EOT 3 EXAM

GRADE 9 G Science

PART 1 (MCQ)

Part 1 الجزء الأول	1	Diffrentiate between regions on Longitudinal sound wave, (Rarefaction, Compression), and assign them on diagram	Textbook physical science, Fig. 1 , 6	252, 257
	2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260
	3	Define Acoustics, echolocation, sonar, and ultrasound, and explain how some animals (bats and dolphins) and humans apply them in their daily life activities	Textbook physical science, figs. 19, 20, 21, 22	269, 270, 271, 272
	4	Explain how the human eye see and relate it to the light wave	Textbook physical science, Fig.1	328
	5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337
	6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

1	Diffrentiate between regions on Longitudinal sound wave, (Rarefaction, Compression), and assign them on diagram	Textbook physical science, Fig. 1 , 6	252, 257

Vibrations and Sound

An amusement park can be a noisy place. The sounds from the rides and games can make it hard to hear what your friends say. All of these sounds have something in common: a vibrating object produces each one. For example, your friends' vibrating vocal cords produce their voices. Vibrating speakers produce the music from a carousel.

Sound Waves

Recall that air is composed of matter. When an object such as a radio speaker vibrates, it collides with some of the particles that make up the nearby air, transferring some energy to those particles. These particles then collide with other particles, passing the energy on further. The energy originally transferred by the vibrating object continues to travel through the air in this way. This process of energy transfer forms a sound wave.

Sound waves are longitudinal waves. Remember that a longitudinal wave is composed of two types of regions—compressions and rarefactions. If you look at **Figure 1,** you will see that when a radio speaker vibrates outward, the particles near the speaker are pushed together, forming a compression. When the speaker moves inward, the particles near the speaker are spread apart, and a rarefaction forms. As long as the speaker continues to vibrate back and forth, sound waves are produced.

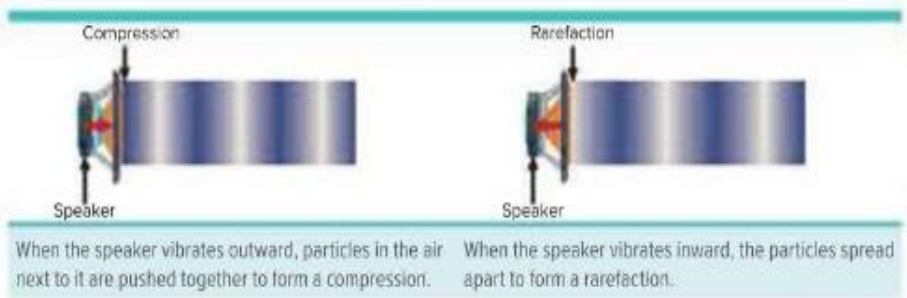


Figure 1 A vibrating speaker cone produces longitudinal waves.

Intensity and Loudness

Recall that the degree of disturbance from a wave corresponds to its amplitude. For a longitudinal wave, amplitude is related to how close together the particles of the medium are in the compressions.

Figure 6 compares longitudinal waves of low amplitude and high amplitude. Increasing the amplitude of a longitudinal wave pushes the particles in that wave's compressions closer together.

To produce a sound wave with greater amplitude, more energy must be transferred from the vibrating object to the medium. This greater energy is then transferred through the medium as the sound wave is transmitted.

What happens to the sound waves from a speaker when you turn up the volume? The notes sound the same, but the amplitude of the sound waves increases. This, in turn, causes your eardrums to vibrate with a higher amplitude when the sound waves reach your ears.

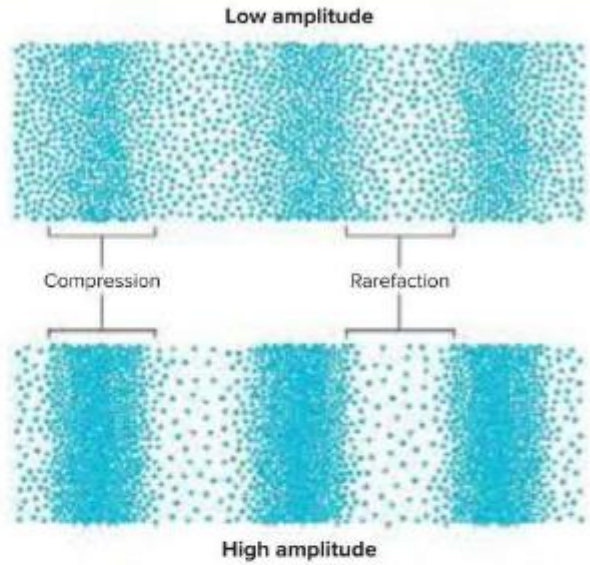


Figure 6 The amplitude of a sound wave depends on the density of the medium in the compressions and rarefactions.

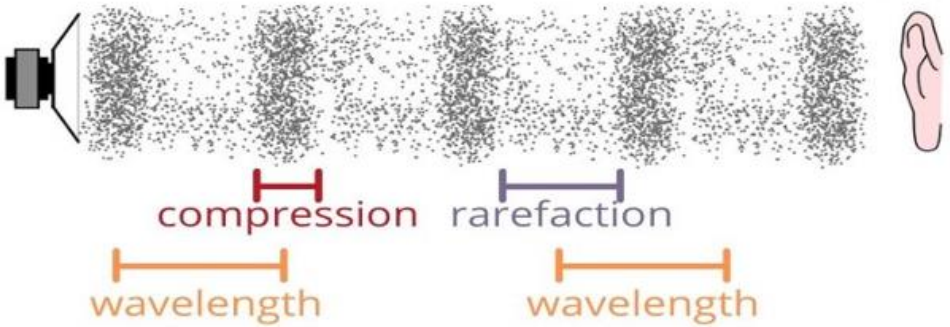
Identify *the areas of highest and lowest density for each wave.*

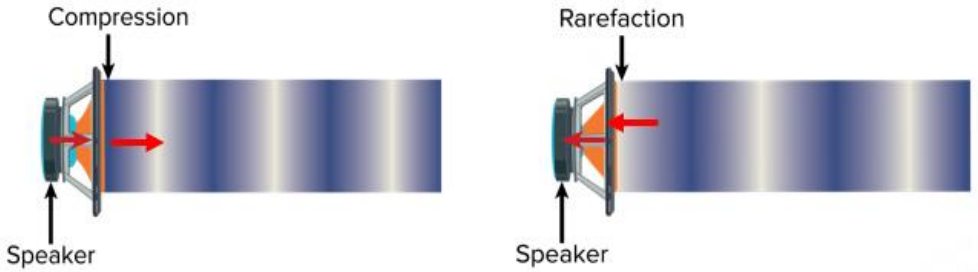
Get It?

Describe what happens to sound waves from a speaker when you turn up the volume.

1	Diffrentiate between regions on Longitudinal sound wave, (Rarefaction, Compression), and assign them on diagram	Textbook physical science, Fig. 1 , 6	252, 257

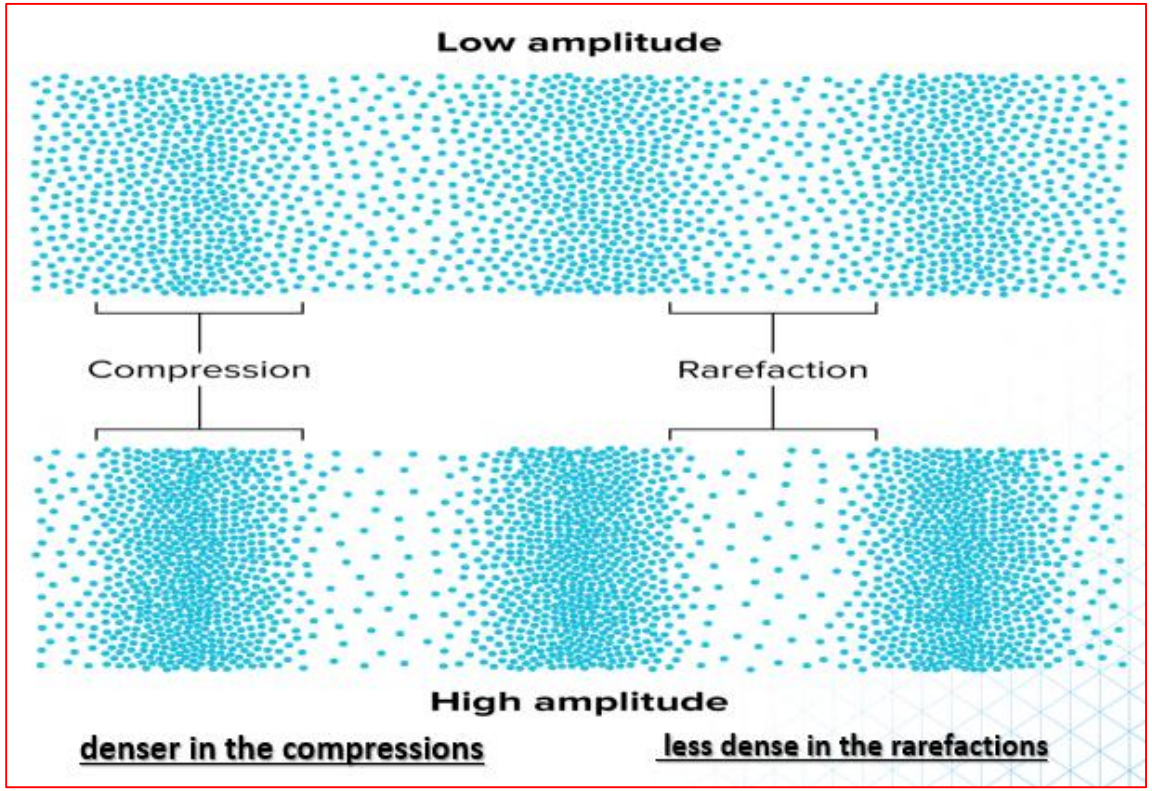
- Sound waves are longitudinal waves.
- Longitudinal wave is composed of two types of regions
  1. compressions
  2. rarefactions





When the speaker vibrates outward, particles in the air next to it are pushed to form a compression.

When the speaker vibrates inward, the particles spread apart to form a rarefaction.



particles vibrate with more energy in a high amplitude wave than in a low amplitude wave.

compared to a low-amplitude wave, a high-amplitude wave has even denser compressions and less dense rarefactions.

1	Diffrentiate between regions on Longitudinal sound wave, (Rarefaction, Compression), and assign them on diagram	Textbook physical science, Fig. 1 , 6	252, 257

6. [redacted] The place in a longitudinal wave where particles are far from each other is called_____?

A Wavelength

B Compression

C Rarefaction

7. [redacted] Property of longitudinal wave where particles are close together is called _____?

A Compression

B Wavelength

C Rarefaction

8. Sound Waves

A are Surface Waves.

B move in a circular motion.

Show answers

Previous Next

C are Longitudinal waves.

D are Transverse Waves

2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260

Figure 7 The intensity of the sound waves from each computer speaker is related to the rate at which energy passes through an imaginary rectangle and how far the listener is from the speaker.

Describe *how the intensity would be different for a person standing 10 m away from the computer speakers.*

Intensity

For sound waves, the amplitude of the waves is related to intensity. **Intensity** is the amount of energy that passes through a certain area in a specific amount of time. Picture sound waves traveling from a computer speaker, through an imaginary rectangle, and to your ears, as shown in **Figure 7**. If you could measure how much energy passed through such a rectangle in one second, you would measure intensity.

When you turn up the volume on your computer, the speaker cone moves in and out through a greater distance. In turn, greater energy is transferred through the medium, resulting in greater intensity. When you turn down the volume, you reduce the energy carried by the sound waves, so you also reduce the intensity.

Distance and intensity Intensity influences how far away a sound can be heard. If you and a friend whisper a conversation, the sound waves you produce have low intensity and are not heard at a far distance. However, when you shout, the sound waves have high intensity and can be heard farther away.

Sound intensity decreases with distance for two reasons. First, the energy that a sound wave carries spreads out as the sound wave spreads out. Second, some of a sound wave's energy converts to other forms of energy, usually thermal energy, as the sound travels through matter. As the sound wave travels farther, more of its energy converts into other forms. Some materials, such as soft, thick curtains, are very effective at converting sound energy to other forms of energy.

Loudness

Some sounds are so loud that they can be painful to hear. **Loudness** is the human perception of sound volume and primarily depends on sound intensity. When sound waves of high intensity reach your ear, they cause your eardrum to move back and forth a greater distance than when sound waves of low intensity reach your ear. As a result, you hear a loud sound.

The decibel scale It is hard to say how loud is too loud. Two people are unlikely to agree on what is too loud because people vary in their perceptions of loudness. A sound that seems fine to you may seem earsplitting to your teacher. Even so, the intensity of sound can be described using a measurement scale.

A **decibel** (DE suh bel), abbreviated dB, is a unit of sound intensity. The loudest sounds that you hear are probably more than 10 billion times more intense than the softest sounds that you can hear. In order to handle this wide range of intensities, the decibel measurement scale is set up in a special way.

Every increase in 10 dB on the decibel scale represents a tenfold increase in intensity. This means that a 50-dB sound is 10 times more intense than a 40-dB sound. You might think that this means a 60-dB sound is 20 times more intense than a 40-dB sound. However, a 60-dB sound is 10 × 10, or 100, times more intense than a 40-dB sound. A 100-dB sound is 10^7, or 10 million, times more intense than a 30-dB sound. A sound can also have an intensity of less than 0 dB. However, people generally cannot hear these sounds.

Sustained sounds above about 90 dB can cause permanent hearing loss. Even short, sudden sounds with intensity levels above 120 dB may cause pain and permanent hearing loss. During some rock concerts, sounds reach this damaging intensity level. Wearing ear protection, such as earplugs, around loud sounds can help protect against hearing loss. **Figure 8** shows some sounds and their intensity levels in decibels.

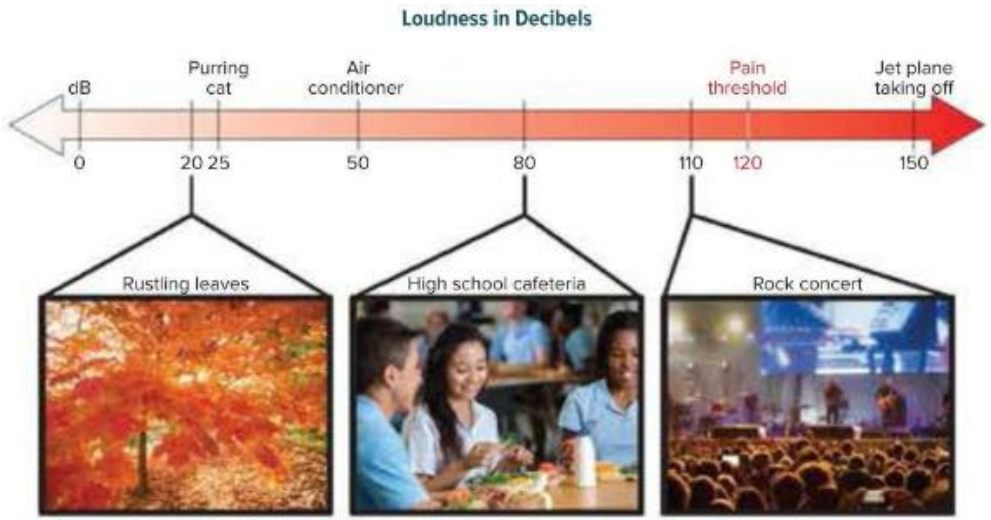


Figure 8 The volumes of different sounds are often measured in decibels.

Identify *where a normal speaking voice would fall on the decibel scale.*

2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260

Intensity	Loudness
Is the amount of energy that passes through a certain area in a specific amount of time.	Is the human perception of sound volume and primarily depends on sound intensity.
Turn up volume→greater energy is transferred→ greater intensity. Turn down volume→ reduce the energy→ reduce the intensity.	A **decibel** is a unit of sound intensity. • Every increase in 10 dB on the decibel scale represents a tenfold increase in intensity. **Example:** **50 dB is 10 More intense than a 40 dB.** **60 dB is 10 x 10 or 100 times more intense than 40 dB.** **100 dB is 10^7 or 10 million times more than 30 dB**
• Sound energy **decreases** with distance??? **Because** 1. **The energy that a sound wave carries spreads out.** 2. **some of the sound's energy is transformed to other forms of energy as it travels.**	**Identify** the following key characteristics of sound intensity. units of sound intensity: decibels (db) level of faintest sound humans can hear: 0 db sustained sound level that damages human hearing: 90 db short-duration sound level that can cause pain: 120 db **Wearing ear protection (earplugs) can help to protect ear.**

2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260

18) Which sound wave property is most related to loudness?

- **A)** amplitude
- **B)** wave speed
- **C)** frequency
- **D)** wavelength

Another word for intensity is _____, and it is measured in _____

answer choices

- Frequency, decibels
- Amplitude, hertz
- Amplitude, decibels
- Frequency, hertz

The loudness (or intensity) of a sound wave is related to its _____

answer choices

- frequency
- duration
- amplitude.
- wavelength

2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260

Pitch

If you have ever studied music, you are probably familiar with the musical scale *do, re, mi, fa, so, la, ti, do.* If you were to sing this scale, your voice would start low and become higher with each note. As you sang, you would hear a change in pitch. **Pitch** is how high or low a sound seems to be. The notes on the right side of a piano have high pitches. The pitch of a sound is primarily related to the frequency of the sound waves.

Frequency and pitch

Frequency is a measure of how many wavelengths pass a particular point each second. For a longitudinal wave, such as sound, the frequency is the number of compressions or the number of rarefactions that pass by each second. Frequency is measured in hertz (Hz). One Hz means that one wavelength passes by in one second.

When sound waves with high frequency reach your ears, many compressions reach your eardrums each second. The waves cause your eardrums and all the other parts of your ears to vibrate more quickly than a sound wave with a low frequency. Your brain interprets these fast vibrations caused by high-frequency waves as a sound with a high pitch.

As the frequency of sound waves decreases, the pitch becomes lower. **Figure 9** shows different notes and their frequencies. Notice that when you sing *do, re, mi, fa, so, la, ti, do,* the second *do* has twice the frequency of the first *do.*

Animals differ in their sensitivities to different ranges of sound frequencies. A human teenager with typical hearing can hear sounds with frequencies from about 20 Hz to 20,000 Hz. However, the highest frequency that a typical human can hear decreases with age. The human ear is most sensitive to sounds in the range of 440 Hz to about 7000 Hz. This roughly corresponds to the notes on the upper half of a piano. Dogs can hear sounds with frequencies up to about 35,000 Hz, and bats can detect frequencies higher than 100,000 Hz.

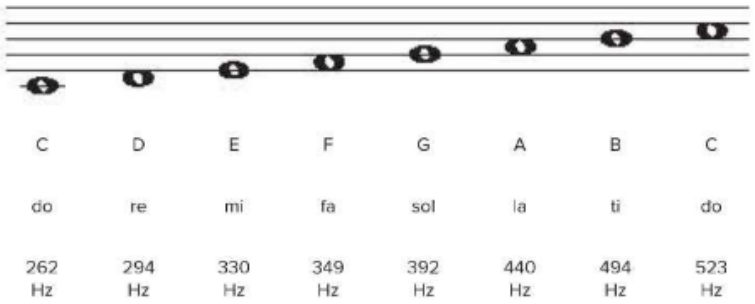


Figure 9 Every musical note has a distinct frequency, which gives that note a distinct pitch.

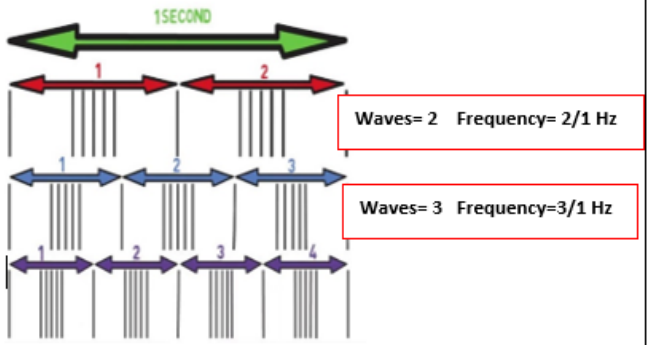
Describe *how pitch changes when frequency increases.*

Frequency: is a measure of how many wavelengths pass a particular point each second.

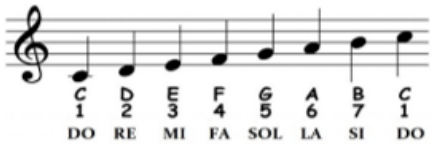
Longitudinal wave (sound) the frequency is the number of compressions or rarefactions that pass by each second.

Measured in hertz (Hz)
One Hz → one wavelength passes by in one second.

Frequency = number of waves/ times



Pitch: is how high or low a sound seems to be.



How pitch changes when frequency increases?

The pitch of a sound is primarily related to the frequency of the sound waves.

