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# Tutorial

## Virtual Labs- Tutorial

### Phase 2

 Question X

Why is the experiment performed at 37°C ?


- ☒ Because 37°C is near typical human body temperature and this helps me understand how well this enzyme functions at the temperature it is normally found.
- ☐ Because 37°C is more than 25°C and multiple values are needed for this experiment.

Great job, that is correct. Exploring how enzymes behave at body temperature is very important to the understanding of physiology.

Continue

# DNA

## DNA BIOLOGY AND TECHNOLOGY • ISOLATION OF DNA Phase 1


 Question X

Why is it important to keep the filtrate and reagents cold?

- ☐ Cold temperature homogenizes DNA.
- ☒ Cold temperature stabilizes DNA.
- ☐ Cold temperature lyses membranes.

**Correct. The cold temperature inhibits DNA breakage.**

Continue

 Question X


What was the purpose of mixing cells with sodium chloride and detergent to form the strawberry filtrate?  
*Select all the correct statements.*

- ☐ A. Sodium chloride is used to digest cell proteins.
- ☒ B. Detergent emulsifies cell and nuclear membranes of cells.
- ☒ C. Sodium ions neutralize the negative charge of DNA to facilitate precipitation.

**Correct**  
B. The detergent disrupts phospholipid bilayers.  
C. This helps the DNA come out of solution.

Continue




 Question X

What is the purpose of the meat tenderizer?

- ☒ To digest associated proteins that bind the DNA.
- ☐ To digest the DNA and release proteins into solution.
- ☐ To homogenize the solution.

**Correct. Proteins help organize DNA into a packed structure inside a cell, so these need to first be removed.**

Continue


 Question X

What is the purpose of the ice cold 95% ethanol?

- ☐ To digest the DNA into fragments that can be collected.
- ☒ To precipitate the DNA from the filtrate.
- ☐ To homogenize the solution.

**Correct. DNA is not soluble in ethanol but it is in the water based filtrate. As a result, the DNA precipitates when it enters the ethanol allowing it to be spooled.**

Continue

 Question X

What is the correct way to spool the DNA?

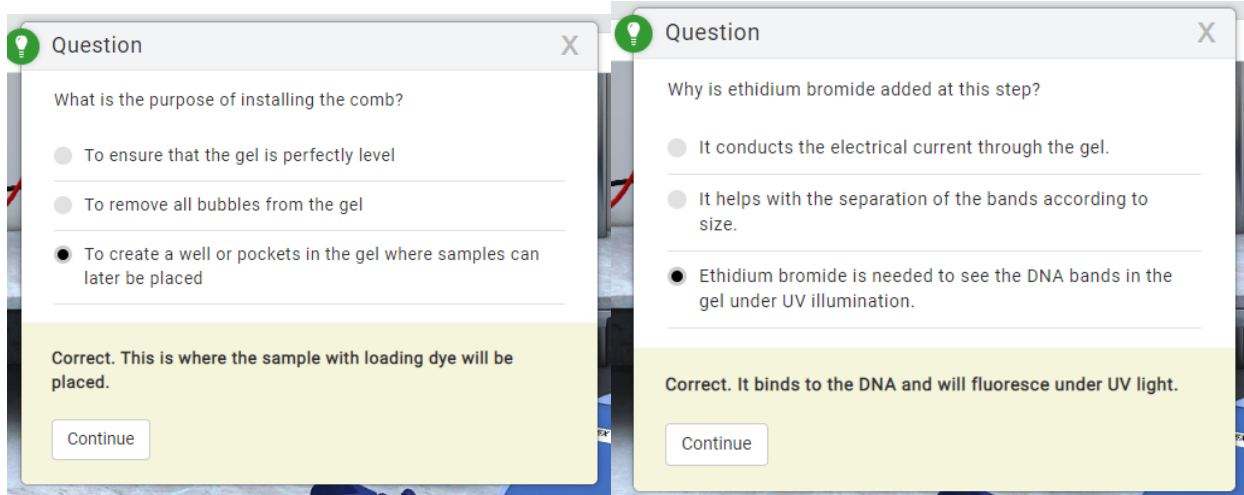
- ☒ Slowly using a constant motion and pressure to collect the precipitate.
- ☐ In rapid jerking movements to catch all possible strands onto the glass rod.
- ☐ As quickly as possible before it dissolves into solution.

**Correct. This gives the best chance at collecting intact DNA strands.**

Continue

## DNA BIOLOGY AND TECHNOLOGY • GEL ELECTROPHORESIS

### Phase 2



**Question**

What is the purpose of installing the comb?

- ☐ To ensure that the gel is perfectly level
- ☐ To remove all bubbles from the gel
- ☒ To create a well or pockets in the gel where samples can later be placed

Correct. This is where the sample with loading dye will be placed.

Continue

**Question**

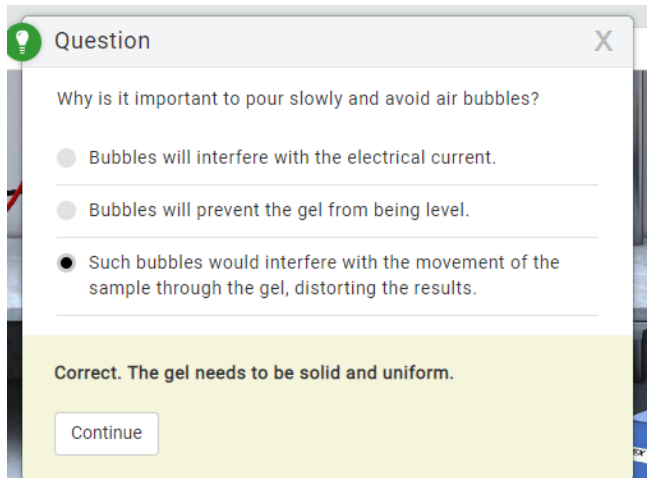
Why is ethidium bromide added at this step?

- ☐ It conducts the electrical current through the gel.
- ☐ It helps with the separation of the bands according to size.
- ☒ Ethidium bromide is needed to see the DNA bands in the gel under UV illumination.

Correct. It binds to the DNA and will fluoresce under UV light.

Continue

### Phase 2



**Question**


Why is it important to pour slowly and avoid air bubbles?

- ☐ Bubbles will interfere with the electrical current.
- ☐ Bubbles will prevent the gel from being level.
- ☒ Such bubbles would interfere with the movement of the sample through the gel, distorting the results.

Correct. The gel needs to be solid and uniform.

Continue

### Phase 4

 Question X


What could happen if you do not get a new tip to load each sample?

- ☐ The volume would be different because some would remain in the tip.
- ☒ There could be cross contamination of the samples giving unreliable results.
- ☐ The sample would no longer be sterile.

**Correct. A new tip will ensure that only the right sample size will be present in the gel once it is run, ensuring accurate results.**

Continue

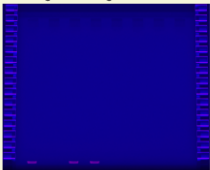
## Phase 5

 Question X

What would happen if the gel was run for too long?

- ☒ The sample bands would move too far and leave the bottom of the gel.
- ☐ Nothing would happen. The bands would just stop in the middle of the gel no matter how long it's run.
- ☐ The sample bands would not separate far enough to see reliable results.

**Correct. Stop too soon and the samples won't separate far enough to be useful, but too long and they'll fall off the far end of the gel leaving no useful results.**



Continue

## DNA Biology and Technology—DNA and RNA Structure Phase 1

Question

The two strands of nucleotides in a DNA molecule are held together by \_\_\_\_\_.

Fill in the blank.

☐ sugar and phosphate bonding

☒ hydrogen bonds between base pairs

☐ peptide bonds

☐ strong ionic bonds

Correct.

Continue

## Phase 2

Question

After DNA replication, each new daughter DNA molecule is composed of \_\_\_\_\_.

Fill in the blank.

☐ one DNA strand and one RNA strand

☐ two parental strands

☐ two newly synthesized strands

☒ one parental strand and one newly synthesized strand

Correct.

Continue

## Phase 3

Question

In transcription, the enzyme RNA polymerase builds a strand of RNA along the \_\_\_\_\_.

Fill in the blank.

☐ ribosome

☐ strand of amino acids

☒ template strand of DNA

☐ coding strand of DNA

Correct.

Continue

# **DIFFUSION**

## Diffusion across a selectively permeable membrane

### Phase 2

Question

X

How are you going to determine if iodine and/or starch diffuse across the dialysis tubing?

*Select all of the correct statements.*

- ☒ A. If only iodine is able to diffuse across the membrane, the solution in the dialysis tubing bag will look dark purple.
- ☐ B. If only starch is able to diffuse across the membrane, the solution in the dialysis tubing will look dark purple.
- ☒ C. If both iodine and starch are able to diffuse across the membrane, both the dialysis tubing and the beaker will look dark purple.

Correct

A. In this situation the iodine would diffuse from the beaker into the dialysis tubing with the starch.

C. If both starch and iodine are able to diffuse across the dialysis tubing they would mix on both sides of the

Question

X

Did diffusion across the membrane occur for the iodine solution?

☐ No

☒ Yes

Correct!

Continue

Question

X

Did diffusion across the membrane occur for the starch solution?

☒ No

☐ Yes

Correct!

Continue

Question

X

Did diffusion across the membrane occur for the glucose solution?

☒ Yes

☐ No

Correct!


Continue

Diffusion: Effect of concentration on the rate of diffusion in a semisolid  
No pop-up questions

Diffusion: Effect of density of media on the rate of diffusion  
No pop-up questions

## Diffusion: Effect of molecular weight on diffusion in air

### Phase 2

 Question X

Why do you believe no precipitate formed in your experiment?


☐ The tube was tilted.

☒ I did not add both hydrochloric acid (HCl) and ammonia (NH<sub>3</sub>) to the tube.

Correct. Try the experiment again.

Continue

### Phase 3

 Question X

Why do you believe no precipitate formed in your experiment?


☐ The tube was tilted.

☒ I did not add both hydrochloric acid (HCl) and ammonia (NH<sub>3</sub>) to the tube.

Correct. Try the experiment again.

Continue

### Phase 4

 Question X

Based on your experimental results, where did the ammonium chloride cloud form?

☒ Closer to the hydrochloric acid (HCl) source.

☐ Independent of where you placed the hydrochloric acid (HCl) and ammonia (NH<sub>3</sub>) cotton balls.

☐ Closer to the ammonia (NH<sub>3</sub>) source.

☐ Midway between the hydrochloric acid (HCl) and ammonia (NH<sub>3</sub>) cotton balls.

Correct.

Continue

# EMG

## ELECTROMYOGRAPHY • TIME TO FATIGUE

No pop-up questions in this simulation

## ELECTROMYOGRAPHY • MOTOR UNIT RECRUITMENT

### Phase 2

Question

X

What does the relatively straight line at the top of the EMG recording show?

☒ Force

☐ Frequency

☐ Voltage

☐ Number of motor units

Correct. The relatively straight line represents force.



Continue



# Endocrine

## ENDOCRINE SYSTEM • EFFECTS OF BLOOD GLUCOSE LEVEL

### Phase 1

 Question 



Match the fish behavior with glucose levels.

Normal	<input type="text" value="Regular swimming speed"/>
Hypoglycemia / insulin shock	<input type="text" value="Fish is lethargic with droopy"/>
Hyperglycemia	<input type="text" value="Fast swimming and darting"/>

Correct

Continue

### Phase 2

 Question 

Based on what you know about the function of insulin, what is the expected end result of adding insulin to the water?

- ☒ Fish is lethargic due to hypoglycemia.
- ☐ Regular swimming due to normoglycemia.
- ☐ Fish swims fast due to hyperglycemia.

Correct. Insulin will cause glucose to enter cells thus lowering blood glucose level. If unchecked the fish will go into insulin shock.

Continue

## ENDOCRINE SYSTEM • INFLUENCE OF THYROID HORMONE ON TEMPERATURE REGULATION

No pop-up questions in this simulation

# Enzyme

## HOW ENZYMES FUNCTION • EFFECT OF CONCENTRATION

### Phase 4

The first screenshot shows a question: "By adding 2 mL of catalase in this step instead of 1 mL what is being tested?". The options are: "Effect of concentration of the enzyme" (selected), "Effect of pH on the reaction", and "Enzyme specificity". The feedback text states: "Correct. Adding more enzyme increases the overall concentration of the enzyme in the solution." A "Continue" button is at the bottom.

The second screenshot shows a question: "Why are you performing the test with distilled water and hydrogen peroxide?". The options are: "It is a specificity test", "It is a negative control test" (selected), and "It is a positive control test". The feedback text states: "Correct. You are performing an experiment where you do not expect a reaction to occur, since you do not have both the enzyme and substrate." A "Continue" button is at the bottom.

## HOW ENZYMES FUNCTION • ACTIVITY

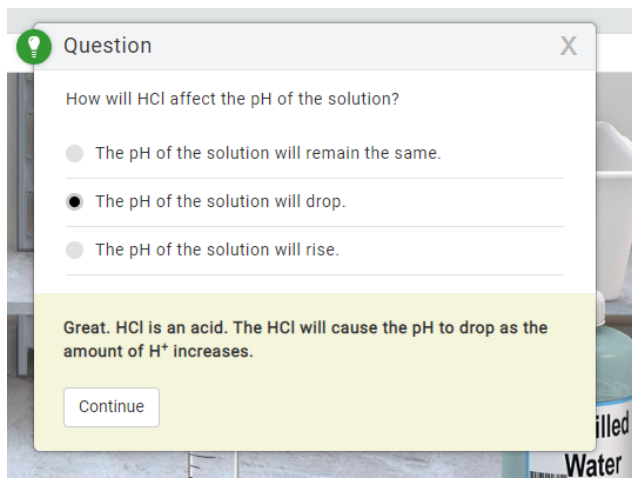
### Phase 3

The first screenshot shows a question: "Why are you performing the test with catalase and water?". The options are: "It is a negative control test", "It is a sensitivity test", "It is a specificity test" (selected), and "It is a positive control test". The feedback text states: "Correct! You are performing the test with catalase and water to see if catalase will catalyze a reaction with anything that is not hydrogen peroxide. Therefore, in this step you are testing the specificity of catalase." A "Continue" button is at the bottom.

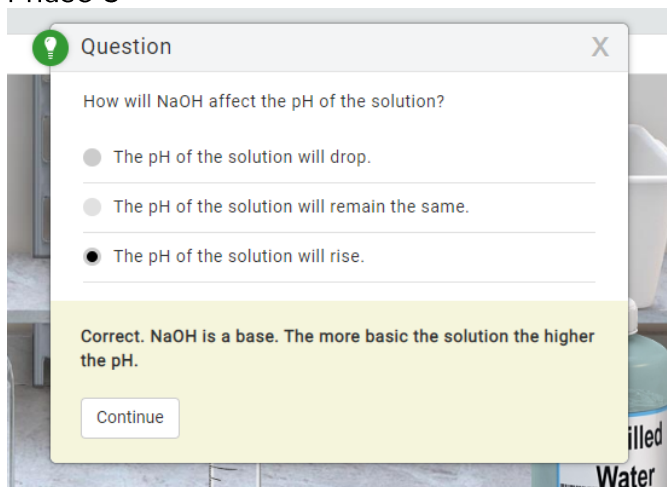
The second screenshot shows a question: "Do you expect to see a reaction from mixing hydrogen peroxide and water?". The options are: "No, the reaction is missing enzyme." (selected), "No, the reaction is missing substrate.", and "Yes, all the reaction components are present.". The feedback text states: "Correct! For the reaction to occur you must have both the enzyme and substrate present. In this experiment the enzyme is missing." A "Continue" button is at the bottom.

## HOW ENZYMES FUNCTION • EFFECT OF PH

### Phase 3



## Phase 5



## HOW ENZYMES FUNCTION • EFFECT OF TEMPERATURE

## Phase 4



### Question



Why is the experiment performed at 37°C ?

- ☒ Because 37°C is near typical human body temperature and this helps me understand how well this enzyme functions at the temperature it is normally found.
- ☐ Because 37°C is more than 25°C and multiple values are needed for this experiment.

**Great job, that is correct. Exploring how enzymes behave at body temperature is very important to the understanding of physiology.**


Continue

# Human Genetics

## HUMAN GENETICS • CHROMOSOMAL INHERITANCE

### Phase 1

APCE DURING MEIOSIS

 Question X

Which describes the cells at the end of meiosis I?

*Select all of the correct statements.*

- ☒ A. The homologous chromosomes are in separate cells.
- ☒ B. The cells are haploid.
- ☐ C. The cells are diploid.
- ☐ D. The sister chromatids are in separate cells.


**Correct**

**A. The two homologous chromosomes of a homologous pair have separated and moved to newly created cells.**

**B. Though two chromatids are connected at the centromere, the cell is haploid because it has half the original chromosome number.**

[Continue](#)

### Phase 2

 Question X



The end of meiosis II produces:

- ☐ four diploid cells.
- ☐ two diploid cells.
- ☐ two haploid cells.
- ☒ four haploid cells.

**Correct. The end product of meiosis is four haploid cells.**

[Continue](#)

### Phase 3

 Question 



If nondisjunction occurs during anaphase I than meiosis I produces:

- ☐ two cells with an extra chromosome and two cells missing a chromosome.
- ☒ one cell with extra homologous chromosomes and one cell missing a homologous chromosome.
- ☐ two diploid cells.
- ☐ two haploid cells.

**Correct. The end product of meiosis with nondisjunction contains cells with an extra chromosome or a missing one.**

[Continue](#)

## Phase 4

 Question 



If nondisjunction occurs during anaphase I, the final product of meiosis II is:

- ☐ two haploid cells.
- ☐ two diploid cells.
- ☐ one cell with an extra chromosome and one cell missing a chromosome.
- ☒ two cells with an extra chromosome and two cells missing a chromosome.

**Correct. The end product of meiosis with nondisjunction contains cells with an extra chromosome or a missing one.**

[Continue](#)

## Phase 5

 Question 

Which describes the cells at the end of meiosis I when nondisjunction occurs during meiosis II?

*Select all of the correct statements.*

- ☒ A. The cells are haploid.
- ☐ B. The cells are diploid.
- ☐ C. The sister chromatids are in separate cells.
- ☒ D. The homologous pairs are in separate cells.



Correct

A. Though two chromatids are connected at the centromere, the cell is haploid because it has half the original chromosome number.

D. The homologous pairs have moved to newly created cells.

Continue

## Phase 6

 Question 

At what phase can nondisjunction occur?


- ☒ Anaphase I or II
- ☐ Prophase I
- ☐ Metaphase II

Correct. When the chromosomes are aligned and begin to be separated to opposite sides, the separation may not be accomplished in either anaphase I or even later during the similar anaphase II.

Continue

## HUMAN GENETICS • GENETIC INHERITANCE

### Phase 1

 Question X

Is hairline shape, ear shape, and eye color a genotype or phenotype?


☐ Genotype

☒ Phenotype

Correct. Phenotype is a characteristic of an organism that can be observed and measured. Hairline, ear shape, and eye color are observable and can be measured.

Continue

## Phase 2

 Question X

Match the following genotypes with their appropriate description.


