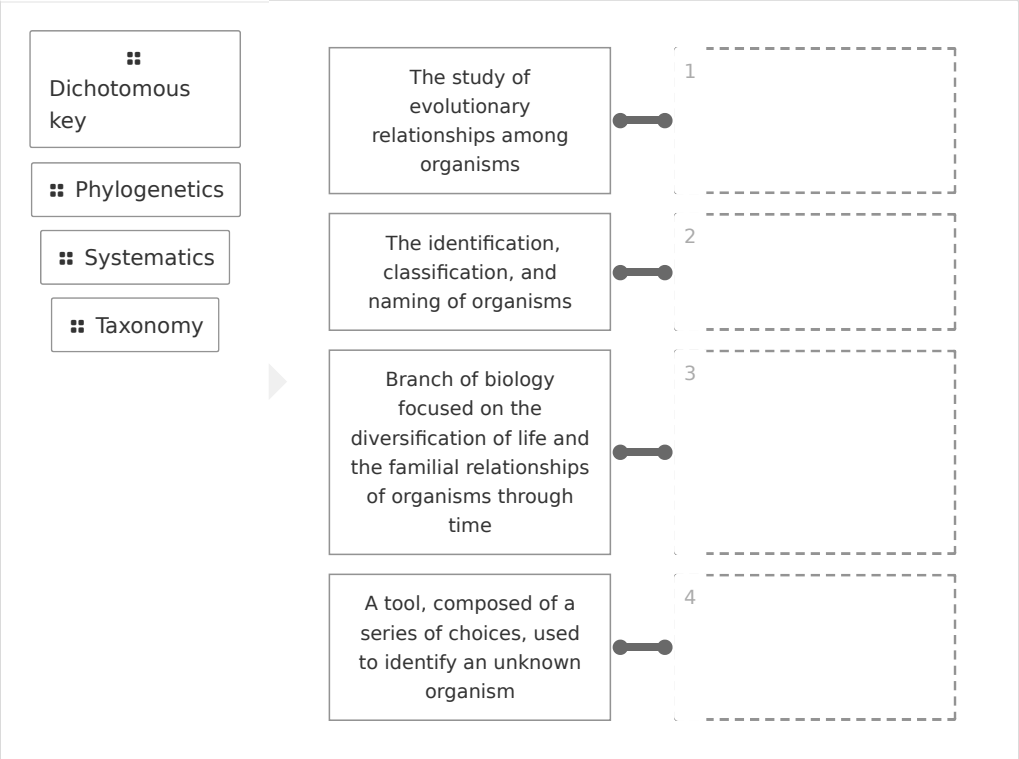
Taxonomy

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Biology - Full Discipline Demo
Course	SI Biology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match each term with the best description.



Correct answers:

1 Phylogenetics 2 Taxonomy 3 Systematics 4 Dichotomous key

Order the ranks of the taxonomic hierarchy from most broad to most specific.

≡ Class

1 **Correct answer:** Domain

≡ Domain

2 **Correct answer:** Kingdom

≡ Family

3 **Correct answer:** Phylum

≡ Genus

4 **Correct answer:** Class

≡ Kingdom

5 **Correct answer:** Order

≡ Order

6 **Correct answer:** Family

≡ Phylum

7 **Correct answer:** Genus

≡ Species

8 **Correct answer:** Species

Exploration

Systematics uses taxonomy and phylogenetics to investigate biodiversity and familial relationships through time.

- True ✔
- False

_____ is a ranking process that arranges organisms into a series of categories.

- Binomial nomenclature
- Taxonomic hierarchy ✔
- Artiodactyla
- Phylogenetics

The choices within each step of a dichotomous key are formatted as a _____.

- duet
- codon
- couplet ✔
- taxon

Exercise 1

What was the lowest taxonomic rank (phylum, class, order, etc.) to which you were able to identify organisms? What evidence in Figure 4 supports this answer?

Organisms were identified to the genus taxonomic rank. This is known because the names in Figure 4 are capitalized and italicized.

