

SI Microbiology - Full Discipline Demo

Methyl Red and Voges-Proskauer Testing

Final Report - Answer Guide

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

Test Your Knowledge

Match each term with the best description.

MR-VP broth	Conversion of sugars to acids, gases, and/or alcohol	1
Methyl red	Media containing 0.5% glucose, peptones and buffers	2
Fermentation	Used to detect the presence of acetoin	3
Barritt's reagent	pH indicator for acidic solutions	4

Correct answers:

1 Fermentation 2 MR-VP broth 3 Barritt's reagent 4 Methyl red

Determine whether each statement is true or false.

⚡ The Voges-Proskauer test is designed to identify microbes that ferment glucose via the 2, 3-butanediol pathway.	
⚡ Acetoin turns yellow in the presence of Barritt's reagents.	
⚡ The methyl red test is designed to identify microbes that perform mixed-acid fermentation to metabolize carbohydrates.	
⚡ Mixed-acid fermenting microbes increase the pH of buffered culture media compared to other fermentative organisms.	
True	False
1	2

Correct answers:

1

The methyl red test is designed to identify microbes that perform mixed-acid fermentation to metabolize carbohydrates.

The Voges-Proskauer test is designed to identify microbes that ferment glucose via the 2, 3-butanediol pathway.

2

Acetoin turns yellow in the presence of Barritt's reagents.

Mixed-acid fermenting microbes increase the pH of buffered culture media compared to other fermentative organisms.

Exploration

Mixed-acid fermentation produces ____.

- ☐ acetic acid
- ☐ ethanol
- ☐ hydrogen gas
- ☒ All of the above

✓

Methyl red is a pH indicator that turns red below pH ____.

- ☒ 4.4
- ☐ 5.5
- ☐ 6.7
- ☐ 8.0

✓

Acetoin turns ____ in the presence of Barritt's reagents.

- ☐ yellow
- ☐ orange
- ☒ red
- ☐ green

✓

Exercise 1

Which of the bacteria tested in this exercise ferment glucose via the mixed-acid fermentation pathway? Explain how your results recorded in Data Table 1 and Photo 1 led to your conclusion.

E. coli ferments glucose via the mixed-acid fermentation pathway as indicated by the positive results for the methyl red test recorded in Data Table 1 and Photo 1. The acid byproducts of the mixed-acid fermentation process lowered the buffered MR-VP media pH that *E. coli* was cultured in resulting in the media turning red when methyl red dye was added. *S. epidermidis* did not produce significant acids to lower the pH of the buffered MR-VP media, resulting in the media turning orange-yellow upon the addition of methyl red dye.

Which of the bacteria tested in this exercise ferment glucose via the 2,3-butanediol pathway? Explain how your results recorded in Data Table 1 and Photo 2 led to your conclusion.

S. epidermidis ferments glucose via the 2,3-butanediol pathway as indicated by the positive results for the Voges-Proskauer test recorded in Data Table 1 and Photo 2. The acetoin precursor of 2,3-butanediol produced during fermentation of the MR-VP media reacted with the Barritt's reagents to form a red layer in the test tube. *E. coli* did not produce 2,3-butanediol during fermentation of the MR-VP media resulting in only yellow colored media after the addition of Barritt's reagents to the test tube.

Data Table 1: MR-VP Results
(SAMPLE ANSWER BELOW)

Microbe	Methyl red result	Voges-Proskauer result
<i>Escherichia coli</i>	Positive	Negative
<i>Staphylococcus epidermidis</i>	Negative	Positive

Photo 1: Methyl Red Test Results
(SAMPLE ANSWER BELOW)