Heterozygous	<input type="text" value="Tt"/>
Homozygous recessive	<input type="text" value="tt"/>
Homozygous dominant	<input type="text" value="TT"/>

Correct

Continue

## Phase 6



 Question X

Would it be more likely for a female or male to show the phenotype for a recessive X-linked mutation?

☐ Female

☒ Male



**Correct. For a male to exhibit an X-linked condition, only his mother would have to be a carrier of the mutation.**

[Continue](#)

# Lab Safety

## LAB SAFETY • PERSONAL SAFETY

### Phase 1

 Question 

Which of the following items in this dissection exercise are potentially dangerous to the student?



Select all of the correct statements.

- ☐ A. Dissection tray
- ☒ B. Scalpel
- ☐ C. Beaker
- ☒ D. Rat

**Correct**  
B. The scalpel is very sharp and could cause accidental cuts.  
D. The rat is likely preserved with chemicals that could irritate skin.

[Continue](#)

### Phase 2

 Question 



Which item in this pH exercise is potentially dangerous to the student?

- ☒ HCl solution
- ☐ Reagent glass
- ☐ pH paper
- ☐ Salt solution

**Correct.** Acid is corrosive and could potentially splash into the eyes or onto the skin or clothing.

[Continue](#)

### Phase 3

 Question 

Which of the following items in this staining exercise are potentially dangerous to the student?

Select all of the correct statements.

- ☐ A. Water spray bottle
- ☒ B. Bunsen burner
- ☒ C. Microbial culture
- ☐ D. Microscope
- ☒ E. Nigrosin and crystal violet



Correct

B. The burner could ignite clothing or hair.  
C. The microbes are an infectious hazard.  
E. The substances might be spilled on the hands or clothing.

Continue

## **LAB SAFETY • HAND WASHING PROCEDURE**

### **Phase 2**

 Question 

Congratulations! You have successfully washed your hands. Why is that important?

- ☐ Hand washing is an important hygienic safeguard.
- ☒ Hand washing is important in preventing contamination and removing hazardous material from the hands.

Correct. Hand washing is a critical safety measure in the laboratory.

Continue

# Mendelian Genetics

## MENDELIAN GENETICS • X-LINKED FRUIT FLY CROSS

### Phase 2

Question

Match the genotype with the correct phenotype.

$X^{R}Y$	Male fly, red eye
$X^{R}X^{r}$	Female fly, red eye
$X^{r}Y$	Male fly, white eye
$X^{r}X^{r}$	Female fly, white eye

Correct

Continue

Incubate 1 Week

### Phase 2

Question

Why were the adult flies in the  $X^{R}Y \times X^{R}X^{r}$  vial incubated for 1 week?

☐ After 1 week, the flies need more food.

☒ One week is long enough for the flies to mate and lay eggs but not long enough for new flies to hatch.


☐ Flies only live for 1 week.

Correct. This ensures there is no mixing of the parental generation and offspring.

Continue

1 Week has passed.  
Go to next phase

### Phase 3

 Question X

Why were the adult flies in the  $X^{R^+}Y \times X^{R^+}X^{R^+}$  vial removed?


- ☐ There is not enough food in the vial for both the adults and offspring.
- ☐ The adult flies will eat their offspring, therefore the ratio of offspring will be incorrect.
- ☒ The goal of the experiment is to count the phenotypic ratio of the offspring, therefore the parental generation must be removed.

Correct. If the parental generation is not removed the ratio of the offspring will be incorrect.

Continue

## **MENDELIAN GENETICS • FRUIT FLY CHARACTERISTICS**

### **Phase 1**

 Question X

Why is it important to be able to differentiate between male and female flies?

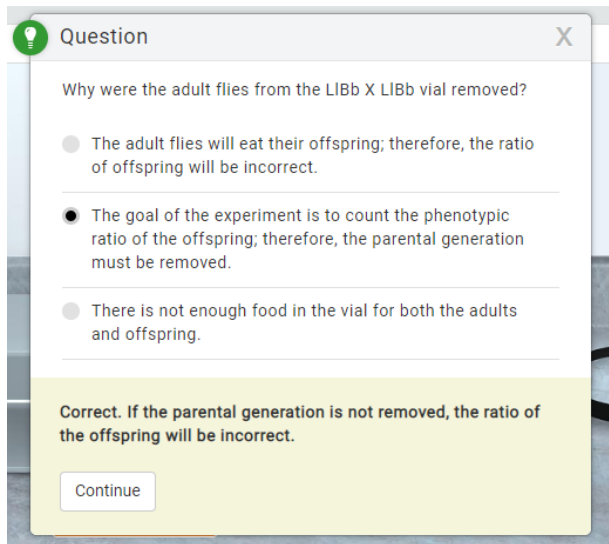
- ☒ To ensure that you have the appropriate mix of male and female flies in your cross.
- ☐ To determine if each trait is sex-linked.
- ☐ It is not important. Flies are unisex and therefore can not be categorized into male and female.
- ☐ To make sure you have five male flies for every female fly.

Correct. If you are unable to correctly separate male and female flies, your cross may only contain a single sex or have the incorrect genotype. Some crosses use male and female flies with different genotypes.

Continue

## **MENDELIAN GENETICS • DIHYBRID FRUIT FLY CROSS**

### **Phase 3**



**MENDELIAN GENETICS • MONOHYBRID PLANT CROSS**  
**No pop-up questions in this simulation**

**MENDELIAN GENETICS • MONOHYBRID FRUIT FLY CROSS**  
**No pop-up questions in this simulation**

**MENDELIAN GENETICS • DIHYBRID PLANT CROSS**  
**No pop-up questions in this simulation**

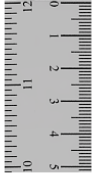
# Metric Measurement

## METRIC MEASUREMENT • LENGTH

### Phase 1

Question

Which side of this ruler should be used to take metric measurements?



☒ Right  
☐ Left

Correct. This side depicts centimeters with 10 millimeter marks in between each number.

Continue

RESET | MY NOTES | TAB DATA | SHOW TABS

### Phase 1

Question

Why are accurate measurements necessary in scientific research?

Select all of the correct statements.

☒ A. So scientists can replicate experiments done by others and compare their findings to the first published research.  
☒ B. So scientists can accurately report findings and suggest theories.  
☐ C. To quickly share relevant findings.

Correct

A. Being able to replicate findings is helped by taking accurate measurements.  
B. Being able to compare accurate results allows for good hypothesis testing.


Continue

## METRIC MEASUREMENT • TEMPERATURE

### Phase 1

**Question**

Which side of this thermometer should be used to take metric measurements?



☐ Left

☒ Right

That is correct. This side depicts degrees Celsius.

Continue

## Phase 1

**Question**

Why is it important to know the difference between Celsius and Fahrenheit scales?

☐ Because it takes water longer to boil when using Fahrenheit units.

☒ Because boiling and freezing occur at very different values on each scale.

☐ Because water freezes faster when using Celsius units.

Correct. Boiling happens at either 100 degrees or 212 degrees, and freezing happens at either 0 degrees or 32 degrees, so getting those reversed gives very different meanings.

Continue


## **METRIC MEASUREMENT • VOLUME**

### **Phase 1**



Question

Where do you need to orient your eye level to take an accurate reading of the meniscus?



©McGraw-Hill Education/Stephen Frisch

☐ Slightly below looking up at the meniscus

☐ Slightly above looking down at the meniscus

☐ Exactly parallel to the meniscus

Submit

## Phase 2

Question

X

You calculated the volume of a drop. Will this value be the same for all droppers?


☒ No

☐ Yes

Correct. Droppers can be found in different sizes and dispense different volumes per drop.

Continue

## Phase 3

 Question X

Why is volume displacement used to calculate the volume of some objects?


- ☐ Because it is difficult to accurately measure a symmetrical object.
- ☒ Because it can be difficult to accurately measure oddly shaped objects.
- ☐ Because measuring length has nothing to do with volume.

**Correct.** Measuring the length of a cube or the diameter of a sphere could give a volume but odd shapes make the mathematics much more difficult.

Continue

## **METRIC MEASUREMENT • WEIGHT**

### **Phase 1**

 Question X

What would be the benefit of taring the scale with the beaker?

- ☒ No calculation is needed to determine the weight of the sodium chloride.
- ☐ We can now easily determine the weight of the beaker without having to worry about the sodium chloride.
- ☐ There is no benefit.


**Correct.** With the weight of the beaker (container) ignored, it is easy to determine how much sodium chloride is present.

Continue

# Microscopy

## MICROSCOPY • OPERATION OF A BRIGHTFIELD MICROSCOPE

### Phase 2

 Question X


Which of the three factors affecting image quality is altered by the light source?

- ☒ Contrast
- ☐ Resolution
- ☐ Magnification

Correct. Contrast can be altered by light intensity and staining.

Continue

### Phase 4

 Question X


How does the coarse and fine focus knob work on a brightfield microscope?

- ☒ The focus knobs move the stage up and down.
- ☐ The focus knobs move the stage toward and away from you as you are looking at the microscope.
- ☐ The focus knobs move the eyepieces further apart or closer together.

Correct. The focus knobs move the stage up and down allowing the user to move the slide into focus.

Continue

### Phase 7

 Question X


Why should the fine focus knob typically be used with the 10X and 40X objective lenses?

- ☐ Focusing using the coarse adjustment knob with the 10X or 40X objective may crack the stage.
- ☐ The coarse focus knob is non-functional with the 10X and 40X objective lenses.
- ☒ The slide should be close to in focus after focusing at the 4X objective. Focusing with the coarse focus knob would result in too large a change in focus.

**Correct.** Using the coarse focus knob would result in a large change in focus, when only a small change is needed.

Continue

## Phase 7

 Question X


What is the total magnification of a specimen using the 40X objective?

- ☐ The total magnification would be 4X.
- ☐ The total magnification would be 40X.
- ☒ The total magnification would be 400X.

**Correct.** Total magnification is 400X.

Continue

## Phase 8

 Question X

What is the advantage of starting with the 4X objective before moving to the 10X, and then the 40X objective?


- ☐ The field of view is larger.
- ☐ The field of view is easier to focus.
- ☒ The field of view is larger and it is easier to focus.

**Correct. The lower power objective has a larger field of view and is easier to focus.**

Continue

## MICROSCOPY • OIL IMMERSION

### Phase 1

 Question X

Why is your image blurry?

- ☒ The oil was not properly removed before changing back to the 40X objective lens.
- ☐ Once you focus on a slide with the 100X objective you cannot go back to a lower power objective.
- ☐ You are not able to get a clear image for this slide using the 40X objective.

**Correct. Oil can only be used for the 100X objective lens and will distort the image when used with other objective lenses.**

Continue

### Phase 1

Question

X

What is important to remember when using oil immersion?

- ☒ Immersion oil can only be used with the 100X objective and without it the image is blurry.
- ☐ Immersion oil helps with resolution with all objective lenses.
- ☐ Immersion oil increases the magnification of the 100X objective lens.

**Correct.** Immersion oil is required for the 100X objective lens but will damage the other lenses.

Continue

## MICROSCOPY • POND WATER WET MOUNT

### Phase 1

Question

X

What are advantages to using a wet mount slide preparation?  
*Select all that apply*

- ☒ A. The specimen could be viewed moving.
- ☒ B. The specimen behavior can be viewed.
- ☐ C. Wet mount slide preparation is a long and difficult process.
- ☒ D. The specimen may be alive.

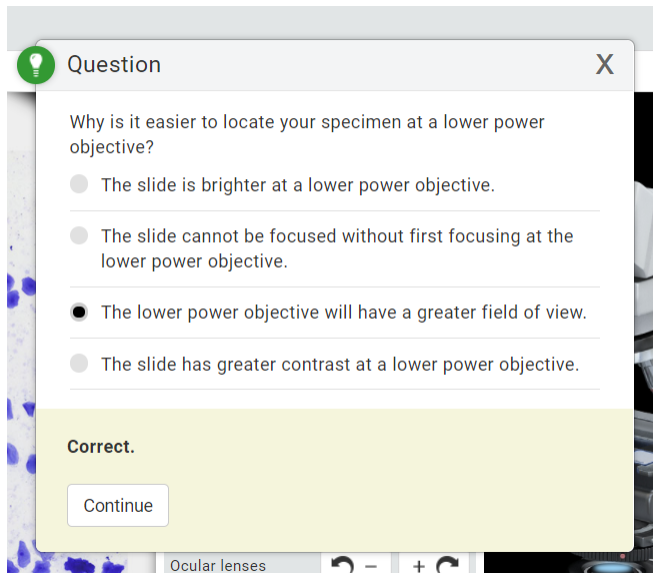
**Correct**

- A. There are additional advantages to viewing a motile specimen.
- B. Wet mount slide preparation allows the viewing of specimen behavior as they interact with the environment.
- D. There are additional advantages to viewing a living specimen.

Continue

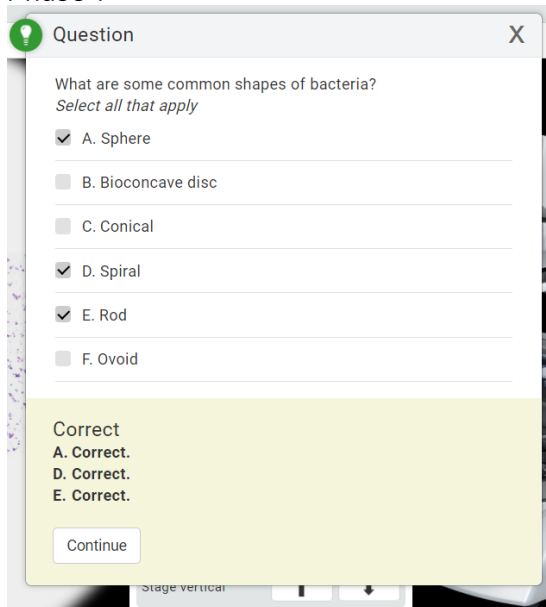
## Microscopy—Animal Cells

### Phase 2

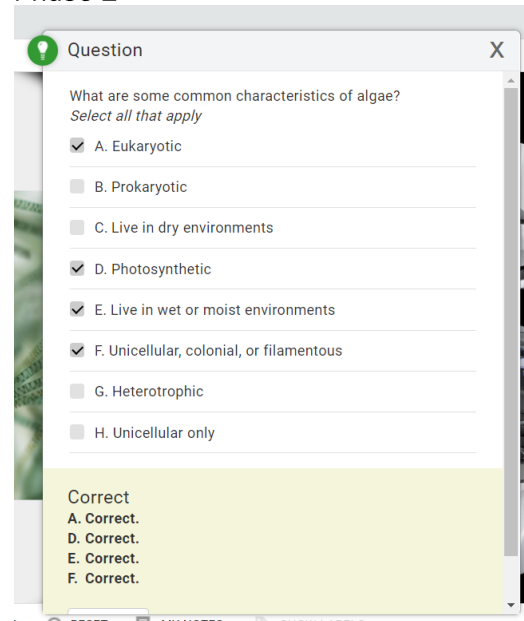


## Microscopy—Diversity of Microorganisms

### Phase 1



### Phase 2



### Phase 3

Question

Protozoans are \_\_\_\_\_

☐ multicellular animal-like organisms that possess differentiated tissues

☐ prokaryotic cells that use photosynthesis for nutrition

☒ unicellular eukaryotic microorganisms that obtain nutrients by engulfing food particles

Correct.

Continue

Question

Which of the following are used by protozoa for motility?  
*Select all that apply*

☒ A. Cilia

☐ B. Fimbriae

☒ C. Flagella

☒ D. Cytoplasmic extensions called pseudopods

Correct  
A. Correct.  
C. Correct.  
D. Correct.

Continue

### Phase 4

Question

Which of the following are common characteristics of fungi?  
*Select all that apply*

☐ A. Prokaryotic

☐ B. Multicellular only

☒ C. Eukaryotic

☒ D. Includes both yeast and molds

☒ E. Unicellular or multicellular

☐ F. Includes yeast and protozoa

Correct  
C. Correct.  
D. Correct.  
E. Correct.

Continue

Question

What is a difference between yeast and mold?

☐ Yeast is heterotrophic and mold is photosynthetic.

☒ Yeast is unicellular and mold is multicellular.

☐ Yeast contains cilia and mold does not.

☐ Yeast is prokaryotic and mold is eukaryotic.

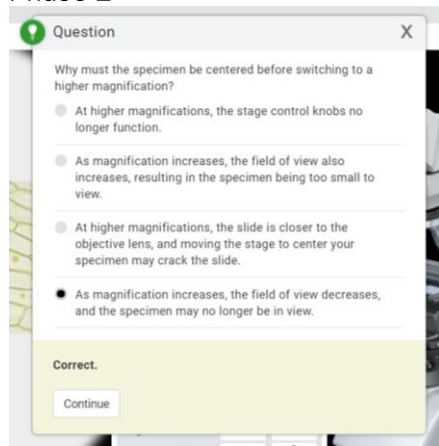
Correct.

Continue



## Microscopy—Plant Cells

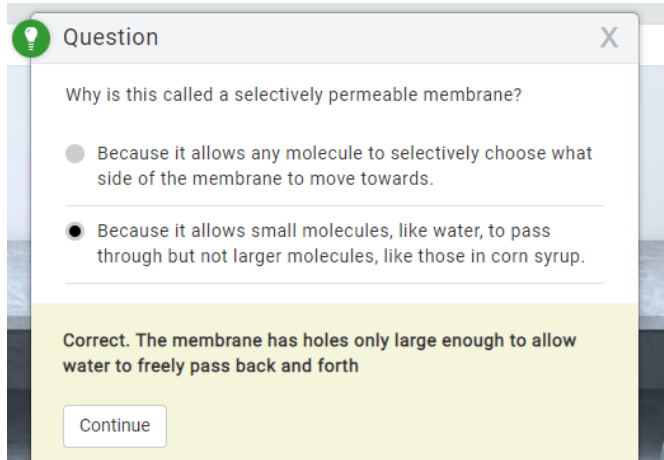
### Phase 2



# Osmosis

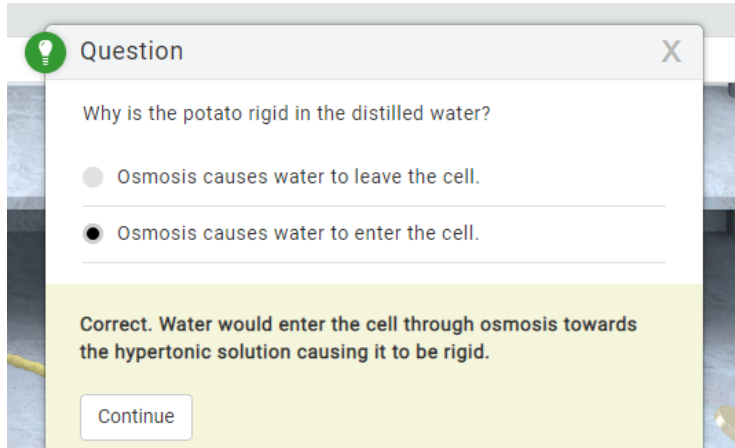
## OSMOSIS • MOVEMENT OF WATER ACROSS A SELECTIVELY PERMEABLE MEMBRANE

### Phase 2




## OSMOSIS • TONICITY IN POTATO STRIPS

### Phase 2



## OSMOSIS • TONICITY IN RED BLOOD CELLS

### Phase 2

 Question X


What is happening to the cell that is causing it to shrink?