In the dichotomous key, what characteristics set *Spirogyra* apart from other organisms? Based on your observations of the slides, describe at least one other characteristic that sets *Spirogyra* apart from the other organisms.

Spirogyra was thin and filamentous with visible spirals of chloroplasts. An additional feature that distinguished the organism is multicellularity.

Why are taxonomy, phylogenetics, and systematics important to understanding biodiversity?

Taxonomy is the identification, classification, and naming of organisms. Modern genetic analyses have led to discoveries of evolutionary relationships between organisms and the field of **Phylogenetics,** the study of evolutionary history and relationships of organisms. Together, taxonomy and phylogenetics comprise **systematics,** the branch of biology focused on the diversification of life and the familial relationships of organisms through time. It estimated that only a fraction of life on Earth has been described: approximately 2 million species have been formally categorized and named and scientists estimate that more than 30 million unique organisms may exist on Earth.

Data Table 1: Organism Identification
(SAMPLE ANSWER BELOW)

Slide	Organism Name	Magnification
A	Spirogyra	150x
B	Volvox	150x
C	Euglena	600x
D	Amoeba	600x
E	Paramecium	600x

Photo 1: Slide A
(SAMPLE ANSWER BELOW)

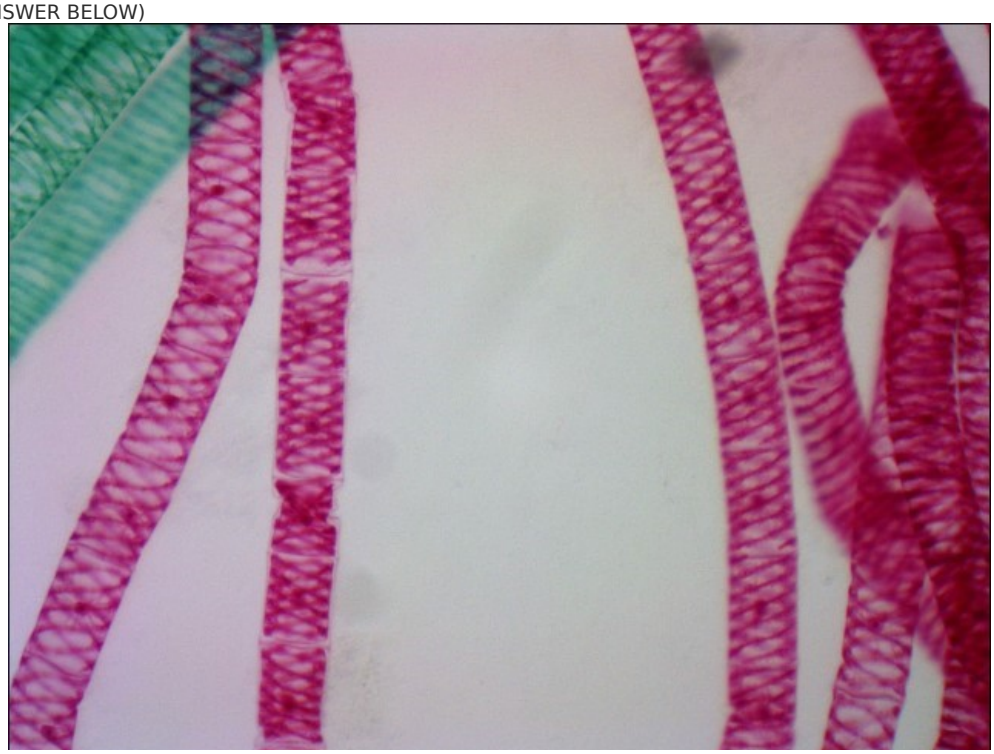


Photo 2: Slide B
(SAMPLE ANSWER BELOW)