High frequency → High pitch

Low frequency → Low pitch

2	Relate intensity and loudness and compare them to frequency and pitch and how they affect sound wave	Textbook physical, fig. 7, 8	258, 259, 260

14) The human perception of pitch primarily depends on ___.

- **A)** loudness
- **B)** resonance
- **C)** intensity
- **D)** frequency

Frequency is measured in ____

answer choices

- meters
- hertz
- decibels
- seconds

15) Which will you hear as the highest pitch?

- **A)** sound wave with frequency of 10,000 Hz
- **B)** sound wave with frequency of 50 Hz
- **C)** sound wave with frequency of 15,000 Hz
- **D)** sound wave with frequency of 30,000 Hz

_____ is the number of times a sound wave vibrates in a given time.

answer choices

- intensity
- frequency
- wavelength
- amplitude

16) The ___ is the frequency at which a material tends to vibrate when it is disturbed.

- **A)** pitch
- **B)** quality
- **C)** resonance
- **D)** natural frequency

The measure of how high or low a sound is:

answer choices

- the intensity
- the size of the wavelength
- how loud or soft a sound is
- the pitch

21) Fill in the blanks using the available answer choices.

Increasing the frequency of a sound wave will change the _____ of a sound.

(Blank 1)

Blank 1 options

- loudness
- intensity
- pitch

3	**Define Acoustics, echolocation, sonar, and ultrasound, and explain how some animals (bats and dolphins) and humans apply them in their daily life activities**	**Textbook physical science, figs. 19, 20, 21, 22**	**269, 270, 271, 272**

Acoustics

When an orchestra stops playing, does it seem as if the sound of the music lingers for a couple of seconds? The sounds and their reflections reach your ears at different times, so you hear echoes. This echoing effect produced by many reflections of sound is called reverberation (re vur bu RAY shun).

During an orchestra performance, reverberation can ruin the sound of the music. To prevent this problem, the people who design concert halls must understand how the size, shape, and furnishings of the room affect the reflection of sound waves.

These scientists and engineers specialize in acoustics (uh KEWS tihks). **Acoustics** is the study of sound. People who study acoustics know that soft, porous materials, such as curtains, can reduce excess reverberation. **Figure 19** shows a concert hall that has been designed to produce a good listening environment.

Figure 19 Cloth drapes, cushioned seats, and carpeted floors help reduce reverberations in this concert hall. The amount of reverberation can be controlled slightly by opening and closing the drapes.

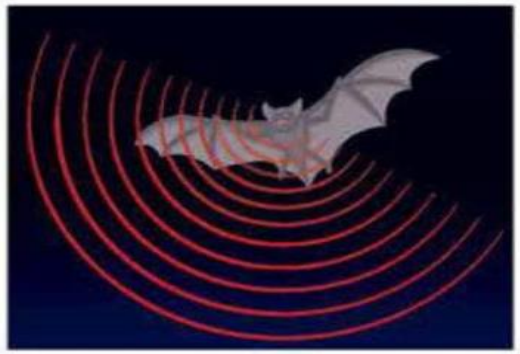
Explain *whether the drapes are more likely to absorb or to reflect sound energy.*

Echolocation

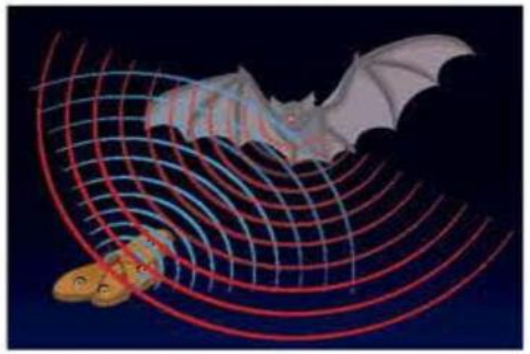
At night, bats swoop around in darkness without bumping into anything. They even manage to find insects and other prey in the dark. Most species of bats depend on echolocation. **Echolocation** is the process of locating objects by emitting sounds and then interpreting the sound waves that are reflected from those objects. **Figure 20** explains more about echolocation.

Figure 20 Visualizing Bat Echolocation

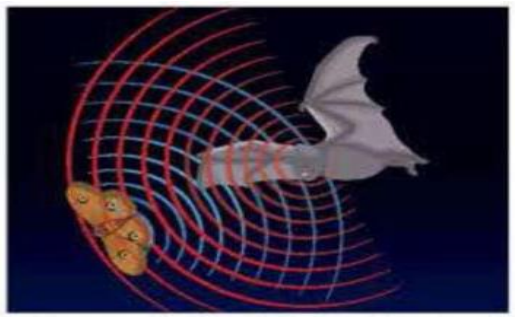
Bats and dolphins navigate and locate prey by using echolocation. The diagrams below show how a bat uses echolocation in hunting for prey. Some species of moths are able to jam a bat's echolocation by emitting their own sounds.



▲ A. The bat emits sound waves.



▲ B. Some of the sound waves reflect off a moth.



▲ C. The bat determines the moth's location and velocity from the reflected waves.

▲ D. The bat continues to emit sound waves and locate the moth until the moth is captured.

3	**Define Acoustics, echolocation, sonar, and ultrasound, and explain how some animals (bats and dolphins) and humans apply them in their daily life activities**	**Textbook physical science, figs. 19, 20, 21, 22**	**269, 270, 271, 272**

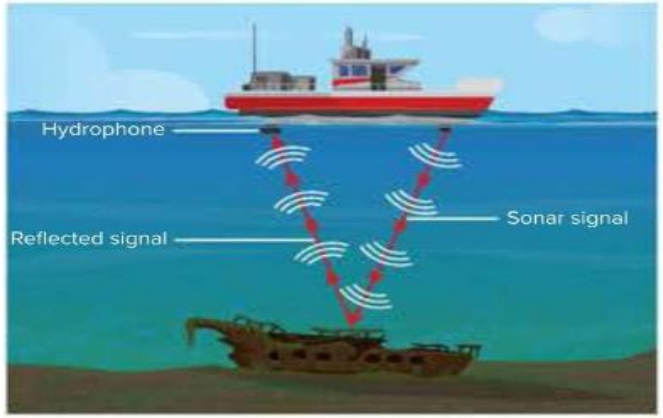


Figure 21 People use sonar to find objects that are underwater. Here, scientists use sonar to locate a sunken ship.

Sonar

More than 140 years ago, a ship named the *SS Central America* disappeared in a hurricane off the coast of South Carolina. In its hold lay ten tons of newly minted gold coins and bars. When the shipwreck occurred, there was no way to search for the ship in the deep water where it sank. The *SS Central America* and its treasures lay at the bottom of the ocean until 1988, when crews used sonar to locate the wreck under 2400 m of water. Over $100 million in gold was eventually recovered.

Sonar, which stands for **SO**und **N**avigation **A**nd **R**anging, is a system that uses the reflection of underwater sound waves to detect objects. First, a sound pulse is emitted toward the bottom of the ocean. The sound travels through the water and is reflected when it hits something solid, as shown in **Figure 21.** A sensitive underwater microphone, called a hydrophone, picks up the reflected signal. Because the speed of sound in water is known, the distance to the object can be calculated by measuring how much time passes between emitting the sound pulse and receiving the reflected signal.

The idea of using sonar to detect underwater objects was first suggested as a way to avoid icebergs, but many other uses have been developed for it. Navy ships use sonar for detecting, identifying, and locating submarines. Fishing crews also use sonar to find schools of fish, and scientists use it to map the ocean floor.

More detail can be revealed by using sound waves of high frequency. As a result, most sonar systems are ultrasonic. **Ultrasound** is sound with frequencies above the range of human hearing, or more specifically, sound with frequencies above 20,000 Hz.

Get It?
Describe how sonar detects underwater objects.

Ultrasound in Medicine

Ultrasonic waves are commonly used in medicine. Medical professionals use ultrasound to examine many parts of the body, including the heart, liver, gallbladder, pancreas, spleen, kidneys, breasts, and eyes. Medical professionals can also use ultrasonic imaging, which is much safer than X-ray imaging, to monitor a human fetus.

When ultrasound is used for medical imaging, an ultrasound technician directs the ultrasound waves toward a target area of a patient's body. The sound waves reflect off the targeted area, and the reflected waves are used to produce electronic signals. A computer program converts these signals into video images called sonograms. A sonogram of a human fetus is shown in **Figure 22.**

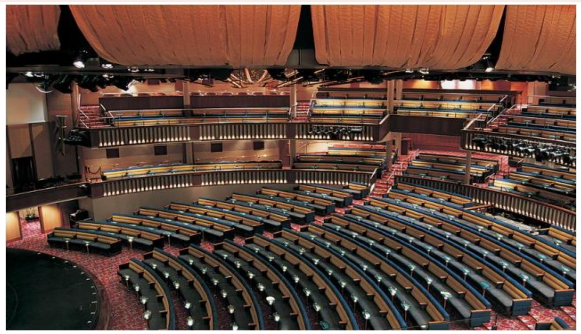
Figure 22 Ultrasonic waves are directed into a pregnant woman's uterus to form images of her fetus. This allows doctors to safely monitor the fetus's growth.

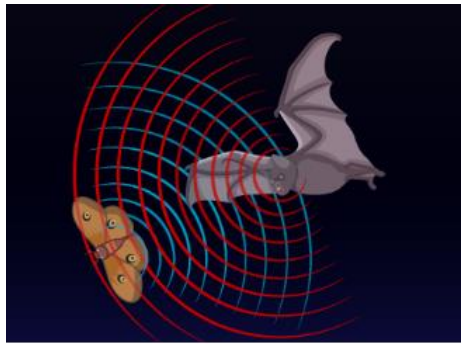
Kidney stones and ultrasound

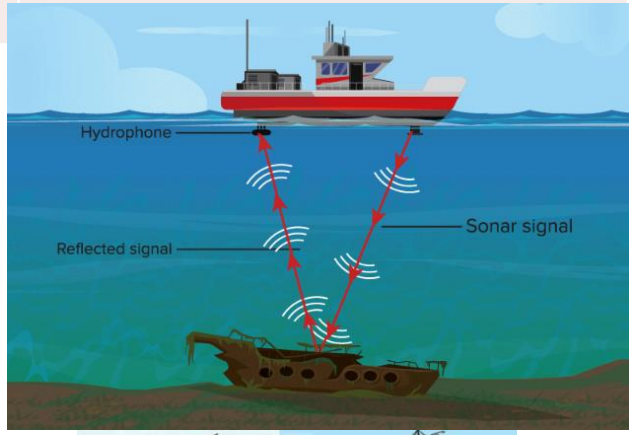
Medical professionals can also use ultrasound to treat certain medical problems. For example, ultrasound can be used to break up kidney stones. Bursts of ultrasound create vibrations that cause the stones to break into small pieces. These fragments then pass out of the body with the urine. Without ultrasound, surgery would be necessary to remove the kidney stones.

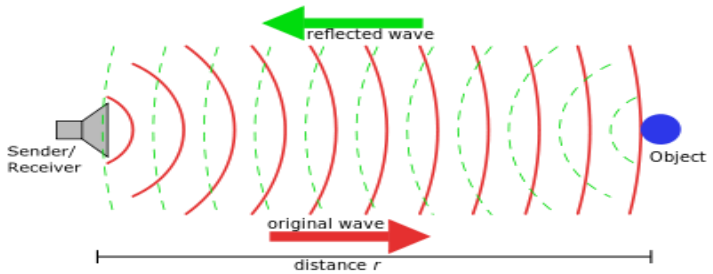
3	Define Acoustics, echolocation, sonar, and ultrasound, and explain how some animals (bats and dolphins) and humans apply them in their daily life activities	Textbook physical science, figs. 19, 20, 21, 22	269, 270, 271, 272

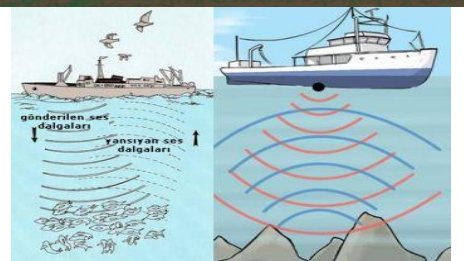
Acoustics	Echolocation	Ultrasound	Sonar
Is the study of sound- the people who study acoustics know the soft, porous materials such as curtains.	Is the process of location objects by emitting sounds and interpreting the sounds wave that are reflected from those objects.	Is sound with frequencies above the range of human hearing (above 20,000Hz)	<u>Stand for SOund Navigation And Ranging</u>. Is a system that uses the reflections of underwater sound waves to detect objects.
Used in concert hall to produce a good listening environment This help in avoid the echoing effect produced by many reflections of sound called reverberation	Dolphins and Bats used echolocation to find preys. (food)	Used in medicine to examine many parts of the body (heart-liver-gallbladder-pancreas-spleen-kidneys-breasts-eyes) Much safer than X-ray.	Used to avoid icebergs. Detecting, identifying and location submarines Find fish school. Map the ocean floor











3	Define Acoustics, echolocation, sonar, and ultrasound, and explain how some animals (bats and dolphins) and humans apply them in their daily life activities	Textbook physical science, figs. 19, 20, 21, 22	269, 270, 271, 272

Quiz

1. Which is the study of sound?

- ~~sonar~~
- B acoustics CORRECT
- ~~echolocation~~
- ~~radar~~

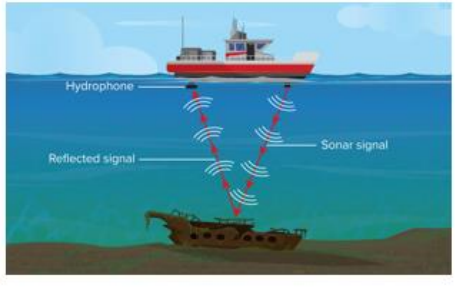
Quiz

2. Which process do bats use to find food?

- A echolocation CORRECT
- ~~acoustics~~
- ~~sonar~~
- ~~ultrasound~~

Quiz

3. Which process does this illustration represent?



- ~~echolocation~~
- C sonar CORRECT
- ~~acoustics~~
- ~~ultrasound~~

Quiz

4. Which process is used in medicine to examine parts of the body, including the heart, liver, gallbladder, pancreas, spleen, kidneys, breasts, eyes, and unborn babies?

- ~~echolocation~~
- ~~sonar~~
- B ultrasound CORRECT
- ~~radar~~

4	Explain how the human eye see and relate it to the light wave	Textbook physical science, Fig.1	328

Light and Vision

Have you ever tried to find an address on a house or an apartment at night on a poorly lit street? It is harder to do those activities in the dark than it is when there is plenty of light. Your eyes see by detecting light, so when you can see something, it is because light came from that object to your eyes. Light is emitted from a light source, such as the Sun or a lightbulb, and then reflects off an object, such as the page of a book, as shown in **Figure 1.**

Figure 1 Light from the lamp reflects off the book and into the student's eyes. People see objects when their eyes detect light emitted or reflected from objects.

When light travels from an object to your eye, you see the object. Light can reflect more than once. For example, light can reflect off an object, into a mirror, and then into your eyes. When no light is available to reflect off objects and into your eyes, you cannot see anything. This is why it is hard to see an address in the dark.

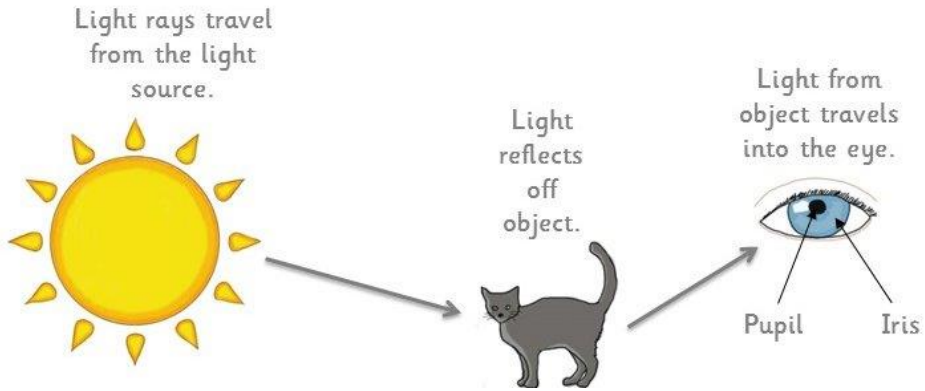
Light rays

Light sources send out light waves that travel in all directions. These waves spread out from the light source, just as ripples on the surface of water spread out from the point of impact of a pebble.

You could also think of the light coming from the source as traveling in narrow beams. Each narrow beam travels in a straight line and is called a light ray. Even though light rays can change direction when they are reflected or refracted, your brain interprets images as if light rays travel in a straight line.

Get It?
Identify two ways to imagine light coming from a source.

iris gets bigger to let in as much light as possible. If there is no light at all, we cannot see anything.



5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337

Ray tracing for concave mirrors

You can diagram how concave mirrors form images by tracing some of the light rays involved. Suppose that the distance between an object, such as the candle in **Figure 5**, and the mirror is greater than the focal length. Light rays bounce off the candle in all directions. One light ray, labeled Ray A, starts from a point on the flame of the candle and passes through the focal point on its way to the mirror. Ray A is then reflected parallel to the optical axis.

Another ray, Ray B, starts from the same point on the candle's flame, but it travels parallel to the optical axis as it moves toward the mirror. The mirror then reflects Ray B through the focal point. The place where Ray A and Ray B meet after they are reflected is a point on the reflected image of the flame.

More points on the reflected image can be located in this way. From each point on the candle, one ray can be drawn that passes through the focal point and is reflected parallel to the optical axis. Another ray can be drawn that travels parallel to the optical axis and then reflects through the focal point. The point where the two rays meet is on the reflected image.

Real images

The image that is diagrammed in **Figure 5** is not virtual. Rays of light pass through the location of the image. A **real image** is an image that is formed when light rays converge to form the image. You could hold a sheet of paper at the location of a real image and see the image projected on the paper.

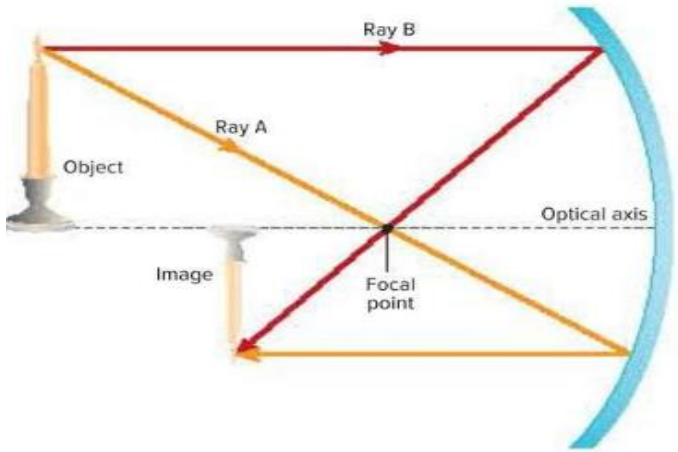


Figure 5 Ray A first passes through the focal point and then reflects parallel to the optical axis. Ray B is first parallel to the optical axis and then reflects through the focal point. An image of the candle forms where the two rays converge.

Diagram *how other points on the image of the candle are formed.*

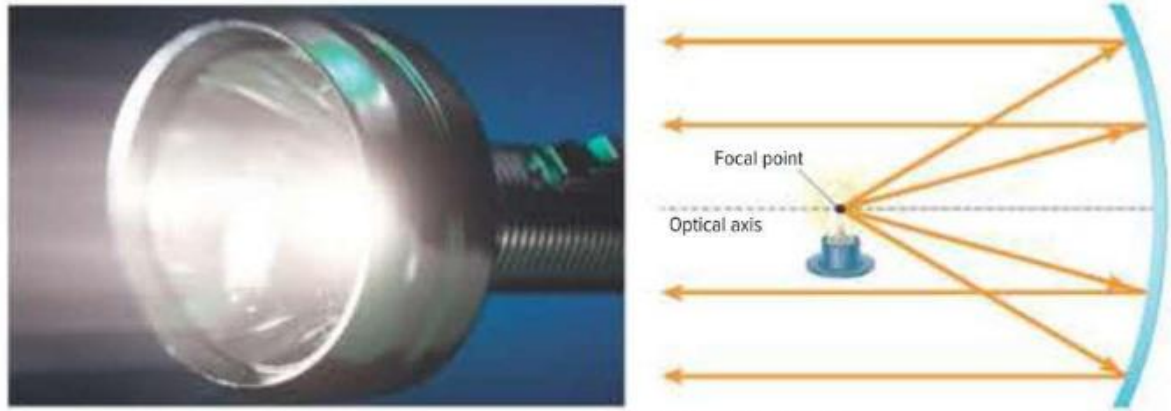


Figure 6 A light beam forms whenever someone places a light source at a concave mirror's focal point.

