**Chapter 4 Review Answers**

**Checking Concepts**

1. (a) Crest

(b) Amplitude

(c) Wavelength

(d) Trough

2. As wavelength increases, frequency decreases,

and vice versa. Another way to say this is that

they are inversely related.

3. Light waves and sound waves both carry

energy. Their waves both can be characterized

by frequency, wavelength, and amplitude.

4. Students’ answers may vary. One way to measure

the wavelength of a small water wave is to

hold a ruler over the top and sight two wave

crests at the same instant along a ruler. Using

a flashing light, or strobe light, that has variable

speed, it is possible to change the rate of

flashing so that it makes the wave appear to

stand still.

5. (a) All colours of light have waves with the

same general shape as that of a transverse

wave. (Also correct: The light waves move

at the same speed in a vacuum, regardless

of the colour.)

(b) Different colours of light differ in that

their waves have different wavelengths and

frequencies.

6. Hertz (Hz) is the unit used to measure frequency.

1 Hz means one vibration per second.

7. Wavelength measures the distance from crest

to crest (or any place on a wave to the same

place on the next wave), while amplitude

measures the distance from the crest to the

equilibrium position, which in a water wave is

the position of the surface of the water when

there is no wave (or from the trough to the

equilibrium position).

8. (a) 0.5 m

(b) 1.0 m

9. (a) 0.4 m

(b) 2.1 m

10. (a) 0.6 m

(b) 2.0 m

11. A shirt can appear blue in white light because

the pigment in the blue shirt absorbs non-blue

colours such as red and green, while at the

same time reflecting blue.

12. Radio waves and infrared waves have waves

that are longer than visible light, while ultraviolet

waves, X rays, and gamma rays have

waves that are shorter than visible light.

13. Radio waves are used in MRI technology to

form an image of soft tissues such as those in

the brain. The person is placed in a very

strong magnetic field. The atoms that make up

the tissue behave like little magnets. When

stimulated with a small amount of radio waves,

the magnets can flip. This causes a radio signal

to be released, which is detected by the MRI

machine. These signals represent information

about the tissues that can be converted into

pictures.

**Understanding Key Ideas**

14. Light waves and waves in a fish pond are both

disturbances that carry energy. They can both

be characterized by wavelength, frequency,

and amplitude.

15. (a) 14 crests/7 s = 2 Hz

(b) 30 crests/5 s = 6 Hz

(c) 0.5 crests/10 s = 20 Hz

16. Wavelength and frequency cannot both

increase together because as the wavelength

gets longer, the troughs and crests get farther

and farther apart. This means that the

frequency must decrease rather than increase.

17. Students’ tables may vary. Sample answer:

**RADIATION TYPE DIFFERENCES SIMILARITIES**

Infrared waves Lowest frequency,

lowest energy,

invisible

– All are forms of

radiation that

move in the form

of waves.

– All move at the

same speed.

– All carry energy.

Visible rays Visible to humans,

intermediate

frequency and

energy

X rays Highest frequency,

can pass through

humans, highest

energy, invisible

18. (a) The red light has the longest wavelength.

(b) The violet (or blue, if that is what she sees)

has the highest frequency.

(c) Mei Lin would remove green, most likely,

and if she did that, recombining the red

and blue would yield orange.

19. Students’ answers may vary but may include

the following points: X rays cause cancer if

received in too great a dosage. A huge overexposure

could even cause burns or other

direct damage to tissue.