- ☐ Due to the isotonic solution, water is leaving the cell.
- ☒ Due to the hypertonic solution, water is leaving the cell.
- ☐ Due to the hypotonic solution, water is leaving the cell.
- ☐ Due to the hypertonic solution, water is entering the cell.

**Correct. The loss of water causes the cell to shrink.**

Continue

### Phase 3

 Question X



What is happening to the cell since there seems to be no change?

- ☐ The hypertonic environment will not allow water to move into or out of the cell.
- ☒ Since the solution is isotonic, there is no net movement of water.
- ☐ The hypotonic environment will not allow water to move into or out of the cell.

**Correct. In an isotonic environment the balance of solutes results in no net change in water balance.**

Continue

### Phase 4



 Question 

Why does blood become clear in distilled water?

- ☒ Because distilled water is hypotonic, the cells have burst and no longer block light passing through the fluid.
- ☐ Because the cells swell up a little and bend light, it's possible to see through the fluid.
- ☐ Because distilled water is hypertonic and the cells shrink up a little, become smaller, and bend light so it's possible to see through the fluid.
- ☐ Because the cells are more dissolved in this type of solution.

**Correct.** In a hypotonic environment, water will be drawn into a cell causing it to swell and potentially burst.

[Continue](#)

 Question 

What is happening to the cell that is causing it to swell?

- ☒ Due to the hypotonic solution, water is entering the cell.
- ☐ Due to the hypertonic solution, water is leaving the cell.
- ☐ Due to the hypertonic solution, water is entering the cell.
- ☐ Due to the isotonic solution, water is entering the cell.

**Correct.** In a hypotonic environment, water will be drawn into a cell causing it to swell and potentially burst.

[Continue](#)

# Respiratory System

## RESPIRATORY SYSTEM • MECHANISM OF BREATHING

### Phase 2

Question

X

What does expansion of the thoracic cage lead to?

☒ An increase in lung volume

☐ A decrease in lung volume

☐ No change in lung volume

Correct. The lungs are pressed against the internal thoracic cage. Therefore, expansion of the thoracic cage increases the lung volume by stretching the lungs.

Continue

## RESPIRATORY SYSTEM • PULMONARY FUNCTION TESTS

### Phase 2

Question

X

You selected **restrictive**. However, Fred is a unique patient that underscores the importance of a physical examination. His patient history correctly suggests factors that can lead to both obstructive and restrictive disorders. Which part of Fred's history suggests a possible **obstructive** disorder?

☐ The construction work without respiratory protection

☒ Smoking

Correct. Smoking is the most common factor in contributing to obstructive disorders.

Continue

# Scientific Method

## APPLYING THE SCIENTIFIC METHOD • PILLBUG PREFERENCE Phase 2

Question

X

Which choice chamber is the experimental group?

☐

The choice chamber with sand on both sides.

☒

The choice chamber with cornstarch on one side and sand on the other side.


Correct. The experimental group will include the variable being tested.

Continue

# Eye and Vision

## ACCOMMODATION OF THE LENS

### Phase 1

 Question X

Patient 1 saw the word "focus" become blurry at 19 cm. What is Patient 1's near point of focus?

☐ 19 cm


☒ 20 cm

☐ 18 cm

Correct. The image was still clear at 20 cm, so that is the near point of focus.

Continue

### Phase 2

 Question X

Patient 2 saw the word "focus" become blurry at 6 cm. What is Patient 2's near point of focus?

☐ 6 cm

☐ 5 cm


☒ 7 cm

Correct. The image was still clear at 7 cm, so that is the near point of focus.

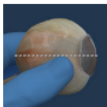
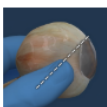
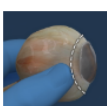
Continue

## EYE AND VISION: EYE DISSECTION

### Phase 4


 Question X

Where would you make a coronal cut, in order to separate anterior from posterior, to most easily visualize internal eye anatomy?

- ☐ 
- ☐ 
- ☒ 

**Correct.** Cutting 1 cm from the edge of the cornea in the coronal plane creates an anterior and posterior part.

[Continue](#)

 Question X

What is the function of the iris?

- ☐ The iris receives light and transmits a signal along the optic nerve.
- ☐ The iris is a convex, transparent structure of the sclera that admits light into the eye.
- ☒ The iris functions to control the amount of light entering the eye.

**Correct.** In bright light, the opening in the iris is smaller to allow less light to enter the eye.

[Continue](#)





### Question



What is the function of the lens?

- ☒ The lens functions to focus the light on the retina.
- ☐ The lens secretes aqueous humor.
- ☐ The primary function of the lens is to separate the anterior and posterior chamber.

**Correct. The lens focuses light on the fovea centralis of the retina.**

Continue



### Question



The retina removed very easily. What holds the retina in place against the choroid?

- ☐ The retina is directly attached to the choroid through the basement membrane.
- ☒ The retina is held in place by pressure from the vitreous humor.



**Correct. The retina is not directly attached to the choroid.**

Continue

# Cardiovascular Physiology

## CARDIOVASCULAR PHYSIOLOGY: PULSE RATE

### Phase 3

 Question 



In which of the following locations did you palpate a significantly faster pulse rate?

- ☒ None. Location does not affect pulse rate
- ☐ Brachial artery
- ☐ Common carotid artery
- ☐ Radial artery

**Correct. Pulse rate is determined by the heart and does not change with location.**

[Continue](#)

### Phase 5

 Question 



Why take the pulse rate again after 5 minutes?

- ☐ It is good to get multiple readings for accuracy.
- ☒ The body takes time to compensate for the new body position.
- ☐ It takes 5 minutes to set up equipment again in an actual lab environment.

**Correct. It takes time for the cardiovascular system to compensate for the new body position.**

[Continue](#)

### Phase 6

 Question 



Do you expect the pulse rate to change when the patient stands up?

- ☒ Yes. I expect the pulse rate to increase.
- ☐ Yes. I expect the pulse rate to decrease.
- ☐ No. I expect the pulse rate to remain the same.

**Correct. The heart must work against gravity to continue to supply blood to tissues.**

Continue

## Phase 7

 Question 

Why did the pulse rate decrease 5 minutes after exercise?



- ☒ The tissue demand for oxygen has decreased.
- ☐ The tissue demand for oxygen has increased.
- ☐ Five minutes after exercising our hearts are more efficient at pumping blood.

**Correct. The tissue demand for oxygen has decreased and, therefore, pulse rate as well.**

Continue

## CARDIOVASCULAR PHYSIOLOGY: BLOOD PRESSURE

## Phase 1



 Question 

How should the blood pressure cuff be positioned on the patient?

- ☐ The hoses on the cuff should be facing posterior and exiting the cuff toward the hand.
- ☐ The hoses on the cuff should be facing posterior and exiting the cuff toward the hand.
- ☐ The hoses on the cuff should be facing anterior and exiting the cuff away from the hand.
- ☒ The hoses on the cuff should be facing anterior and exiting the cuff toward the hand.

Correct.

[Continue](#)

 Question 



Normal expected blood pressure for an adult is less than 115/70. What do the numbers indicate when writing blood pressure?

- ☐ The top number (115) is systolic pressure during exertion, and the bottom number (70) is systolic pressure during rest.
- ☒ The top number (115) is systolic pressure; the bottom number (70) is diastolic pressure.
- ☐ The top number (115) is diastolic pressure; the bottom number (70) is systolic pressure.


Correct. The top number indicates pressure in a vessel during ventricular contraction. The bottom number indicates pressure in a vessel during ventricular relaxation. You are now ready to take patient's blood pressure.

[Continue](#)

## Phase 2

 Question 

Which of the following statements is correct?


 [How to measure](#)

- ☒ Systolic pressure is recorded when Korotkoff sounds are first heard. Diastolic pressure is recorded when Korotkoff sounds are no longer heard.
- ☐ Systolic pressure is recorded 10 mmHg after Korotkoff sounds are first heard. Diastolic pressure is recorded when Korotkoff sounds are no longer heard.
- ☐ Diastolic pressure is recorded when Korotkoff sounds are first heard. Systolic pressure is recorded when Korotkoff sounds are no longer heard.

Correct. Korotkoff sounds are first heard when the pressure in the vessel is greater than the pressure in the blood pressure cuff. Korotkoff sounds are no longer heard when the pressure in the blood pressure cuff is below the lowest pressure in the vessel.

[Continue](#)

## Phase 3

 Question X


Why should the cuff not be inflated beyond 20-30 mmHg above expected value?

- ☐ Overinflation of the cuff will result in damage to the sphygmomanometer.
- ☐ Overinflation of the cuff will result in an incorrect blood pressure reading.
- ☒ Overinflation of the cuff may result in injury to the patient.

**Correct. Overinflation of the cuff can put too high a pressure on the patient and cause injury.**

Continue

#### Phase 4

 Question X

What happens to the location of blood when you stand up compared to lying down?

- ☒ Blood will pool in the lower limbs due to gravity.
- ☐ Blood supply to the head will increase from compensation of the body due to change in position.
- ☐ There is no change in blood distribution upon standing.

**Correct. Gravity pulls blood to the lowest location in the body.**

Continue

#### Cardiovascular Physiology—Heart Auscultation Phase 2

Question

X

During which phase of the cardiac cycle is the first heart sound heard?

☒

Ventricular systole

☐

Ventricular diastole

**Correct.** Contraction of the ventricles increases pressure in the ventricles and closes the AV valves.

Continue

Question

X

During which phase of the cardiac cycle is the second heart sound heard?

☒

Ventricular diastole

☐

Ventricular systole


**Correct.** Relaxation of the ventricles decreases pressure in the ventricles, and the semilunar valves close.

Continue



# Photosynthesis

## PHOTOSYNTHESIS: DETERMINING RATE IN WHITE LIGHT Phase 2

 Question X

Why is a 3% sodium bicarbonate ( $\text{NaHCO}_3$ ) solution added to each test tube?  
*Select all that apply.*


- ☐ A. It is a source of oxygen.
- ☐ B. It is a pH indicator.
- ☒ C. It is a source of carbon dioxide.
- ☒ D. It is a source of water.
- ☐ E. Its volume changes due to photosynthesis.

Correct

**C. Carbon dioxide is a reactant for photosynthesis.**

**D. Water is a reactant for photosynthesis and Elodea lives in water.**

Continue

 Question X

Why do you cover one test tube in aluminum foil?

- ☒ The foil-covered tube is a negative control.
- ☐ The foil-covered tube is a positive control.

Correct. The foil blocks the light and should be negative for photosynthesis.

Continue



Question

Why is the volume level for the Elodea exposed to white light increasing?

☒

 The plant is undergoing photosynthesis and producing oxygen.

☐

 The plant is undergoing cellular respiration and producing oxygen.

☐

 The plant is growing in the white light.

Correct. The addition of oxygen is displacing the liquid in the volumeter.

Continue

Question

Why is the volume level for the Elodea covered with foil decreasing?

☐

 The plant is undergoing photosynthesis and consuming oxygen.

☐

 The plant is growing in the white light.

☒

 The plant is undergoing cellular respiration and is consuming oxygen.

Correct. A plant that is not exposed to light will make its energy by cellular respiration and consume oxygen.

Continue

## Phase 4

Question

What processes do the solid red and the orange dotted lines represent in your graph?

☒

 The solid red line represents photosynthesis, and the orange dotted line represents cellular respiration.

☐

 The orange dotted line represents photosynthesis, and the solid red line represents cellular respiration.

Correct. Photosynthesis produces oxygen, and as a result, the volume of oxygen increases. Cellular respiration uses oxygen, and as a result, the volume of oxygen decreases.

Continue

## PHOTOSYNTHESIS: MONITORING PHOTOSYNTHESIS WITH CARBON DIOXIDE UPTAKE

### Phase 1

Question

X

Why is phenol red added to the test tubes?

- ☐ Phenol red participates with the light reactions of photosynthesis.
- ☐ Phenol red detects the release of oxygen.
- ☐ Phenol red provides carbon atoms for photosynthesis.
- ☒ Phenol red is a pH indicator.

**Correct. Phenol red changes color with pH.**

Continue

Question

X

What is the initial color of the test tube?

- ☐ Yellow
- ☒ Pinkish-red

**Correct. Phenol red is initially pinkish-red.**

Continue

Question

X

Acidic solutions will appear what color?

- ☒ Yellow
- ☐ Pinkish-red

**Correct. Phenol red turns yellow in an acidic environment.**

Continue

## PHOTOSYNTHESIS: PHOTOSYNTHETIC PIGMENTS

### Phase 1

### Question



What is the purpose of the chromatography solvent?

- ☐ The chromatography solvent breaks apart the pigment molecules into small enough pieces to move up the paper.
- ☐ The chromatography solvent chemically reacts with the pigments and allows them to be seen.
- ☒ The pigments dissolve in the chromatography solvent, which allows them to be separated.

**Correct. As the solvent moves up the paper, the pigments are carried along and are separated.**

Continue

### Question




What is the purpose of using extract from chloroplasts?

- ☐ Chloroplasts are the only part of the plant that will stick to chromatography paper.
- ☐ Chloroplasts are the easiest part of the plant to extract.
- ☒ Chloroplasts contain the photosynthetic pigments.

**Correct. To separate the photosynthetic pigments, we must collect them where they are located in the chloroplasts.**

Continue

## PHOTOSYNTHESIS: COMPARING GREEN AND BLUE LIGHT Phase 2


 Question X

Why do you need to add carbon dioxide with the 3% sodium bicarbonate ( $\text{NaHCO}_3$ ) solution?

- ☐ It is a pH indicator.
- ☒ Carbon dioxide can be used by plants to make glucose during photosynthesis.
- ☐ Carbon dioxide breaks down into glucose that the plants need to survive.
- ☐ The volume of carbon dioxide changes due to photosynthesis.

**Correct. Carbon dioxide is a reactant for photosynthesis.**

Continue

 Question X


Why cover one test tube in aluminum foil?

- ☐ The foil-covered tube is a positive control.
- ☒ The foil-covered tube is a negative control.

**Correct. The foil blocks the light and should be negative for photosynthesis.**

Continue

### Phase 3


 Question X

What are the reactants for photosynthesis? (select all that apply)

- ☒ A.  $\text{CO}_2$  (carbon dioxide)
- ☒ B.  $\text{H}_2\text{O}$  (water)
- ☐ C.  $\text{O}_2$  (oxygen)
- ☐ D.  $\text{C}_6\text{H}_{12}\text{O}_6$  (glucose)

**Correct**  
A. Carbon dioxide is a reactant in photosynthesis and is provided by the sodium bicarbonate.  
B. Water is a reactant in photosynthesis.

Continue

 Question X

Do you expect photosynthesis to occur without light?

- ☒ No
- ☐ Yes

**Correct. Light energy is required for photosynthesis.**

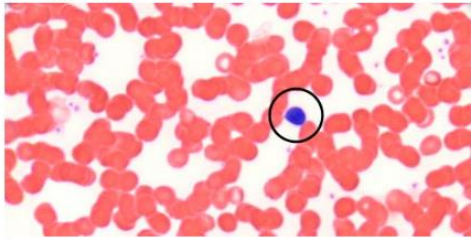
Continue

# Blood

## BLOOD: DIFFERENTIAL WHITE BLOOD CELL COUNT Phase 4

Question X

What type of white blood cell is shown here?



☒ Lymphocyte

☐ Eosinophil

☐ Neutrophil

☐ Basophil

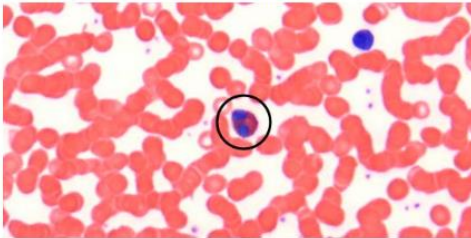
☐ Monocyte

Correct. Lymphocytes are small cells with a round nucleus that fills most of the cytoplasm.

Continue

Question X

What type of white blood cell is shown here?



☐ Neutrophil

☐ Basophil

☐ Monocyte

☒ Eosinophil

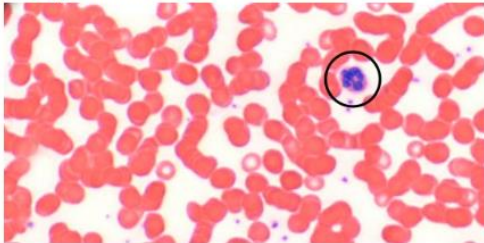
☐ Lymphocyte

Correct. Eosinophils are very rare cells. They contain bright red granules.

Continue

Question X

What type of white blood cell is shown here?



☐ Monocyte

☐ Eosinophil

☐ Lymphocyte

☐ Basophil

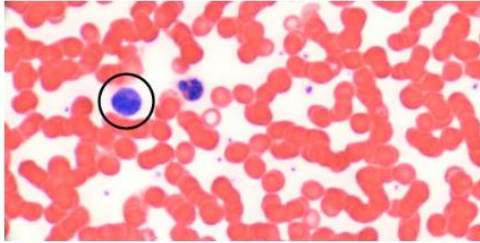
☒ Neutrophil

Correct. Neutrophils are the most common WBC. They have a multilobed nucleus and contain pink granules.

Continue

Question X

What type of white blood cell is shown here?



☐ Lymphocyte

☐ Eosinophil

☒ Monocyte

☐ Basophil

☐ Neutrophil

Correct. Monocytes are large cells with a bean-shaped nucleus that fills half of the cytoplasm.

Continue

Question

X

What WBC type do you expect to find the most?

☐ Lymphocyte

☐ Monocyte

☒ Neutrophil

☐ Basophil

☐ Eosinophil

**Correct. Depending on the many factors, the normal range for neutrophils is 30–75% of all WBCs.**

Continue

## BLOOD: BLOOD TYPING

### Phase 2

Question

X

What do you label on the slide?

*Select all that apply.*

☐ A. Unique slide number

☒ B. Blood sample number

☐ C. Blood type

☒ D. Serum type

**Correct**  
**B. Correct**  
**D. Correct**

Continue

Question

X

Your next instruction is to dispose of the toothpick. You will use a new toothpick to stir each sample. Why is this important?

☐ Using fresh equipment is always good practice in lab.

☐ The wood toothpick reacts with antibodies if exposed for too long.

☒ Using the same toothpick would cross-contaminate the samples.

**Correct. Each blood sample needs to be mixed with only one type of antibody. Using the same toothpick will contaminate the samples.**

Continue

Question X

Which blood samples show agglutination?



- ☐ A. Anti-A
- ☐ B. Anti-B
- ☐ C. Anti-D
- ☒ D. None

Correct

D. No blood samples show agglutination

Continue

### Phase 3

Question X

Which blood samples show agglutination?



- ☒ A. Anti-A
- ☐ B. Anti-B
- ☒ C. Anti-D
- ☐ D. None

Correct

A. The Anti-A sample does show agglutination

C. The Anti-D sample does show agglutination

Continue

### Phase 4

Question

X

Which blood samples show agglutination?



