

## Investigation 12.B: Distinguishing Sights and Sounds Answer Key

### Part 1

#### Answers to Analysis Questions

1. The results of this investigation should support the hypothesis that you can distinguish different shades of colour better in brighter light. Colour vision is mediated by specialized nerve cells in the retina called cones, which function only in bright light. When light becomes dim, rods take over, and these provide neither colour vision nor high acuity (ability to detect fine detail, such as that needed for reading).

Peripheral vision is provided primarily by the rods. The cones are used for colour vision and are found mainly in the centre of the field of view. Therefore, you should notice that you cannot distinguish colours as easily when looking at the beakers out of the corner of your eye.

2. You should find that other students obtained similar results. If not, discuss the possible reasons or sources of error.

#### Answer to Conclusion Question

3. The rods and cones are responsible for vision. The cones are primarily responsible for colour discrimination.

In Step 5, when you look straight at the beakers, the light energy is striking the central portion of the retina. This region contains more cones. Therefore, you are able to distinguish different shades of colour—especially in bright light. In a dark room and with moderate lighting, you will be relying more on information from rods.

In Step 6, when you look out of the corner of your eye, the light energy is striking the outside edge of the retina. This region contains more rods than cones. Therefore, you cannot easily distinguish different shades of colour even in bright light when most of the light energy is striking this region of the retina. You will be relying more on information from rods.

In Step 7, when you move farther from the coloured water, less light energy is striking the cones. The cones require more light intensity to be stimulated. The farther the distance, the more you will be relying on information from rods.

### Part 2

#### Answers to Analysis Questions

1. The specific structures of the inner ear that allow us to distinguish different frequencies are the oval window, organ of Corti, basilar membrane, hair cells, and stereocilia. Different areas of the organ of Corti are sensitive to different wave frequencies. High frequencies, such as the sound of a whistle, most strongly stimulate the hair cells closest to the oval window. Low frequencies, however, such as a low note played by a tuba, most strongly stimulate the hair cells farthest from the oval window.
2. The frequencies you will be able to detect will depend on a number of factors including the amount of background noise in the room, your perception of sound, and any damage you may have suffered already to the ear or organ of Corti. Predictions may or may not have been correct.
3. Hearing varies from person to person, with countless factors influencing the range of frequencies that any one of us can detect. Age and genetic makeup play a part, as do many other

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

variables, such as the use of loud machines without wearing proper hearing protection, attendance at a noisy concert the night before, or the amount of wax in your ears.

#### **Answers to Conclusion Questions**

4. Hearing loss generally results from nerve damage (damage to the hair cells) or damage to the sound-conducting system of the outer or middle ear. Birth defects, ear infections, and noise are common causes of hearing loss.
5. The pinnae face forward, so humans can hear sounds in front better than they can hear sounds behind or to the side.