Explain *why the reflected rays of light in the diagram are parallel to each other.*

Spotlights

What happens when you place an object exactly at the focal point of a concave mirror? **Figure 6** shows that when the object is at the focal point, the mirror reflects all light rays parallel to the optical axis. The rays never meet, and no image forms. Even the virtual rays that extend behind the mirror do not meet. Therefore, a light placed at the focal point is reflected in a beam. Car headlights, flashlights, spotlights, and other devices use concave mirrors in this way to produce light beams with nearly parallel rays.

Virtual images

A concave mirror forms a virtual image when you place an object between the concave mirror and that mirror's focal point. **Figure 7** shows that the reflected rays diverge, and a magnified virtual image forms.

Just as it does with a plane mirror, your brain interprets the diverging rays as if they came from one point behind the mirror. You can find this point by imagining virtual rays that extend behind the mirror. The resulting image is magnified. Shaving mirrors and makeup mirrors are concave mirrors that are used for magnification. They form enlarged, upright images of a person's face so that it is easier to see small details.

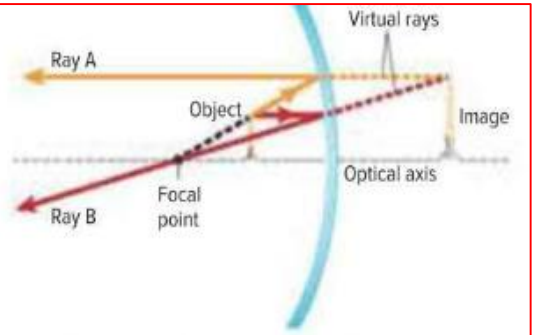


Figure 7 An enlarged and virtual image forms where the virtual rays converge when an object is placed between a concave mirror and that mirror's focal point.

Infer *why this image could not be projected on a screen.*

5	**Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point**	**Textbook physical, figs.(5, 6, 7, 8), table (1, 2)**	**331, 332, 333, 334, 337**

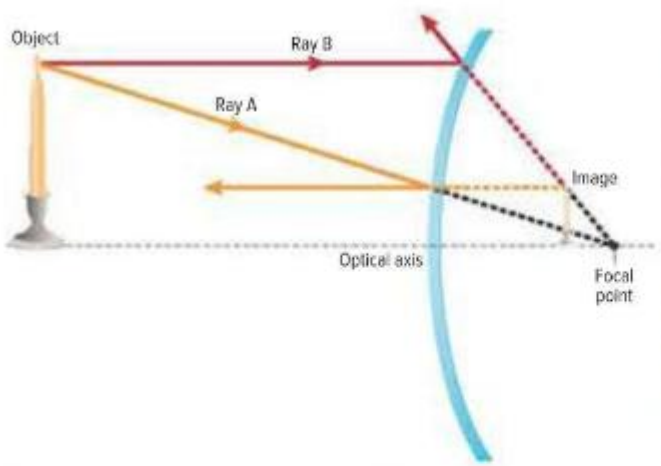


Figure 8 Convex mirrors always form reduced, upright, virtual images.

Convex Mirrors

Why do you think the security mirrors in banks and stores are shaped the way that they are? The next time that you are in a store, look at one of the back corners or at the end of an aisle to see if a large, rounded mirror is mounted there. You can see a large area of the store in the mirror. A **convex mirror** is a mirror that curves outward, like the back of a spoon.

Light rays that hit a convex mirror spread apart after they are reflected. Look at **Figure 8** to see how the rays from an object are reflected off a convex mirror to form an image. The reflected rays diverge and never meet, so the image formed by a convex mirror is a virtual image. The image is also always upright and is smaller than the actual object.

Uses of convex mirrors

Because convex mirrors cause light rays to diverge, they allow large areas to be viewed. As a result, a convex mirror is said to have a wide field of view. In addition to increasing the field of view in places like grocery stores and factories, convex mirrors can widen the view of traffic that can be seen in rear-view or side-view mirrors of automobiles.

However, because the image that a convex mirror forms is smaller than the object, your perception of distance can be distorted. Objects look farther away than they truly are in a convex mirror. Distances and sizes seen in a convex mirror are not realistic, so most convex side mirrors on cars carry a printed warning that states "Objects in mirror are closer than they appear."

Table 1 Images Formed by Mirrors

Mirror Shape	Distance of Object from Mirror	Virtual/Real	Image Created Upright/ Upside Down	Size
Plane	any distance	virtual	upright	same as object
Concave	object more than two focal lengths from mirror	real	upside down	smaller than object
	object between one and two focal lengths	real	upside down	larger than object
	object at focal point	none	none	none
	object within focal length	virtual	upright	larger than object
Convex	any distance	virtual	upright	smaller than object

Mirror images

The different shapes of plane, concave, and convex mirrors cause them to reflect light in distinct ways. For example, concave mirrors are the only mirrors that magnify images. Convex mirrors always make objects appear to be smaller and farther away than they actually are. Each type of mirror has different uses. Most wall mirrors are plane mirrors. Most makeup and shaving mirrors are concave mirrors. Most store security mirrors are convex mirrors. **Table 1** summarizes the characteristics of plane mirrors, concave mirrors, and convex mirrors.

5	**Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point**	**Textbook physical, figs.(5, 6, 7, 8), table (1, 2)**	**331, 332, 333, 334, 337**

<table>
<tr>
<td>A concave mirror is a mirror whose surface curves inward.

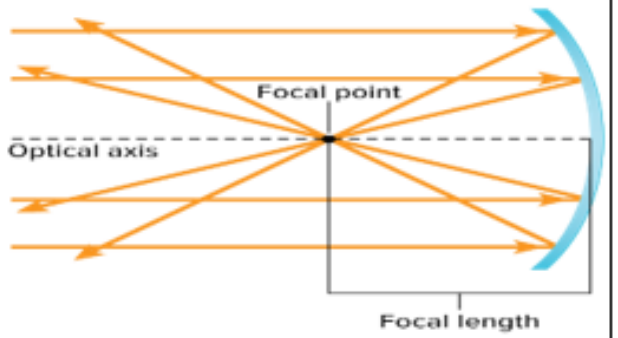
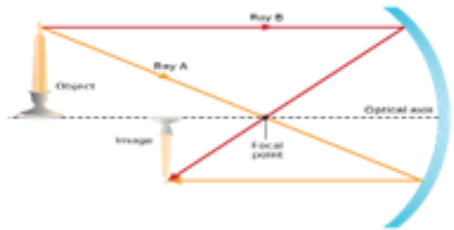
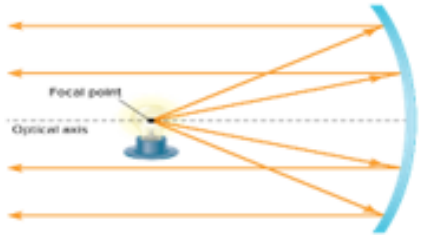
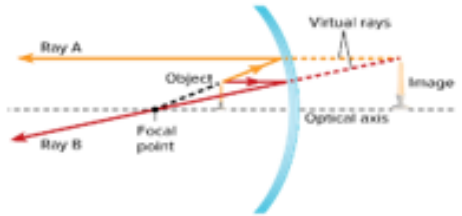
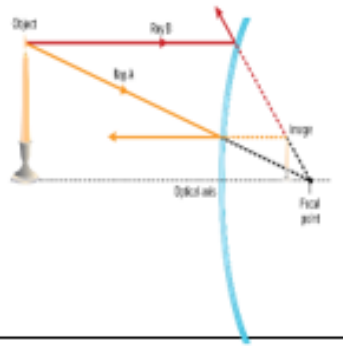
Concave mirrors are made so that every light ray traveling parallel to the optical axis is reflected through a single point, called the focal point.</td>
<td colspan="2"> 
</td>
<td>• The optical axis is an imaginary straight line drawn perpendicular to the surface of the mirror at the mirror’s center.
• The focal length is the distance from the center of the mirror to the focal point.
• A real image is an image that is formed when light rays converge to form an image.</td>
</tr>
<tr>
<td>An object that is farther from a concave mirror than the focal length</td>
<td>An object placed exactly at the focal point of a concave mirror</td>
<td>an object is between the mirror and the focal point.</td>
</tr>
<tr>
<td> 
Image:
1.real/smaller
2. upside down</td>
<td> 
Not produce an image</td>
<td> 

Image:
1. virtual/larger
2. upright</td>
</tr>
<tr>
<td>A convex mirror is a mirror that curves outward, like the back of a spoon.</td>
<td>Convex mirrors always produce:
1. smaller
2. upright
3.virtual
  </td>
<td>• Convex mirrors produce a wide-angle view.
• Car side mirrors and store security mirrors are examples of convex mirrors.</td>
</tr>
</table>

5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337

Quiz

2-What type of mirror causes rays parallel to the optical axis to be reflected to the focal point?

- a plane mirror
- B a concave mirror CORRECT
- a convex mirror
- a divergent mirror

Quiz

3-What type of mirror can be used for magnification?

- A a concave mirror CORRECT
- a convex mirror
- a plane mirror
- a divergent mirror

Quiz

4-What refers to the distance from the center of a mirror to the focal point?

- A focal length CORRECT
- optical axis
- radius of curvature
- index of concavity

Quiz

5-In which of these locations would you be most likely to find a convex mirror?

- in a bathroom
- in a flashlight
- C on the side of a car CORRECT
- in a makeup kit

5	**Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point**	**Textbook physical, figs.(5, 6, 7, 8), table (1, 2)**	**331, 332, 333, 334, 337**

3. Image behind the mirror is

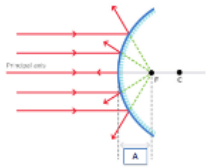
A upright
B real
C virtual
D upside down

4. image above the principal axis (PA) is

A virtual
B upside down
C real
D upright

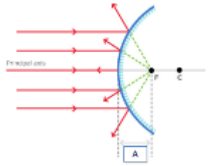
5. if the object is beyond C (2F)

A image is real, bigger and upright
B image is virtual, smaller and upside down
C image is real, smaller and upright
D image is real, smaller and upside down

8. 

In the image, all the rays meet at F, What is F

A focal length
B center of curvature
C focal point
D reflection

9. 

This image is showing a convex mirror because the image is (choose 2 answers)

A image is virtual
B rays meeting behind the mirror
C image is real
D rays meeting behind the mirror

10. this type of mirror is used in supermarkets to see around bends

A plane
B convex
C window
D concave

5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337

2) Which type of mirror can form real images?

- **A)** conical
- **B)** spherical
- **C)** convex
- **D)** plane
- **E)** concave

3) Describe the image formed when an object is more than twice the focal length away from a concave mirror.

- **A)** inverted and enlarged
- **B)** upright and enlarged
- **C)** upright and reduced
- **D)** inverted and reduced

5	**Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point**	**Textbook physical, figs.(5, 6, 7, 8), table (1, 2)**	**331, 332, 333, 334, 337**

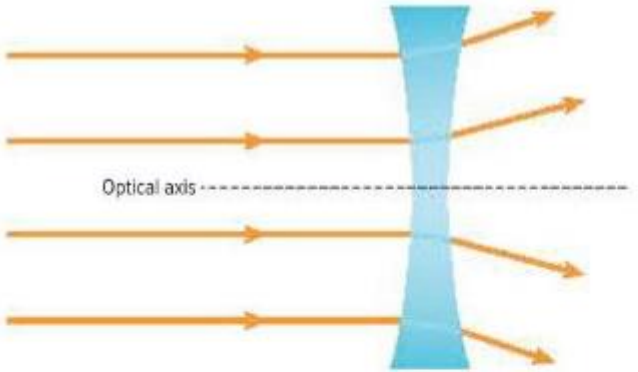


Figure 11 A concave lens causes light rays to diverge.

Classify *Does a concave lens behave more like a concave mirror or a convex mirror?*

Concave Lenses

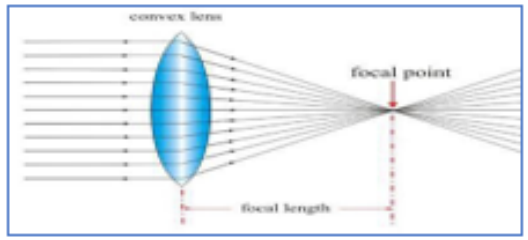
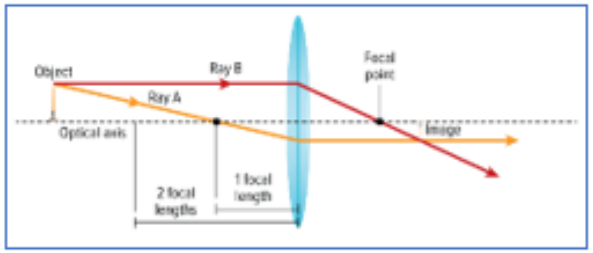
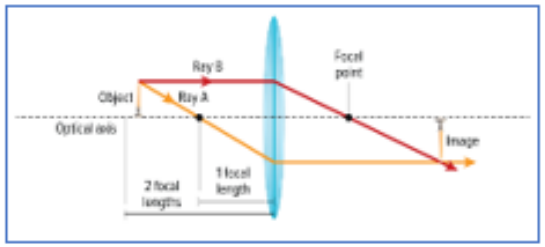
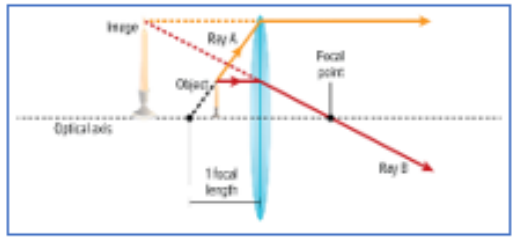
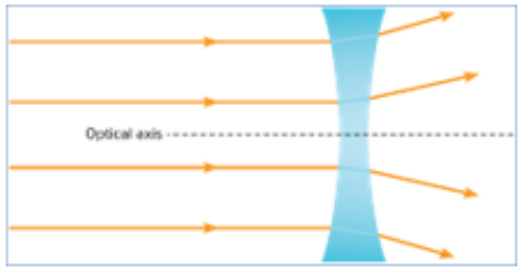
A **concave lens** is a lens that is thinner in the middle and thicker at the edges. As shown in **Figure 11,** light rays that pass through a concave lens bend outward, away from the optical axis. The rays spread out and never meet at a focal point, so they never form a real image. However, a concave lens can form virtual images. These virtual images are always upright and smaller than the actual object. Notice that concave lenses and convex mirrors both produce the same types of images.

Concave lenses are used in some types of eyeglasses and in some microscopes. Concave lenses are usually placed in combination with other lenses. A summary of the images formed by concave and convex lenses is shown in **Table 2.**

Table 2 Images Formed by Lenses

Lens Shape	Location of Object	Virtual/Real	Image Created Upright/Upside Down	Size
Convex 	object beyond 2 focal lengths from lens	real	upside down	smaller than object
	object between 1 and 2 focal lengths	real	upside down	larger than object
	object within 1 focal length	virtual	upright	larger than object
Concave 	object at any position	virtual	upright	smaller than object

5	**Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point**	**Textbook physical, figs.(5, 6, 7, 8), table (1, 2)**	**331, 332, 333, 334, 337**

A convex lens is a lens that is thicker in the middle than at the edges. • The image that a convex lens forms depends on the relative positions of the lens and object.		• Light rays traveling parallel to the optical axis are refracted so they pass through a single point, which is the focal point.
object is more than 2 focal lengths from a lens	**object is between 1 and 2 focal lengths from a lens,**	**object is less than 1 focal length from a lens**
a real, reduced, and upside-down image forms 	• a real, enlarged, and upside-down image forms. 	virtual, enlarged, and upright image forms. 
A concave lens is a lens that is thinner in the middle and thicker at the edges.		• Light rays that pass through a concave lens spread out and never meet, so they never form a real image. • A concave lens can form reduced, upright, virtual images. • Concave lenses and convex mirrors produce the same kind of images.

5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337

Quiz

1-What do lenses do?

- reflect light
- B refract light **CORRECT**
- diffract light
- interfere with light

Quiz

2-What kind of image does a convex lens produce when the object is more than 2 focal lengths from the lens?

- real, upright
- B real, upside down **CORRECT**
- virtual, upright
- virtual, upside down

Quiz

3-What describes the images produced by a concave lens?

- always magnified
- always upside down
- always real
- D always virtual **CORRECT**

5	Compare between mirrors and lenses, and differentiate between types of mirrors and lenses according to their shape, reaction with light, and possessing a focal point	Textbook physical, figs.(5, 6, 7, 8), table (1, 2)	331, 332, 333, 334, 337

1) Match the mirror and lens types with their descriptions.

Plane Mirror	⟷	flat and smooth
Concave Mirror	⟷	curved inward
Convex Mirror	⟷	curved outward
Concave Lens	⟷	thinner in the middle than at the edges
Convex Lens	⟷	thicker in the middle than at the edges

7) Light is refracted and spread out by

- ○ **A)** convex mirrors.
- ○ **B)** concave mirrors.
- ● **C)** concave lenses.
- ○ **D)** convex lenses.

11) Which way does the lens shown bend incoming light that is parallel to the optical axis?

- ● **A)** away from its optical axis
- ○ **B)** toward its optical axis
- ○ **C)** away from its edges
- ○ **D)** toward its focal point

8) Describe the image formed by a concave lens.

- ☐ **A)** real
- ● **B)** virtual
- ● **C)** upright
- ☐ **D)** inverted
- ● **E)** reduced
- ☐ **F)** enlarged

12) Match the statements with the corresponding vision problem.

Correct Answer

Farsightedness	⟷	Nearby objects appear blurry. , Light rays reach the retina before they converge. , Convex lenses correct this vision problem.
Nearsightedness	⟷	Faraway objects appear blurry. , Light rays converge before reaching the retina. , Concave lenses correct this vision problem.

6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

Energy in an Ecosystem

One way to study the interactions of organisms within an ecosystem is to follow the energy that flows through it. Organisms differ in how they obtain energy and are classified as autotrophs or heterotrophs based on how they obtain it.

Autotrophs

All of the green plants and other organisms that produce their own food in an ecosystem are primary producers called autotrophs. An **autotroph** (AW tuh trohf) is an organism that collects energy from sunlight or inorganic substances to produce food.

Organisms that contain chlorophyll absorb light energy during photosynthesis and use it to convert the inorganic substances carbon dioxide and water to organic molecules. In places where sunlight is unavailable, some bacteria use hydrogen sulfide and carbon dioxide to make organic molecules to use as food. Autotrophs, including plants and algae, are the foundation of all ecosystems because they make energy available for all other organisms in an ecosystem.

Heterotrophs

A **heterotroph** (HE tuh roh trohf) is an organism that gets its energy requirements by consuming other organisms. Therefore, heterotrophs also are called *consumers*. A heterotroph that eats only plants, such as a cow, rabbit, or grasshopper, is an **herbivore** (HUR buh vor). Heterotrophs that prey on other heterotrophs, such as wolves, lions, and lynxes, shown in **Figure 12**, are called **carnivores** (KAR nuh vorz).

Figure 12 This wolf is a heterotroph that is about to consume another heterotroph, a moose.

Identify *an additional classification for each of these animals.*

Figure 13 This fungus is obtaining food energy from the dead log. Fungi are decomposers that recycle materials found in dead organisms.

Explain *why decomposers are important in an ecosystem.*

Organisms that eat both plants and animals are called **omnivores** (AHM nih vorz). Bears, humans, and mockingbirds are examples of omnivores.

The **detritivores** (duh TRYD uh vorz) eat fragments of dead matter in an ecosystem, returning nutrients to the soil, air, and water. Detritivores include worms and many aquatic insects that live on stream bottoms. Decomposers, similar to detritivores, break down dead organisms by releasing digestive enzymes. Fungi, such as those in **Figure 13**, and bacteria are decomposers.

All heterotrophs perform some decomposition when consuming another organism. The primary role of decomposers is to break down organic compounds and make nutrients available to producers. Without the presence and activities of detritivores and decomposers, organic material and the nutrients would not be available to other organisms to reuse.

6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

1- **Identify** how **energy flows** through an ecosystem in a typical food chain.

A. from an autotroph to a heterotroph

B. from a heterotroph to an autotroph

C. from a carnivore to an herbivore

D. from an omnivore to an herbivore

2- What type of **organism is the foundation** of all ecosystems?

A. autotroph

B. herbivore

C. heterotroph

D. decomposer

3- How do **detritivores** obtain their energy in an ecosystem?

A. They feed on fragments of dead plants and animals.

B. They feed on organisms by releasing digestive enzymes.

C. They get energy from inorganic substances to make food

D. They use chlorophyll to capture energy from the sun

4- Which type of organism exists at all trophic levels **except the first trophic level**?

A. carnivores

B. herbivores

C. autotrophs

D. Heterotrophs

6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

5- What type of **organism returns nutrients** to an ecosystem?

A. decomposer
B. primary producer
C. secondary producer
D. top level consumer

16- Why is this mouse classified as an **omnivore**?

A. It consumes grasshoppers.
B. It is consumed by snakes.
C. It consumes both grasshoppers and snakes.
D. It is a third-level consumer

18- A (an) ____ **collects energy** from sunlight or inorganic substances to **produce food**.

