SI Biology - Full Discipline Demo

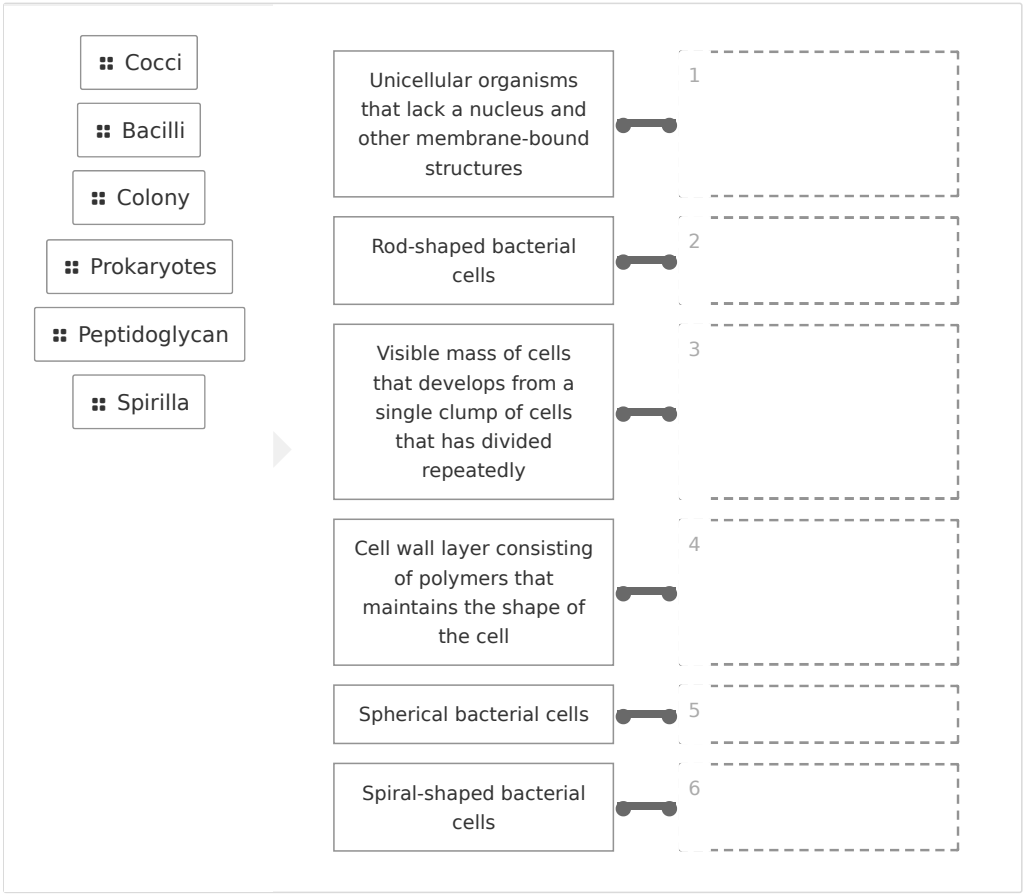
Prokaryotes

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 Prokaryotes 2 Bacilli 3 Colony 4 Peptidoglycan 5 Cocci

6 Spirilla

Order the steps of Gram staining from first to last.

≡ Crystal violet dyes all bacterial cells.

1 **Correct answer:** Crystal violet dyes all bacterial cells.

≡ Decolorizer further adheres dyes to the cell wall of Gram-positive bacteria while washing dyes from Gram-negative bacteria.

2 **Correct answer:** Iodine reacts with crystal violet, adhering dyes to bacterial cells.

≡ Iodine reacts with crystal violet, adhering dyes to bacterial cells.

3 **Correct answer:** Decolorizer further adheres dyes to the cell wall of Gram-positive bacteria while washing dyes from Gram-negative bacteria.

≡ Safranin causes Gram-negative bacteria to become pink.

4 **Correct answer:** Safranin causes Gram-negative bacteria to become pink.

