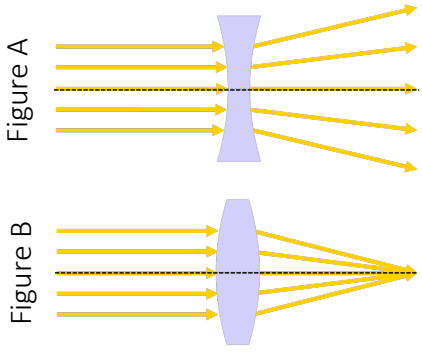
Name: _____ Date: _____

◆ Concave and Convex Lenses Reading Passage

CONCAVE AND CONVEX LENSES



A **lens** is a curved piece of glass that causes light to refract or bend in a specific way. Lenses focus light to form an image. They can make an image appear sharper or they can enlarge or reduce the size of an image. Lenses have many uses. They are used in glasses and contacts to help correct vision, in telescopes to view distant objects in space and in microscopes to view very small objects. There are two main types of lenses: concave and convex.

A **concave lens** is a lens where the center of the lens is thinner than the edges. The center of the lens "caves in." A concave lens causes light waves to spread out or diverge. For this reason, a concave lens is also called a divergent lens. When you look through a concave lens, the object(s) you are looking at appears smaller. For example, a peephole in a door uses a concave lens to produce a panoramic view of things outside the door. A fisheye lens to a camera uses a concave lens to produce a panoramic picture.

A **convex lens** is a lens where the center of the lens is thicker than the edges. The center "bulges out." A convex lens causes light waves to converge to a single point. For this reason, a convex lens is also called a convergent lens. When you look through a convex lens, the object(s) appears larger or magnified. For example, convex lenses are used in things like binoculars and telescopes. They are also used in magnifying glasses, microscopes and cameras as well. The lens of your eye is actually a convex lens. It refracts light so to focus it on the retina. The retina receives visual information and sends that information to your brain. Your brain produces an image with the information.

Questions

1. What is a lens?
2. What type of lens is illustrated in Figure A and Figure B?
3. What is the difference between a concave and convex lens?
4. Compare how concave and convex lenses are used.
5. What would happen to our vision if the lens of the human eye was a concave lens? Defend your answer.

Name: _____ Date: _____

◆ Concave and Convex Lenses Answer Sheet

Questions

1. What is a lens?

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2. What type of lens is illustrated in Figure A and Figure B?

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3. What is the difference between a concave and convex lens?

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4. Compare how concave and convex lenses are used.

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5. What would happen to our vision if the lens of the human eye was a concave lens? Defend your answer.

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Name: _____ Date: _____

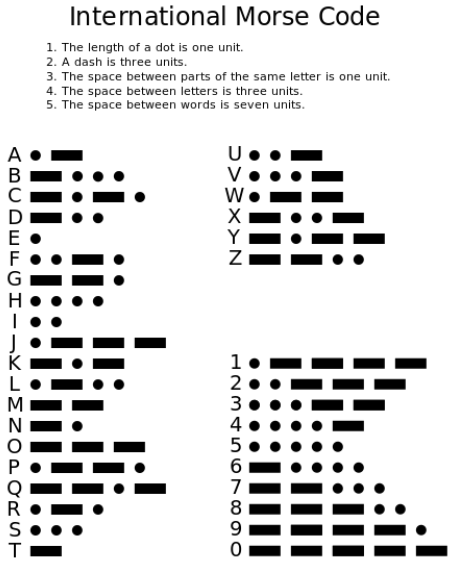
● Generating a Wave Signal Reading Passage

GENERATING A WAVE SIGNAL

Waves can be used to communicate or transmit information across long distances. Radio waves are used to transmit television and radio programs. Microwaves are used to transmit information between cellphones or between an internet router and a computer Infrared is used to transmit information from a remote control to a television.

Waves transmit information as signals. A **signal** is a wave with a specific pattern that carries information. The amplitude, wavelength and frequency of the wave determine the pattern and thus, the information carried by the signal.