A) heterotroph
B) herbivore
C) detritivore
D) autotroph

20- How can **detritivores** be <u>beneficial to the environment</u>?

A) provide food for autotrophs
B) rid waste and dead matter
C) allow predation to occur
D) facilitate photosynthesis in plants

6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

44-An organism that uses energy to produce its own food supply from inorganic compounds is called a(an)

Select one:

A) Consumer.

B) Detritivore.

C) Autotroph.

D) Heterotroph.

46-When an organism dies, the nutrients in its body

Select one:

A) can never be reused by other living things.

B) Nothing happen

C) Are released by the action of decomposers.

D) Are immediately released into the atmosphere.

54-A bird stalks, kills, and then eats an insect. Based on its behavior, which ecological terms describe the bird?

A) Carnivore, consumer

B) Autotroph, herbivore

C) Herbivore, decomposer

D) Producer, heterotroph

56-What is an organism that **feeds only on plants** called?

A) detritivore

B) Herbivore

C) Omnivore

D) Carnivore

6	Classify organisms according to their way they obtain energy (feed): Autotroph and Heterotroph (Herbivore, Carnivores, Omnivores, Detritivores)	Textbook biology, Fig. 12, 13	15, 16

59-Organisms that obtain nutrients by **breaking down** dead and decaying plants and animals are called

Select one:

A) Decomposers.

B) Autotrophs.

C) Producers.

D) Omnivores.

60-The **algae** at the beginning of the food chain are

A) Decomposers.

B) Producers.

C) Consumers.

D Heterotrophs.

70-In a food web, which type of organism receives energy from every other type?

A) carnivore

B) Herbivore

C) Producer

D) Decomposer

76-Fungi are

A) Decomposers.

B) Autotrophs.

C) Scavengers.

D) Omnivores.

PART 2 (MCQ)

الجزء الثاني Part 2	7	Describe the effects of temperature, density, and elasticity on sound waves	Textbook physical, Fig.3	253, 254
	8	Define the Doppler effect and describe how the Doppler Effect occurs in the natural world and its applications	Textbook physical, Fig.10, 11	261, 262
	9	Describe the image formed from plane mirrors, and how that image is formed	Textbook physical, fig. 2, 3	329, 330
	10	List the vision problems that may occur in the human eye and how they are corrected	Textbook physical, figs. (14, 15)	340, 341
	11	Define the terms Ecology, biosphere, and ecosystem	Textbook biology, fig. 3 , 4	7
	12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms ⟶ populations ⟶ communities ⟶ whole ecosystems	Textbook biology, fig.7	10, 11
	13	Study the symbiotic relationships between organisms	Textbook biology, fig. 10, 11	12, 13, 14
	14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18
	15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43
	16	List the measures used towared sustainable use of natural resources and in protecting biodiversity	Textbook biology, fig. 17, 18,19, 20	47, 48, 49, 50

7	Describe the effects of temperature, density, and elasticity on sound waves	Textbook physical, Fig.3	253, 254

Figure 2 A vacuum is a region where no matter is present. Outer space is not a perfect vacuum, but there is too little matter for sound waves to travel through outer space. Therefore, these astronauts must use radios to communicate with each other.
Explain *why the astronauts need radios in order to talk to each other.*

Sound in liquids and solids

If you have been underwater and heard garbled voices, you know that sound travels through water. If you have put your ear to your desk and heard sounds, you know that sound travels through solids. Sound waves travel through any type of matter—solid, liquid, or gas. The matter through which a wave travels is called the medium. A sound wave produces compressions and rarefactions in a medium as it travels through that medium.

What happens when there is no matter through which sound can travel? Could sound be transmitted without matter to compress, expand, and collide? In order for astronauts, such as the ones in **Figure 2,** to talk to each other, they must use electronic communication equipment because there is no atmosphere to transmit sound waves. Sound waves cannot travel through the vacuum of outer space.

The speed of sound

The speed of a sound wave through a medium depends on that medium's composition and whether that medium is solid, liquid, or gas. **Table 1** shows the speed of sound through some common mediums. The temperature, density, and elasticity of the medium also affect the speed of sound.

Table 1 Speed of Sound in Different Mediums

Medium	Speed of Sound (m/s)
Air (0°C)	330
Air (20°C)	340
Cork	500
Water (0°C)	1400
Water (20°C)	1500
Copper	3600
Bone	4000
Steel	5800

Temperature and sound speed The speed of sound through a fluid depends on the temperature of that fluid. This relationship is particularly pronounced for gases but also exists for liquids, such as water. As the temperature of a fluid increases, the particles that make up that fluid move faster. This makes them more likely to collide with each other. If the particles that make up a medium collide more often, more energy can be transferred in a shorter amount of time. As a result, the sound waves travel faster.

When houses are close together, you can walk quickly from house to house. When particles are close together, such as in a solid or a liquid, energy can be transferred quickly from particle to particle.

When houses are far apart, it takes longer to walk from house to house. When particles are far apart, such as in a gas, it takes longer to transfer energy from particle to particle.

Figure 3 Walking between houses is a model for particles transferring the energy of a sound wave.
Explain *why sound would travel more slowly in cork than in water.*

Density and sound speed Sound usually travels fastest in solids and slowest in gases. One reason for this is that the individual particles that make up liquids and solids are usually closer together than the particles that make up gases. **Figure 3** helps to illustrate why sound travels quickly in solids and liquids. Imagine that you are going door to door to raise money for a charity. In a city, it doesn't take very long to walk from house to house. In a rural area, it takes longer to walk from house to house. Similarly, when the particles that make up a medium are farther apart, sound travels more slowly through that medium.

Elasticity and sound speed Elasticity is the tendency of an object to rebound to its original state when it is deformed. A rubber ball is elastic. It tends to spring back to its original shape after someone squeezes it. A ball of clay is much less elastic.

Elastic objects also rebound more quickly when sound waves travel through them. Therefore, sound waves travel more quickly through elastic objects. Usually, solids are more elastic than liquids, and liquids are more elastic than gases. This is another reason why sound waves typically travel fastest through solids, slower through liquids, and slowest through gases.

7	Describe the effects of temperature, density, and elasticity on sound waves	Textbook physical, Fig.3	253, 254

11. In which medium would sound travel the fastest if all of the mediums are at the same temperature?

A water
B steel
C cork
D air

List the order of mediums through which sound travels from fastest to slowest.

answer choices

- Liquid, Gas, Solid
- Gas, Solid, Liquid
- Solid, Liquid, Gas
- Solid, Gas, Liquid

. The speed of sound, like all waves, depends on the _____ through which it travels.

answer choices

- **medium**
- large
- orange juice
- source

Which of the following is a CORRECT statement?

answer choices

- Sound can travel through the vacuum of space
- Sound can't travel through the vacuum of space
- Sound is produced in the vacuum of space
- Sound can travel between planets

The speed of sound

Temperature and sound speed	Density and sound speed	Elasticity and sound speed
As the temperature of fluid increases the particles move faster, collide more, more energy can be transferred in short time. Sound moves faster.	Solid and liquid Particles are closer together than gas. Sound travels fastest in solids and slowest in gases.	Elasticity is the tendency of an object to rebound to its original state when it deformed. Also rebound more quickly when sound wave travel through them Sound travel more quickly in elastic object.
Gas and liquid	Solid and liquid	Solid more elastic

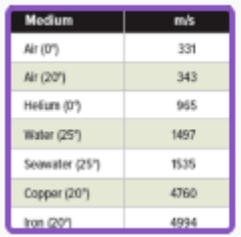
In which medium would sound travel the fastest, water at 10°C or water at 25°C? Why?

7	**Describe the effects of temperature, density, and elasticity on sound waves**	**Textbook physical, Fig.3**	**253, 254**

The speed of sound in air depends on the _____ of the air.

answer choices

- Mood
- Temperature
- CO2



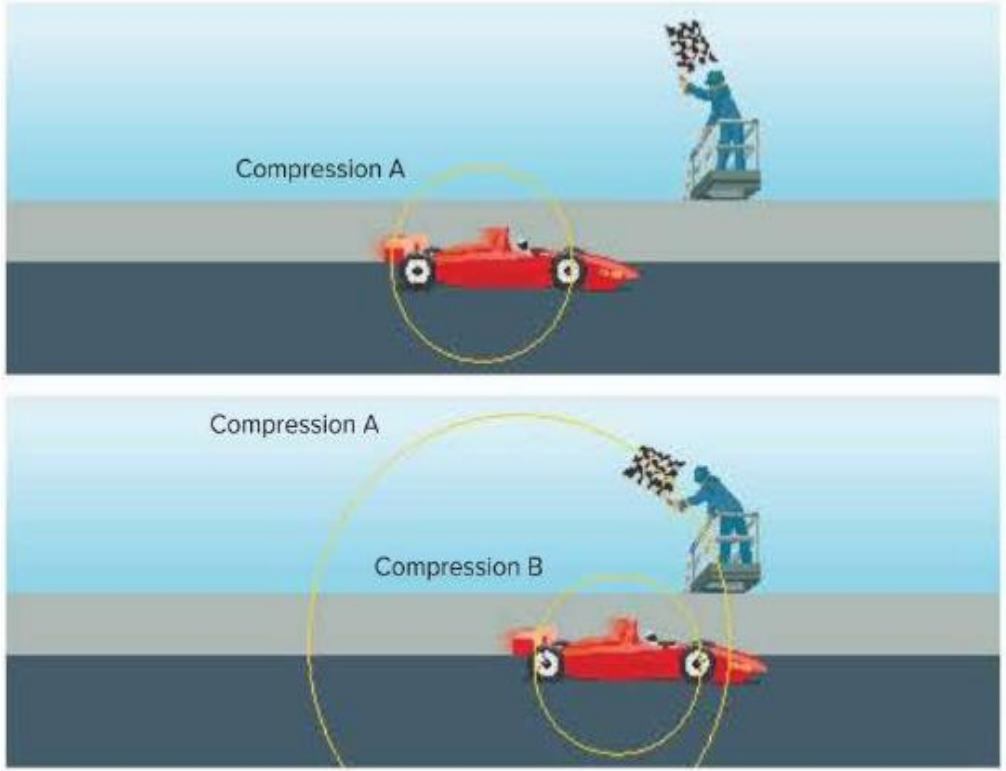
Medium	m/s
Air (0°)	331
Air (20°)	343
Helium (0°)	965
Water (25°)	1497
Seawater (25°)	1535
Copper (20°)	4760
Iron (20°)	4994

What is the speed of sound in air at 0 ºC?

answer choices

- 441 m/s
- 343 m/s
- 331 m/s

8	Define the Doppler effect and describe how the Doppler Effect occurs in the natural world and its applications	Textbook physical, Fig.10, 11	261, 262



The race car sends out a sound wave as it moves, producing compression A. Compression A continues to move outward, and the car continues to move forward.

The car is closer to the flagger when it creates compression B. Compressions A and B are closer together in front of the car, so the flagger hears a higher-pitched sound.

Figure 10 The Doppler effect occurs when the source of a sound wave is moving relative to a listener.
Explain *why the flagger will hear a lower-pitched sound once the car passes him.*

The Doppler Effect

Imagine that you are standing at the side of a racetrack with race cars zooming past. When the cars are moving toward you, the pitches of their engines are higher. When the cars are moving away from you, the pitches are lower. The **Doppler effect** is the change in wave frequency due to a wave source moving relative to an observer or an observer moving relative to a wave source. **Figure 10** shows how the Doppler effect occurs.

Moving sound sources

As a race car moves, it sends out sound waves in the form of compressions and rarefactions. In the top panel of **Figure 10,** the race car produces a compression labeled A as that race car speeds toward the flagger. Compression A travels through the air toward the flagger.

By the time compression B leaves the race car in the bottom panel of **Figure 10,** the car has moved forward. Because the car has moved since the time it created compression A, compressions A and B are closer together in front of the car. Because the compressions are closer together, the frequency is higher and the flagger hears a higher pitch. The compressions behind the moving car are farther apart, resulting in the flagger observing a lower pitch after the car passes.

Moving observers

You can also observe the Doppler effect when you are moving past a sound source that is standing still. Suppose you were riding in a school bus and you passed a building with a ringing bell. The pitch would sound higher as you approached the building and lower as you rode away from it.

The Doppler effect happens any time a sound source is moving relative to an observer. It occurs whether the sound source or the observer is moving. The faster the change in position, the greater the change in frequency and pitch.

Electromagnetic waves and the Doppler effect

The Doppler effect also occurs for other waves besides sound waves. For example, the frequency of electromagnetic waves changes if an observer and wave source are moving relative to each other. Astronomers use the Doppler effect to help measure the motions of stars and other objects.

In addition, police radar guns, such as the one shown in **Figure 11,** use the Doppler effect to measure the speeds of cars. The radar gun sends radar waves toward a moving car. The waves are reflected from the car and their frequency is shifted, depending on the speed and direction of the car. From the Doppler shift of the reflected waves, the radar gun determines the car's speed.

Figure 11 Police use radar guns to measure the speeds of motorists on highways. Radar guns function based on the Doppler effect.

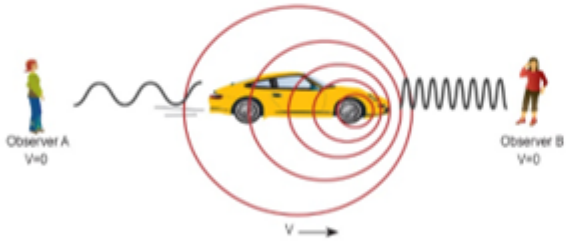
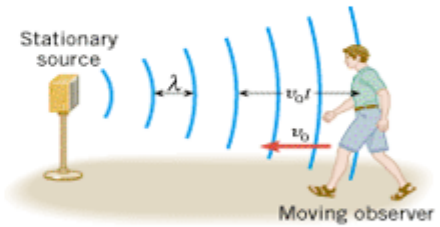
8	**Define the Doppler effect and describe how the Doppler Effect occurs in the natural world and its applications**	**Textbook physical, Fig.10, 11**	**261, 262**

19) If you are watching a moving train, what would happen to the pitch of the whistle at a crossing as the locomotive approaches and then passes by the crossing?

- ○ **A)** The pitch would decrease and then increase again.
- ● **B)** The pitch would decrease suddenly as the train passed.
- ○ **C)** The pitch would increase suddenly as the train passed.
- ○ **D)** The pitch would remain the same.

C. The Doppler Effect

Doppler effect: is the change in wave frequency due to a wave source moving relative to an observer or an observer moving relative to a wave source.

Moving sound sources	Moving observers
	
Compressions are closer together in front of the car, the frequency is higher and observer B hears a higher pitch than observer.	The pitch would sound higher as observer move toward the source and lower as he move away from it.

Organize information about the Doppler effect in the following table.

Motion of source relative to observer	**Toward**	**Away from**
Compressions are...	closer together	farther apart
Frequency is...	higher	lower
Pitch is...	higher	lower

8	**Define the Doppler effect and describe how the Doppler Effect occurs in the natural world and its applications**	**Textbook physical, Fig.10, 11**	**261, 262**

What is the Doppler Effect?

answer choices

- A change in frequency due to the relative motion of a wave source and an observer
- When a wave overlaps with another wave
- When a wave bounces off of another object
- When a wave bends due to traveling through a different medium

You are standing on the side of the road when a police car races past you with its siren on. After the police car passes you, what happens to the pitch of the siren?

answer choices

- It increases
- It decreases
- It turns red

When the car moves AWAY from you, its horn seems...

answer choices

- Low pitched
- High pitched
- Normal

Look at the picture. Who is experiencing a higher pitched sound?

answer choices

- Observer A
- Observer B
- There's no difference

When an ambulance move TOWARD you it sounds _____ pitched.

answer choices

- high
- low
- medium

9	Describe the image formed from plane mirrors, and how that image is formed	Textbook physical, fig. 2, 3	329, 330

Plane Mirrors

Greek mythology tells the story of a handsome young man named Narcissus who noticed his image in a pond and fell in love with himself. Like pools of water, mirrors are smooth surfaces that reflect light to form images. Just as Narcissus did, you can see yourself as you glance into a quiet pool of water or walk past a shop window. Most of the time, however, you probably look for your image in a flat, smooth mirror. A flat, smooth mirror is a **plane mirror.**

Get It?
Define What is a plane mirror?

Reflections from plane mirrors

What do you see when you look into a plane mirror? Your reflection is upright. If you were one meter in front of the mirror, your image would appear to be one meter behind the mirror, or two meters from you. You might notice that the reflection of any writing in a plane mirror appears backward.

Figure 2 shows how you see yourself in a plane mirror. First, light rays from a light source strike you. Every point that is struck by the light rays reflects these rays so they travel outward in all directions. If your friend were looking at you, these reflected light rays coming from you would enter her eyes so she could see you. However, if a mirror is placed between you and your friend, the light rays are reflected from the mirror into your eyes.

Get It?
Describe the steps that allow you to see your face in a plane mirror.

Figure 2 Light reflects off of the girl's forehead and then off of the mirror before entering the girl's eyes.

Virtual images

You can understand your brain's interpretation of your reflection in a mirror by looking at **Figure 3.** The light waves that are reflected off you travel in all directions. Light rays reflected from your chin strike the mirror at different places. Then, they reflect off the mirror in different directions. A few of these light rays reflect off the mirror in just the right way to enter your eyes.

Recall that your brain always interprets light rays as if they have traveled in a straight line. It does not realize that the light rays have been reflected and that they changed direction. Your reflected image appears to be behind the mirror.

Get It?
Explain Why does your reflected image in a plane mirror appear to be behind the mirror?

An image that your brain perceives even though no light rays pass through the location of that image is a **virtual image.** The imaginary light rays that appear to come from virtual images are called virtual rays. The dashed line in **Figure 3** is a virtual ray. Plane mirrors always form upright, virtual images.

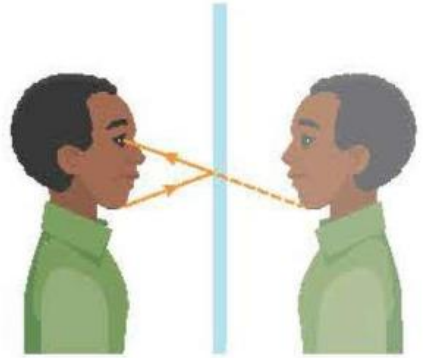


Figure 3 The light rays that reflect off of a plane mirror appear to originate behind that mirror. This gives the illusion that objects exist behind the plane mirror.

Concave Mirrors

Not all mirrors are flat like plane mirrors. A **concave mirror** is a mirror whose surface curves inward. Concave mirrors, like plane mirrors, reflect light waves to form images. However, a concave mirror's curved surface produces different images from a plane mirror's flat surface.

Features of concave mirrors

A concave mirror has an optical axis. The **optical axis** is an imaginary straight line drawn perpendicular to the surface of the mirror at the mirror's center. Concave mirrors are made so that every light ray traveling toward the mirror parallel to the optical axis is reflected through a point on the optical axis called the focal point.

The **focal point** for a concave mirror is the point on the optical axis on which light rays that are initially parallel to the optical axis converge after they reflect off the mirror. The distance from the center of the mirror to the focal point is the **focal length.** Using the focal point and the optical axis, you can diagram how some of the light rays that travel to a concave mirror are reflected, as shown in **Figure 4.**

Get It?
Describe the relationship between the focal point and the focal length for a concave mirror.

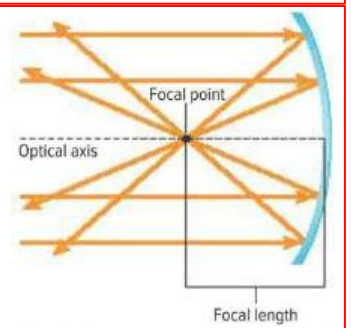


Figure 4 A concave mirror has an optical axis and a focal point. When light rays travel toward the mirror parallel to the optical axis, they reflect through the focal point. Light rays that travel through the focal point before hitting the mirror are reflected parallel to the optical axis.

9	Describe the image formed from plane mirrors, and how that image is formed	Textbook physical, fig. 2, 3	329, 330

5. Which of the following best describes the image formed by a plane mirror?

A real, upright and the same size as object

B virtual, upright and the same size as object

C real, inverted and reduced

D virtual, inverted and enlarged

6. The image of an object as formed by a plane mirror is located ____.

A any of the above, depending on the object's locaiton

B behind the mirror surface

C on the mirror surface

D in front of the mirror surface

7. A real image is always

A upright

B virtual

C behind the mirror

D in front of the mirror

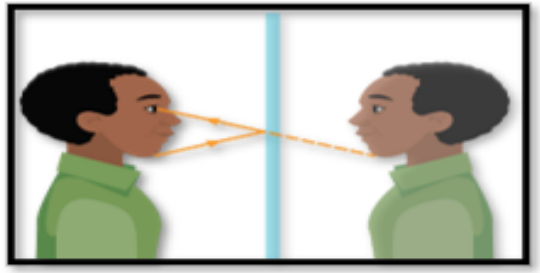
1. 