Exploration

Prokaryotes are only adapted to live in extreme environments where other life forms cannot survive.

- True
- False ✔

Gram-positive bacteria have a(n) ____ peptidoglycan layer that maintains the shape of the cell.

- absent
- thin
- thick ✔
- impervious

Colonies grown on agar plates can differ in _____.

- color
- shape
- size
- All of the above ✔

Gram staining turns Gram-positive bacteria _____.

- green
- purple ✔
- red
- yellow

Exercise 1

What are individual colonies appearing on agar plates composed of? How are the colonies that develop on plates an indication of the abundance and diversity of microbes from a sample collection site?

An isolated colony on an agar plate consists of numerous cells that originated from a single cell or clump of cells. Because different prokaryotes form colonies with different morphologies, the number and type of colonies that develop on an agar plate are indicative of the number and types of microbes present at the collection site.

How are the colonies that develop on plates an indication of the abundance and diversity of microbes from a sample collection site?

Because different prokaryotes form colonies with different morphologies, the number and type of colonies that develop on an agar plate are indicative of the number and types of microbes present at the collection site.

How did the abundance and diversity of prokaryotes differ between the skin sample and the samples taken from objects in your home? Reference Data Table 1 and Photos 1-4 in your explanation.

Student answers will vary but should correlate with the results recorded in Data Table 1 and the evidence provided in Photos 1-4.

How might your results from this exercise lead you to make changes in your personal habits or in your home environment? Reference Data Table 1 and Photos 1-4 in your explanation.

Student answers will vary. Students may indicate that they would clean the surfaces they come in contact with more frequently, or they may indicate an increase personal hygiene. All answers should reference and be supported by Data Table 1 and Photos 1-4.

Data Table 1: Sampling Location Description and Label
(SAMPLE ANSWER BELOW)

Plate	Location Description	Label
Skin Sample	Inside of elbow swab	Skin
Household surface 1	Student answers will vary based on collection sites chosen.	
Household surface 2		
Household surface 3		

Photo 1: Skin Sample
(SAMPLE ANSWER BELOW)

Photo 2: Household Surface 1

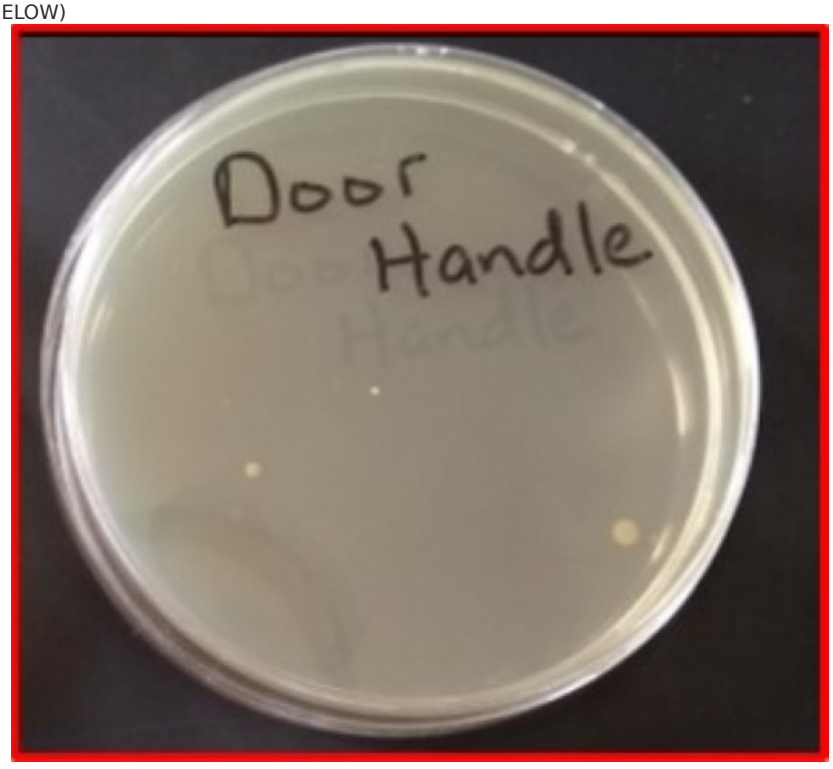
(SAMPLE ANSWER BELOW)