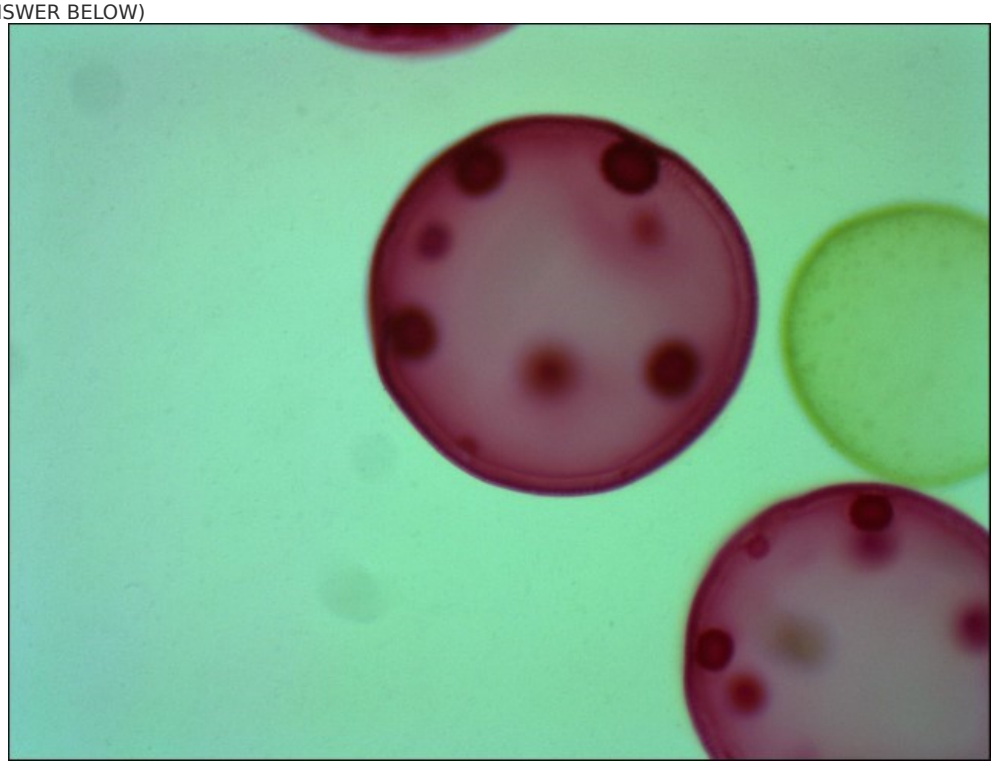


Photo 3: Slide C
(SAMPLE ANSWER BELOW)

Photo 4: Slide D
(SAMPLE ANSWER BELOW)