☐ A. Anti-A

☒ B. Anti-B

☐ C. Anti-D

☐ D. None

Correct

B. The Anti-B sample does show agglutination

Continue

BLOOD: HEMATOCRIT  
Phase 3

Question

X

What position in the centrifuge should the negative sample be placed?

☐ Any position

☒ 16

☐ 5

Correct. Position 16 is opposite from 4 and will balance the centrifuge.

Continue

Phase 7



Question X

What position in the centrifuge should the empty capillary tube be placed?

- ☒ 24
- ☐ Any position
- ☐ 22

**Correct. Position 24 is opposite from 12 and will balance the centrifuge.**

Continue

## BLOOD: HEMOGLOBIN CONTENT Phase 2

Question X

What is the purpose of the hemolysis applicator?

- ☐ It keeps the blood from clotting during measurement.
- ☐ It spreads the sample evenly across the chamber.
- ☒ It breaks down the cell membranes of the RBCs releasing the hemoglobin into solution.

**Correct. For the hemoglobinometer to work, the hemoglobin must be released from the cells.**

Continue

# Digestive\_System

## DIGESTIVE SYSTEM: ENZYMES AND DIGESTION

### Phase 1

Question

X

Why do you test the mixtures in a water bath that is at 37°C?

- ☒ Because this is human body temperature.
- ☐ Because it is the lab standard.
- ☐ At this near-freezing temperature, enzymes are stable.

**Correct. We need to test enzymes at the temperature they are usually exposed to.**

Continue

Question

X

Why is the solution boiled for 10 minutes?

- ☐ To enhance the production of maltose from starch.
- ☒ The Benedict reaction requires heat to cause a color change.
- ☐ To inhibit the production of maltose from starch.

**Correct. Unless heated, the chemical reaction that causes the color change cannot occur.**

Continue

### Phase 3

Question

X

What is the purpose of making a maltose control solution?

- ☒ It confirms that Benedict reagent produces an orange color in the presence of maltose.
- ☐ It confirms that the tube contains sugar.
- ☐ It shows which pH is best for this reaction.

**Correct. An orange color is formed when Benedict reagent reacts with simple sugars such as maltose.**

Continue

## Phase4

Question

X

What is the purpose of making a control solution with starch and water at pH 7 but not including amylase?

- ☐ To show that Benedict reagent causes a color change in the presence of starch.
- ☐ To confirm that amylase is broken down in a neutral environment.
- ☒ To eliminate the possibility that starch is broken down into simple sugars by any other mechanisms than that of amylase.

**Correct.** This controls for the possibility that starch may spontaneously break down into simple sugars when placed in water or boiled.

Continue

## Evidence of Evolution

### EVIDENCE OF EVOLUTION: MOLECULAR EVIDENCE

#### Phase 2

Question

X

Why is it necessary to wash the plate after removing reagents from the wells?

- ☐ To enhance the binding between the serum proteins and the antibody.
- ☒ To remove unbound serum proteins and antibodies.
- ☐ To increase the similarity of the human and the animal proteins.
- ☐ To ensure that the wells remain sterile.

**Correct.** The washing ensures that the unbound proteins and antibodies are removed from the well.

Continue

Question

X

Continue

**Question** X

What are the detection antibodies binding to in the wells?

- ☐ They bind to the indicator dye and cause a color change.
- ☐ They bind directly to the antigen.
- ☒ They bind to antibodies.
- ☐ They bind to the plastic walls of the wells.

**Correct. Any antibodies bound to serum proteins in the previous step will be targeted by the detection antibodies.**

Continue

**Question** X

What will make the detection dye change color?

- ☒ The presence of an enzyme that will convert the detection dye from clear to blue.
- ☐ The antibody will cause a conformation change in the dye molecule, making it turn blue.
- ☐ The presence of an enzyme that will convert the detection dye from blue to clear.
- ☐ The temperature of the room.

**Correct. The detection antibodies have an enzyme that will convert the detection dye from clear to blue.**

Continue

## Evidence of Evolution—Fossils and Comparative Anatomy

### Phase 1

**Question** X

The greater the number of layers, or strata, that lie above a fossil, the \_\_\_\_\_.

Fill in the blank.

- ☒ older the fossil
- ☐ better preserved the fossil
- ☐ more likely it is to be a transitional form
- ☐ younger the fossil

**Correct.**

Continue

### Phase 3

**Question** X

Even though its structure and function has been modified in different species, the humerus bone of vertebrate forelimbs is an example of \_\_\_\_\_ because it arose from the same bone in a common ancestor.

Fill in the blank.

- ☒ Homology
- ☐ Analogy
- ☐ Convergent evolution
- ☐ Superposition

**Correct.**

Continue

## Phase 5

Question

X

What describes one way that the bat forelimb has evolved to be adapted for flight?

- ☐ The phalanges have been lost, and the forelimb ends at the metacarpals.
- ☐ The phalanges are hollow, reduced, and aligned close together.
- ☐ The phalanges are fused together to form a single digit.
- ☒ The phalanges are very long and are linked by a fibrous webbing.

Correct.

Continue

## Phase 7

Question

X

The ulna bone in the forelimb of a cat is homologous to the \_\_\_\_\_ bone in the forelimb of a horse.

Fill in the blank.

- ☐ humerus
- ☐ carpals
- ☒ ulna
- ☐ radius

Correct.

Continue

## Natural Selection

### NATURAL SELECTION: ANTIBIOTIC-RESISTANT BACTERIA Phase 1

#### Question

What is the purpose of the sterile spreader?

- ☐ To stimulate mutations for antibiotic resistance.
- ☐ To ensure that the bacteria adhere to the agar plate.
- ☒ To uniformly disperse bacterial cells across the surface of the agar plate.

**Correct. Spreading the bacteria out will allow individual colonies to form.**

Continue

### NATURAL SELECTION: NATURAL SELECTION IN INSECTS

No pop-up questions in this simulation.

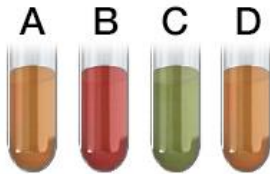
## Chemical Composition of Cells

### CHEMICAL COMPOSITION OF CELLS: TEST FOR SUGARS

#### Phase 1

#### Question X

Lynn performed the Benedict test on water (Tube A) and three samples of variable simple sugar concentration (Tubes B, C, D). Which of the following best explains the experimental results observed in Tube A?



- ☒ Tube A was contaminated by the contents of one of the other tubes.
- ☐ Benedict reagent was not added to Tube A.

Correct.

Continue

### CHEMICAL COMPOSITION OF CELLS: TEST FOR STARCH

#### Phase 1

#### Question X

Which solution is the positive control?

- ☐ Glucose solution
- ☒ Starch solution
- ☐ Distilled water

Correct. Since iodine tests for the presence of starch, you can verify that a positive result turns purple by using a solution of starch.

Continue

## Phase 4

Question

X

What is the purpose of testing distilled water in tube 3?

- ☐ To make sure there is a positive control.
- ☐ To eliminate the possibility that residue in the graduated cylinder causes a positive result.
- ☒ To eliminate the possibility that the water portion of the potato and onion solutions causes a positive result.

**Correct.** Since iodine tests for the presence of starch, you need to rule out water to test the potato and onion specifically.

Continue

## CHEMICAL COMPOSITION OF CELLS: DIGESTION OF STARCH

### Phase 1

Question

X

Why does the procedure use a graduated cylinder and not simply have you put 2 mL of unknown solution directly into the test tube?

- ☐ A main objective of this lab is to successfully transfer liquids.
- ☐ Benedict reagent will only work in a graduated cylinder.
- ☒ Accuracy is important in the laboratory. There is not a way to accurately put 2 mL into a test tube without first measuring 2 mL in the graduated cylinder.
- ☐ Using a clear graduated cylinder allows the researcher to observe the unknown solution for contamination prior to use.

**Correct.** In scientific experiments, it is very important to use consistent amounts and procedures to rule out results caused by variables other than the dependent variable.

Continue

Question

X

Continue



## Phase 2

Question

X

At this point, the tubes all contain unknown solutions and amylase that has reacted for 30 minutes. You added Benedict reagent, and the unknown solutions are still light blue, indicating no simple sugars are present. Which of the following is/are possible reason(s) for a negative result in this case?  
**Select all that apply.**

☒ A. The samples are not heated yet.

☒ B. Unknown solutions were mixed incorrectly.

☒ C. All unknown solutions are water.

Correct

A. Recall from the introduction that Benedict reagent requires heat to react.

B. If the correct chemicals were not mixed or contamination occurs, the expected result would not occur.

C. If samples contain water, then Benedict will not react.

Continue

## CHEMICAL COMPOSITION OF CELLS: EMULSIFICATION OF LIPIDS

### Phase 1

Question

X

Which tube do you predict contains emulsifier?

☒ Right tube

☐ Left tube

Correct. The tube that has bubbles contains an emulsifier.

Continue

## CHEMICAL COMPOSITION OF CELLS: TEST FOR PROTEINS

### Phase 1

Question

Why does the procedure use a graduated cylinder and not simply have you put 2 mL of solution directly into the test tube?

☐ One objective of this lab is to successfully transfer liquids.

☒ Accuracy is important in the laboratory. There is no way to accurately put 2 mL into a test tube without first measuring 2 mL in the graduated cylinder.

☐ Biuret reagent will only work in a graduated cylinder.

Correct. In scientific experiments, it is very important to use consistent amounts and procedures to rule out results caused by variables other than the dependent variable.

Continue

Question

Which solution is the negative control?

☐ Pepsin

☐ Albumin

☒ Distilled water

☐ Starch

Correct. In scientific experiments, it is very common to use water as a negative control when testing for other substances.

Continue



## CHEMICAL COMPOSITION OF CELLS: TEST FOR FAT

No pop-up questions in this sim.

# Ubiquity of Microorganisms

## Ubiquity of Microorganisms: Sampling for Bacteria

### Phase 1



 Question 

Where is the label placed on a petri plate?

- ☐ Along the side edge of the lid.
- ☐ On the top of the lid.
- ☒ On the bottom of the plate.
- ☐ On the inside of the lid so it is visible when incubated upside down.

**Correct.** Plates are incubated upside down to keep lid condensation from falling onto the agar surface. This also prevents the label from being separated from the agar plate.

[Continue](#)

 Question 

Why is it important to first moisten the applicator swab with sterile broth media?

- ☒ It aids in picking up bacteria on objects and spreading them evenly over the agar plate.
- ☐ Dry applicator swabs would stick to the agar plate.
- ☐ Dry applicator swabs cannot pick up bacteria.
- ☐ The broth will sterilize the object being sampled so growth can take place on the plate.

**Correct**

[Continue](#)

### Phase 3



## Question



It is important to wet your hands before using soap to ensure a good lather and to prevent the soap from washing off too quickly.

☒ True

☐ False



**Correct.**

Continue

# Aseptic Technique

## Aseptic Technique: Broth Culture to Sterile Broth

### Phase 2

 Question 

Which of the following are correct ways to label the organism found in a culture?  
*Select all that apply.*

☐ A. *Coli*



☐ B. *Escheria c.*

☒ C. *E. coli*

☒ D. *Escherichia coli*

**Correct**  
C. Correct  
D. Correct

[Continue](#)

 Question 

Why was one sterile broth inoculated with *E. coli* and the other was not?

☐ The tube that did not have bacteria added serves as a positive control to ensure that the broth would support the growth of *E.coli*

☒ The tube that did not have bacteria added serves as a negative control to ensure that the broth and test tubes are sterile.



☐ The tube that did not have bacteria added serves as a negative control to ensure that the broth would support the growth of *E.coli*

**Correct**

[Continue](#)

## Aseptic Technique: Slant Culture to Sterile Agar Slant

### Phase 2

 Question 

Which of the following patterns is used to streak an agar slant?



- ☐ Pass the loop across the surface of the slant and cut several lines into the agar making a grid pattern.
- ☐ Pass the loop across the surface of the slant and push the loop completely to the bottom of the tube.
- ☒ Pass the loop across the surface of the slant.

**Correct.**

Continue

## Aseptic Technique: Broth Culture to Sterile Agar Plate

### Phase 1

 Question 

Where is the label placed on a petri plate?

- ☒ On the bottom of the plate.
- ☐ On the inside of the lid.
- ☐ Along the side edge of the lid.
- ☐ On the top of the lid.

**Correct. Plates are incubated in this position to keep lid condensation from falling onto the agar surface. This also prevents the label from being separated from the agar plate.**

Continue

### Phase 2



### Question



Which of the following best describes the result you see on the plate?

- ☒ It shows a successful transfer of *E. coli* from a broth onto an agar plate.
- ☐ It shows an unsuccessful transfer of *E. coli* from a broth onto an agar plate as nothing grew after 24 hours.
- ☐ It shows an unsuccessful transfer of *E. coli* from a broth onto an agar plate due to heavy mold contamination.
- ☐ It shows a successful transfer of *E. coli* that spread from a single inoculation point in the exact center of the plate.

**Correct.**

Continue

# Staining

## Staining: Preparing a Smear Sample from a Bacterial Sample

### Phase 3

Question

Why is aseptic technique important during laboratory activities like smear preparation?  
*Select all that apply.*

☐ A. Aseptic technique aids in selecting a treatment, because we can observe what methods kill the infectious agent.

☒ B. Proper aseptic technique aids in keeping microbes from spreading to other surfaces, where they might be contacted by others in the lab.

☒ C. Proper aseptic technique helps prevent contamination from being introduced into your sample during preparation.

☒ D. Aseptic technique helps prevent accidental infection of the handler.

Correct

B. Correct


C. Correct

D. Correct

Continue

### Phase 4




 Question X

Creating a bacterial smear from solid media, such as an agar plate or slant, often feels more tangible than creating a smear from liquid media. Which of the following is appropriate when creating a smear in this fashion?

- ☒ Using the loop, you should disperse the bacterial sample material into a water drop on the slide.
- ☐ The tip of a gloved finger can be used to mix the bacteria and water on the surface of the slide.
- ☐ You can place a big lump of bacterial sample onto the slide to ensure the smear is as concentrated as possible.

**Correct**  
Continue


 Question X

As you create your smear from a sample on solid media, it is important to use an appropriate amount of material and evenly disperse the organisms onto the surface of the slide. Which of the following can occur due to using excessive material as you create a smear preparation?  
*Select all that apply.*

- ☒ A. It will be difficult to apply stain correctly to the slide for visualization.
- ☒ B. It will be difficult to distinguish bacterial cell morphology and arrangements of cells on the smear sample.
- ☒ C. It will be difficult to remove excess dye stain in later steps of the smear procedure.
- ☐ D. It will be difficult to sterilize the slide after the procedure is complete

**Correct**  
**A. Correct**  
**B. Correct**  
**C. Correct**  
  
Continue

Phase 5

 Question X

This is how your smear preparation looks in the microscope immediately after completion.


**True or False:** This image, as it appears, is able to be interpreted for information about the organism(s) on the slide.

☐ True

☒ False

**Correct**

Continue

 Question X

This is how your smear preparation looks in the microscope after simple staining with methylene blue.

**True or False:** This image, as it appears, is able to be interpreted for information about the organism(s) on the slide.

☒ True

☐ False

**Correct**

Continue



### Question



Now that you have seen the difference in the smear preparation after simple methylene blue staining, which of the following is correct regarding your smear now?

*Select all that apply.*

- ☐ A. Addition of methylene blue highlights the bacterial cell nucleus and organelles that were difficult to discern without stain.
- ☒ B. The addition of methylene blue helps visualize the shape and arrangements of bacterial cells that were difficult to discern without stain.
- ☒ C. The addition of methylene blue helps show the intact appearance and localization of the cells, compared with no staining.
- ☒ D. The addition of methylene blue makes visualizing some bacterial cell characteristics more apparent, compared to no staining.

Correct

B. Correct


C. Correct

D. Correct

Continue

**Staining: Preparing an acid fast stain sample from a bacterial sample and analyzing by microscopy**

Phase 3


 Question X

The primary stain, carbolfuchsin, binds to \_\_\_\_\_ in the sampled bacteria.

- ☐ peptidoglycan
- ☐ membrane proteins
- ☐ carbohydrates
- ☒ cell wall lipids, such as mycolic acid

**Correct!**

Continue


 Question X

When staining a known acid fast organism, in the presence of acid alcohol decolorizer, carbolfuchsin dye should \_\_\_\_\_ in the sampled bacteria.

- ☐ be neutralized
- ☐ change color
- ☐ be removed
- ☒ be retained

**Correct!**


Continue

 Question X

The rationale for using methylene blue as a counterstain in the acid-fast protocol is to \_\_\_\_\_

- ☐ neutralize the acid alcohol staining reagent before handling.
- ☐ kill the remaining acid-fast bacterial cells.
- ☐ wash non-acid-fast bacterial cells off the slide.
- ☒ provide contrasting color to non-acid-fast bacterial cells.

**Correct!**  
Continue

 Question X

Your acid-fast stain is complete and correct. Which of the following statements would apply to the image you see?

*Select all that apply.*

- ☒ A. You can observe non-acid-fast bacterial cells on this field.
- ☐ B. You can observe acid-neutral bacteria on this field.
- ☒ C. You can observe acid-fast bacterial cells on this field.
- ☐ D. You cannot distinguish any bacteria on this field.

**Correct**  
**A. Correct!**  
**C. Correct!**  
  
Continue

**Staining: Preparing a capsule stain sample from a bacterial sample and analyzing by microscopy**  
Phase 4

Question

X

What is the purpose of skipping the heat fixation step in the capsule stain procedure?

- ☒ Capsules are fragile and can be destroyed with heating.
- ☐ Heat fixation is unnecessary in capsule staining because the organisms are harmless.
- ☐ Capsules are converted to slime layers if heated.
- ☐ Heat fixation is unnecessary because organisms with capsules naturally adhere to the slide.
- ☐ Capsules will appear too dark if heated.

Correct!

Continue

Question

X

Your capsule stain is complete and correct. Which of the following statements would apply to the image you see?

*Select all that apply.*

- ☒ A. You can observe encapsulated organisms in this field.
- ☒ B. The background is stained dark with nigrosin.
- ☒ C. The bacterial cells are stained with crystal violet.
- ☐ D. No bacterial capsules can be visualized in this field.
- ☐ E. The capsules have stained with the primary and secondary dye colors.

Correct

A. Correct!

B. Correct!

C. Correct!


Continue

## Staining: Gram Staining

### Phase 2

Question

X



☒ A. This image shows a cell morphology of cocci.

☐ B. This image shows a cell arrangement of staphylococci.

☐ C. This image suggests the Gram stain was done incorrectly.

☒ D. This image shows a cell arrangement of streptococci.

☐ E. This image shows a cell morphology of bacilli.

☒ F. This image likely depicts a Gram-stained bacterial smear.

Correct

A. Correct!

D. Correct!

F. Correct!

Continue

Question

X

After correct Gram staining, the gram-negative cells will appear \_\_\_\_\_, whereas the gram-positive cells appear \_\_\_\_\_.