Photo 3: Household Surface 2

(SAMPLE ANSWER BELOW)

Photo 4: Household Surface 3

(SAMPLE ANSWER BELOW)



Data Table 2: Colony Morphology
(SAMPLE ANSWER BELOW)

Plate Label	Abundance	Diversity	Morphologies
Skin	Student results will vary based on sample but should relate to uploaded photos	Student results will vary based on sample but should relate to uploaded photos	Students should use terms for margin, shape, and size
Student labels will vary based on collection site			

Exercise 2

What is the purpose of heat-fixing cells prior to staining?

Cells are heat-fixed prior to staining to both assure the cells are killed and to cement the cells to the glass slide so that they do not rinse away during the staining process.

What can you conclude about the cell wall structure of the cells on the two slides you Gram stained? Reference Data Table 3 and Photos 9-10 in your explanation.

Students should conclude that Gram negative cells have thin peptidoglycan layers surrounded by a membrane and that Gram positive cells have a thick peptidoglycan layer exposed to the environment. Student conclusions of Gram negative and Gram positive cells should match the results recorded in Data Table 3 and Photos 9-10.

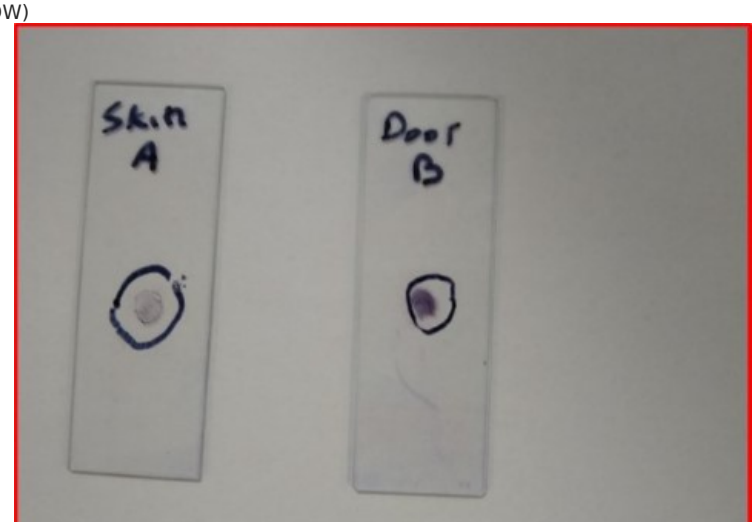
Did the cells from your Gram stained slides appear similar to the cells viewed in the three prepared slides? Reference Photos 6-10 in your answer.

Student answers will vary. If students select a colony to stain from collected from the skin, it could appear similar to the coccus cells from the prepared slide uploaded in Photo 8. Students are less likely to stain spirillum cells similar to those in the prepared slide uploaded into Photo 6. Student explanations should reference Photos 6-10.

Data Table 3: Microscope Observation
(SAMPLE ANSWER BELOW)

Slide	Agar Plate	Colony Morphology	Cell Shape	Cell Type
A	Skin	White, punctiform, pulvinate, entire	coccus	Gram-positive
B	Doorknob	Beige, circular, convex, entire	bacillus	Gram-positive

Photo 5: Gram Stained Slides
(SAMPLE ANSWER BELOW)