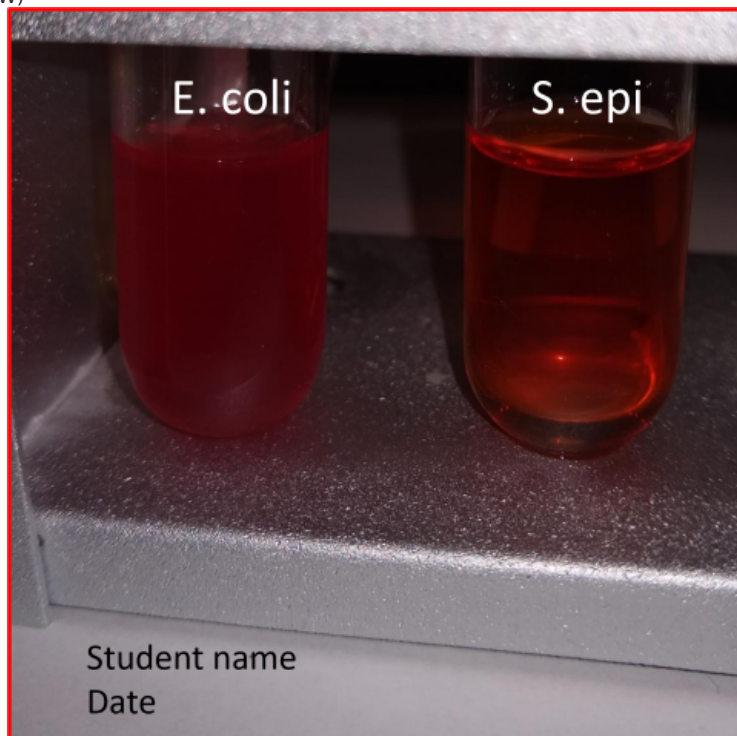
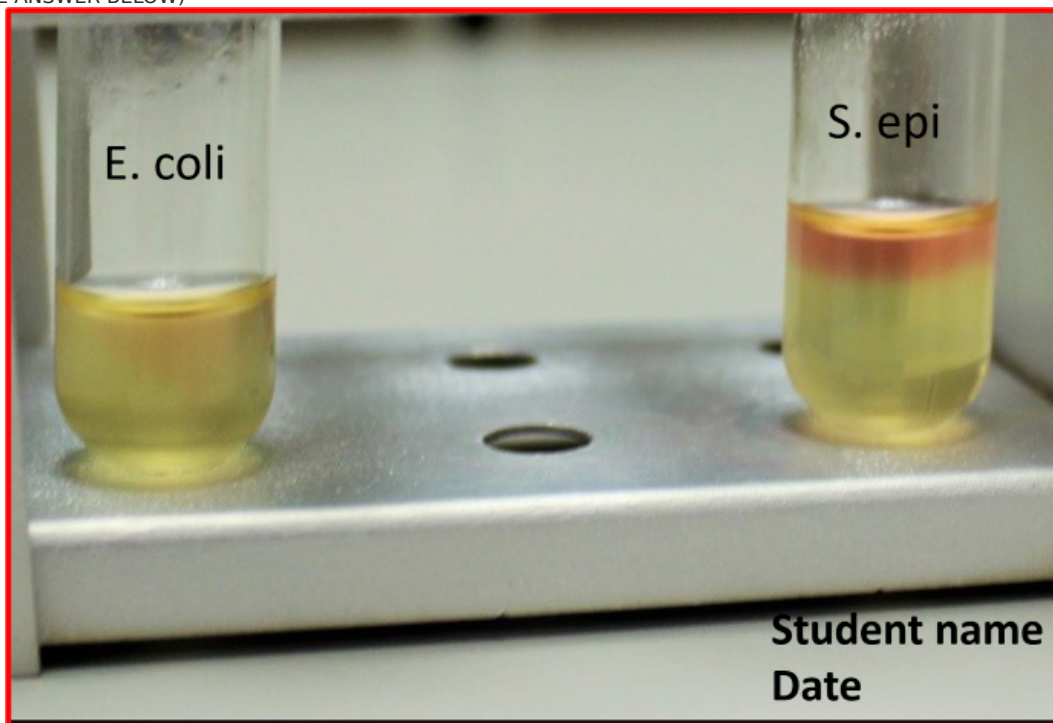


Photo 2: Voges-Proskauer Test Results
(SAMPLE ANSWER BELOW)



Competency Review

Mixed-acid fermentation produces ____ molecule(s) of acid for each molecule of glucose metabolized.

- ☐ one
- ☐ two
- ☐ three
- ☒ four ✓

MR-VP broth contains ____.