☐ green; unstained

☐ dark blue; light blue

☐ unstained; green


☒ red; purple

☐ purple; red

Correct!

Continue

Phase 3

 Question X

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?*Select all that apply*

☒ A. You can observe gram-positive cocci on this field.

☒ B. You can observe gram-negative bacilli on this field.

☐ C. You can observe gram-neutral bacteria on this field.

☐ D. You cannot distinguish any bacteria on this field.

Correct

A. Correct!

B. Correct!

Continue

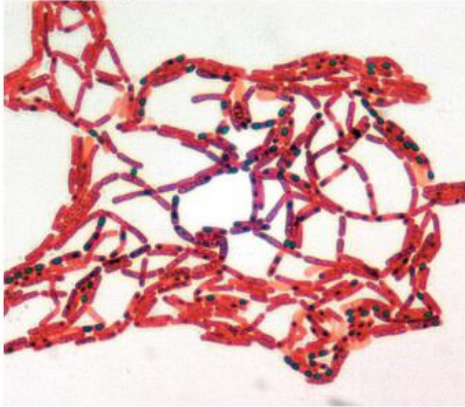
**Staining: Preparing a spore stain sample from a bacterial sample and analyzing by microscopy**  
Phase 2



**Question** X

Based on what you understood from the video, which of the following statements are correct?

Select all that apply.



- ☒ A. This image shows primarily endospores.
- ☒ B. This image could be representative of a *Bacillus* species.
- ☐ C. This image shows primarily exospores.
- ☒ D. In this image, the endospores are green in color.
- ☐ E. In this image, the endospores are red in color.
- ☐ F. This image could be representative of a *Staphylococcus* species.

Correct  
A. Correct!  
B. Correct!  
D. Correct!

Continue

**Question** X

What is the purpose of adding a strip of paper to the spore stain procedure?

Select all that apply.

- ☒ A. The paper allows for more contact time between the dye and spores.
- ☐ B. The paper helps hold stain away from the sample.
- ☐ C. The paper is sticky and removes live bacteria from the smear.
- ☐ D. The paper is protective to the scientist doing the stain.
- ☒ E. The paper keeps the dye from evaporating too quickly during the heating step.

Correct  
A. Correct!  
E. Correct!

Continue

Phase 4



## Question



Your spore stain is complete and correct. Which of the following statements would apply to the image you see?

*Select all that apply.*

- ☒ A. You can observe vegetative bacteria on this field.
- ☒ B. You can observe spores on this field.
- ☐ C. You can observe gram-positive and gram-negative bacteria on this field.
- ☐ D. You cannot distinguish any spores on this field.

Correct


A. Correct!

B. Correct!

Continue

# Isolation Methods

## Isolation Methods: Pour Plating Method Phase 2

 Question X

Which of the following statements is correct regarding the samples you created?

Select all that apply.

- ☒ A. Tube III will be expected to contain the fewest number of CFUs (colony forming units).
- ☒ B. The original, undiluted *E. coli* culture could be used in pour plating but would likely grow too many colonies to be analyzed.
- ☒ C. Tube I contains the most bacteria in the series.
- ☐ D. Tubes I, II, and III will likely grow identical numbers of surface and subsurface colonies.
- ☐ E. Tube II is not ready for pour plating until it is diluted back into Tube I.

Correct


A. Correct!

B. Correct!

C. Correct!

Continue

## Phase 3

 Question X

The tubes are already inoculated, and we do not need the loop for this part of the protocol. However, some in-person microbiology lab procedures may recommend keeping your Bunsen flame on and working nearby it on the benchtop as you complete this experiment. Why might this recommendation be acceptable during an isolation methods protocol?


- ☐ The Bunsen flame will be used as the heat source for incubation.
- ☒ The Bunsen flame augments our aseptic technique, as working near the flame reduces the chances that airborne microorganisms land on the open petri dishes when pour plates are being created.
- ☐ The Bunsen flame will need to be passed over the top of the melted agar, so as to sterilize the surface of the pour plate.
- ☐ The Bunsen flame remains on to provide extra light for the scientist as plates are poured.
- ☐ The Bunsen flame could be used to sterilize hands before creating pour plates.

Correct!

Continue

## Isolation Methods: Quadrant Streak Plate Method

### Phase 3


 Question X

If you stopped the procedure here and analyzed your quadrant streak plate after incubation, which of the following would correctly describe the outcome?

- ☐ Intermediate growth visible, appears in only two quadrants, high number of isolated colonies present
- ☐ Isolated colonies would be present in one quadrant
- ☐ Scanty growth visible, appears in multiple quadrants, intermediate number of isolated colonies present
- ☒ Heavy growth visible, appears only in one quadrant, no isolated colonies present

**Correct!**  
Continue

### Phase 4

 Question X

If your completed quadrant streak plate showed two different and distinct colony appearances, what could you conclude?

*Select all that apply.*

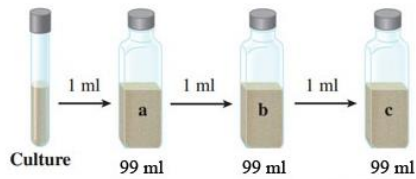
- ☒ A. Your initial bacterial culture inoculum contained two unique bacteria species.
- ☐ B. Your technique was poor, as correct quadrant streak plate protocol would have eliminated all but one species in the sample.
- ☐ C. Your Bunsen burner flame was too hot and caused growth of bacteria too early during the streaking.
- ☒ D. Your plate was inoculated with a single species, but break in aseptic technique could have allowed contaminant bacteria to also grow.

**Correct**  
**A. Correct!**  
**D. Correct!**  
Continue

## Isolation Methods • Quantitative Dilution Of Bacteria Phase 1

### Question X

You have completed the steps to create serial dilutions in the bottles. Each bottle now contains a proportion of cells from the initial culture sample. Match the bottle to its contained dilution factor.



Bottle A	<input type="text" value="1:100"/>
Bottle B	<input type="text" value="1:10,000"/>
Bottle C	<input type="text" value="1:1,000,000"/>

Correct

[Continue](#)

## Phase 2

### Question X

Based on your knowledge of the serial dilution protocol and predictions for the plating growth, which of the following statements is/are correct?

Select all that apply.

- ☒ Plate "C 1.0 mL 1:1,000,000" has a good chance of showing many isolated, countable colonies because of its dilution factor.
- ☐ Plate "B 0.1 mL 1:100,000" will have more colonies than the "B 1 mL 1:100,000" version.
- ☐ Plate "B 1.0 mL 1:10,000" would be predicted to have the fewest colonies because it has the lowest number.
- ☒ Plate "C 0.1 mL 1:10,000,000" will have fewer isolated colonies than plate "B 0.1 mL 1:100,000" even though both plates received the same volume of inoculum.

Correct

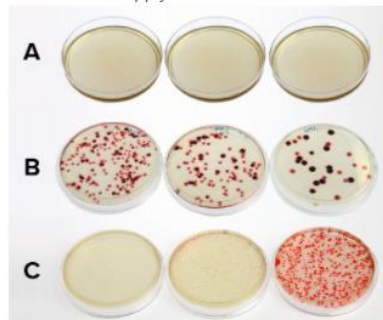
A. Correct!  
D. Correct!

Continue

### Question X

Which set(s) of serial dilution plates show(s) an unsuccessful dilution series?

Select all that apply.



- ☒ Plate set A
- ☐ Plate set B
- ☒ Plate set C

Correct

A. Correct!  
C. Correct!

Continue

## Isolation Methods • Optical Density Phase 3


### Question X

Why is 550 nm a correct wavelength setting for the spectrophotometer?

- ☐ This is the best choice of wavelength because 550 nm will count the living bacteria but not dead bacteria.
- ☒ Bacterial cells absorb light well in the wavelength range of 550–600 nm, allowing for measurement of growth as more bacteria are present.
- ☐ This wavelength will help sterilize the sample in the instrument.
- ☐ This wavelength will encourage growth of bacteria, as this wavelength of light induces bacterial photosynthesis for energy during replication.

Correct!

Continue


 Question X

Why was the spectrophotometer absorbance reset to “zero” without bacteria in the broth?

- ☒ The goal of the experiment is to record absorbance by bacteria as the measurement of bacterial growth, and this sets the instrument to detect how “zero” bacteria would appear in broth.
- ☐ The goal of this experiment is to remove and count down to “zero” bacteria in the broth, and this instructs the instrument when to stop counting.
- ☐ Resetting to “zero” programs the instrument to only count living bacterial cells.
- ☐ Resetting to “zero” is done only to see if the instrument is still powered on.

**Correct!**  
Continue

#### Phase 4

 Question X

What phase of bacterial growth likely describes the culture at 2 hours of growth?

- ☒ Lag phase
- ☐ Exponential phase
- ☐ Death phase
- ☐ Stationary phase

**Correct!**  
Continue

#### Phase 5

Question X

What phase of bacterial growth likely describes the culture at 6 hours of growth?

- ☒ Exponential phase
- ☐ Stationary phase
- ☐ Death phase
- ☐ Lag phase

Correct!

Continue

Phase 6

Question X

What phase of bacterial growth likely describes the culture at 8 hours of growth?

- ☒ Stationary phase
- ☐ Death phase
- ☐ Exponential phase
- ☐ Lag phase

Correct!

Continue

## Microbial Growth

Microbial Growth • Effects Of Osmotic Pressure  
Phase 1



Question

X

What is the importance of labeling each plate?

*Select all that apply.*

- ☒ A. To identify which plates belong in which incubator.
- ☒ B. To know the salt content of each plate.
- ☒ C. So the placement of each of the 3 bacterial samples will be marked and visible.

**Correct**

A. Correct. Without indicating which organism was placed, it will be impossible to tell which line of growth is each organism.

B. Correct. Without indicating which organism was placed, it will be impossible to tell which line of growth is each organism.

C. Correct. Without indicating which organism was placed, it will be impossible to tell which line of growth is each organism.

Continue

## Microbial Growth • Effects Of Temperature

### Phase 3

Question

X

Which type of organism would grow well at 55°C?

- ☒ Thermophile
- ☐ Psychrophile
- ☐ Mesophile
- ☐ Extreme Thermophile

**Correct!**

Continue

# UNKNOWN BACTERIAL IDENTIFICATION

UNKNOWN BACTERIAL IDENTIFICATION: SAMPLE 1

Phase 2



## Question

Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?

- ☒ You can observe gram-negative bacilli on this field.
- ☐ You cannot distinguish any bacteria on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You can observe gram-positive cocci on this field.

**Correct**

Continue



## Question

X

One initial suspect bacteria you considered was the common sepsis (bloodstream infection) organism *Staphylococcus aureus*. Why can we rule this organism out as the cause in the patient?

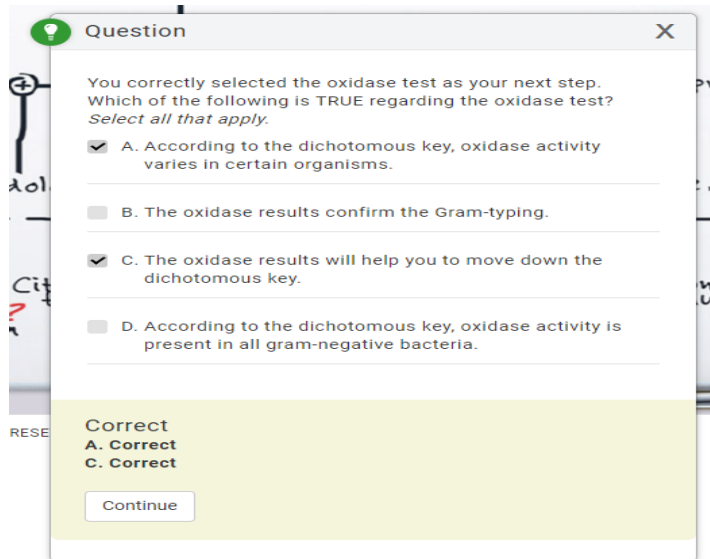
- ☐ *S. aureus* is not found in water or the environment.
- ☐ The Gram stain result shows the unknown organism is gram-neutral. *S. aureus* is gram-negative and can be ruled out.
- ☐ *S. aureus* does not stain, instead appearing only by microscopy for identification.
- ☒ The Gram stain result shows the unknown organism is gram-negative. As *S. aureus* is a known gram-positive organism, it can be ruled out.

**Correct**

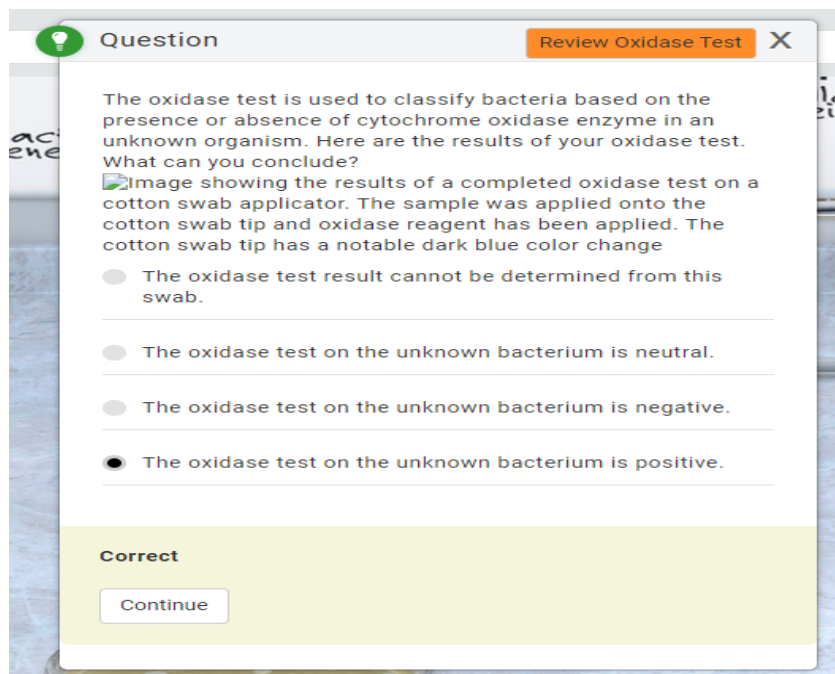
Continue

## Phase 3

### Dichotomous Key Introduction



#### Phase 4: Oxidase testing



#### Phase 5: Glucose Fermentation testing

Question

Review PRB Test X

Why is it important to observe and record results of your phenol red broth (PRB) immediately after 24 hours of incubation?

- ☐ Extended incubation will cause sugars to naturally break down and lead to false negatives.
- ☐ After 24 hours of growth, the bacteria are making sugars rather than consuming them, and the test would not be accurate.
- ☒ Extended incubation can lead to reversion and inconclusive test results.
- ☐ After 24 hours of growth, the culture is considered contaminated and should not be read.


Correct

Continue

Question

Review PRB Test X

The Phenol Red broth (PRB) test detects glucose fermentation in acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your PRB test. The broth on the left is your sample, compared to a control reaction on the right. Durham tubes can be disregarded, as no gas production is noted. What can you conclude?


 Image showing the results of a completed Phenol Red Broth (PRB-G) test tube, along with a control tube. After a 24 hour incubation at 37°C, The PRB-G tube has turned to a red color. The control tube is yellow in color.

- ☒ The phenol red test shows the unknown bacterium is negative for glucose fermentation.
- ☐ The phenol red test on the unknown bacterium is neutral.
- ☐ The phenol red test results cannot be determined from this broth because it was incubated for too long.
- ☐ The phenol red test shows the unknown bacterium is positive for glucose fermentation.

Correct


Continue

Phase 6

 Question

Review Nitrate Reduction Test X


After addition of nitrate reagents A and B, your tube remains colorless. Is your testing for nitrate complete?

 Tube with colorless results

- ☐ Maybe. The expected outcome after adding reagents A and B is colorless, but the solution may still turn red and turn out positive for nitrate reduction after other reagents, such as zinc, are added.
- ☐ Yes. Testing is complete and the unknown bacterium can be classified as negative for nitrate reduction because of the colorless reaction.
- ☒ No. Testing is incomplete because the unknown bacterium may reduce nitrate in the tube to other nitrogenous forms besides nitrite or not reduce the nitrate in the tube at all.


**Correct**

Continue

 Question

Review Nitrate Reduction Test X

After addition of nitrate reagents A and B, as well as zinc addition, your tube remains colorless. What can you conclude?

 Tube with colorless results


- ☐ The colorless result after zinc addition shows the test was done incorrectly, because all bacteria are able to convert nitrate into nitrite. The test should always result in red color after both reagent A and B, as well as after zinc addition.
- ☒ The colorless result after zinc addition shows the unknown bacterium reduced nitrate to nitrogenous forms other than nitrite and can be classified as a "nitrate reducer."
- ☐ The colorless result after zinc addition shows the unknown bacterium is unable to reduce nitrate and should be classified as negative for nitrate reduction.

**Correct**

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #2

### Phase 2 Gram Staining

 Question


Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?

- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You can observe gram-positive cocci on this field.
- ☒ You can observe gram-negative bacilli on this field.
- ☐ You cannot distinguish any bacteria on this field.

Correct

Continue

 Question

X

We now have a Gram stain result. Why can we NOT make a conclusive diagnosis yet as to the cause in our patient?

- ☐ These organisms do not stain, as they appear only by microscopy for identification.
- ☒ The Gram stain result shows the unknown organism is gram-negative. All our possible suspects (*E. coli*, *E. aerogenes*, *A. faecalis*, and *P. vulgaris*) are gram-negative, and hence cannot be ruled out without further differentiation.
- ☐ These organisms do not stay gram-negative for long, as they change Gram type between the culture and in the human host. We will need a blood sample from Jenny.
- ☐ The Gram stain result shows the unknown organism is gram-neutral and does not match our suspect list.

Correct

Continue

### Phase 3

Dichotomous key intro:

Question

X

You correctly selected the oxidase test as your next step. Which of the following is TRUE regarding the oxidase test? *Select all that apply.*

- ☒ A. The oxidase results will help you to move down the dichotomous key.
- ☐ B. According to the dichotomous key, oxidase activity is present in all gram-negative bacteria.
- ☐ C. The oxidase results confirm the Gram-typing.
- ☒ D. According to the dichotomous key, oxidase activity varies in certain organisms.

Correct

A. Correct

D. Correct

Continue

## Phase 4


### Oxidase testing

Question

Review Oxidase Test

X

The oxidase test is used to classify bacteria based on the presence or absence of cytochrome oxidase enzyme in an unknown organism. Here are the results of your oxidase test. What can you conclude?



- ☒ The oxidase test on the unknown bacterium is negative.
- ☐ The oxidase test on the unknown bacterium is neutral.
- ☐ The oxidase test on the unknown bacterium is positive.
- ☐ The oxidase test result cannot be determined from this swab.

Correct.

Continue



Phase 6  
Lactose Fermentation testing

## Question



Which of the following is/are TRUE regarding labeling this plate?

*Select all that apply.*

- ☒ A. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ B. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☐ C. The label should be placed on the lid of the plate for easy reading.
- ☒ D. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.