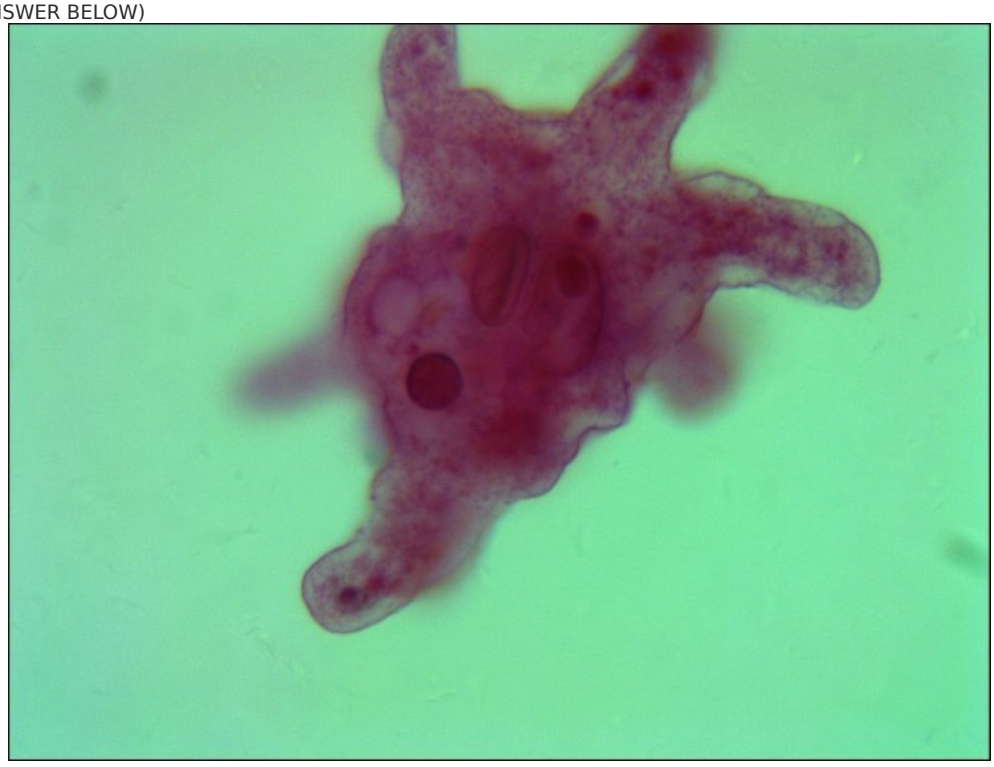
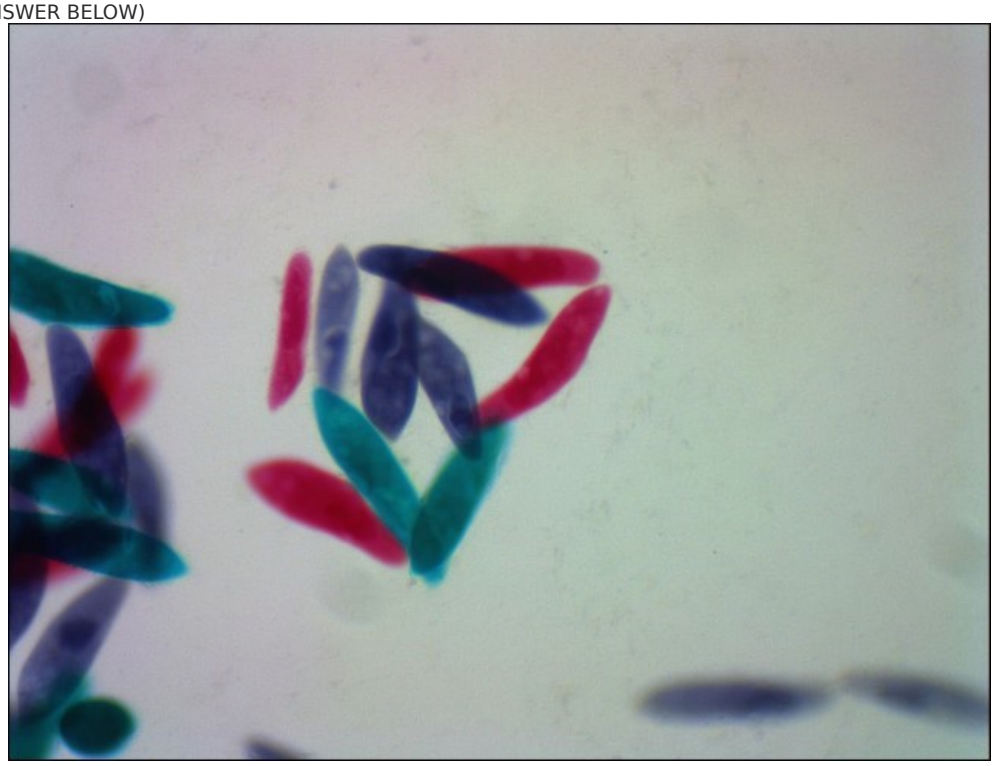


Photo 5: Slide E

(SAMPLE ANSWER BELOW)



Exercise 2

List the features used to classify leaf types in the dichotomous key.

1. Leaf shape
2. Leaf type (compound or single)
3. Leaf margin

List some characteristics that are shared among all of the leaves. Why are shared characteristics not included in dichotomous keys?

All leaves were green and had veins and stems. Shared characteristics not included dichotomous keys because couplet statements should be mutually exclusive.

What is binomial nomenclature? Why is it preferred over the use of common names?