Type of mirror found in a bathroom...

A Plane

B Concave

C Convex

Plane Mirrors A flat, smooth mirror	 Plane mirrors always form: 1. virtual/ same size 2. upright/ behind the mirror	Light from objects (or from you) strikes the mirror and is reflected in all directions. Some of the light rays enter your eyes. Your brain interprets the light rays as if they have traveled in a straight line. • **A virtual image is an image your brain perceives even though no light rays pass through the location of the image.**

10	List the vision problems that may occur in the human eye and how they are corrected	Textbook physical, figs. (14, 15)	340, 341

Farsighted

In a farsighted eye, light rays from nearby objects do not converge enough to form a sharp image on the retina.

A convex lens causes light rays to converge slightly before entering the eye. As a result, sharp images can be formed on the retina.

Figure 14 A farsighted person can see faraway objects clearly, but he or she has trouble focusing on nearby objects. For example, a farsighted person could watch a football game from the stands without glasses. However, a farsighted person would have more difficulty reading without proper glasses. Farsightedness can be corrected by convex lenses.

Vision problems

People with good vision can clearly see objects that are about 25 cm or farther away from their eyes. However, people with the most common vision problems see objects clearly only at some distances, or they see all objects as being blurry.

Astigmatism One vision problem, called astigmatism, occurs when the surface of the cornea is unevenly curved. When people have astigmatism, their corneas are more oval than round in shape. Astigmatism causes blurry vision at all distances. Corrective lenses must also have an uneven curvature, canceling out the effect of an uneven cornea.

Farsightedness Another vision problem is farsightedness. A farsighted person can see distant objects clearly but cannot bring nearby objects into focus. Light rays from nearby objects do not converge enough after passing through the cornea and the lens to form a sharp image on the retina, as shown in **Figure 14.** The problem can be corrected with a convex lens that bends light rays so they are less spread out before they enter the eye, also shown in **Figure 14.**

Farsightedness is often related to age. As many people age, the lenses in their eyes become less flexible. The muscles around the lenses still contract as they try to change the shape of the lens. However, the lenses have become more rigid and cannot be made curved enough to focus on close objects. People who are more than 40 years old might not be able to focus on objects closer than 1 m from their eyes.

Nearsighted

In a nearsighted eye, light rays from distant objects converge too much and form a sharp image in front of the retina.

A concave lens makes the light rays spread out before entering the eye, enabling a sharp image to be formed on the retina.

Figure 15 People use concave lenses to correct nearsightedness.

Nearsightedness A person who is nearsighted can see objects clearly only when those objects are nearby. Objects that are far away appear blurred. In a nearsighted eye, the cornea and the lens form a sharp image of a distant object before the light reaches the retina, as shown in **Figure 15.**

To correct this problem, a nearsighted person can wear concave lenses. **Figure 15** shows how a concave lens causes incoming light rays to diverge before they enter the eye. Then the light rays from distant objects can be focused by the eye to form a sharp image on the retina and not in front of it.

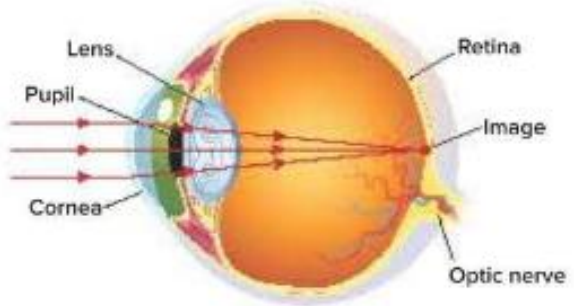


Figure 12 The cornea is a convex lens that causes light rays from distant objects to converge on the retina. The eye lens helps bring closer objects into focus.

10	List the vision problems that may occur in the human eye and how they are corrected	Textbook physical, figs. (14, 15)	340, 341

Quiz

4-Where does light enter the eye?

- A the cornea CORRECT
- ✗ the lens
- ✗ the retina
- ✗ the optic nerve

Quiz

5-Which of these is NOT associated with farsightedness?

- ✗ difficulty focusing on nearby objects
- B sharp image forms in front of the retina CORRECT
- ✗ can be corrected by convex lenses
- ✗ occurs more in older people

50. Short sightedness (myopia) is when?

A light focuses on the retina
B light focuses behind the retina
C light focuses in front of the retina.

51. long sightedness (hyperopia) is when?

A light focuses in front of the retina.
B light focuses behind the retina
C light focuses on the retina

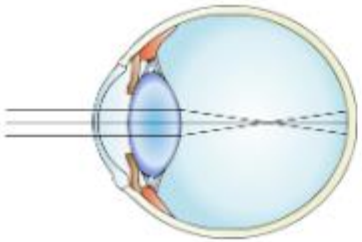
52. long sightedness (hyperopia) is treated by using lens which are?

A Concave
B Convex

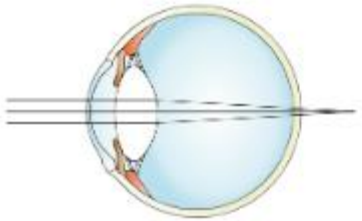
53. Short sightedness(myopia) is treated by using lens which are?

A Convex
B Concave

10	List the vision problems that may occur in the human eye and how they are corrected	Textbook physical, figs. (14, 15)	340, 341

54.  The image shows someone who is suffering from?

(A) short sightedness
B no eye condition
C long sightedness

55.  The image shows someone who is suffering from?

A no eye condition
B short sightedness
(C) long sightedness

11	Define the terms Ecology, biosphere, and ecosystem	Textbook biology, fig. 3 , 4	7

The Biosphere

Because ecologists study organisms and their environments, their studies take place in the biosphere. The **biosphere** (BI uh sfihr) is the portion of Earth that supports life. The photo of Earth taken from space shown in **Figure 3** shows why the meaning of the term *biosphere* should be easy to remember. The term *bio* means "life," and a sphere is a geometric shape that looks like a ball. When you look at Earth from this vantage point, you can see how it is considered to be "a ball of life."

Although "ball of life" is the literal meaning of the word *biosphere*, this is somewhat misleading. The biosphere includes only the portion of Earth that includes life. The biosphere forms a thin layer around Earth. It extends several kilometers above Earth's surface into the atmosphere and extends several kilometers below the ocean's surface to the deep-ocean vents. It includes landmasses, bodies of freshwater and saltwater, and all locations below Earth's surface that support life.

Figure 3 This color-enhanced satellite photo of Earth taken from space shows a large portion of the biosphere.

The biosphere's diverse locations contain organisms that are able to survive in the unique conditions found in their particular environment. Ecologists study these organisms, their adaptations, and the factors in their environment. These factors are divided into two large groups—the living factors and the nonliving factors.

Figure 4 shows a glimpse into the vast amount of diversity contained within Earth's biosphere. From rainforests to deserts to deep-ocean vents, diverse organisms populate diverse locations.

Get It?
Define the term *biosphere*.

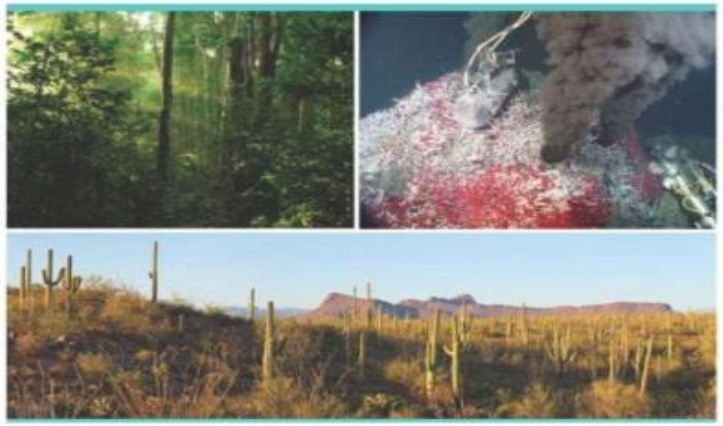


Figure 4 Rainforests, deserts, and deep-ocean vents are all home to unique organisms. The plants, animals, and microorganisms that live in each of these parts of the biosphere are adapted to the living and nonliving factors there.

14- In what type of activity would you most expect an **ecologist** to be involved?

A. identifying and classifying various species of insects in an ecosystem

B. locating fossils of distinct species of turtles in a geographical area

C. observing the relationships that woodpeckers have with other species in their environment

D. studying the internal organs of a seal to learn how it survives in its environment

22- The **exchange** of matter through the ____ is called the biogeochemical cycle.

A) biosphere

B) Water cycle

C) Food chain

D) Phosphorus chain

11	Define the terms Ecology, biosphere, and ecosystem	Textbook biology, fig. 3 , 4	7

65-The **lowest level of environmental complexity** that includes living and nonliving factors is the

A) Community.

B) Biosphere.

C) Ecosystem.

D) Biome.

66-What is the **original source of almost all the energy** in most ecosystems?

A) Water

B) Carbohydrates

C) Carbon

D) Sunlight

31_Scientists who **study the relationships** among **living organisms and their environment** are called ____.

A) Biotechnologists

B) Ecologists

C) Geologists

D) Botanists

77- Matter can recycle through the biosphere because

Select one:

A) matter is passed out of the body as waste.

B) matter is assembled into chemical compounds.

C) biological systems use only carbon, oxygen, hydrogen, and nitrogen.

D) biological systems do not use up matter, they transform it.

12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms ⟶ populations ⟶ communities ⟶ whole ecosystems	Textbook biology, fig.7	10, 11

Levels of Organization

The biosphere is too large and complex for most ecological studies. To study relationships within the biosphere, ecologists look at different levels of organization or smaller pieces of the biosphere. The levels increase in complexity as the numbers and interactions between organisms increase. The levels of organization are: organism, population, biological community, ecosystem, biome, and biosphere. Refer to **Figure 7** as you read about each level.

Organisms, populations, and biological communities

The lowest level of organization is the individual organism itself. In **Figure 7** on the next page, the organism is represented by a single fish. Individual organisms of a single species that share the same geographic location at the same time make up a **population.** The school of fish represents a population of organisms. Individual organisms often compete for the same resources, and if resources are plentiful, the population can grow. Usually there are factors that prevent populations from becoming extremely large. For example, when the population has grown beyond what the available resources can support, the population size declines until it reaches the number of individuals that the available resources can support.

The next level of organization is the **biological community,** a group of interacting populations that occupy the same geographic area at the same time. Organisms might or might not compete for the same resources in a biological community. The collection of plant and animal populations, including the school of fish, represent a biological community.

Ecosystems, biomes, and the biosphere

The next level of organization after a biological community is an ecosystem. An **ecosystem** is a biological community and all of the abiotic factors that affect it. As you can see in **Figure 7**, an ecosystem might contain an even larger collection of organisms than a biological community. In addition, it contains the abiotic factors present, such as water temperature and light availability. Although **Figure 7** represents an ecosystem as a large area, an ecosystem also can be small, such as an aquarium or tiny puddle. The boundaries of an ecosystem are somewhat flexible and can change, and ecosystems even might overlap. The next level of organization is the biome.

A **biome** is a large group of ecosystems that share the same climate and have similar types of communities. The biome shown in **Figure 7** is a marine biome. All of the biomes on Earth combine to form the highest level of organization—the biosphere.

Ecosystem Interactions

The interactions between organisms are important in an ecosystem. A community of organisms increases the chances for survival of any one species by using the available resources in different ways. If you look closely at a tree in the forest, like the one shown in **Figure 8**, you will find a community of different birds using the resources of the tree in different ways. For example, one bird species might eat insects on the leaves while another species of bird might use pieces of bark as nesting materials. The chance of survival for the birds increases because they are using different resources.

The trees shown in **Figure 8** also are habitats. A **habitat** is an area where an organism lives. A habitat might be a single tree for an organism that spends its life on one tree. If the organism moves from tree to tree, its habitat would be a grove of trees.

Figure 8 These trees are the habitat for the community of organisms that live in them.

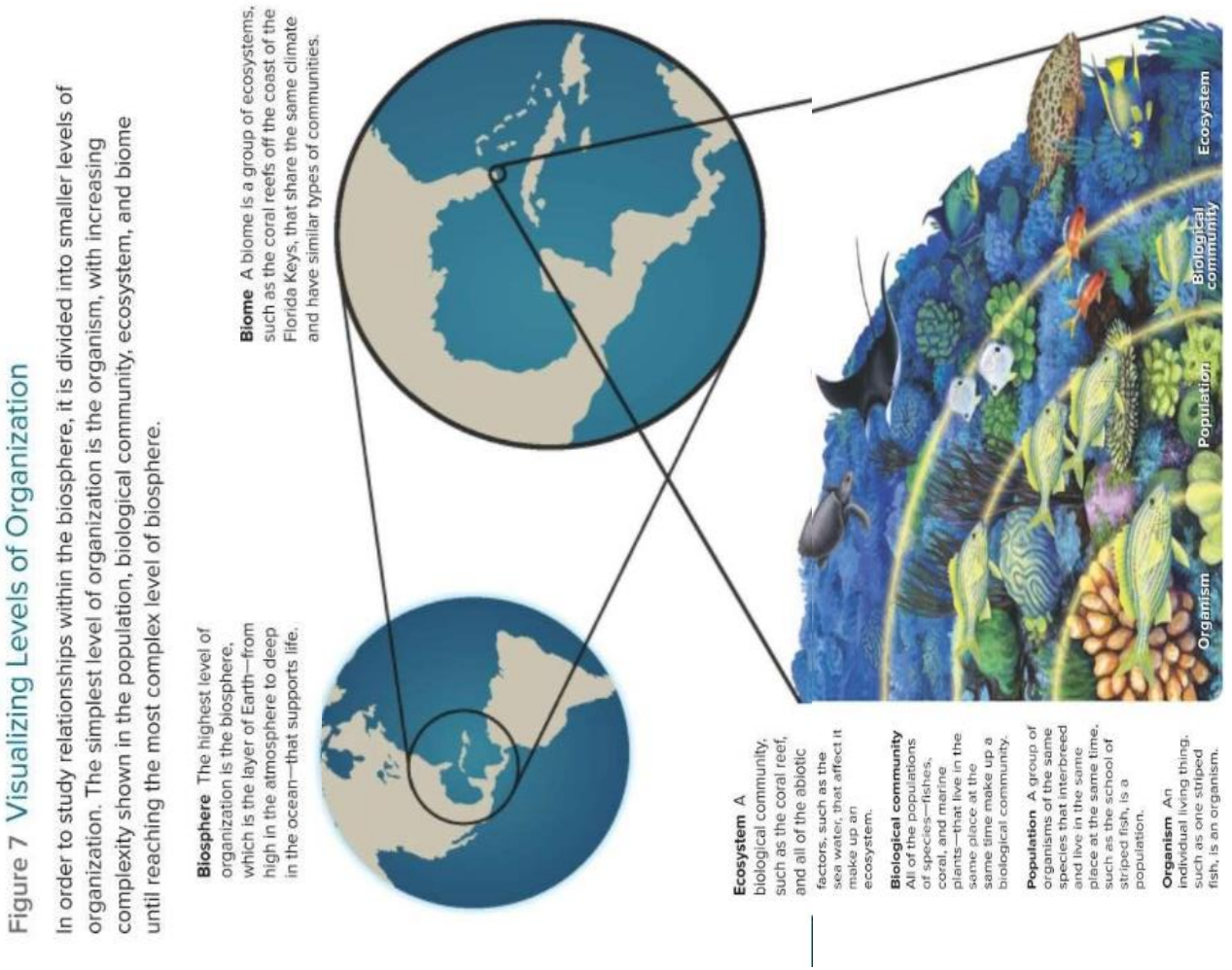
Organisms not only have a habitat—they have a niche as well. A **niche** (NIHCH) is the role or position that an organism has in its environment. An organism's niche is how it meets its needs for food, shelter, and reproduction. The niche might be described in terms of requirements for living space, temperature, moisture, or in terms of appropriate mating or reproduction conditions.

Get It?

Compare and contrast a habitat and a niche.

Figure 9 During droughts, animals compete for water; when water is plentiful, competition decreases.

12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms ⟶ populations ⟶ communities ⟶ whole ecosystems	Textbook biology, fig.7	10, 11



5-What is the name for **a group of interacting populations** that occupy the **same area** at the same time?

A. ecosystem

B. habitat

C. biological community

D. biotic collection

6- Which defines **habitat**?

A. all of the biotic factors in an ecosystem

B. an area where an organism lives

C. an area in which various species interact

D. the role or position that an organism has

12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms → populations → communities → whole ecosystems	Textbook biology, fig.7	10, 11

21- How would a **population decrease in primary consumers** affect the ecosystem?

A) Primary producers would suddenly decrease.

B) Third-level consumer population would increase.

C) Third-level consumer populations would eventually decrease.

D) There would be no overall effect.

25-Tree branches are an example of a ____.

A) Niche

B) Habitat

C) Biome

D) Mutualism

26-What does a **decrease in salmon population** due to an increase in river temperature indicate?

A) an abiotic factor affecting a biotic factor

B) change in population but not in abiotic factors

C) an effect of predation

D) an unchanging biological community

50-Several species of warblers can live **in the same** spruce tree ONLY because they

Select one:

A) Can find different temperatures within the tree.

B) Occupy different niches within the tree.

C) Have different habitats within the tree.

D) Eat different foods within the tree.

12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms ⟶ populations ⟶ communities ⟶ whole ecosystems	Textbook biology, fig.7	10, 11

53-A group of organisms of different species living together in a particular place is called a

A) habitat.

B) Biome.

C) Population.

D) Community.

65-The **lowest level of environmental complexity** that includes living and nonliving factors is the

A) Community.

B) Biosphere.

C) Ecosystem.

D) Biome.

61-Different species can share the same habitat, but competition among them is reduced if they

A) Occupy different niches.

B) Eat less.

C) Increase their populations.

D) Reproduce at different times.

77- Matter can recycle through the biosphere because

Select one:

A) matter is passed out of the body as waste.

B) matter is assembled into chemical compounds.

C) biological systems use only carbon, oxygen, hydrogen, and nitrogen.

D) biological systems do not use up matter, they transform it.

12	Define the terms population, biological community, biome, habitat, niche, and ecosystem, describe the different levels of organization in an ecosystem from individual organisms ⟶ populations ⟶ communities ⟶ whole ecosystems	Textbook biology, fig.7	10, 11

80- A ____ is a group of **interacting populations** in a particular area.

A) biological community

B) biome

C) species

D) habitat

What term best describes the bee's role of gathering pollen?

ما المصطلح المناسب لوصف دور النحلة في جمع حبوب اللقاح؟

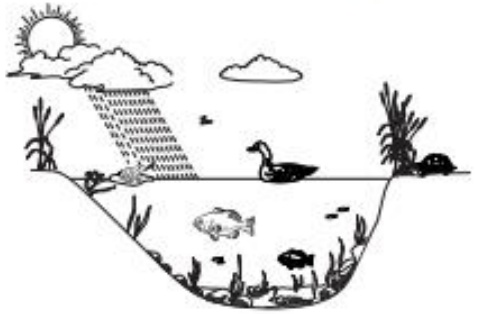
a. Niche موقع ملائم

b. Parasite طفيل

c. Predator مفترس

d. Habitat موطن بيئي

Use the illustration below to answer question 6.



6 **The illustration above shows living and nonliving factors that interact in a certain area. Which term best describes the interactions shown in the diagram?**

A biome
B food chain
C ecosystem
D population

2) Place the levels of organization in order from smallest to largest, with the smallest listed first.

A) biosphere
B) population
C) organism
D) biological community
E) biome
F) ecosystem

Correct Answer

1. organism
2. population
3. biological community
4. ecosystem
5. biome
6. biosphere

13	Study the symbiotic relationships between organisms	Textbook biology, fig. 10, 11	12, 13, 14

Community Interactions

Organisms that live together in a biological community constantly interact. These interactions, along with the abiotic factors, shape an ecosystem. Interactions include competition for basic needs such as food, shelter, and mates, as well as relationships in which organisms depend on each other for survival.

Competition

Competition occurs when more than one organism uses a resource at the same time. Resources are necessary for life and might include food, water, space, and light. For example, during a drought, as shown in **Figure 9**, water might be scarce for many organisms. The strong organisms directly compete with the weak organisms for survival. Usually the strong survive and the weak die. Some organisms might move to another location where water is available. At times when water is plentiful, all organisms share the resources and competition is not as fierce.

Predation

Many species get their food by eating other organisms. The act of one organism pursuing and consuming another organism for food is **predation** (prih DAY shun). The organism that pursues another organism is the predator, and the organism that is pursued is the prey. If you have watched a cat catch a bird or mouse, you have witnessed a predator catch its prey.

Some insects also prey on other insects. Ladybugs and praying mantises are two examples of insects that are predators. Insect predators, such as these two, also are called beneficial insects because they can be used to kill harmful insects. For example, organic gardeners use beneficial insects for insect control. Instead of using insecticides, organic gardeners rely on beneficial insects to control unwanted insect populations.