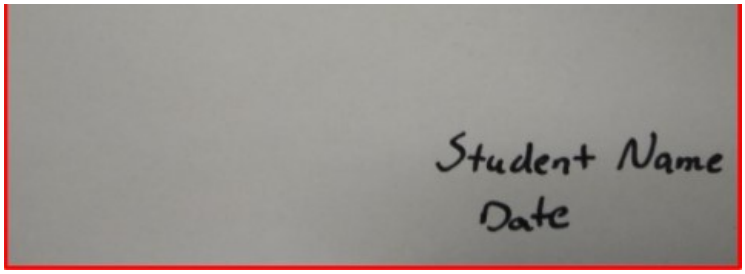
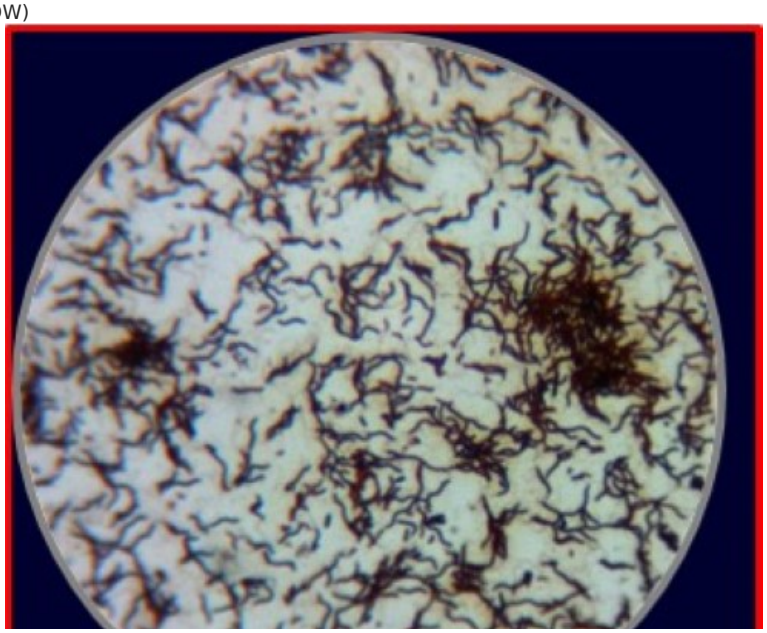


Photo 6: Bacteria Spirillum
(SAMPLE ANSWER BELOW)



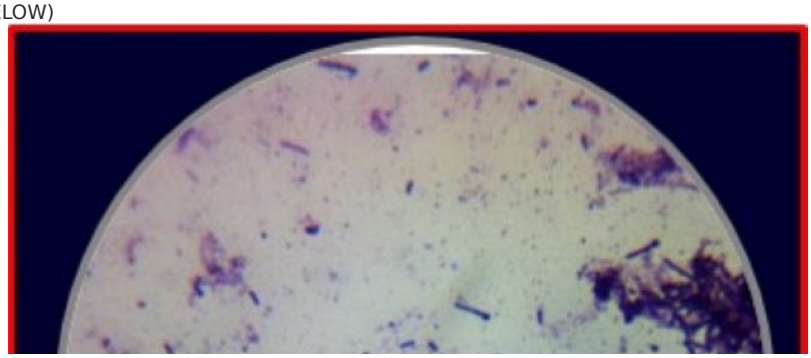
Data Table 4: Slide Magnification

(SAMPLE ANSWER BELOW)

Slide	Total magnification
Bacteria Spirillum	600
Bacteria Bacillus Form	600
Bacteria Coccus Form	600
A	600
B	600

Photo 7: Bacteria Bacillus Form

(SAMPLE ANSWER BELOW)