**Correct**

**A. Correct.**

**D. Correct.**

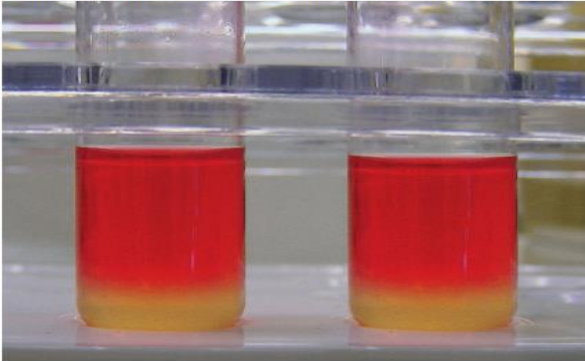
Continue

Question

Review Methyl Red Test

X

The MR-VP test detects glucose fermentation into acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your MR-VP test. The broth on the right is your sample, compared to a positive control reaction on the left. What can you conclude?



- ☐ The methyl red test shows the unknown bacterium is negative for glucose fermentation.
- ☒ The methyl red test shows the unknown bacterium is positive for glucose fermentation.
- ☐ The methyl red test on the unknown bacterium is neutral.
- ☐ The methyl red test results cannot be determined from this broth.

Correct.

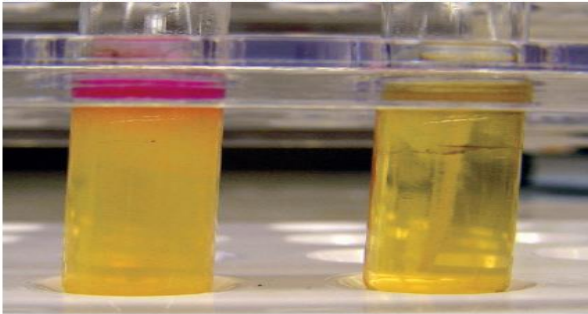
Continue

Phase 7:  
Indole testing

Question

Review Indole Test X

The indole test detects the ability of the bacteria to convert tryptophan into indole and is used to classify bacteria based on this result for an unknown organism. Here are the results of your indole test. The broth on the left is your sample, compared to a control reaction on the right. What can you conclude?



- ☐ The indole test shows the unknown bacterium is negative for tryptophan conversion to indole.
- ☐ The indole test on the unknown bacterium is neutral.
- ☒ The indole test shows the unknown bacterium is positive for tryptophan conversion to indole.
- ☐ The indole test results cannot be determined from this broth.

**Correct.**

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #3

### Phase 2 Gram Staining

Question

Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?

- ☒ You can observe gram-negative bacilli on this field.
- ☐ You cannot distinguish any bacteria on this field.
- ☐ You can observe gram-positive cocci on this field.
- ☐ You can observe gram-neutral bacteria on this field.

Correct

Continue

Question

X


We now have a Gram stain result. Why can we NOT make a conclusive diagnosis yet as to the cause in our patient?

- ☐ These organisms do not stain, as they appear only by microscopy for identification.
- ☒ The Gram stain result shows the unknown organism is gram-negative. All our possible suspects (*E. coli*, *S. typhimurium*, and *S. sonnei*) are gram-negative, and hence cannot be ruled out without further differentiation.
- ☐ The Gram stain result shows the unknown organism is gram-neutral and does not match our suspect list.
- ☐ These organisms do not stay gram-negative for long, as they change Gram type between the culture and in the human host. We will need a blood sample from Jenny.

Correct

Continue

Phase 3  
Dichotomous key Intro:

 Question X

You correctly selected the oxidase test as your next step. Which of the following is TRUE regarding the oxidase test? *Select all that apply.*

- ☐ A. According to the dichotomous key, oxidase activity is present in all gram-negative bacteria.
- ☒ B. According to the dichotomous key, oxidase activity varies in certain organisms.
- ☐ C. The oxidase results confirm the Gram-typing.
- ☒ D. The oxidase results will help you to move down the dichotomous key.

Correct


**B. Correct**

**D. Correct**


Continue

## Phase 4

### Oxidase testing

 Question Review Oxidase Test X

The oxidase test is used to classify bacteria based on the presence or absence of cytochrome oxidase enzyme in an unknown organism. Here are the results of your oxidase test. What can you conclude?



- ☐ The oxidase test on the unknown bacterium is positive.
- ☐ The oxidase test result cannot be determined from this swab.
- ☐ The oxidase test on the unknown bacterium is neutral.
- ☒ The oxidase test on the unknown bacterium is negative.

Correct.

Continue

## Phase 5

### Lactose fermentation testing

Question

X

Which of the following is/are TRUE regarding labeling this plate?  
*Select all that apply.*

- ☒ A. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☒ B. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ C. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☐ D. The label should be placed on the lid of the plate for easy reading.

**Correct**  
**A. Correct.**  
**B. Correct.**


Continue

Question

Review Lactose Fermentation Test

X

MacConkey agar helps detect lactose fermentation into acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your MacConkey agar growth. What can you conclude?




- ☐ The MacConkey agar test shows the unknown bacterium is positive for lactose fermentation.
- ☐ The MacConkey agar test results cannot be determined from this plate.
- ☒ The MacConkey agar test shows the unknown bacterium is negative for lactose fermentation.
- ☐ The MacConkey agar test on the unknown bacterium is neutral but may indicate glucose fermentation.

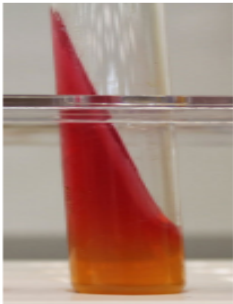
**Correct.**

Continue

Phase 6  
H<sub>2</sub>S testing

 **Question** Review H<sub>2</sub>S Production Test X

The H<sub>2</sub>S test in TSI agar slants detects the formation of hydrogen sulfide by bacteria and is used to classify bacteria based on this result for an unknown organism. Here are the results of your H<sub>2</sub>S test. What can you conclude?



- ☒ The TSI slant shows no black of any kind, and hence the unknown bacterium is negative for H<sub>2</sub>S production.
- ☐ The H<sub>2</sub>S test results cannot be determined from a TSI slant.
- ☐ The TSI slant colors show the unknown bacterium is positive for H<sub>2</sub>S production.
- ☐ The H<sub>2</sub>S test on the unknown bacterium is neutral.

**Correct.**

[Continue](#)

Phase 7  
Citrate testing




Question

Review Citrate Test

X

The citrate test on Simmons agar slants detects the metabolism of citrate by bacteria and can be used to classify bacteria based on this result for an unknown organism. The results of your citrate test are shown in the left tube. A control reaction citrate tube is on the right. What can you conclude?



☐ The citrate test is positive for this unknown organism.

☐ The citrate test on the unknown bacterium is neutral.

☐ The citrate test results cannot be determined from a slant.

☒ The citrate test is negative for this unknown organism.

**Correct.**

Continue

## UNKNOWN BACTERIAL IDENTIFICATION. SAMPLE #4

### Phase 2

### Gram staining

Question

Review Gram Stain Test

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?

☐ You can observe gram-positive cocci on this field.

☐ You cannot distinguish any bacteria on this field.

☒ You can observe gram-negative bacilli on this field.

☐ You can observe gram-neutral bacteria on this field.

Correct

Continue

Question

We now have a Gram stain result. Why can we NOT make a conclusive diagnosis yet as to the cause in our patient?

☐ These organisms do not stay gram-negative for long, as they change Gram type between the culture and in the human host. We will need a blood sample from Jenny.

☐ The Gram stain result shows the unknown organism is gram-neutral and does not match our suspect list.

☒ The Gram stain result shows the unknown organism is gram-negative. All our possible suspects (*E. coli*, *S. typhimurium*, and *S. sonnei*) are gram-negative, and hence cannot be ruled out without further differentiation.

☐ These organisms do not stain, as they appear only by microscopy for identification.

Correct

Continue

### Phase 3

#### Dichotomous key intro

Question

You correctly selected the oxidase test as your next step. Which of the following is TRUE regarding the oxidase test? Select all that apply.

☒ A. The oxidase results will help you to move down the dichotomous key.

☐ B. According to the dichotomous key, oxidase activity is present in all gram-negative bacteria.

☐ C. The oxidase results confirm the Gram-typing.

☒ D. According to the dichotomous key, oxidase activity varies in certain organisms.

Correct


A. Correct

D. Correct

Continue


### Phase 4

## Oxidase testing

 Question

[Review Oxidase Test](#) X

The oxidase test is used to classify bacteria based on the presence or absence of cytochrome oxidase enzyme in an unknown organism. Here are the results of your oxidase test. What can you conclude?



- ☐ The oxidase test result cannot be determined from this swab.
- ☐ The oxidase test on the unknown bacterium is neutral.
- ☒ The oxidase test on the unknown bacterium is negative.
- ☐ The oxidase test on the unknown bacterium is positive.

**Correct.**

[Continue](#)

## Phase 5

### Lactose fermentation testing

Question

X

Which of the following is/are TRUE regarding labeling this plate?  
Select all that apply.

- ☒ A. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ B. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☐ C. The label should be placed on the lid of the plate for easy reading.
- ☒ D. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.


**Correct**  
A. Correct.  
D. Correct.

Continue

Question

Review Lactose Fermentation Test X

MacConkey agar helps detect lactose fermentation into acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your MacConkey agar growth. What can you conclude?




- ☒ The MacConkey agar test shows the unknown bacterium is negative for lactose fermentation.
- ☐ The MacConkey agar test on the unknown bacterium is neutral but may indicate glucose fermentation.
- ☐ The MacConkey agar test shows the unknown bacterium is positive for lactose fermentation.
- ☐ The MacConkey agar test results cannot be determined from this plate.

**Correct.**

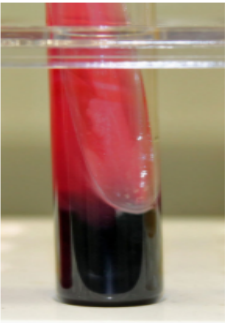
Continue

Phase 6  
H<sub>2</sub>S testing

 Question

Review H<sub>2</sub>S Production Test X

The H<sub>2</sub>S test in TSI agar slants detects the formation of hydrogen sulfide by bacteria and is used to classify bacteria based on this result for an unknown organism. Here are the results of your H<sub>2</sub>S test. What can you conclude?



- ☐ The TSI slant shows no black of any kind, and hence the unknown bacterium is negative for H<sub>2</sub>S production.
- ☒ The TSI slant colors show the unknown bacterium is positive for H<sub>2</sub>S production.
- ☐ The H<sub>2</sub>S test on the unknown bacterium is neutral.
- ☐ The H<sub>2</sub>S test results cannot be determined from a TSI slant.

**Correct**

Continue

Phase 7  
Urease testing

**Question** Review Urease Test X

urease slant test are shown in the left tube. A control reaction urease slant is on the right. What can you conclude?



☐ The urease test is positive for this unknown organism.  
☐ The urease test on the unknown bacterium is neutral.  
☒ The urease test is negative for this unknown organism.  
☐ The urease test results cannot be determined from a slant.

**Correct.**

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #5

### Phase 2 Gram staining

**Question** Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following statements would apply to the image you see?

☒ You can observe gram-negative bacilli on this field.  
☐ You cannot distinguish any bacteria on this field.  
☐ You can observe gram-neutral bacteria on this field.  
☐ You can observe gram-positive cocci on this field.

**Correct**

Continue

**Question** X

We now have a Gram stain result. Why can we NOT make a conclusive diagnosis yet as to the cause in our patient?

☒ The Gram stain result shows the unknown organism is gram-negative. All our possible suspects (*E. coli*, *S. marcescens*, and *K. pneumoniae*) are gram-negative, and hence cannot be ruled out without further differentiation.  
☐ These organisms do not stay gram-negative for long, as they change Gram type between the culture and in the human host. We will need a blood sample from Jenny.  
☐ The Gram stain result shows the unknown organism is gram-neutral and does not match our suspect list.  
☐ These organisms do not stain, as they appear only by microscopy for identification.

**Correct**

Continue

### Phase 3

## Dichotomous key Intro:

Question

You correctly selected the oxidase test as your next step. Which of the following is TRUE regarding the oxidase test? *Select all that apply.*

☒ A. According to the dichotomous key, oxidase activity varies in certain organisms.

☐ B. According to the dichotomous key, oxidase activity is present in all gram-negative bacteria.

☒ C. The oxidase results will help you to move down the dichotomous key.

☐ D. The oxidase results confirm the Gram-typing.

Correct

A. Correct

C. Correct

Continue


## Phase 4

### Oxidase testing

Question

Review Oxidase Test

The oxidase test is used to classify bacteria based on the presence or absence of cytochrome oxidase enzyme in an unknown organism. Here are the results of your oxidase test. What can you conclude?



☒ The oxidase test on the unknown bacterium is negative.

☐ The oxidase test on the unknown bacterium is neutral.

☐ The oxidase test on the unknown bacterium is positive.

☐ The oxidase test result cannot be determined from this swab.

Correct.

Continue

## Phase 5

### Lactose fermentation testing

**Question** X

Which of the following is/are TRUE regarding labeling this plate?  
Select all that apply.


- ☒ A. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☐ B. The label should be placed on the lid of the plate for easy reading.
- ☒ C. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ D. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.

**Correct**  
A. Correct.  
C. Correct.

[Continue](#)

**Question** Review Lactose Fermentation Test X

MacConkey agar helps detect lactose fermentation into acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your MacConkey agar growth. What can you conclude?



- ☐ The MacConkey agar test shows the unknown bacterium is negative for lactose fermentation.
- ☐ The MacConkey agar test on the unknown bacterium is neutral but may indicate glucose fermentation.
- ☐ The MacConkey agar test results cannot be determined from this plate.
- ☒ The MacConkey agar test shows the unknown bacterium is positive for lactose fermentation.

**Correct**

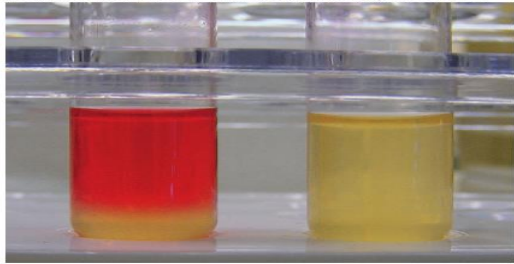
[Continue](#)

Phase 6  
Methyl red testing



**Question** Review Methyl Red Test X

The MR-VP test detects glucose fermentation into acidic products and is used to classify bacteria based on this result for an unknown organism. Here are the results of your MR-VP test. The broth on the right is your sample, compared to a positive control reaction on the left. What can you conclude?



- ☒ The methyl red test shows the unknown bacterium is negative for glucose fermentation.
- ☐ The methyl red test on the unknown bacterium is neutral.
- ☐ The methyl red test results cannot be determined from this broth.
- ☐ The methyl red test shows the unknown bacterium is positive for glucose fermentation.

**Correct.**

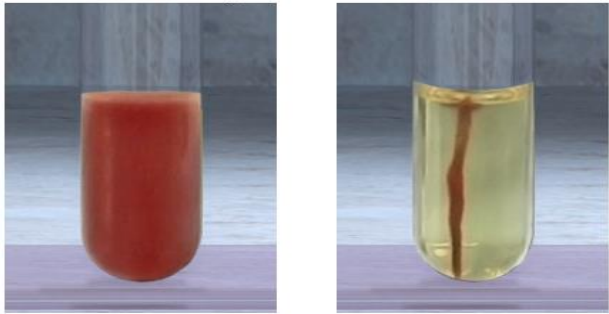
Continue

## Phase 7

### Motility testing

**Question** Review Motility Test X

The motility test detects the movement of bacteria visually in a semi-solid medium and is used to classify bacteria based on this result for an unknown organism. The results of your motility test are shown in the right tube. A control motility test is on the left. What can you conclude?




- ☐ The motility test is positive for this unknown organism.
- ☐ The motility test results cannot be determined from an agar.
- ☐ The motility test on the unknown bacterium is neutral.
- ☒ The motility test is negative for this unknown organism.

**Correct.**

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #6

### Phase 2 Gram Staining


 Question Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following would apply to the image you see?

- ☒ You can observe gram-positive cocci on this field.
- ☐ You can observe gram-negative bacilli on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You cannot distinguish any bacteria on this field.

**Correct. The purple color indicates a positive test for gram-positive bacteria.**

Continue

 Question X

One initial suspect bacteria you considered was the common sepsis (bloodstream infection) organism *Streptococcus pyogenes*. Based on the Gram stain result, why can we rule this organism down as the cause in the patient?

- ☐ *S. pyogenes* is not found on skin or the environment.
- ☐ *S. pyogenes* does not stain, instead appearing only by microscopy for identification.
- ☐ The Gram stain result shows the unknown organism is gram-neutral. *S. pyogenes* is gram-negative and can be ruled out.
- ☒ The Gram stain result suggests the unknown organism is gram-positive cocci in clusters. The appearance for *S. pyogenes* would be expected to be gram-positive cocci in chains, and hence could be ruled down as less likely.

**Correct.**

Continue

### Phase 3 Dichotomous key Intro

Question

You correctly selected the catalase test as your next step. Which of the following is TRUE regarding the catalase test?

*Select all that apply.*

☒ A. According to the dichotomous key, catalase activity varies in certain organisms.

☐ B. The catalase results confirm the Gram-typing.

☐ C. According to the dichotomous key, catalase activity is present in all gram-positive bacteria.

☒ D. The catalase results will help you to move down the dichotomous key.

Correct

A. Correct.

D. Correct.

Continue

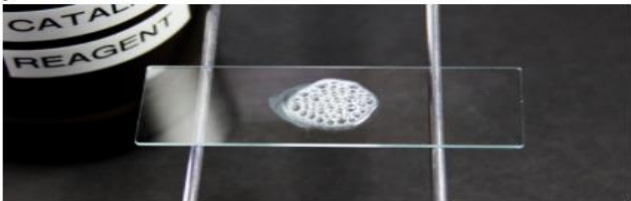
## Phase 4

### Catalase testing

Question

Review Catalase Test

The catalase test is used to classify bacteria based on the presence or absence of catalase enzyme in an unknown organism. Here are the results of your catalase test. What can you conclude?



☐ The catalase test on the unknown bacterium is negative.

☐ The catalase test result cannot be determined from this sample.

☒ The catalase test on the unknown bacterium is positive.

☐ The catalase test on the unknown bacterium is neutral.

Correct. The presence of bubbles indicates a positive catalase test

Continue

## Phase 5

### Mannitol salt agar testing

**Question** X

Which of the following is/are TRUE regarding labeling this plate? Select all that apply.



- ☒ A. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☐ B. The label should be placed on the lid of the plate for easy reading.
- ☐ C. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☒ D. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.

**Correct**  
A. Correct.  
D. Correct.

Continue

**Question** Review Mannitol Salt Agar Test X

The mannitol salt agar (MSA) test selects for bacterial growth under high-salt conditions and also differentiates mannitol fermentation by detecting acidic products. Here are the results of your MSA test. The plate on the left is your sample, compared to a control reaction plate on the right. What can you conclude?