0 Word(s)

Data Table 2: Descriptions of Leaf Types
(SAMPLE ANSWER BELOW)

Leaf Type	Description
Oak	Many rounded lobes
Basswood	Heart-shaped, ridged/toothed edge
Elm	Oval shaped with a point, ridged/toothed edge
Horse-Chestnut	5 leaves (leaflets) attach at a single point, edges are irregular
Maple	Star-shaped leaf with 5 points
Locust	Many oval-shaped leaves (leaflets) on a single branch; leaves have smooth edges
Ash	Many oval-shaped leaves (leaflets) on a single branch; leaves have regular, toothed edges; leaf tips are somewhat pointed
Pecan	Many leaves (leaflets) on a single branch; leaves have regular, toothed edges, are somewhat slender, and are narrower through the middle than the ash

Data Table 3: Dichotomous Key to Leaves
(SAMPLE ANSWER BELOW)

Step	Description	Instruction (such as, “Go to 2”) or Leaf Name (for example, Maple)
1.a.	Many leaflets attached to a single branch (compound)	Go to 2
1.b.	Leaf is single (simple)	Go to 5
2.a.	Leaves are palmate with 5 leaves attached at a single location	Horse-Chestnut
2.b.	Leaves are pinnately compound, spread along the length of the branch	Go to 3
3.a.	Leaflets are smooth and oval-shaped with rounded ends	Locust
3.b.	Leaflets are ridged and somewhat oval, with pointed ends	Go to 4
4.a.	Leaflets are slender, their width being about ⅓of the length	Pecan
4.b.	Leaflets are wider, their width being about ½ of the length	Ash

5.a.	Leaf has rounded lobes	Oak
5.b.	Leaf has a pointed terminus and does not have lobes	Go to 6
6.a.	Leaf is star-shaped with 5 pointed ends	Maple
6.b.	Leaf is not star-shaped and has a singular, pointed end	Go to 7
7.a.	Heart-shaped, ridged- toothed edge	Basswood
7.b.	Oval shaped with a point, ridged- toothed edge	Elm
8.a.		
8.b.		
9.a.		
9.b.		
10.a.		
10.b.		

Competency Review

Phylogenetics is the identification, classification, and naming of organisms.

- True
- False ✔

_____ is the most specific taxonomic classification.

- Class
- Family
- Genus
- Species ✔

Organisms that belong to the same genus are more similar than organisms belonging to the same class.

- True ✔
- False

Each scientific name contains the _____ to which the organism belongs.

- class and family
- genus and species ✔
- kingdom and order
- domain and phylum

The couplets of a dichotomous key are mutually exclusive choices.

- True ✔
- False

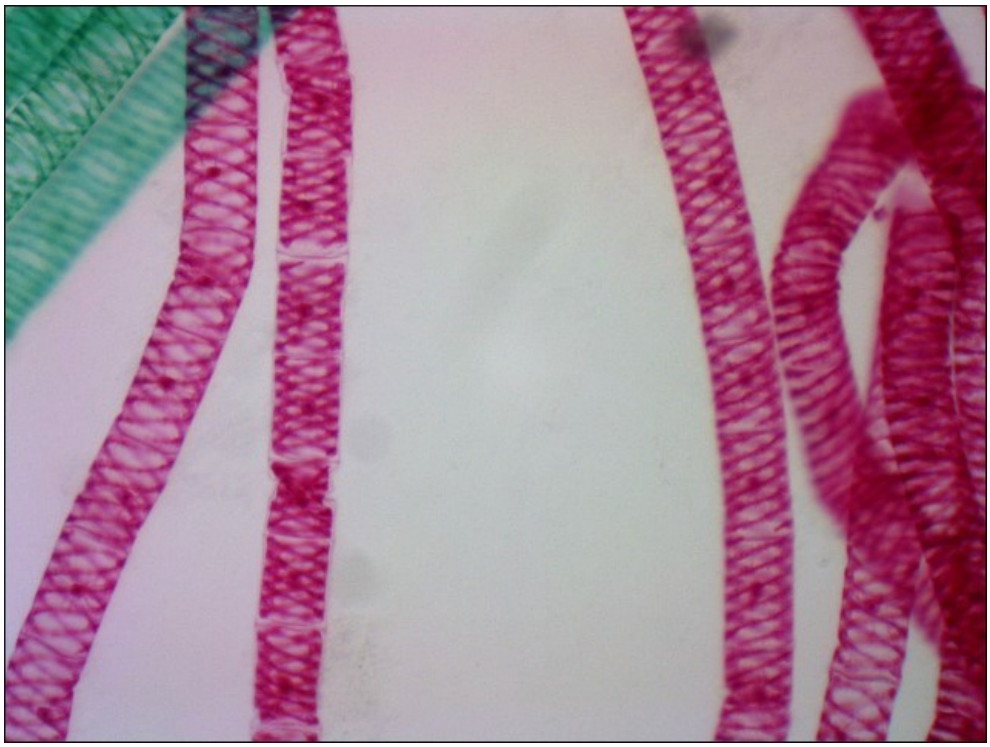
The dichotomous key indicates that ____ is separated from *Paramecium* and *Euglena* by a hollow sphere body form.