Animals are not the only organisms that are predators. The Venus flytrap, a plant native to some regions of North and South Carolina, has modified leaves that form small traps for insects and other small animals. The plant emits a sweet, sticky substance that attracts insects. When the insect lands on the leaf, the leaf trap snaps shut. Then, the plant secretes a substance that digests the insect over several days.

Get It?

Describe one example each of competition and predation.

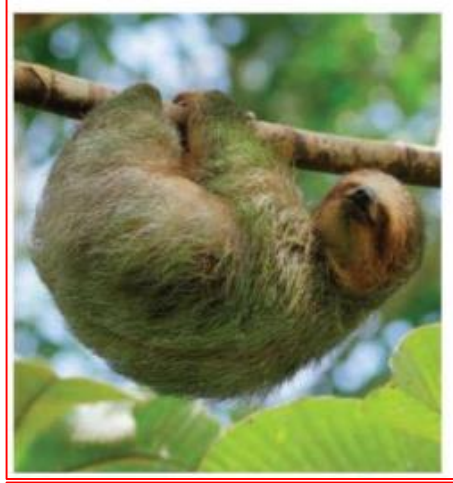


Figure 10 Algae live in this sloth's fur as part of a symbiotic relationship.

Explain *why this is an example of a mutualistic relationship.*

Symbiotic relationships

Some species survive because of relationships they have developed with other species. The close relationship that exists when two or more species live together is **symbiosis** (sihm bee OH sus). There are three different kinds of symbiosis: mutualism, commensalism, and parasitism.

Mutualism The relationship between two or more organisms that live closely together and benefit from each other is **mutualism** (MYEW chuh wuh lih zum). **Figure 10** displays an example of a mutualistic relationship between a mammal and an algae. A specific kind of algae grows and takes shelter in the sloth's fur. The sloth's fur also absorbs water easily, providing the algae with the moisture it needs to survive. In return, the sloth receives additional camouflage from the green-colored algae, and it may also absorb some nutrients produced by the algae through its skin.

Another example of a mutualistic relationship is found in lichens. Lichens are formed by a mutualistic relationship between fungi and algae. The algae provide food for the fungi, and the fungi provide a habitat for the algae. The close association of these two organisms provides two basic needs for the organisms—food and shelter.

Commensalism Have you ever seen lichens growing on a tree? The lichens benefit from their relationship to the tree by gaining more exposure to sunlight. The tree is not harmed by the lichen, but it does not receive any benefit from the lichen either. This type of relationship is commensalism. **Commensalism** (kuh MEN suh lih zum) is a relationship in which one organism benefits and the other organism is neither helped nor harmed.

The relationship between the clownfish and the sea anemone in which it lives is likely commensal. The clownfish finds food and protection by living in the sea anemone. While the sea anemone is not harmed, it does not receive any apparent benefit from the relationship with the clownfish.

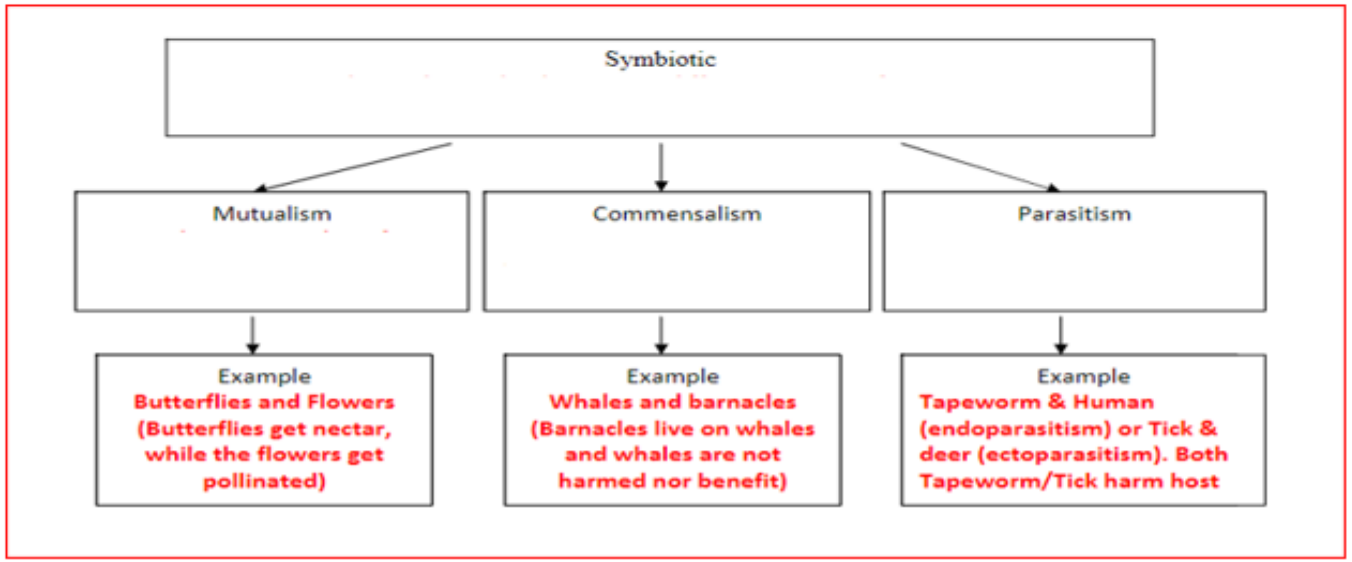
Parasitism A symbiotic relationship in which one organism benefits at the expense of another organism is **parasitism** (PER us suh tih zum). Parasites can be external, such as ticks and fleas, or internal, such as bacteria, tapeworms, and roundworms. In most cases of parasitism, the parasite does not kill the host, instead only harming or weakening it. This is because the death of the host would also mean the death of the parasite unless it could quickly find another host. This is not the case of the tomato hornworm that is infected with cocoons of a parasitic wasp in **Figure 11**, because the pupating wasps will most likely kill their host.

Another type of parasitism is brood parasitism. Brown-headed cowbirds demonstrate brood parasitism because they rely on other bird species to build their nests and incubate their eggs. A brown-headed cowbird lays its eggs in another bird's nest and abandons the eggs. The host bird incubates and feeds the young cowbirds. Often the baby cowbirds push the host's eggs or young from the nest, resulting in the survival of only the cowbirds. In some areas, the brown-headed cowbirds have significantly lowered the population of songbirds through this type of parasitism.

Figure 11 This tomato hornworm is host to a number of pupating parasitic wasps. This case of parasitism is unusual because the wasps will likely kill their host.

13	Study the symbiotic relationships between organisms	Textbook biology, fig. 10, 11	12, 13, 14

Organisms that live together in a biological community constantly interact. These interactions, along with the abiotic factors, shape an ecosystem. Interactions include.



Direction: Study the pictures below. Choose the correct ecologocal relationship that corresponds to the picture. Just click the correct answer.

COMMENSALISM
PREDATION
MUTUALISM
PARASITISM

COMMENSALISM
PREDATION
MUTUALISM
PARASITISM

COMMENSALISM
PREDATION
MUTUALISM
PARASITISM

COMMENSALISM
PREDATION
MUTUALISM
PARASITISM

13	Study the symbiotic relationships between organisms	Textbook biology, fig. 10, 11	12, 13, 14

4) Choose the type of relationship that best defines the scenarios below.

	competition	parasitism	predation	commensalism
Red-tailed hawks and black racer snakes prey on the same species of rodents in the same habitat.	●	○	○	○
One organism benefits, while another is unharmed during a long-term relationship between the two.	○	○	○	●
A tick becomes lodged on the skin of a hiker.	○	●	○	○
Coyotes eat mice and rabbits.	○	○	●	○

14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

Which of the following is an example of mutualism?

أي مما يلي مثال على تبادل المنفعة؟

a. جراد البحر والبلم اللذان يستريحان تحت نفس الصخرة
Crayfish and minnows resting under the same rock

b. نوعان من الأفاعي ذات علامات مماثلة لترويع الزعاف السام
Two snake species with similar markings advertising their toxic venom

c. سمكة تحمي الروبيان، الذي يبني جحراً ليشاركاه
A fish protecting a shrimp, who builds a burrow for the pair to share

d. النمر يطارد الغزالة
A peacock courting and mating with a peahen

The relationship between two living things in which one gains benefits at the expense of the other is called:

العلاقة بين كائنين يستفيد أحدهما بينما يتضرر الآخر تسمى:

a. communsalism التعايش

b. predation الافتراس

c. parasitism التطفل

d. mutualism تبادل المنفعة

3) Suppose two leaf-eating species of animals live in a habitat where there is a severe drought and many plants die as a result. Which term describes the kind of relationship the two species probably will have?

- **A)** predator-prey
- **B)** abiotic
- **C)** symbiotic
- **D)** competitive

14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

The insect in the photo below is gathering pollen and nectar for food, but at the same time is aiding in the plant's reproduction. What does this relationship demonstrate?

تجمع الحشرة المبيّنة في الشكل أدناه حبوب اللقاح والرحيق من أجل غذائها لكنها في الوقت نفسه تساعد في تكاثر النبات. ماذا تمثّل هذه العلاقة؟

a. تبادل منفعة Mutualism

b. تعايش Commensalism

Which of the following is an example of predation?

أي مما يلي يُعتبر مثال على الافتراس؟

a. القراد في جلد الذئب
Tick lodging in the skin of a wolf

b. سمكة المهرج التي تحمي صغارها
Clownfish protecting its anemone

c. كبشان يتصارعان على الإناث
Two male rams fighting for females

d. بطة برية تتغذى على اللافقاريات البحرية
Mallard eating aquatic invertebrates

14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

Models of Energy Flow

Ecologists use food chains and food webs to model the energy flow through an ecosystem. Food chains and food webs are simplified representations of the flow of energy. Each step in a food chain or food web is called a **trophic** (TROH fihk) **level.** Autotrophs make up the first trophic level in all ecosystems. Heterotrophs make up the remaining levels. With the exception of the first trophic level, organisms at each trophic level get their energy from the trophic level before it.

Food chains

A **food chain** is a model that shows how energy flows through an ecosystem. **Figure 14** shows a typical grassland food chain. Arrows represent the energy flow, which typically moves from autotrophs to heterotrophs. The flower uses energy from the Sun to make its own food. The grasshopper obtains energy from eating the flower. The mouse obtains energy from eating the grasshopper. Finally, the snake gains energy from eating the mouse. At each step in the food chain, some energy is used for cellular processes and to build new cells and tissues. Some energy is released into the environment.

Figure 14 A food chain is a simplified model representing the transfer of energy from organism to organism.

Food webs

Feeding relationships usually are more complex than a single food chain because most organisms feed on more than one species. Birds, for instance, eat a variety of seeds, fruits, and insects. The model most often used to represent the feeding relationships in an ecosystem is a food web. A **food web** is a model representing the many interconnected food chains and pathways in which energy flows through a group of organisms. **Figure 15** shows a food web illustrating the feeding relationships in a desert community.

Ecological pyramids

Another model that ecologists use to show how energy flows through ecosystems is the ecological pyramid. An ecological pyramid is a diagram that can show the relative amounts of energy, biomass, or numbers of organisms at each trophic level in an ecosystem.

Notice in **Figure 16,** on the next page, that in a pyramid of energy, only 10 percent of all energy is transferred to the level above it. This occurs because most of the energy contained in the organisms at each level is consumed by cellular processes or released to the environment as heat. Usually, the amount of **biomass**—the total mass of living matter at each trophic level—decreases at each trophic level.

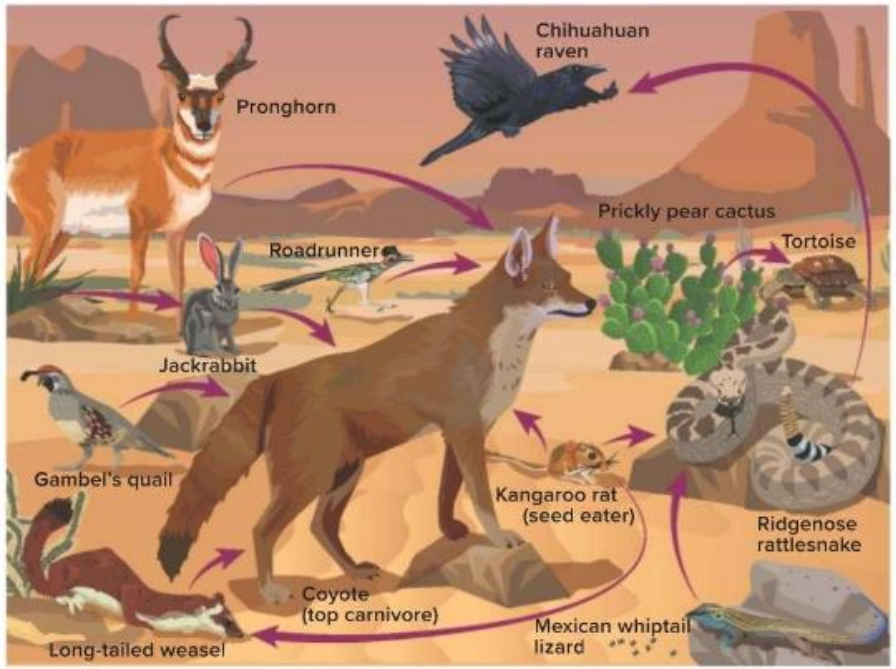


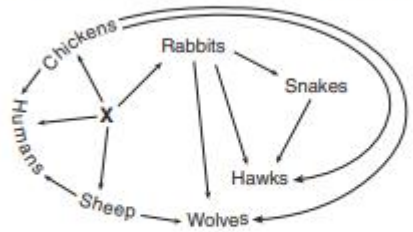
Figure 15 A food web is a model of the many ways in which energy flows through organisms.

Figure 16 Ecological pyramids are models used to represent trophic levels in ecosystems.
Identify *the process by which autotrophs at the bottom of the pyramid convert energy from the Sun.*

As shown in the pyramid of numbers, the relative number of organisms at each trophic level also decreases because there is less energy available to support organisms. The ecosystem determines the shape of an ecological pyramid.

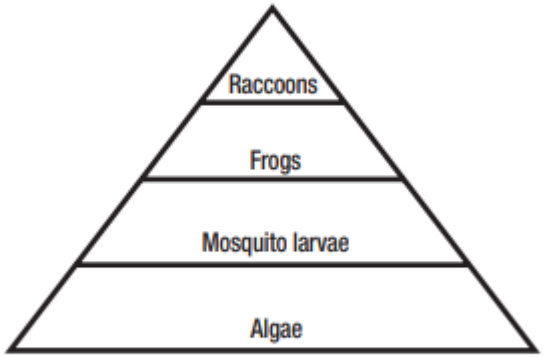
14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

9 A food web is represented in the diagram below. What does the X mostly likely represent?



A autotrophs
B decomposers
heterotrophs
D parasites

12 According to the energy pyramid below, which organisms are the primary consumers?



A algae
mosquito larvae
C frogs
D raccoons

14 What is released at each level of a pyramid of energy?

A animals
heat
C decomposers
D plants

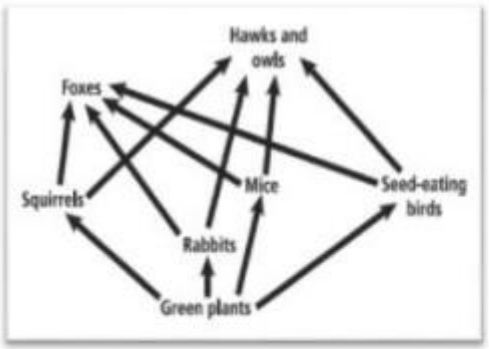
10 In which type of ecological relationship do two organisms benefit from living together?

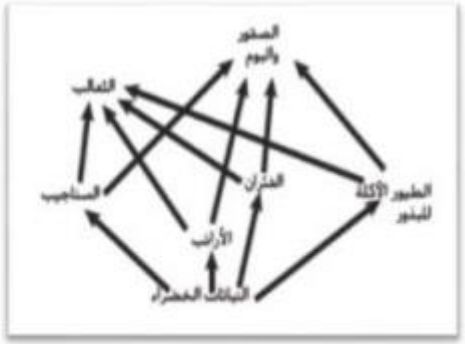
A commensalism
B competition
mutualism
D parasitism

14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

Use the illustration below to answer the following question:
What happens to the energy that the fox Uses for maintaining its body temperature?

استخدم الشكل أدناه للإجابة عن السؤال التالي:
ما الذي يحدث للطاقة التي يستخدمها الثعلب للحفاظ على اتزان درجة حرارة جسمه؟





a. تنتقل إلى البيئة المحيطة.
It moves into the surrounding environment

b. تبقى في الثعلب خلال عملية أيض الغذاء.
It stays in the fox through the metabolism of food

c. تحصل عليها المحللات التي تتغذى على الثعلب.
It is taken up by decomposers that consume the fox

d. تنتقل إلى المستوى الغذائي التالي عندما يؤكل الثعلب
It travels to the next trophic level when the fox is eaten

14	Explain how energy and matter flow in ecosystem, and compare and contrast between the models that represent it (food chain, food web, Ecological pyramids)	Textbook biology, fig. 14, 15, 16	16, 17, 18

The models used to represent trophic levels in ecosystems are called:

النماذج التي تستخدم لتمثيل المستويات الغذائية في الأنظمة البيئية تسمى:

a. food chain السلسة الغذائية

b. Relationship between organisms العلاقات بين الكائنات

c. Ecological pyramids الأهرام البيئية

d. food web الشبكة الغذائية

Only .....% of energy gets passed on from one trophic level to the next:

يتم تمرير ..... ٪ فقط من الطاقة من مستوى غذائي إلى المستوى التالي:

a. %10

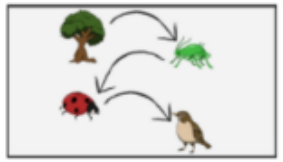
b. %20

c. %50

d. %5

The picture below refers to:

تشير الصورة المبينة أدناه الى:



a. only consumers المستهلكون فقط

b. Trophic levels المستوي الغذائي

c. food web شبكة غذائية

d. food chain سلسلة غذائية

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Factors That Threaten Biodiversity

Anthropogenic changes to the environment are changes induced by human activity. They include habitat loss, pollution, the introduction of invasive species, overexploitation, and climate change. These changes can disrupt an ecosystem and threaten the survival of some species. Today's high rate of extinction differs from past mass extinctions. After a mass extinction in the past, new species evolved and biodiversity recovered after several million years. This time, the recovery might be different. Humans are changing conditions on Earth faster than new traits can evolve in some species to cope with the new conditions. Evolving species might not have the natural resources they need. **Natural resources** are all materials and organisms found in the biosphere, including minerals, fossil fuels, nuclear fuels, plants, animals, soil, clean water, clean air, and solar energy.

Overexploitation

One of the factors that is increasing the current rate of extinction is the **overexploitation,** or excessive use, of species that have economic value.

For example, wood from mahogany trees is prized for its beauty and its durability. These trees are native to tropical areas of the globe. Because they grow so slowly, it takes about 100 years for a mahogany tree to fully mature. Overexploitation of mahogany tree populations and illegal logging have led some varieties of this tree to border on extinction.

Plants are not the only living organisms that have been subjected to overexploitation. the great herds of bison that once roamed the central plains of North America were hunted to the brink of extinction because their meat and hides could be sold commercially and because they were hunted for sport. At one time, it is estimated that there were 50 million bison. By 1889, there were less than 1000 bison left.

Passenger pigeons are another example of a species that were overexploited. At one time, there were huge flocks of these birds that would darken the skies of North America during their migration. Unfortunately, they were overhunted and forced from their habitats. By the early 1900s, they had become extinct.

Get It?

Explain the term overexploitation as it relates to species extinction.

Ocelot White rhinoceros

Figure 10 The ocelot and all species of rhinos, including the white rhinoceros, are in danger of becoming extinct, due in part to overexploitation.

The ocelot, shown in **Figure 10**, is found from Texas to Argentina and is in danger of becoming extinct. The increasing loss of their habitat and the commercial value of their fur are reasons for their declining numbers. The white rhinoceros, also shown in **Figure 10**, is one of five species of rhinos, all of which are in danger of becoming extinct. They are hunted and killed for their horns, which are then sold for so-called medicinal purposes. Historically, overexploitation was the primary cause of species extinction. However, the number one cause of species extinction today is the destruction of habitat.

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Habitat loss

There are several ways that species can lose their habitats. If a habitat is destroyed or disrupted, the native species might have to relocate or they will die. For example, humans are clearing areas of tropical rain forests and are replacing the native plants with agricultural crops or grazing land.

Destruction of habitat The clearing of tropical rain forests, like what is shown in **Figure 11**, has a direct impact on global biodiversity. As mentioned earlier, the tropical latitudes contain much of the world's biodiversity in their native populations. In fact, estimates show that more than half of all species on Earth live in the tropical rain forests. The removal of so much of the natural forest will cause many species on Earth to become extinct as a result of habitat loss.

