

# USING THE SPECTROPHOTOMETER

Performance-Based Process Skill Assessment and Rubric

## STUDENT LEARNING OBJECTIVES

1. Students will be able to conduct an experiment using the spectrophotometer.

## MATERIALS

Spectrophotometer  
2 Cuvettes per student  
Starch Solution: Enough for entire class  
Distilled water: Enough for entire class  
Iodine - I<sub>2</sub>KI: Enough for entire class  
Data Sheet

## PROCEDURES

### Set-up

- 1) Prepare two cuvettes: A blank and an experimental  
**Blank:** 8 ml of distilled water + 0.1 ml of I<sub>2</sub>KI  
**Experimental:** 4 ml of starch + 4 ml of distilled water + 0.1 ml of I<sub>2</sub>KI

### Collecting the Data

Using the cuvettes you prepared, complete the following five procedures:

1. Measure % transmittance for the experimental solution at wavelengths 440-700 and record the data in Table 1. Be sure to calibrate the spectrophotometer using the blank between each measurement.
- 2) Calculate absorbance for the % transmittance data you recorded in Table 1 using the following formula:  $\text{Absorbance} = 2 - \log_{10} \%T$

### Reporting the Results

- 3) Graph wavelength vs. absorbance data. Include x and y-axis labels, figure title, and figure summary.
- 4) Answer the following two questions and provide a detailed explanation:
  - a. Why is it necessary to blank the spectrophotometer? Explain.
  - b. Which wavelength recorded the greatest absorbance? Explain.

### Discussion

- 5) Describe another possible experiment that could be conducted using the spectrophotometer. Briefly discuss how you would "Collect Data and Report Results."

Table 1. Record the % transmittance and calculate the absorbance

Wavelength	Absorbance	% Transmittance
440		
460		
480		
520		
540		
560		
580		
640		
680		
700		

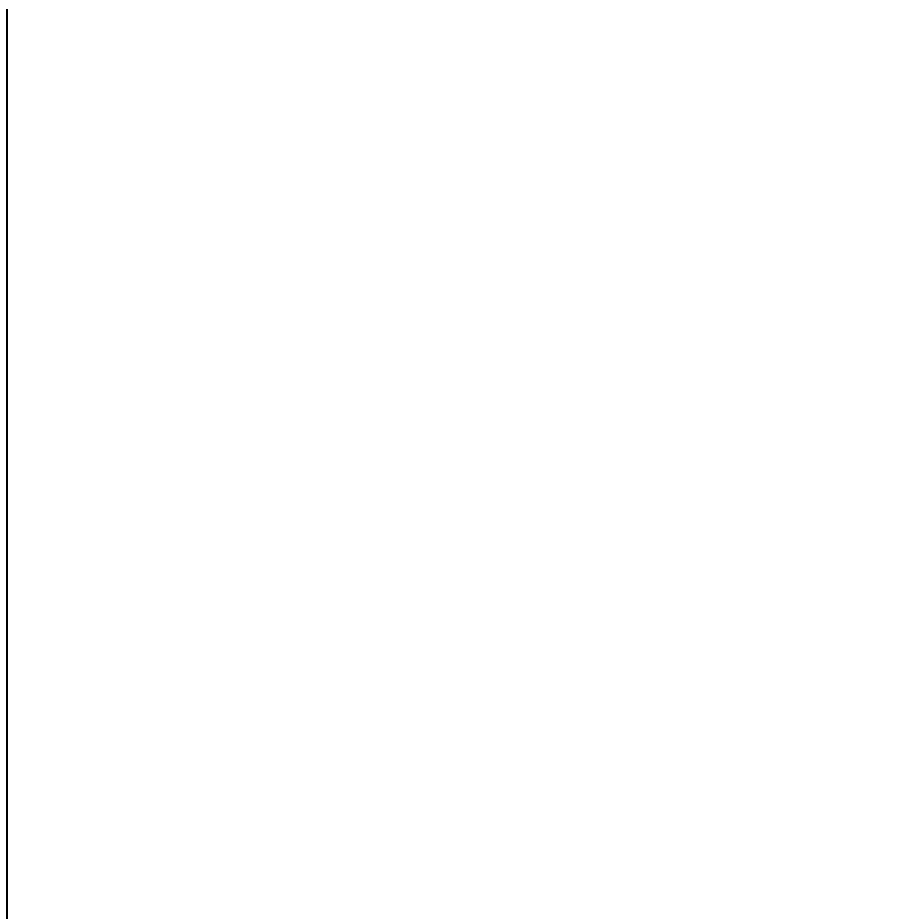


Figure 1.

### DRAFT SCORING RUBRIC

KEY TASKS	1	2	3	4	5
Measure % transmittance	Measures some of the wavelengths, and some measurements are accurate within a few degrees	Measures all wavelengths, and at least 3 measurements are accurate within a few degrees	Measures all wavelengths, and at least 5 measurements are accurate within a few degrees	Measures all wavelengths, and at least 7 measurements are accurate within a few degrees	Measures all wavelengths, and all measurements are accurate within a few degrees
Calculate absorbance	Calculates some absorbances and some calculations are correct.	Calculates all absorbances and at least 3 calculations are correct.	Calculates all absorbances and at least 5 calculations are correct.	Calculates all absorbances and at least 7 calculations are correct.	Calculates all absorbances and all calculations are correct.
Graph wavelength vs. absorbance	Graph absorbance for some of the wavelengths, and does not properly label x and y-axis or provide a figure title or figure summary.	Graph absorbance for some of the wavelengths, and may or may not properly label x and y-axis or provide a figure title or figure summary.	Graph absorbance for all wavelengths, but does not properly label x and y-axis and does not provide a figure title or figure summary.	Graph absorbance for all wavelengths and includes x and y-axis labels, but does not provide a figure title or figure summary.	Graph absorbance for all wavelengths and includes x and y-axis labels, figure title, and figure summary.
Answering the questions	Doesn't answer any of the questions.	Answers only one question and may or may not provide an explanation for one or both questions.	Answers both questions but doesn't provide an explanation for one or both questions.	Answers both questions and provides a brief explanation for each.	Answers both questions and provides a detailed explanation for each.
Briefly describe another experiment	Does not describe another experiment.	Barely describes another experiment and doesn't discuss how they would collect data or report results.	Briefly describes another experiment, but doesn't discuss how they would collect data or report results.	Briefly describes another experiment, discusses how they would collect data, but doesn't discuss how they would report results.	Briefly describes another experiment, and discusses how they would collect data and report results.