Dichotomous Key for Microorganisms

1.	a.	Body is amorphous (without a defined shape) and can resemble a fried egg. Has "false feet" called pseudopods that act as extensions of the body. Nucleus visible.	*Amoeba*
	b.	Body has a well-defined, regular shape. A nucleus may or may not be visible.	Go to 2
2.	a.	Filamentous body form with cells linked together in a long, thin strand. Chloroplasts are arranged in a spiral pattern.	*Spirogyra*
	b.	Body shape is not a thin filament. Chloroplasts not present OR when present, the chloroplasts are not in a spiral arrangement.	Go to 3
3.	a.	Body is a hollow sphere that often contains other smaller spheres which are daughter colonies.	*Volvox*
	b.	Body is not a hollow sphere.	Go to 4
4.	a.	Oval or teardrop body shape. Body surrounded by cilia, short hair-like structures used for locomotion. Cilia may appear as fuzzy borders around the cell membrane of the organism.	*Paramecium*
	b.	Teardrop body shape. Body has a single flagellum, a long whip-like structure used for locomotion. Organisms also move by contracting and stretching their body and often appear contracted into a ball.	*Euglena*

- ○ *Amoeba*
- ○ *Spirogyra*
- ○ *Volvox* ✔
- ○ *Chloroplast*

The protist in the image below is _____.



- *Amoeba*
- *Spirogyra* ✔
- *Paramecium*
- *Euglena*

Leaf shape and margin style are features used when developing a dichotomous key for leaf types.

- True ✔
- False

Extension Questions

Use the table to answer the following questions:

a. What are the common and scientific names of all five organisms in the chart?
b. Create two groups that include the organisms that are the closest related.
c. At which taxonomic classification (kingdom, phylum, class, etc.) do all the organisms diverge into unique categories?

Common Name	European corn borer	Mealworm beetle	Snout moth	Peppered moth	Long nosed weevil
Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Arthropoda	Arthropoda	Arthropoda	Arthropoda	Arthropoda
Class	Insecta	Insecta	Insecta	Insecta	Insecta
Order	Lepidoptera	Coleoptera	Lepidoptera	Lepidoptera	Coleoptera
Family	Crambidae	Tenebrionidae	Pyraloidae	Geometridae	Belidae
Genus	*Ostrininia*	*Tenebrio*	*Pyralis*	*Biston*	*Rhinotia*
Species	*nubialis*	*molitor*	*farinalis*	*betularia*	*hemistictus*

(SAMPLE ANSWER BELOW)

a. European corn borer *Ostrininia nubialis* Mealworm beetle *Tenebrio molitor* Snout moth *Pyralis farinalis* Peppered moth *Biston betularia* Long nosed weevil *Rhinotia hemistictus*
b. The European corn borer (*Ostrininia nubialis*), snout moth (*Tenebrio molitor*), and peppered moth (*Biston betuaria*) can be grouped together because they have the same classification from kingdom through order (Lepidoptera). The mealworm beetle (*Tenobrio molitor*) and long nosed weevil (*Rhinotia hemistictus*) can be grouped together because they also share the same classification from kingdom through order (Coleoptera).
c. All animals diverge from each other at the Family level: Crambidae, Tenebrionidae, Pyraloidae, Geometridae, and Belidae (respectively).