- ☐ The MSA test on the unknown bacterium can be concluded as neutral.
- ☐ The MSA test shows the unknown bacterium grew and is negative for mannitol fermentation.
- ☐ The MSA test results cannot be determined from this because it did not grow well.
- ☒ The MSA test shows the unknown bacterium grew and is positive for mannitol fermentation.

**Correct. The organism grew and caused the medium to change color to yellow.**

Continue


## Phase 6

### Coagulase testing

Question

Review Coagulase Test X

After addition of bacteria to your coagulase tube, you tilt the tube to observe for any clotting of the rabbit plasma reagent, due to presence of coagulase enzyme. Your tube is shown on the left, with a negative control tube for coagulase on the right. What can you conclude?



☐ Testing is inconclusive as both tubes appear similar in their reactions.

☒ Your tube shows the coagulation of rabbit plasma and the unknown bacterium can be classified as positive for coagulase enzyme production.

☐ Your tube shows no coagulation of rabbit plasma and the unknown bacterium can be classified as negative for coagulase enzyme.


Correct.

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #7

### Phase 2

### Gram staining

 Question


Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following would apply to the image you see?

- ☒ You can observe gram-positive cocci on this field.
- ☐ You cannot distinguish any bacteria on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You can observe gram-negative bacilli on this field.

**Correct.** The purple color indicates a positive test for gram-positive bacteria.

Continue

 Question

X

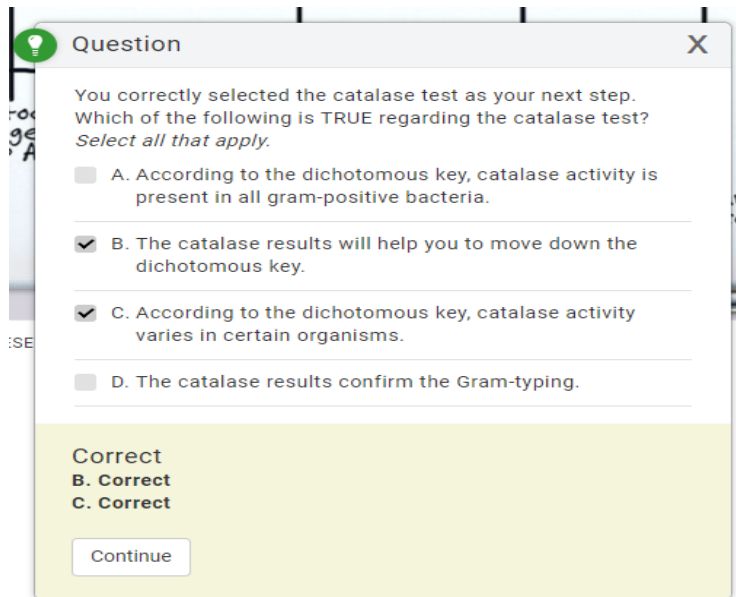
One initial suspect bacteria you considered was the common UTI-causing bacterium *Escherichia coli*. Why can we rule this organism down as the cause in the patient?

- ☐ The Gram stain result shows the unknown organism is gram-neutral. *E. coli* is also gram-neutral and cannot be ruled out.
- ☒ The Gram stain result shows the unknown organism is gram-positive. *E. coli* would appear gram-negative and hence can be ruled down.
- ☐ *E. coli* does not stain, instead appearing only by microscopy for identification.
- ☐ *E. coli* is not found on skin or the environment, and poorly introduced to human host tissues.

**Correct.**

Continue

Phase 3  
Dichotomous key intro



Phase 4  
No Pop-up questions

Phase 5  
Mannitol salt agar testing

Question

X

Which of the following is/are TRUE regarding labeling this plate? Select all that apply.

- ☐ A. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☒ B. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☐ C. The label should be placed on the lid of the plate for easy reading.
- ☒ D. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.

**Correct**

**B. Correct.**

**D. Correct.**


Continue

Question

Review Mannitol Salt Agar Test

X

The mannitol salt agar (MSA) test selects for bacterial growth under high-salt conditions and also differentiates mannitol fermentation by detecting acidic products. Here are the results of your MSA test. The plate on the right is your sample, compared to a control reaction plate on the left. What can you conclude?



- ☐ The MSA test shows the unknown bacterium grew and is positive for mannitol fermentation.
- ☐ The MSA test results cannot be determined from this because it did not grow well.
- ☒ The MSA test shows the unknown bacterium grew and is negative for mannitol fermentation.
- ☐ The MSA test on the unknown bacterium can be concluded as neutral.

**Correct.**

Continue


Phase 6  
Novobiocin test



Question

Review Antimicrobial Tests X

After incubation with a novobiocin disc, you observe the plate results. Your plate is shown on the right, with a control plate for novobiocin sensitivity on the left. What can you conclude?



☐ Your plate shows a zone of inhibition and the unknown bacterium can be classified as sensitive to novobiocin.

☐ Testing is inconclusive as both plates appear similar in their reactions.

☒ Your plate shows no zone of inhibition and the unknown bacterium can be classified as resistant to novobiocin.


Correct.

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #8

### Phase 2

### Gram staining

 Question


Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following would apply to the image you see?

- ☐ You can observe gram-negative bacilli on this field.
- ☐ You cannot distinguish any bacteria on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☒ You can observe gram-positive cocci on this field.

**Correct.** The purple color indicates a positive test for gram-positive bacteria.

Continue

 Question

X


One initial suspect bacteria you considered was the common endocarditis bacterium *Enterococcus faecalis*. Why can we rule this organism down as the cause in the patient?

- ☒ The Gram stain result shows the unknown organism as gram-positive cocci in clusters, suggestive of staphylococci. *E. faecalis* is a streptococcus species and would appear as gram-positive chains, and hence can be ruled down.
- ☐ *E. faecalis* does not stain, instead appearing only by microscopy for identification.
- ☐ The Gram stain result shows the unknown organism is gram-neutral. *E. faecalis* is also gram-neutral and cannot be ruled out.
- ☐ *E. faecalis* is not found on skin or the environment, and poorly introduced to human host tissues.

**Correct.**

Continue

Phase 3  
Dichotomous key Intro

 Question X

You correctly selected the catalase test as your next step. Which of the following is TRUE regarding the catalase test? *Select all that apply.*

- ☒ A. According to the dichotomous key, catalase activity varies in certain organisms.
- ☐ B. The catalase results confirm the Gram-typing.
- ☐ C. According to the dichotomous key, catalase activity is present in all gram-positive bacteria.
- ☒ D. The catalase results will help you to move down the dichotomous key.


**Correct**

A. Correct.  
D. Correct.

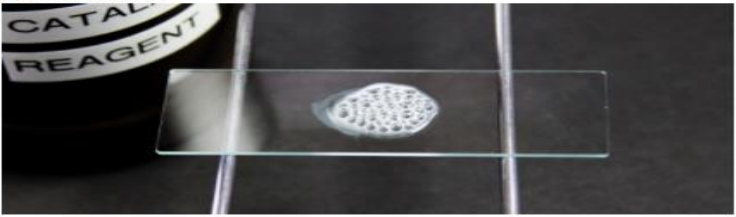
Continue

#### Phase 4

#### Catalase testing

 Question Review Catalase Test X

The catalase test is used to classify bacteria based on the presence or absence of catalase enzyme in an unknown organism. Here are the results of your catalase test. What can you conclude?



- ☐ The catalase test result cannot be determined from this sample.
- ☐ The catalase test on the unknown bacterium is negative.
- ☒ The catalase test on the unknown bacterium is positive.
- ☐ The catalase test on the unknown bacterium is neutral.

**Correct.**

Continue

## Phase 5

### Mannitol salt agar testing

Question

X

Which of the following is/are TRUE regarding labeling this plate? Select all that apply.

- ☒ A. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ B. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.
- ☐ C. The label should be placed on the lid of the plate for easy reading.
- ☒ D. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.


**Correct**  
**A. Correct.**  
**D. Correct.**

Continue

Question

Review Mannitol Salt Agar Test X

The mannitol salt agar (MSA) test selects for bacterial growth under high-salt conditions and also differentiates mannitol fermentation by detecting acidic products. Here are the results of your MSA test. The plate on the right is your sample, compared to a control reaction plate on the left. What can you conclude?




- ☐ The MSA test shows the unknown bacterium grew and is positive for mannitol fermentation.
- ☐ The MSA test on the unknown bacterium can be concluded as neutral.
- ☒ The MSA test shows the unknown bacterium grew and is negative for mannitol fermentation.
- ☐ The MSA test results cannot be determined from this because it did not grow well.

**Correct.**

Continue



## Phase 6

### Novobiocin test

 Question

Review Antimicrobial Tests X

After incubation with a novobiocin disc, you observe the plate results. Your plate is shown on the right, with a control plate for novobiocin sensitivity on the left. What can you conclude?



- ☒ Your plate shows a zone of inhibition and the unknown bacterium can be classified as sensitive to novobiocin.
- ☐ Testing is inconclusive as both plates appear similar in their reactions.
- ☐ Your plate shows no zone of inhibition and the unknown bacterium can be classified as resistant to novobiocin.


Correct.

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #9

### Phase 2

#### Gram staining

 Question


Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following would apply to the image you see?

- ☐ You can observe gram-negative bacilli on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You cannot distinguish any bacteria on this field.
- ☒ You can observe gram-positive cocci on this field.

**Correct.** The purple color indicates a positive test for gram-positive bacteria.

Continue

 Question

X

One initial suspect bacteria you considered was the common endocarditis bacterium *Escherichia coli*. Why can we rule this organism down as the cause in the patient?

- ☐ The Gram stain result shows the unknown organism is gram-neutral. *E. coli* is also gram-neutral and cannot be ruled out.
- ☐ *E. coli* does not stain, instead appearing only by microscopy for identification.
- ☒ The Gram stain result shows the unknown organism as gram-positive cocci in chains, suggestive of streptococci. *E. coli* is a gram-negative bacillus, and hence can be ruled down.
- ☐ *E. coli* is not found on skin or the environment and poorly introduced to human host tissues.

**Correct.**

Continue

Phase 3  
Dichotomous key intro

Question

X

You correctly selected the catalase test as your next step. Which of the following is TRUE regarding the catalase test? *Select all that apply.*

- ☐ A. The catalase results confirm the Gram-typing.
- ☐ B. According to the dichotomous key, catalase activity is present in all gram-positive bacteria.
- ☒ C. According to the dichotomous key, catalase activity varies in certain organisms.
- ☒ D. The catalase results will help you to move down the dichotomous key.

Correct

C. Correct

D. Correct

Continue

## Phase 4

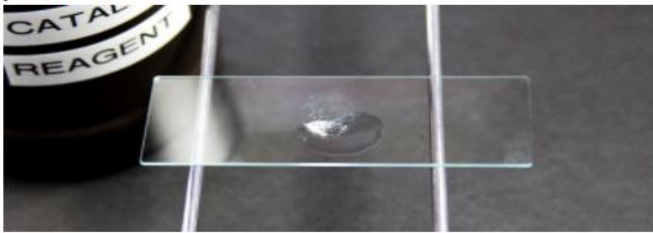
### Catalase testing

Question

Review Catalase Test

X

The catalase test is used to classify bacteria based on the presence or absence of catalase enzyme in an unknown organism. Here are the results of your catalase test. What can you conclude?



- ☐ The catalase test on the unknown bacterium is neutral.
- ☐ The catalase test on the unknown bacterium is positive.
- ☐ The catalase test result cannot be determined from this sample.
- ☒ The catalase test on the unknown bacterium is negative.

Correct.

Continue

Phase 5  
Blood agar plate hemolysis test



Question

X

Which of the following is/are TRUE regarding labeling this plate? Select all that apply.

- ☐ A. The label should be placed on the lid of the plate for easy reading.
- ☒ B. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☒ C. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☐ D. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.

Correct

B. Correct.

C. Correct.


Continue

Question

Review Blood Agar Plate Hemolysis Test

X

The blood agar hemolysis test grows bacteria with fastidious conditions and also differentiates between bacterial hemolysis of RBCs by visualization. Here are the results of your blood agar hemolysis test. What can you conclude?



- ☒ The blood agar hemolysis test shows the unknown bacterium grew and is beta-hemolytic.
- ☐ The blood agar hemolysis test shows the unknown bacterium grew and is alpha-hemolytic.
- ☐ The blood agar hemolysis test on the unknown bacterium can be concluded as neutral.
- ☐ The blood agar hemolysis test shows the unknown bacterium grew and is gamma-hemolytic.

Correct.

Continue


## Phase 6

### Bacitracin test

Question

Review Antimicrobial Tests X

After incubation with a bacitracin disc, you observe the plate results. Your plate is shown at the left, with a control plate on the right. What can you conclude?



☒

 Your plate shows no zone of inhibition, and the unknown bacterium can be classified as resistant to bacitracin.

☐

 Testing is inconclusive as both plates appear similar in their reactions.

☐

 Your plate shows a zone of inhibition, and the unknown bacterium can be classified as sensitive to bacitracin.

Correct.

Continue


## Phase 7

### CAMP test

Question

Review Camp Test X

After incubation for a CAMP test, you observe the plate results. Your plate is shown at the left, with a control plate on the right. What can you conclude?



☐

 Your plate results show the unknown bacterium can be classified as CAMP negative.

☒

 Your plate results show the unknown bacterium can be classified as CAMP positive.

☐


 Testing is inconclusive as both plates appear similar in their reactions.

Correct.

Continue

## UNKNOWN BACTERIAL IDENTIFICATION • SAMPLE #10

### Phase 2 Gram Staining

 Question


Review Gram Stain Test X

Your Gram stain is complete and correct. Which of the following would apply to the image you see?

- ☒ You can observe gram-positive cocci on this field.
- ☐ You can observe gram-negative bacilli on this field.
- ☐ You can observe gram-neutral bacteria on this field.
- ☐ You cannot distinguish any bacteria on this field.

**Correct.** The purple color indicates a positive test for gram-positive bacteria.

Continue

 Question

X


One initial suspect bacteria you considered was the common otitis media bacterium *Haemophilus influenzae*. Why can we rule this organism down as the cause in the patient?

- ☒ The Gram stain result shows the unknown organism as gram-positive cocci in chains, suggestive of streptococci. *H. influenzae* is a gram-negative bacterium, and hence can be ruled down.
- ☐ The Gram stain result shows the unknown organism is gram-neutral. *H. influenzae* is also gram-neutral and cannot be ruled out.
- ☐ *H. influenzae* is not found in the human host or the environment and poorly introduced to human host tissues.
- ☐ *H. influenzae* does not stain, instead appearing only by microscopy for identification.

**Correct.**

Continue

### Phase 3 Dichotomous key intro

 Question X

You correctly selected the catalase test as your next step. Which of the following is TRUE regarding the catalase test? *Select all that apply.*

- ☒ A. According to the dichotomous key, catalase activity varies in certain organisms.
- ☐ B. According to the dichotomous key, catalase activity is present in all gram-positive bacteria.
- ☒ C. The catalase results will help you to move down the dichotomous key.
- ☐ D. The catalase results confirm the Gram-typing.

Correct


A. Correct

C. Correct


Continue

#### Phase 4

#### Catalase testing

 Question Review Catalase Test X

The catalase test is used to classify bacteria based on the presence or absence of catalase enzyme in an unknown organism. Here are the results of your catalase test. What can you conclude?

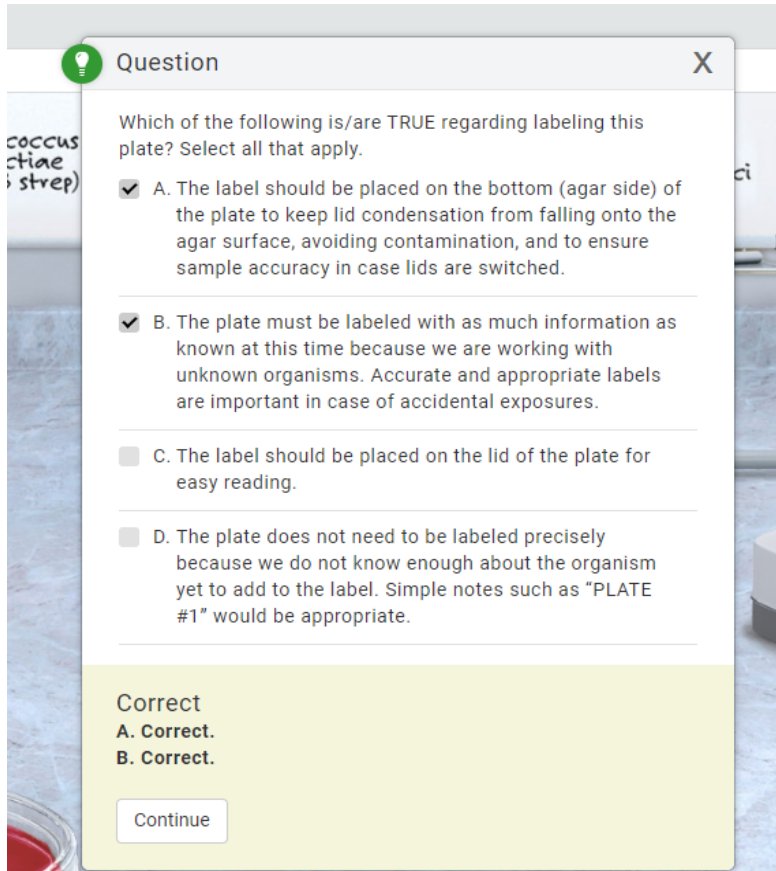


- ☐ The catalase test on the unknown bacterium is positive.
- ☒ The catalase test on the unknown bacterium is negative.
- ☐ The catalase test on the unknown bacterium is neutral.
- ☐ The catalase test result cannot be determined from this sample.

Correct.

Continue

Phase 5  
Blood agar plate hemolysis test

A screenshot of a digital learning interface. In the background, a petri dish containing a blood agar plate is visible, with handwritten notes on a nearby surface that include "cocci", "strep", and "strep". Overlaid on this is a "Question" dialog box. The dialog box has a title bar with a lightbulb icon and a close button (X). The question text asks which statements are true regarding labeling the plate. There are four options, A through D, each with a checkbox. Options A and B are checked, while C and D are not. Below the options, a yellow box indicates the correct answers are A and B. A "Continue" button is at the bottom of the dialog box.

**Question**


Which of the following is/are TRUE regarding labeling this plate? Select all that apply.

- ☒ A. The label should be placed on the bottom (agar side) of the plate to keep lid condensation from falling onto the agar surface, avoiding contamination, and to ensure sample accuracy in case lids are switched.
- ☒ B. The plate must be labeled with as much information as known at this time because we are working with unknown organisms. Accurate and appropriate labels are important in case of accidental exposures.
- ☐ C. The label should be placed on the lid of the plate for easy reading.
- ☐ D. The plate does not need to be labeled precisely because we do not know enough about the organism yet to add to the label. Simple notes such as "PLATE #1" would be appropriate.

**Correct**  
**A. Correct.**  
**B. Correct.**


Continue

Phase 5  
Blood agar plate hemolysis test

 Question

Review Blood Agar Plate Hemolysis Test X

The blood agar hemolysis test grows bacteria with fastidious conditions and also differentiates between bacterial hemolysis of RBCs by visualization. Here are the results of your blood agar hemolysis test. What can you conclude?