Figure 11 Cleared land often is used for agricultural crops or as grazing land for livestock. Planting large expanses of crops reduces the biodiversity of the area.

Disruption of habitat Some habitats might not be destroyed, but they can be disrupted. For example, off the coast of Alaska, a chain of events occurred in the 1970s that demonstrates how the declining numbers of one member of a food web can affect the other members. As you can see from the chain of events shown in **Figure 12**, the decline of one species can affect an entire ecosystem. When one species plays such a large role in an ecosystem, that species is called a keystone species. A decline in various fish populations, possibly due to overfishing, has led to a decline in sea lion and harbor seal populations. Some scientists hypothesize that climate change also played a role in the decline. This started a chain reaction that affected many species.

Figure 12 A declining population of one species can affect an entire ecosystem. When the number of harbor seals and sea lions declined, killer whales ate more sea otters. The decline in sea otter population led to an increase in sea urchins, which eat kelp. This led to the ultimate decline in kelp forests.

Which is not a way in which species lose their habitats?

A. background extinction
B. destruction
C. disruption
D. pollution

- humans are clearing areas of tropical rain forests and are replacing the native plants with agricultural crops. This is an example of ……..

A – habitat fragmentation
B - Habitat loss
C – Eutrophication
D - introduced species

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Fragmentation of habitat

The separation of an ecosystem into small pieces of land is called **habitat fragmentation.** Populations often stay within the confines of the small parcel because they are unable or unwilling to cross the human-made barriers. The smaller the parcel of land, the fewer species it can support. Fragmentation also reduces genetic diversity because it reduces the opportunities for individuals in one area to reproduce with individuals from another area. Smaller, separated, and less genetically diverse populations are less able to resist disease or respond to changing environmental conditions.

Carving the large ecosystem into small parcels increases the number of edges, creating edge effects, as illustrated in **Figure 13**, on the next page. **Edge effects** are different environmental conditions that occur along the boundaries of an ecosystem. For example, edges of a forest near a road have different abiotic factors, such as temperature, wind, and humidity, than does the interior of a forest.

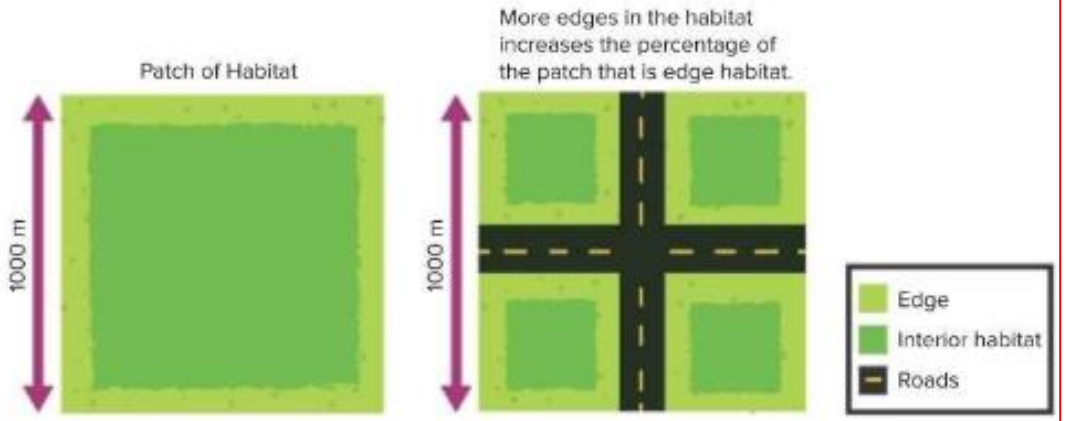


Figure 13 The smaller the habitat size, the greater percentage of the habitat that is subject to edge effects.

Typically, the temperature and wind will be higher and the humidity lower on the edges in a tropical forest. Species that thrive deep in the dense forest might perish on the edges of the ecosystem. Predators and parasites also thrive on the boundaries of ecosystems, which makes the species in these areas more vulnerable to attack.

Climate Change

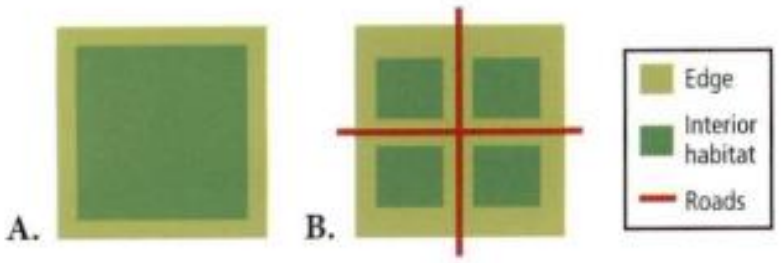
Species have evolved to live within certain temperature ranges. When these temperatures increase, the species members that cannot adapt die. This threatens the survival of the species as well as other species that depend on it for survival. Climate change is expected to overtake habitat destruction as the greatest threat to biodiversity in the first half of this century. In fact, scientists predict that climate change will threaten approximately 25 percent of all land species by 2050.

Get It?

Explain how an increase in global temperatures threatens biodiversity.

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Use the figure below to answer questions 20 and 21.



20. Which habitat has the greatest impact resulting from edge effects?

A. A
B. B
C. A and B equally
D. neither A nor B

21. Which habitat naturally supports the greater amount of biodiversity?

A. A
B. B
C. A and B equally
D. neither A nor B

20) Which would be a direct effect caused by habitat fragmentation?

- **A)** waterfowl unable to breed due to a drained wetland
- **B)** harvested trees result in less leaf litter for rich soil
- **C)** box turtles separated by a road and unable to mate
- **D)** jaguars unable to find enough food in smaller forests

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Pollution

Pollution and atmospheric changes threaten biodiversity and global stability. Pollution changes the composition of air, soil, and water. There are many types of pollution. Substances—including many humanmade chemicals that are not found in nature—are released into the environment.

Pesticides, such as DDT (dichloro-diphenyl-trichlor oethane), and industrial chemicals, such as PCBs (polychlo rinated biphenyls), are examples of substances that are found in food webs. These substances are ingested by organisms when they drink water or eat other organisms that contain the toxic substances. Some substances are metabolized by an organism and excreted with other waste products.

However, other substances, such as DDT and PCBs, accumulate in the tissues of organisms. Carnivores at the higher trophic levels seem to be most affected by the accumulation of toxic substances because of a process called biological magnification. **Biological magnification** is the increasing concentration of toxic substances in organisms as trophic levels increase in a food chain or food web.

An example of biological magnification is shown in **Figure 14**. The concentration of a toxic substance is relatively low when it enters the food web; it is only at 0.001 parts per million (ppm) in producers. The concentration of a toxic substance in individual organisms increases as it spreads to higher trophic levels, ultimately resulting in a concentration of 25 ppm in the organisms that live in the highest trophic level of the food web.

Current research implies that these substances might disrupt normal processes in some organisms. For example, DDT might have played a role in the near extinction of the American bald eagle and the peregrine falcon. DDT is a pesticide that was used from the 1940s to the 1970s to control crop-eating and disease-carrying insects. DDT proved to be a highly effective pesticide, but evidence suggested that it caused the eggshells of fish-eating birds to be fragile and thin, which led to the death of the developing birds. Once these toxic effects were discovered, the use of DDT was banned in some parts of the world.

Acid precipitation Another pollutant that affects biodiversity is acid precipitation. When fossil fuels are burned, sulfur dioxide is released into the atmosphere. In addition, the burning of fossil fuels in automobile engines releases nitrogen oxides into the atmosphere. These compounds react with water and other substances in the air to form sulfuric acid and nitric acid. These acids eventually fall to the surface of Earth in rain, sleet, snow, or fog. Acid precipitation removes calcium, potassium, and other nutrients from the soil, depriving plants of these nutrients. It damages plant tissues and slows their growth. Sometimes, the acid concentration is so high in lakes, rivers, and streams that fish and other organisms die.

Eutrophication Another form of water pollution, called eutrophication, destroys underwater habitats for fish and other species. **Eutrophication** (yoo troh fih KAY shun) occurs when fertilizers, animal waste, sewage, or other substances rich in nitrogen and phosphorus flow into waterways, causing extensive algae growth.

The algae use up the oxygen supply during their rapid growth and after their deaths during the decaying process. Other organisms in the water suffocate. In some cases, algae also give off toxins that poison the water supply for other organisms. Eutrophication is a natural process, but human activities often accelerate the rate at which it occurs.

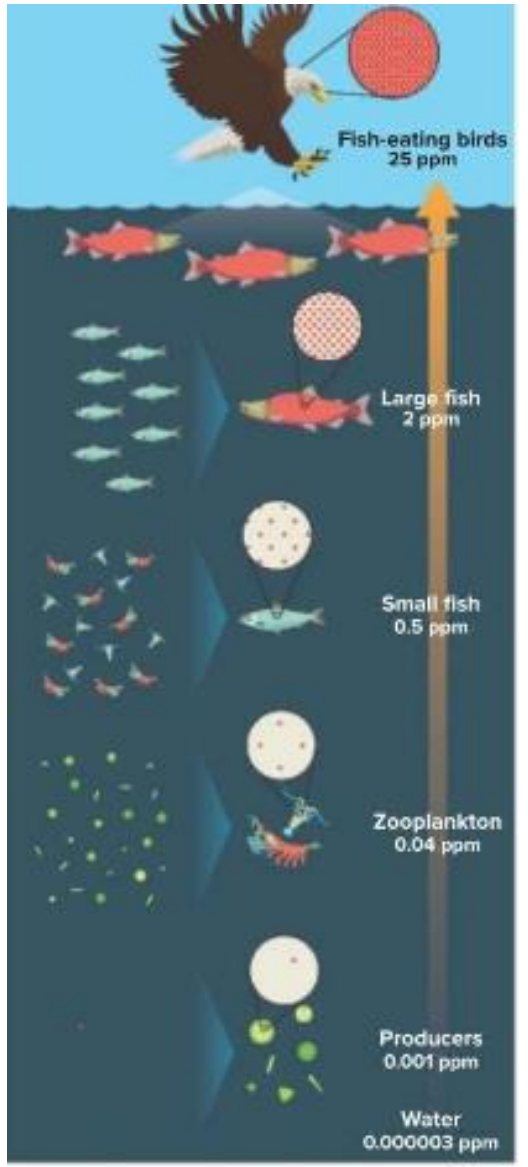


Figure 14 The concentration of toxic substances increases as the trophic level in a food chain increases.

15	Interpert the factors that are threats to biodiversity (list them and explain their meaning with giving examples)	Textbook biology, fig. 12, 13, 14	39, 41, 42, 43

Quiz

1. Which term is a method that is used to restore biodiversity to a polluted or damaged area?

- biological corridor
- renewable resource
- B bioremediation
  CORRECT
- sustainable use

– What is name of the increasing concentration of toxic substances in organisms as trophic levels increase in a food chain or food web?

A – Overexploitation

B – Edge effects

C - Biological magnification

D - Eutrophication

22) The pesticide DDT accumulating in the tissues of osprey is an example of _____.

biological magnification

16	List the measures used towared sustainable use of natural resources and in protecting biodiversity	Textbook biology, fig. 17, 18,19, 20	47, 48, 49, 50

Renewable versus nonrenewable resources

The classification of a resource as renewable or nonrenewable depends on the context in which the resource is being discussed. A single tree or a small group of trees in a large forest ecosystem is renewable because replacement trees can be planted or can regrow from seeds present in the soil. Enough of the forest is still intact to serve as a habitat for the organisms that live there. However, when the entire forest is cleared, as shown in **Figure 17**, the forest is not considered a renewable resource. The organisms living in the forest have lost their habitat, and they most likely will not survive. In this example, it is possible that more than one natural resource is nonrenewable: the forest and any species that might become extinct.

Figure 17 This cleared forest is considered a nonrenewable resource. There is not enough of it intact to provide a habitat for the organisms that live there.

Sustainable use

One approach to using natural resources, called sustainable use, is demonstrated in **Figure 18**. Just as the name implies, **sustainable use** means using resources at a rate at which they can be replaced or recycled while preserving the long-term environmental health of the biosphere. Conservation of resources includes reducing the amount of resources that are consumed, recycling resources that can be recycled, and preserving ecosystems, as well as using them in a responsible manner. Sustainable use can be accomplished on an individual level, by companies and industries, or by entire countries.

Figure 18 Replacing resources preserves the health of the biosphere.
Explain *why this process is considered a sustainable use of a resource.*

Protecting Biodiversity

In Lesson 2, you learned how human activities have affected many ecosystems. Many efforts are underway worldwide to slow the loss of biodiversity and to work toward sustainable use of natural resources. When evaluating these efforts and other solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Protected areas in the United States

Conservation biologists recognize the importance of establishing protected areas where biodiversity can flourish. Such places should remain relatively undisturbed by human activities that could destroy plant and animal life. The United States established its first national park, Yellowstone National Park, in 1872 to protect the area's geological features. Many additional national parks and nature reserves have been established since 1872.

International protected areas

The United States is not the only country to establish national parks and nature reserves. Currently, about ten to fifteen percent of the world's land is set aside as some type of reserve. Historically, these protected areas have been small islands of habitat surrounded by areas that contain human activity. Because the reserves are small, they are impacted heavily by human activity. Costa Rica has established megareserves. These reserves contain one or more zones that are protected from human activity by buffer zones, areas in which sustainable use of natural resources is permitted. This approach creates large managed areas for preserving biodiversity while providing natural resources to local populations.

16	List the measures used towared sustainable use of natural resources and in protecting biodiversity	Textbook biology, fig. 17, 18,19, 20	47, 48, 49, 50

Biodiversity hotspots

Conservation biologists have identified locations around the world that are characterized by exceptional levels of **endemic** species—species that are only found in that specific geographic area—and critical levels of habitat loss. They have termed these areas hotspots. To be called a hotspot, a region must meet two criteria. First, there must be at least 1500 species of vascular plants that are endemic, and the region must have lost at least 70 percent of its original habitat. The 36 internationally recognized hotspots are shown in **Figure 19** on the next page.

Approximately half of all plant and animal species are found in hotspots. These hotspots originally covered 17 percent of Earth's surface; however, only about a tenth of that habitat remains.

Biologists who are in favor of recovery efforts in these biological hotspots argue that focusing on a limited area would save the greatest number of species. Other biologists argue that concentrating funding on saving species in these hotspots does not address the serious problems that are occurring elsewhere. For example, saving a wetland area might save fewer species, but the wetland provides greater services by filtering water, regulating floods, and providing a nursery for fish. These biologists think that funding should be spent in areas around the world rather than focused on the biodiversity hotspots. Scientists often use computer simulations to test different ways of solving a problem or to see which one is most efficient or economical.

Figure 19 Visualizing Biodiversity Hotspots

Biodiversity hotspots, highlighted in red on the map, are ecosystems where endemic species are threatened. If these species become extinct, biodiversity will decrease.

1 California Floristic Province	13 Maputaland-Pondoland-Albany	25 Indo-Burma
2 Madrean Pine-Oak Woodlands	14 Madagascar and the Indian Ocean Islands	26 Sundaland
3 Mesomerica	15 Coastal Forests of Eastern Africa	27 Southwest Australia
4 Tumbes-Chocó-Magdalena	16 Eastern Aforomontane	28 Wallacea
5 Tropical Andes	17 Mediterranean Basin	29 Philippines
6 Chilean Winter Rainfall-Valdivian Forests	18 Caucasus	30 Japan
7 Atlantic Forest	19 Irano-Anatolian	31 Polynesia-Micronesia
8 Cerrado	20 Horn of Africa	32 East Melanesian Islands
9 Caribbean Islands	21 Western Ghats and Sri Lanka	33 New Caledonia
10 Guinean Forests of West Africa	22 Himalayas	34 New Zealand
11 Succulent Karoo	23 Mountains of Central Asia	35 Forests of East Australia
12 Cape Floristic Region	24 Mountains of Southwest China	36 North American Coastal Plain

16	List the measures used towared sustainable use of natural resources and in protecting biodiversity	Textbook biology, fig. 17, 18,19, 20	47, 48, 49, 50

Corridors between habitat fragments

Conservation ecologists are maintaining and improving biodiversity by providing corridors, or passageways, between habitat fragments. Corridors, such as those shown in **Figure 20**, are used to connect smaller parcels of land. These corridors allow organisms from one area to move safely to the other area. This creates a larger piece of land that can sustain a wider variety of species and a wider variety of genetic variation. However, corridors do not completely solve the problem of habitat destruction. Diseases easily pass from one area to the next as infected animals move from one location to another. This approach also increases edge effect. One large habitat would have fewer edges, but often a large habitat is hard to preserve.

Legislative actions

During the 1970s, a great deal of attention was focused on destruction of the environment and maintaining biodiversity. Laws were enacted in countries around the world, and many treaties between countries were signed in an effort to preserve the environment. In the United States, the Endangered Species Act was enacted in 1973. It was designed to legally protect the species that were becoming extinct or in danger of becoming extinct. An international treaty, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), was signed in 1973. It outlawed the trade of endangered species and animal parts, such as ivory elephant tusks and rhinoceros horns. Since the 1970s, many more laws and treaties have been enacted and signed with the purpose of preserving biodiversity for future generations.

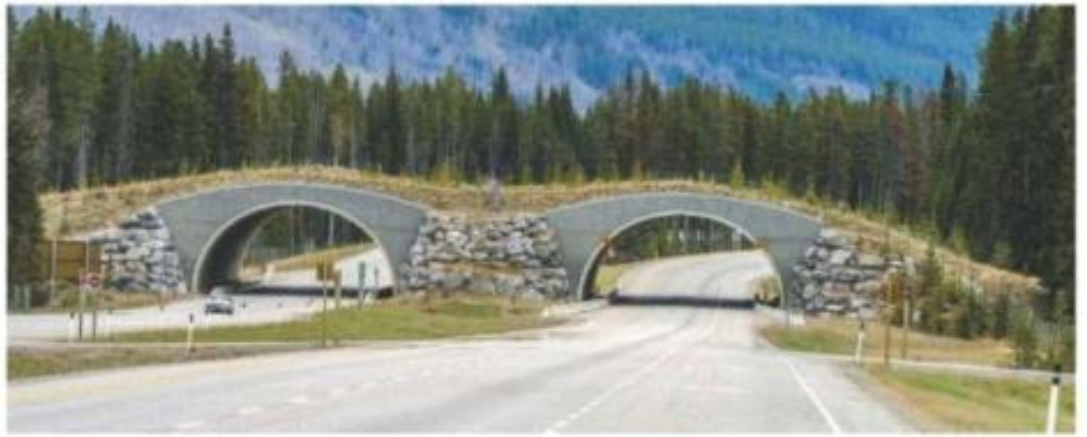


Figure 20 Corridors between habitat fragments allow safe passage for animals.

Describe *What are the advantages and disadvantages of corridors?*

Use the figure below to answer question 33.

33. Which is an advantage of the habitat corridor shown above?

A. Corridors increase the edge effect in the area.

B. Diseases are passed easily from one area to another.

C. Parasites are passed easily from one area to another.

D. Members of species can move safely from one area to another.

PART 3 (WRITTEN)

Part 3 الجزء الثالث	17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256
	18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9
	19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23
	20	Link biodiversity to healthy ecosystem, highlight the importance of biodiversity, and List all the economic (Direct, Indirect), aestheic and scientific values of biodiversity	TextbookBiology	33, 34, 35

Bonus Questions - الأسئلة الإضافية	21	unannounced		
	22	unannounced		

17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256

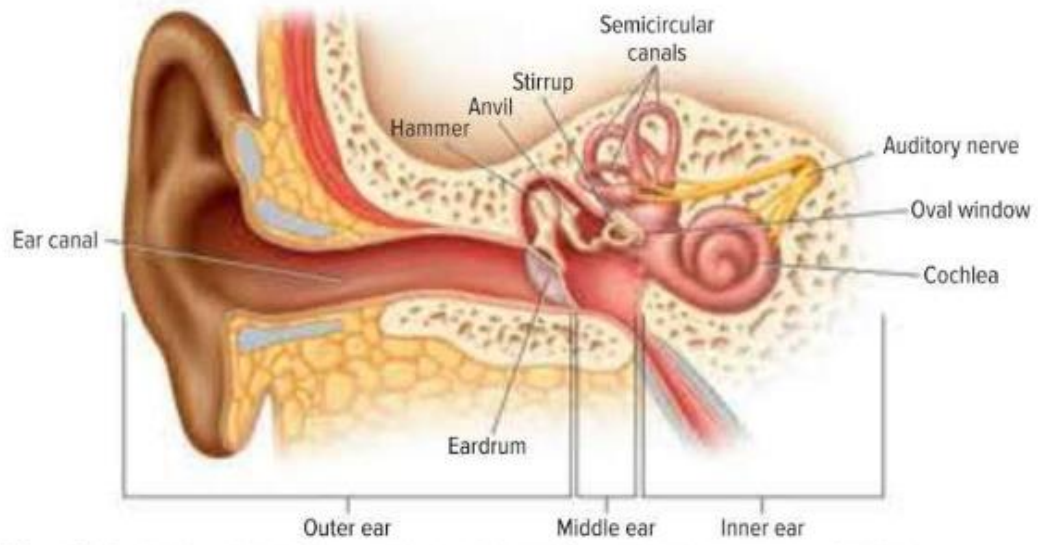


Figure 4 The three sections of the ear gather sound, amplify sound, and convert sound into an electric signal.