- ☐ 0.5% glucose
- ☐ peptones
- ☐ buffers
- ☒ All of the above ✓

When cultured in the laboratory, mixed-acid fermenting microbes lower the pH of buffered culture media more than other fermentative organisms.

- ☒ True ✓
- ☐ False

2,3-Butanediol fermentation does not produce acids as byproducts and does not significantly decrease the pH of buffered media.

- ☐ True ✓
- ☐ False

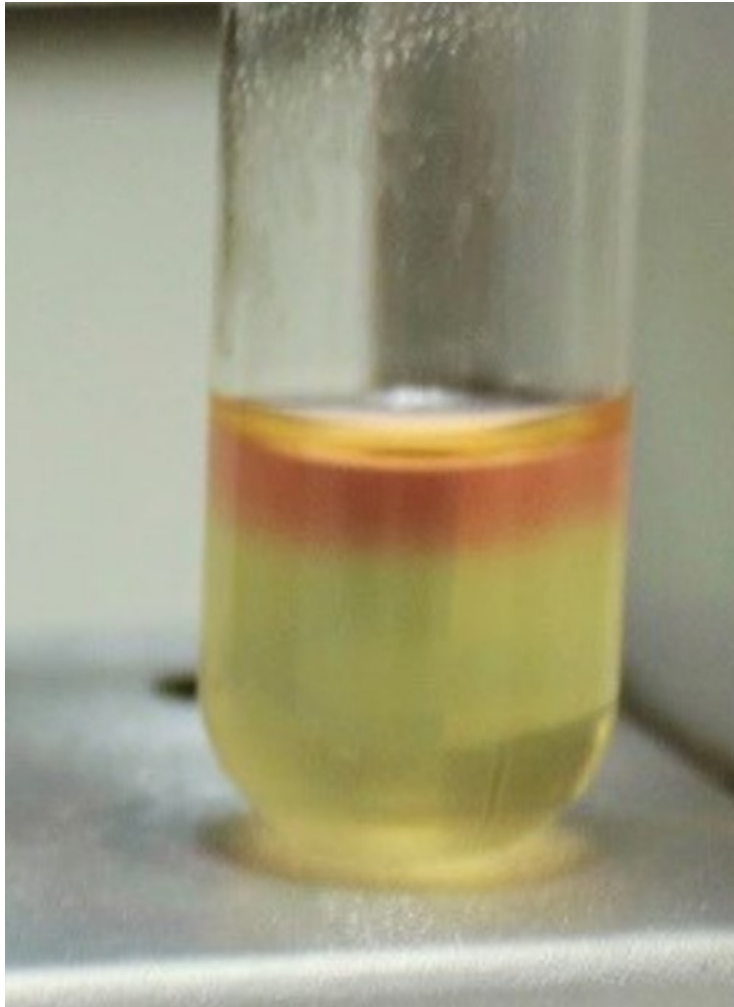
Barritt's reagents are used to detect the presence of ____, a precursor of 2,3-butanediol.

- ☐ acetic acid
- ☒ acetoin ✓
- ☐ lactic acid
- ☐ ethanol

Cultures for methyl red and Voges-Proskauer testing should be incubated for 48 hours in ____.

- ☒ broth tubes ✓
- ☐ agar plates
- ☐ stab tubes
- ☐ motility media

The test tube in the photo below represents a positive result for a Voges-Proskauer test.



- ☐ True
- ☐ False

✓

***E. coli* ferments carbohydrates via the ____ pathway.**

- ☐ mixed-acid
- ☐ 2,3-butanediol
- ☐ both mixed-acid and 2,3-butanediol
- ☐ None of the above

✓

***S. epidermidis* does not ferment carbohydrates.**

☐ True

☒ False



Extension Questions

A microbiology student mistakenly used unbuffered nutrient broth instead of MR-VP broth when performing methyl red testing on *S. epidermidis* and *E. coli*. Apply your knowledge of methyl red testing to predict how the student's results would be impacted by the broth substitution. (SAMPLE ANSWER BELOW)

Because the nutrient broth was unbuffered, the fermentation byproducts of both *E. coli* and *S. epidermidis* could significantly lower the pH of the broth and result in methyl red dye turning red while performing the methyl red test. These results would indicate that both microbes were mixed-acid fermenters.