To send information by wave signals, information must first be coded. In other words, information – such as text, music or a voice message – is transformed into a wave with a specific pattern A device known generally as a signal generator codes information into a wave. Then, the wave is transmitted or broadcasted from where the signal was generated. It travels across a distance to its destination(s). At its destination(s), the wave is received by a receiver. Devices such as cell phones or computers are receivers that can receive signals. The receiver decodes or translates the signal back into its original form.



Wave pulses transmit information across a long distance. A **wave pulse** is a single wave disturbance or a short wave "burst." A pulse is a signal because a pulse carries a short piece of information. **Morse code** was an early form of communication that transmitted text information as a series of "dots and dashes" or short and long wave pulses. With Morse Code, a unique combination of dots and dashes codes for each letter of the alphabet and numbers 0 through 9. A dot is a short-wave signal or pulse. A dash is a long-wave signal or pulse. A person using Morse Code would use it to code text into a series of dots and dashes. The text is sent out as a pattern of short and long wave signals by a transmitter. The wave signals would be received by a radio and decoded by a person or machine back into the original text.

Name: _____ Date: _____

● Generating a Signal with Waves Answer Sheet

Questions

1. What kind of waves are used to communication information?

_____

_____

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2. What is a signal?

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3. Describe Morse Code.

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4. Explain how coding, transmitting, receiving and decoding are important to using waves to communication information.

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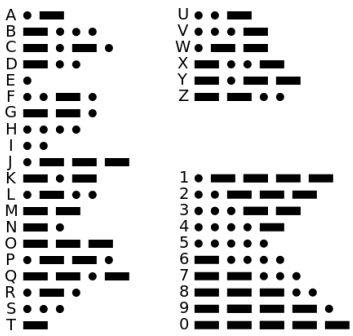
5. Use Morse Code to generate a code for the text “I need help.” The combination of dots and dashes for each letter and number are shown below.



Name: _____ Date: _____

■ Analog vs. Digital Signals Reading Passage

ANALOG VS. DIGITAL SIGNALS

Signals are waves that carry information across long distances. The pattern of a wave in the signal codes for different information. The pattern of the wave is determined by the wave's amplitude, frequency and wavelength. There are two different kinds of signals: analog and digital. **Analog signals** are wave signals that are not generated from digital information. They are generated continuously where small fluctuations in the wave pattern code for the information carried by the signal. Analog signals are not generated as pulses or "bursts" of waves. On the other hand, **digital signals** are wave signals that are generated electronically from digital information. They transmit information as pulses or bursts of waves.

Today, we most often use digital signals to communicate information. Digital information is coded or digitalized into a pattern of numbers. Specifically, digital information is coded into patterns of 1s and 0s. We call this a **binary pattern**. This information can be stored or transmitted as a digital signal. To transmit digital information, a pattern of pulses or "wave bursts" codes for the 1s and 0s of the digital information. High-tech devices, such as computers and cellphones receive digital signals. They can convert digital signals back into the original information or they can store the information.

Digital signals are a more reliable way to code and transmit information than analog signals. Both types of signals are used today. However, modern communication relies most of the transmission of digital signals rather than analog signals. Because analog signals are continuous, they tend to "catch" interference (which we often call noise). For this reason, they are more likely to become distorted. When an analog signal becomes distorted, the information coded in the signal is corrupted and the signal may not be correctly decoded by receivers. On the other hand, digital signals are more productive and efficient because digital signals transmit information in discrete values. The signals are less likely to get altered or distorted and thus, retain their accuracy in delivering information across long distances. Additionally, digital signals are less likely to break down or degrade over long distances compared to analog signals and digital signals, generally, can be transmitted faster than analog signals.

_____

Name: _____ Date: _____

■ Analog and Digital Signals Answer Sheet

Questions

1. What is a signal?

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2. What is digital information?

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_____

3. Compare and contrast analog and digital signals.

_____
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4. Explain how digital information can be sent from one electronic device to another.

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5. Do you think the reading passage makes a good argument for why digital signals are a better way to code, store and transmit information? Defend your answer.

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_____
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