 Image showing bacterial growth on a Blood Agar plate. The plate is inoculated with a quadrant streak pattern and single colonies are visible in the last dilution streak. All colonies on the plate agar show a notable green-tinted breakdown of red blood cells surrounding the colony.

- ☐ The blood agar hemolysis test shows the unknown bacterium grew and is beta-hemolytic.
- ☐ The blood agar hemolysis test on the unknown bacterium can be concluded as neutral.
- ☒ The blood agar hemolysis test shows the unknown bacterium grew and is alpha-hemolytic.
- ☐ The blood agar hemolysis test shows the unknown bacterium grew and is gamma-hemolytic.

**Correct.**

Continue

Phase 6  
Optochin test




### Question

Review Antimicrobial Tests



After incubation with an optochin disc, you observe the plate results. Your plate is shown at the left with a control plate on the right. What can you conclude?

 Images showing bacterial growth on Blood Agar plates. An optochin antibiotic disc was placed on each plate and the plates were inoculated and have grown a lawn of bacteria after incubation at 37°C for 24 hours. The left plate is notable for a zone of inhibition, where there is no recorded bacterial growth, around the disc. The zone is small-to-moderate in diameter. The right plate has no measurable zone of inhibition, as the bacteria have grown up against the sides of the disc.

- ☐ Testing is inconclusive as both plates appear similar in their reactions.
- ☐ Your plate shows no zone of inhibition and the unknown bacterium can be classified as resistant to optochin.
- ☒ Your plate shows a zone of inhibition and the unknown bacterium can be classified as sensitive to optochin.

**Correct.**

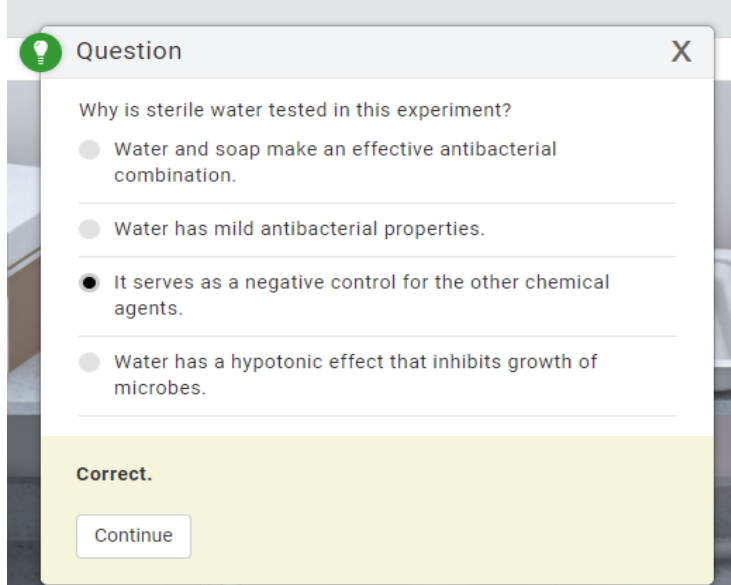
Continue

# CONTROL OF MICROBIAL GROWTH

## CONTROL OF MICROBIAL GROWTH • EFFECT OF ANTISEPTICS AND DISINFECTANTS

### Phase 2

Place chemically treated disc for plate #1



### Phase 3

Inoculate plate #2

No pop-ups in phase 3

### Phase 4

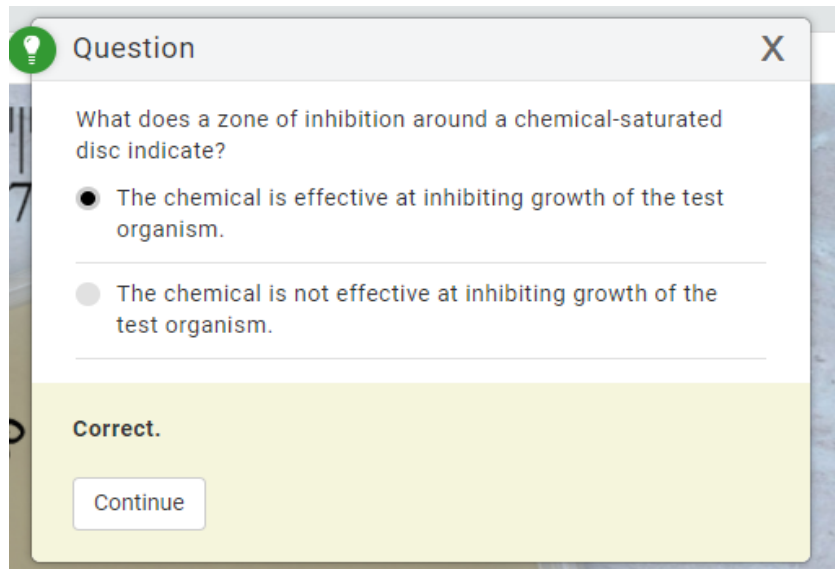
Place chemically treated disc for plate #2

No pop-up in Phase 4

### Phase 5

Observe growth on P. Vulgaris plate



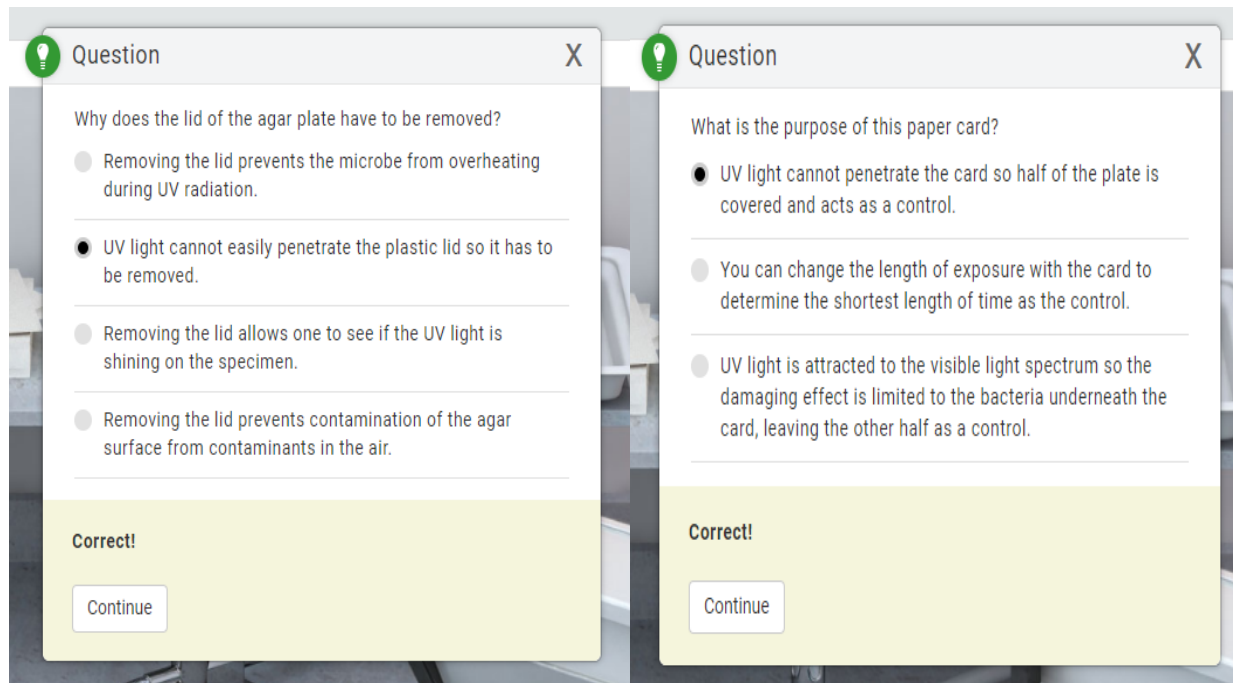


No pop-ups in 6-8

## CONTROL OF MICROBIAL GROWTH • EFFECT OF ULTRAVIOLET LIGHT

### Phase 2



Expose plates to UV light



## CONTROL OF MICROBIAL GROWTH • ANTIMICROBIC SENSITIVITY TESTING (KIRBY-BAUER METHOD)

### Phase 3

Inoculate plate and test *P. vulgaris*

 Question 

What is the correct way to measure the zone of inhibition?

- ☒ Measure the complete diameter of the zone from one side across the disc to the other side of the clear area, in millimeters.
- ☐ Measure from the edge of the disc to the edge of the zone, in millimeters.
- ☐ Measure the diameter of the agar plate and divide by the number of discs placed on the plate.
- ☐ Measure the radius from the center of the disc to the edge of the clear zone, in millimeters.

**Correct.**

[Continue](#)

### Bacterial Genetics

## BACTERIAL GENETICS • BACTERIAL TRANSFORMATION

### Phase 3 Inoculate Plates with +pGLO



### Question



What is the purpose of the LB agar plate?

- ☐ It is a selective medium with an antibiotic that prevents growth of non-resistant cells and a sugar that allows for the expression of a plasmid gene.
- ☐ It is a selective medium containing an antibiotic to inhibit the growth of non-resistant cells.
- ☒ It is a non-selective medium for bacterial growth.

**Correct.**

Continue



### Question




What is the purpose of the LB/amp agar plate?

- ☒ It is a selective medium containing an antibiotic to inhibit the growth of non-resistant cells.
- ☐ It is a selective medium with an antibiotic that prevents growth of non-resistant cells and a sugar that allows for the expression of a plasmid gene.
- ☐ It is a non-selective medium for bacterial growth.

**Correct.**

Continue

 Question X


What is the purpose of the LB/amp/ara agar plate?

- ☒ It is a selective medium with an antibiotic which prevents growth of non-resistant cells and a sugar that allows for the expression of a plasmid gene.
- ☐ It is a non-selective medium for bacterial growth.
- ☐ It is a selective medium containing an antibiotic to inhibit the growth of non-resistant cells.

**Correct.**  
Continue

## BACTERIAL GENETICS • DNA PROFILING

### Phase 1 Restriction enzyme digestion part 1

 Question X



What is the purpose of changing micropipette tips after each step?

- ☐ To keep restriction buffer from being added to the tube.
- ☒ To prevent cross contamination of the samples.
- ☐ To prevent the reaction from happening too quickly.
- ☐ To denature DNA as it is being added to the tube.

**Correct!**  
Continue

## BACTERIAL GENETICS • DNA PROFILING

### Phase 2

 Question 

What does the EcoRI/PstI enzyme mixture do?

- ☐ The enzyme mixture replicates specific regions of DNA.
- ☐ The enzyme mixture joins together short DNA sequences to create longer ones.
- ☐ The enzymes are used to purify DNA.
- ☒ The enzyme mixture cuts DNA at specific locations, creating various-sized fragments.

**Correct!**

Continue

### Phase 3

#### Gel electrophoresis



### Question



What are the main purposes for adding a loading dye to the samples before they are loaded into the gel?

*Select all that apply*


- ☒ A. It contains glycerol, which allows the samples to sink into the wells.
- ☐ B. It buffers the samples against the electrical charge of the gel box.
- ☒ C. It contains a colored indicator, allowing migration of the samples to be monitored during electrophoresis.
- ☐ D. It stabilizes the fragments so they are kept intact while migrating through the agarose gel.

Correct

A. Correct!

C. Correct!

Continue

 Question X

What would be the result of running the gel too long?


- ☒ The DNA sample will move through the entire gel and exit at the bottom.
- ☐ The DNA fragments would collect near the top of the gel and not move any farther.
- ☐ It would cause the larger fragments to move faster through the gel than the shorter fragments.
- ☐ The DNA fragments would not leave the loading well.

Correct!

Continue

## BACTERIAL GENETICS • POLYMERASE CHAIN REACTION (PCR)

### Phase 2 Transfer isolated DNA

 Question X



What is the purpose of changing micropipette tips after each step?

- ☒ To prevent cross contamination of the samples.
- ☐ To denature DNA as it is being added to the tube.
- ☐ To prevent the reaction from happening too quickly.
- ☐ To keep restriction buffer from being added to the tube.

Correct.

Continue

### Phase 3 Prepare master mix solution

 Question 

What is the importance of creating a master mix?



*Select all that apply.*

- ☒ A. It helps correct for pipette errors at small volumes.
- ☐ B. It makes the reaction run faster.
- ☒ C. It is easier to set up a single tube to add needed components in bulk versus pipetting each sample tube individually.
- ☒ D. It ensures more consistent concentrations of reagents for each tube.

Correct  
A. Correct.  
C. Correct.  
D. Correct.

Continue

## Phase 5

 Question 

Place the steps of one PCR cycle into the correct order.

Step 1

Step 2

Step 3

Correct

Continue

## Phase 6





### Question



What are the main purposes for adding a loading dye to the samples before they are loaded into the gel?

*Select all that apply.*

- ☒ A. It contains a colored indicator, allowing migration of the samples to be monitored during electrophoresis.
- ☒ B. It contains glycerol, which allows the samples to sink into the wells.
- ☐ C. It stabilizes the fragments so they are kept intact while migrating through the agarose gel.
- ☐ D. It buffers the samples against the electrical charge of the gel box.

**Correct**



**A. Correct.**

**B. Correct.**

Continue

## Urinary System

### Urinary System—Urinalysis Phase 1



 Question 

The patient has clear urine. What could this indicate?

- ☒ Clear-color urine may indicate a more diluted urine.
- ☐ Clear-color urine may indicate a urinary tract infection.
- ☐ Clear-color urine may indicate a more concentrated urine.

**Correct.**

[Continue](#)

 Question 

The pads on a urinalysis test strip contain which of the following?


- ☐ Urine solvents
- ☐ Urine solutes
- ☒ Reagents that react with solutes
- ☐ pH indicators

**Correct.**

[Continue](#)

neg. 5 (0.5) 15 (1.5) 50 (5) 150 (15) mg/dL (mmol/L)

## Phase 2


 Question X

The patient has cloudy urine. What could this indicate?

- ☐ Cloudy urine may indicate a more concentrated urine.
- ☒ Cloudy urine may indicate a urinary tract infection.
- ☐ Cloudy urine indicates normal, healthy urine.
- ☐ Cloudy urine may indicate a more diluted urine.

**Correct.**

Continue

 Question


Why is it important to wait 60 seconds before reading the urine values?

- ☒ You must allow adequate time for the urine to react with each test pad.
- ☐ It allows chemical reaction to occur in the urine.
- ☐ Urine has to be exposed to oxygen in order for it to react with the test pads.

**Correct.**

Continue

## Phase 3

 Question X

In which specific part of the kidney is urine formed?

- ☒ Nephron
- ☐ Renal cortex
- ☐ Glomerulus
- ☐ Renal medulla
- ☐ Bladder

**Correct. Nephrons are located in both the renal cortex and renal medulla.**

Continue

## pH Balance

### pH Balance—Function of Buffers

#### Phase 2

**Question** X

What could result from using the same stir rod to sample each solution?

- ☒ The results would not be reliable, as cross-contamination would occur.
- ☐ There would be no effect. We only change rods due to protocol.

**Correct.**

Continue

**Question** X

What effect do you expect Hydrochloric acid (HCl) to have on a solution?

- ☐ Increase the pH by increasing the concentration of hydrogen ions.
- ☒ Lower the pH by increasing the concentration of hydrogen ions.
- ☐ Increase the pH by decreasing the concentration of hydrogen ions.
- ☐ Lower the pH by lowering the concentration of hydrogen ions.

**Correct. As the concentration of hydrogen ions increases the pH decreases.**

Continue

#### Phase 3

**Question** X

Match the solution or item to its purpose.

Buffer solution	A positive control of a known
pH paper	Reacts to a change in pH by c
pH paper color key	Shows range of different colc
Artificial cytosol	Mimics intracellular fluid.
Water	A negative control containing

**Correct**

Continue

### pH Balance—Antacids as Buffers

#### Phase 3

**Question** X

What is the function of phenol red in this experiment?

- ☐ It is a proton donor.
- ☒ It is a pH indicator.
- ☐ It is a buffer.
- ☐ It is a base.

**Correct.**

Continue

#### Phase 4

**Question** X

What is the purpose of using hydrochloric acid (HCl) in this experiment?

- ☒ HCl simulates stomach acid.
- ☐ HCl activates the chemical reaction.
- ☐ HCl is a safe acid.
- ☐ HCl is a buffer.

**Correct.**

Continue

## Cell Division

### Cell Division—Examining Mitosis Phase 1

**Question** X

In what phase of mitosis are the chromosomes aligned along the equator of the cell?

☐ Prophase

☐ Telophase

☒ Metaphase

☐ Anaphase

Correct.

Continue

*Prophase Metaphase Anaphase*

### Phase 3

**Question** X

Why are some cells in the onion root tip undergoing mitosis?

☐ Cells in the root tip can fuse to double their chromosome number.

☐ Specialized cells in root tips produce gametes for sexual reproduction.

☒ A root tip is a plant tissue that is growing.

☐ Programmed cell death occurs as root tips mature.

Correct.

Continue

Ocular lenses

### Cell Division—Examining Meiosis Phase 1

**Question** X

Homologous chromosomes separate and move toward opposite poles of the cell during what phase of meiosis I?

☐ Prophase I

☒ Anaphase I

☐ Telophase I

☐ Metaphase I

Correct.

Continue

*Anaphase I Telophase I Cy*

### Phase 6

**Question** X

In human females, germ-line cells that undergo meiosis are found in what organ?

☒ Ovary

☐ Kidney

☐ Urinary bladder

☐ Uterus

Correct.

Continue

### Phase 3

**Question** X

At the end of meiosis II, how many daughter cells are produced?

☐ Two

☒ Four

☐ One

☐ Eight

Correct.

Continue

*Anaphase II Telophase II*

### Phase 7

**Question** X

The large, circular structures in the micrograph are cross-sections of what coiled tubules in the human testes?

☐ Fallopian tubes

☒ Seminiferous tubules

☐ Prostate glands

☐ Ejaculatory ducts

Correct.

Continue

Light

## Phase 8

Question

X

In human males, meiosis occurring in germ-line cells found in the \_\_\_\_\_ give rise to gametes called \_\_\_\_\_.

*Fill in the blanks.*

☐ ovaries; sperm

☐ ovaries; oocytes

☒ testes; sperm

☐ testes; oocytes

**Correct.**

Continue

## Cell Structure

### Cell Structure—Examining Plant and Animal Cells

#### Phase 1

Question

X

Identify features that are present in eukaryotic cells but not in prokaryotic cells.

*Select all that apply.*

☒ A. Membrane-bounded organelles

☐ B. A cell membrane

☒ C. A nucleus

☐ D. Cytoplasm

☐ E. Proteins

**Correct**  
A. Correct.  
C. Correct.

Continue

#### Phase 3

Question

X

What structure is found in plant cells but not in animal cells?

☒ Chloroplast

☐ Nucleus

☐ Centrioles

☐ Cell membrane

**Correct.**

Continue

#### Phase 2

Question

X

What part of all cells encases the cytoplasm and forms a boundary between the cell interior and cell exterior?

☒ Cell membrane

☐ DNA

☐ Endoplasmic reticulum

☐ Nucleus

**Correct.**

Continue

#### Phase 4

## Phase 5

