

CHAPTER 12	Investigation 12.B: Distinguishing Sights and Sounds	BLM 12.3.3
HANDOUT		
Question: What range of sights and sounds can you distinguish?		

Part 1: Distinguishing Shades of Colour

Hypothesis

Write a hypothesis about which factors might affect your ability to distinguish different shades of a colour.

Materials

- liquid food colouring
- 5 beakers (100 mL) or 5 clear containers of equal size
- water

Procedure

1. Read the procedure, and create a table to record your data.
2. Put an equal amount of water (about 50 mL) into the five beakers (or clear containers).
3. Label the beakers 1 through 5, so that the labels can be concealed. Put 1 drop of food colouring in the first beaker, 2 drops in the second, 3 drops in the third, 4 drops in the fourth, and 5 drops in the fifth. Jiggle the beakers gently to mix the samples.
4. Have someone else change the order of the beakers. Then try to arrange the beakers from darkest to lightest colour. Check your success, and record results in the following table.

Conditions	Actual order of beakers	Perceived order of beakers

Investigation 12.B: Distinguishing Sights and Sounds (cont'd)

5. Repeat step 4 with the five beakers in different lightings: dark room, moderate lighting, and, if possible, bright sunlight. Look straight at the beakers when you observe them.
6. Repeat step 5, but this time look at the beakers from out of the corners of your eyes.
7. Repeat step 4 with the five beakers at several different distances: for example, 1 m, 5 m, 10 m, and 20 m.

Analysis

1. What factors allowed you to discriminate the different shades most easily? Did your observations support or refute your hypothesis? Explain.
2. Compare your results with the results of other students.

Conclusions

3. Name the structures in the eye that are responsible for vision and colour discrimination. Which receptors did you rely on the most in step 5? Which receptors did you rely on the most in steps 6 and 7? Justify your answers by explaining how the different receptors work.

Investigation 12.B: Distinguishing Sights and Sounds (cont'd)

Part 2: Distinguishing Sound Frequencies

Prediction

Predict the range of frequencies that you will be able to hear.

Materials

- device that produces a wide range of sound frequencies, such as a set of tuning forks, a frequency signal generator, a Vernier or Pasco computer program that aids in analyzing different sound frequencies, or an Internet site that provides different tone frequencies
- frequency sensor (optional)

Procedure

1. In the first column of the following table, list the frequencies that you will generate with your device. In the next column, *predict* whether or not you will be able to detect each frequency. You will use the third column in steps 2 and 3 to record whether or not you can hear each frequency and, if so, to describe what you hear.

[illegible]

CHAPTER 12	Investigation 12.B: Distinguishing Sights and Sounds (cont'd)	BLM 12.3.3
HANDOUT		

2. Set up your test in a quiet location. If you are using a frequency generator, turn it on. If a frequency sensor is available, turn this on too, so you can use it to record the exact frequencies generated.
3. Starting with the lowest frequency, check your ability to hear the sound generated. Then switch to higher frequencies in 1000 Hz increments, until you reach the highest frequency that can be generated. At each increment, fill in your data table.
4. Close your eyes, and have a partner generate a 4000 Hz sound at different locations around your head. Indicate to your partner where the sound is coming from. After the test, check with your partner to see if you were correct. Note the locations that you identified correctly.

Analysis

1. Name the specific structures of the inner ear that allow us to discriminate different frequencies. How did these structures function to allow you to hear sounds of different frequencies?
2. What range of frequencies were you able to hear? Was your prediction correct?

CHAPTER 12	Investigation 12.B: Distinguishing Sights and Sounds (cont'd)	BLM 12.3.3
HANDOUT		

3. Compare your results with other students' results or with data supplied by your teacher. Are there people who can hear frequencies that you cannot, or vice versa? Suggest a reason for this.

Conclusions

4. If you cannot hear certain frequencies within the range of 20 to 20 000 Hz, suggest a reason why. Explain specifically what damage might have occurred in your ears.
5. In step 5, why was it easier to locate the source of a sound when the sound was directly in front of you or behind you, and more difficult to locate the source when the sound came from either side of you?

Extension

6. Research different causes of hearing loss. Contact an audiologist (hearing specialist), and arrange for a visit to learn how hearing tests are performed.