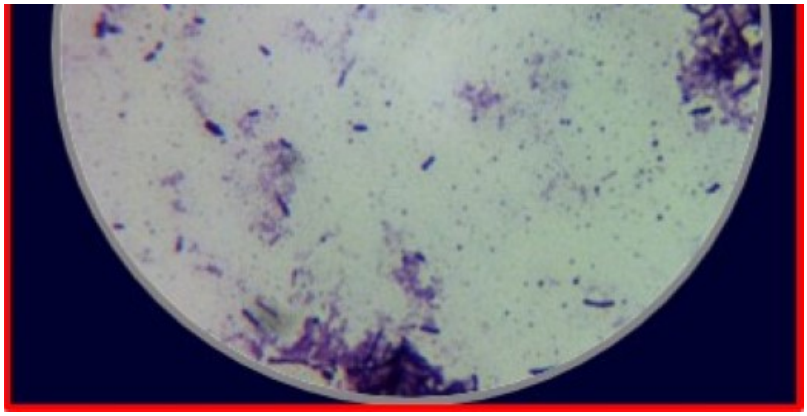
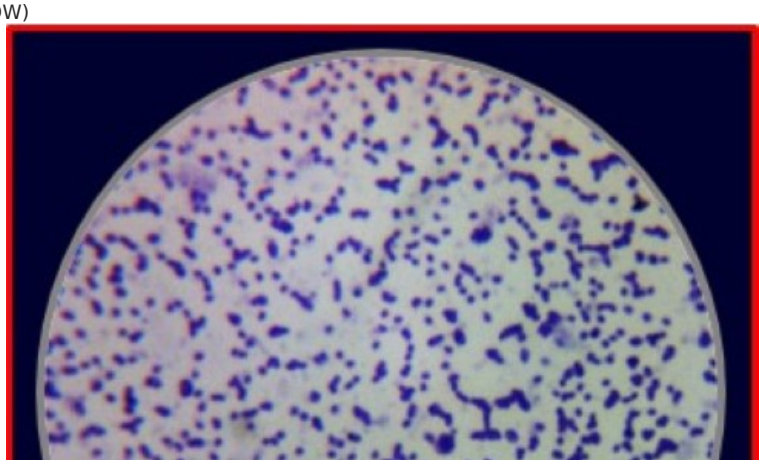


Photo 8: Bacteria Coccus Form

(SAMPLE ANSWER BELOW)



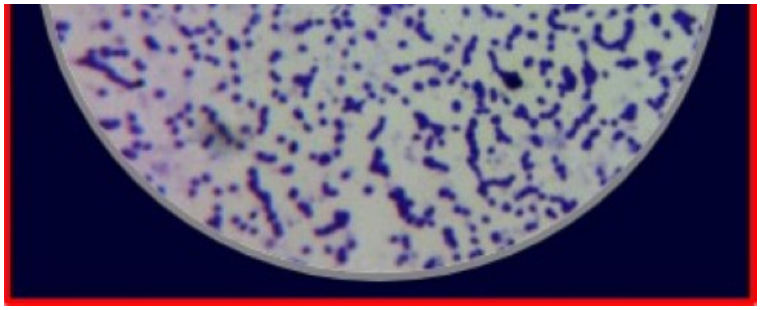


Photo 9: Slide A
(SAMPLE ANSWER BELOW)

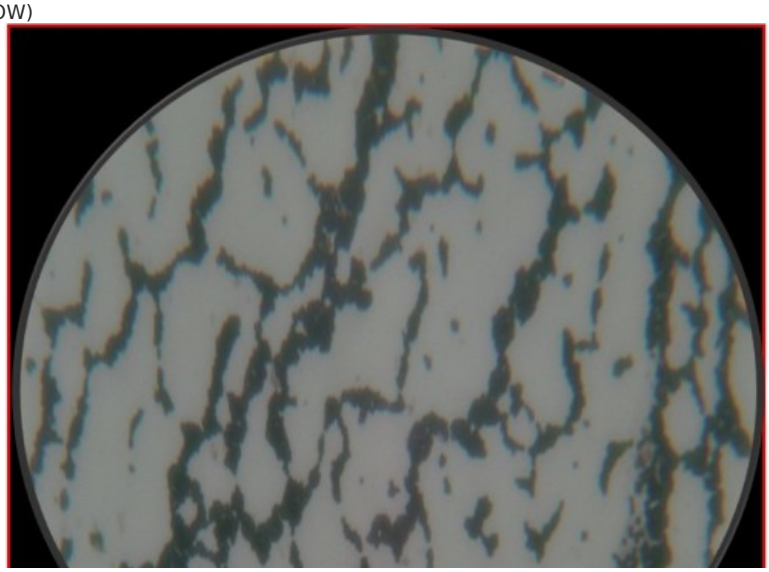
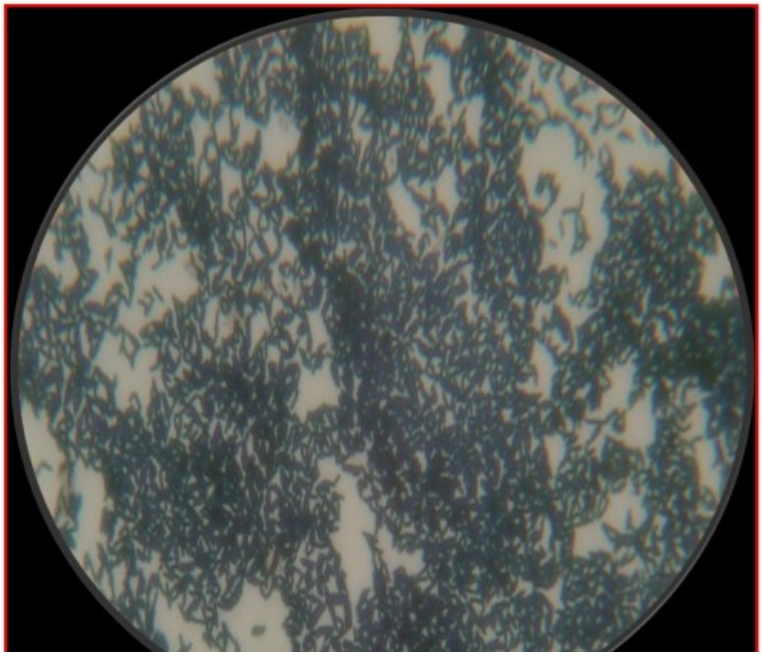
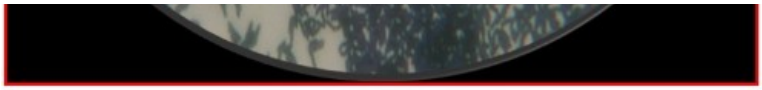


Photo 10: Slide B

(SAMPLE ANSWER BELOW)





Competency Review

The primary role of prokaryotes in the environment is to spread disease.

- True
- False ✔

_____ are spherical cells that may exist singly or as clumps and chains.

- Bacilli
- Cocci ✔
- Spirilla
- Umbonate

The _____ layer of the cell wall differs between Gram-positive and Gram-negative bacteria.

- cytoplasm
- lipid
- peptidoglycan ✔
- protein

The morphologies of prokaryotic colonies can be used to identify species.

- True ✔
- False

Gram staining is a _____ -step procedure of applying dyes to the cell walls of bacteria.

- two
- three
- four ✔
- five

_____ stains Gram-negative bacteria pink.

- Crystal violet
- Decolorizer
- Iodine
- Safranin ✔

A skin swab sample should produce different colony morphologies when cultured on agar plates than a sample collected from a household surface.

- True ✔
- False

Before Gram staining, bacteria smears must be _____.

- blotted dry with paper towels
- heat-fixed ✔
- rinsed with tap water
- refrigerated

Prokaryotes present in the household environment differ by colony morphology and cell shape.

- True ✔
- False

Extension Questions

A patient at a health clinic has an infected cut on their arm. Apply your knowledge of prokaryotes and associated laboratory techniques to describe procedures to identify the source of the infection.

(SAMPLE ANSWER BELOW)

A sterile swab should be used to collect a sample from the infected cut that should then be streaked onto an agar plate. The resulting colonies would then be observed for color, size, shape, and margin. An isolated colony could then be collected and used to create a smear that would be heat-fixed and Gram stained. The cell wall shape and structure could then be observed to identify the bacteria.