Identify *the three sections of the human ear.*

The Ear

Your ears and brain work together to interpret sound waves. When you think of your ear, you probably picture just the fleshy, visible, outer part. But, as shown in **Figure 4,** the human ear has three sections—the outer ear, the middle ear, and the inner ear. Each section of the ear has a different function.

The outer ear

The visible part of your ear, the ear canal, and the eardrum make up the outer ear. The outer ear gathers sound waves. The gathering process starts with the outer part of your ear, which is shaped to help capture and direct sound waves into the ear canal. The ear canal is a passageway that is 2 cm to 3 cm long and is a little narrower than your index finger. The sound waves travel along this passageway, which leads to the eardrum. The **eardrum** is a tough membrane that is about 0.1 mm thick and transmits sound from the outer ear to the middle ear.

Get It?
Identify what makes the eardrum vibrate.

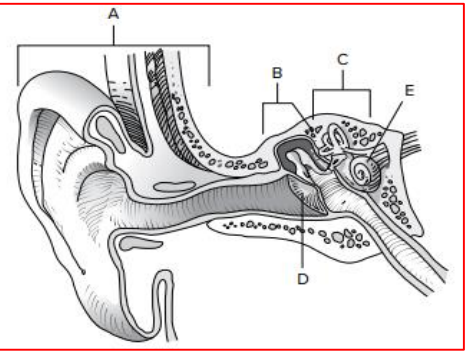
The middle ear

When the eardrum vibrates, it passes the sound waves into the middle ear, where three tiny bones start to vibrate. These bones are the hammer, the anvil, and the stirrup. They make a lever system that increases the force and pressure exerted by the sound waves. The bones amplify the sound wave. The stirrup is connected to a membrane on a structure called the oval window, which vibrates as the stirrup vibrates.

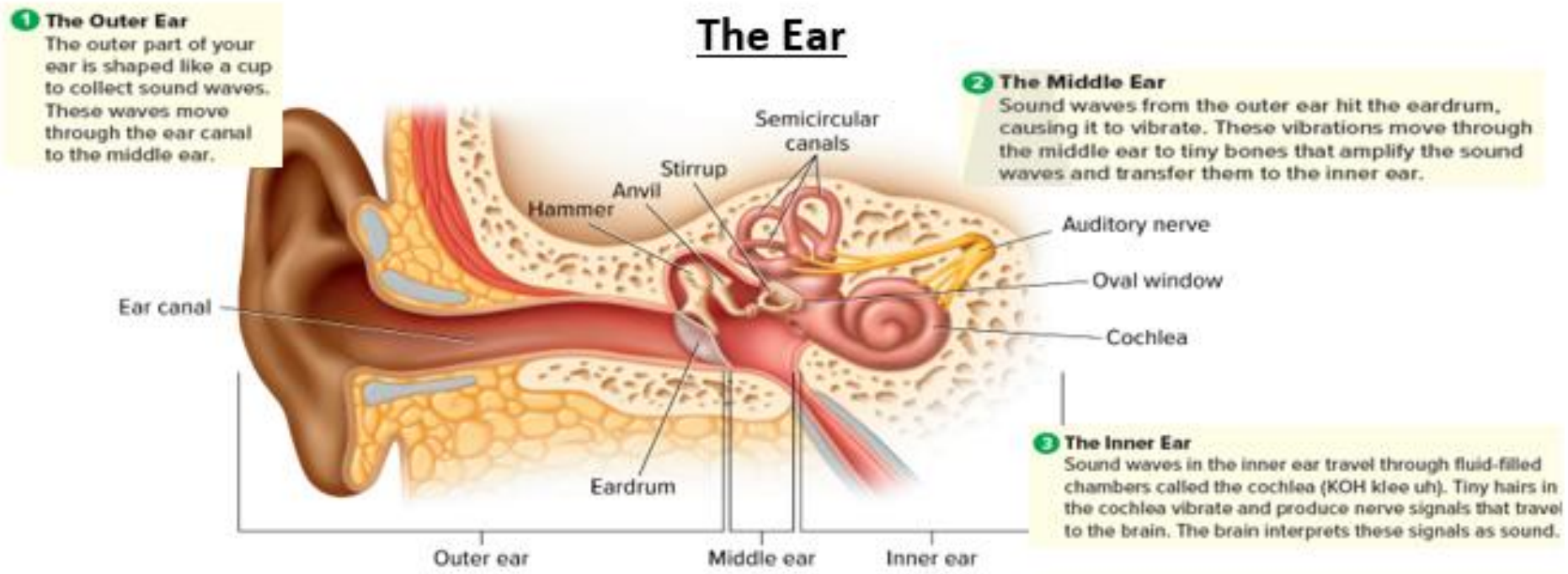
$$speed = \frac{distance}{time}$$

Directions: In questions 7 through 11, identify the parts of the ear in the diagram below by putting the correct letters in the blanks.

_____ **7.** cochlea
_____ **8.** eardrum
_____ **9.** inner ear
_____ **10.** middle ear
_____ **11.** outer ear



17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256



The outer ear	The middle ear	The inner ear
Ear canal= passageway 2cm to 3cm long and is a little narrower than index finger	Three tiny bones Hammer-anvil-stirrup (Lever system) = increase force and pressure exerted by sound wave	Cochlea= a spiral-shaped structure that is filled with liquid and contains tiny hair cells. Hair cells vibrates
Eardrum= a tough membrane that is 0.1mm thick and transmits sound from outer to middle ear.	As the stirrup vibrates a membrane on a structure called the ovel window vibrates	Nerve impulses are sent through the auditory nerve and to brain. Cochlea (sound wave→nerve impulses)

17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256

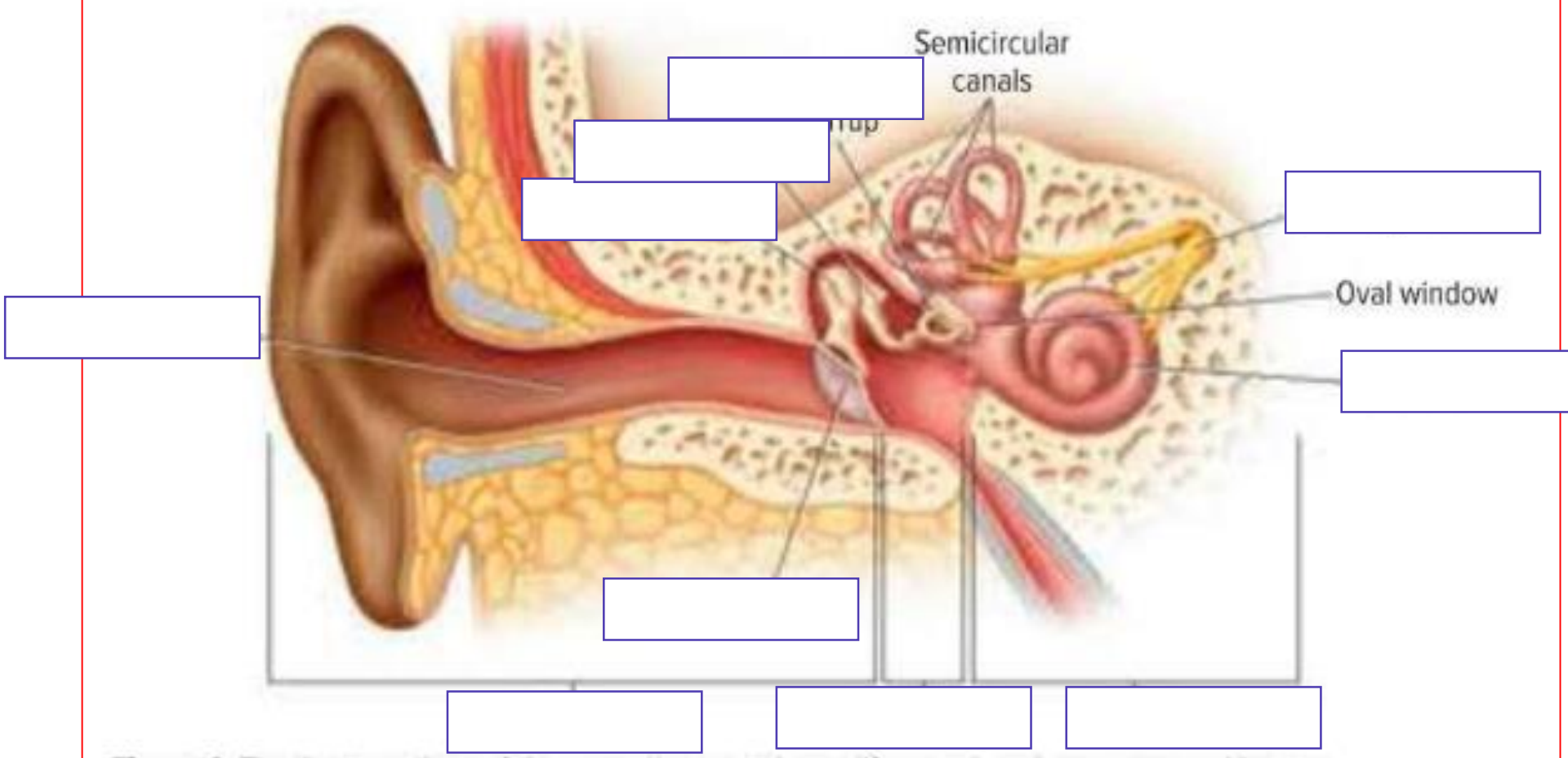


Figure 4 The three sections of the ear gather sound, amplify sound, and convert sound into an electric signal.

Identify *the three sections of the human ear.*

Ear canal
Outer ear
Middle ear
Inner ear
Cochlea
Auditory nerve
Stirrup
Anvil
Hammer

17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256

15. Which part of the ear is involved in amplifying sound?

A ear canal
B outer ear
C anvil
D auditory nerve

16. Which part of the ear gathers sound waves?

A middle ear
B auditory nerve
C outer ear
D inner ear

17. Hearing loss is usually the result of damage to which part?

A stirrup
B ear canal
C hair cells
D outer ear

2. Choose the correct word.

a. The *pinna* / *cochlea* captures the sound.

b. The cochlea sends the sound through the *ear canal* / *auditory nerve* to the brain.

c. The brain *interprets* / *vibrates* the information.

d. The sound travels through *the* *ear canal* / *pinna*.

e. The sound makes the *eardrum* / *small bones* vibrate.

f. The *ear canal* / *cochlea* captures the sound vibrations.

https://www.liveworksheets.com/worksheets/en/Natural_Science/Human_body/The_ear_px356272cr

17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256

Figure 2 A vacuum is a region where no matter is present. Outer space is not a perfect vacuum, but there is too little matter for sound waves to travel through outer space. Therefore, these astronauts must use radios to communicate with each other.
Explain *why the astronauts need radios in order to talk to each other.*

Sound in liquids and solids

If you have been underwater and heard garbled voices, you know that sound travels through water. If you have put your ear to your desk and heard sounds, you know that sound travels through solids. Sound waves travel through any type of matter—solid, liquid, or gas. The matter through which a wave travels is called the medium. A sound wave produces compressions and rarefactions in a medium as it travels through that medium.

What happens when there is no matter through which sound can travel? Could sound be transmitted without matter to compress, expand, and collide? In order for astronauts, such as the ones in **Figure 2,** to talk to each other, they must use electronic communication equipment because there is no atmosphere to transmit sound waves. Sound waves cannot travel through the vacuum of outer space.

The speed of sound

The speed of a sound wave through a medium depends on that medium's composition and whether that medium is solid, liquid, or gas. **Table 1** shows the speed of sound through some common mediums. The temperature, density, and elasticity of the medium also affect the speed of sound.

Temperature and sound speed The speed of sound through a fluid depends on the temperature of that fluid. This relationship is particularly pronounced for gases but also exists for liquids, such as water. As the temperature of a fluid increases, the particles that make up that fluid move faster. This makes them more likely to collide with each other. If the particles that make up a medium collide more often, more energy can be transferred in a shorter amount of time. As a result, the sound waves travel faster.

Table 1 Speed of Sound in Different Mediums

Medium	Speed of Sound (m/s)
Air (0°C)	330
Air (20°C)	340
Cork	500
Water (0°C)	1400
Water (20°C)	1500
Copper	3600
Bone	4000
Steel	5800

The inner ear

When the membrane in the oval window vibrates, the sound vibrations are transmitted into the inner ear. The inner ear contains the cochlea (KOH klee uh). The **cochlea** is a spiral-shaped structure that is filled with liquid and contains tiny hair cells. These hair cells are shown in **Figure 5.** When the hair cells in the cochlea begin to vibrate, nerve impulses are sent through the auditory nerve and to the brain. It is the cochlea that converts sound waves to nerve impulses.

Hearing loss When a person's hearing is damaged, it is usually because the tiny hair cells in the cochlea are damaged or destroyed, often by loud sounds. This damage is permanent. The hair cells in the cochlea of humans and other mammals do not grow back when damaged or destroyed.

However, current research suggests that doctors may be able to repair damaged or even destroyed hair cells in the future. Much of this research centers on birds. Unlike in mammals, the hair cells in birds do grow back when damaged or destroyed.

Figure 5 Hair cells in the human ear send nerve impulses to the brain when sound waves cause them to vibrate. In this photo, the hair cells are magnified 5500 times.

23) The main problem that occurs when humans are exposed to too much noise pollution is that the noise __.

- ○ **A)** interferes with conversations
- ● **B)** damages the inner ear
- ○ **C)** vibrates the internal organs
- ○ **D)** resonates inside the body

17	Assign the parts of human ear and their function, Calculate speed (m/s) (distance/time) of sound waves and use it to compare different mediums (materials)	Textbook physical,table1, Fig.4	253, 255, 256

The speed of sound

Temperature and sound speed	Density and sound speed	Elasticity and sound speed
As the temperature of fluid increases the particles move faster, collide more, more energy can be transferred in short time. Sound moves faster.	Solid and liquid Particles are closer together than gas. Sound travels fastest in solids and slowest in gases.	Elasticity is the tendency of an object to rebound to its original state when it deformed. Also rebound more quickly when sound wave travel through them Sound travel more quickly in elastic object.
Gas and liquid	Solid and liquid	Solid more elastic

In which medium would sound travel the fastest, water at 10°C or water at 25°C? Why?

18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9

Biotic factors

The living factors in an organism's environment are called the **biotic** (by AH tihk) **factors.** Consider the biotic factors in the stream community shown in **Figure 5.** These biotic factors include all of the organisms that live in the water, such as fish, algae, frogs, and microscopic organisms. In addition, organisms that live on the land adjacent to the water are biotic factors for the deer. Additionally, migratory animals, such as birds that pass through the area, are biotic factors.

The interactions among organisms are necessary for the health of all species in the same geographic location. For example, the deer need other members of its species to reproduce. Deer also depend on other organisms for food and, in turn, are a food source for other organisms.

Abiotic factors

The nonliving factors in an organism's environment are called **abiotic** (ay bi AH tihk) **factors.** The abiotic factors for different organisms vary across the biosphere, but organisms that live in the same geographic area might share the same abiotic factors. These factors might include temperature, air or water currents, sunlight, soil type, rainfall, or available nutrients.

Organisms depend on abiotic factors for survival. For example, the abiotic factors important to a particular plant might be the amount of rainfall, the amount of sunlight, the type of soil, the range of temperature, and the nutrients available in the soil. The abiotic factors for the deer in **Figure 5** include the air temperature, the minerals present in the rocks, and the hours of sunlight per day.

Organisms are adapted to surviving in the abiotic factors that are present in their natural environments. If an organism moves to another location with a different set of abiotic factors, the organism might die if it cannot adjust quickly to its new surroundings. For example, if a lush green plant that normally grows in a swampy area is transplanted to a dry desert, the plant likely will die because it cannot adjust to abiotic factors present in the desert.

Get It?
Compare and contrast abiotic and biotic factors shown in the photo at the beginning of this module.

Figure 5 The deer standing on this rock is a biotic factor in this stream community. Other organisms in the water, such as frogs and algae, also are biotic factors.

Explain *how organisms are dependent on other organisms.*

All populations grow exponentially until some limiting factor slows the population's growth.

- O True
- O False

The abiotic components of an ecosystem consist of:

1. Plants and Animals
2. Algae and Fungi
3. Producers, Consumers and Decomposers
4. Air, Water, Soil

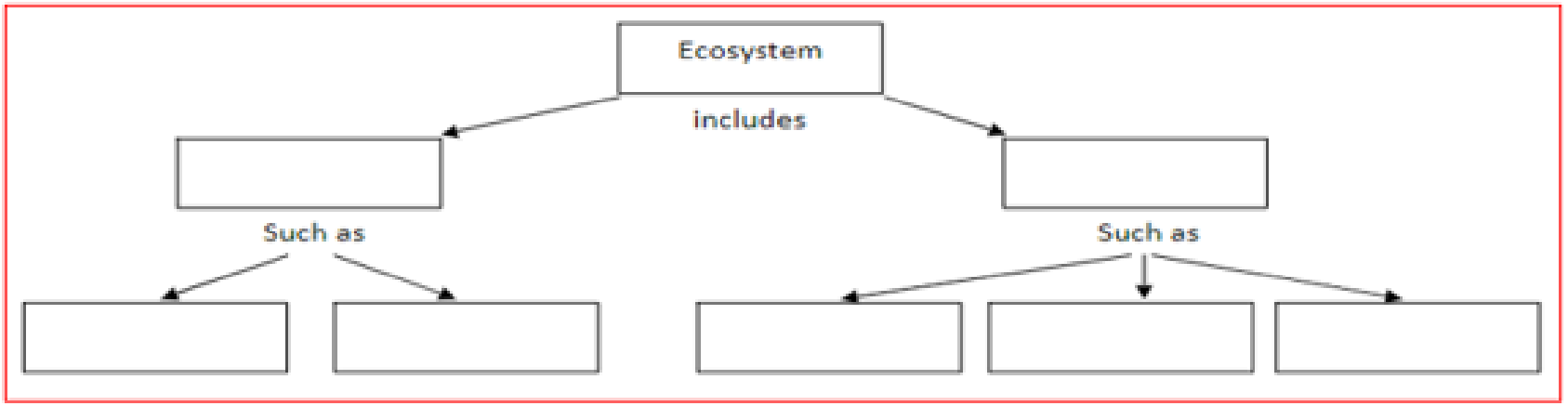
Which is a biotic factor that affects the size of a population in a specific ecosystem?

a. average temperature
b. type of soil
c. number and kinds of predators
d. concentration of oxygen

18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9

The factors in all environments can be divided into two groups—living factors and nonliving factors.

1. **Biotic factors** are the living factors in an organism's environment. For example, the algae, frogs, and microscopic organisms
2. **abiotic factors** the nonliving factors in an organism's environment. For example, for the salmon might be the temperature range of the water, the pH of the water, and the salt concentration of the water. For a plant, might include the amount of rainfall, the amount of sunlight, the type of soil, the range of air and soil temperatures, and the nutrients available in the soil.



18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9

Limiting factors

Any abiotic factor or biotic factor that restricts the numbers, reproduction, or distribution of organisms is called a **limiting factor.** Abiotic limiting factors include sunlight, climate, temperature, water, nutrients, fire, soil chemistry, and space. Biotic limiting factors include living things, such as other plant and animal species. Factors that restrict the growth of one population might enable another to thrive. In a desert oasis, water is a limiting factor for all the organisms. Temperature might also be a limiting factor. Desert species must be able to withstand extreme temperatures.

Range of tolerance

For any environmental factor, an upper limit and lower limit define the conditions in which an organism can survive. For example, steelhead trout live in cool, coastal rivers and streams from California to Alaska. The ideal range of water temperature for steelhead trout is between 13°C and 21°C, as illustrated in **Figure 6**. However, steelhead trout can survive water temperatures from 9°C to 25°C. At these temperatures, steelhead trout experience physiological stress, such as inability to grow or reproduce. They will die if the water temperature goes beyond the upper or lower limits.

The ability of any organism to survive when subjected to abiotic factors or biotic factors is called **tolerance.** Consider **Figure 6** again. Steelhead trout tolerate a specific range of temperatures. That is, the range of tolerance of water temperature for steelhead is 9°C to 25°C. Notice that the greatest number of steelhead live in the optimum range in which the temperature is best for survival. Between the optimum range and the tolerance limits lies the zone of physiological stress. At these temperatures, there are fewer fish. Beyond the upper tolerance limit of 25°C and the lower tolerance limit of 9°C, there are no steelhead trout. Therefore, water temperature is a limiting factor for steelhead when water temperature is outside the range of tolerance.

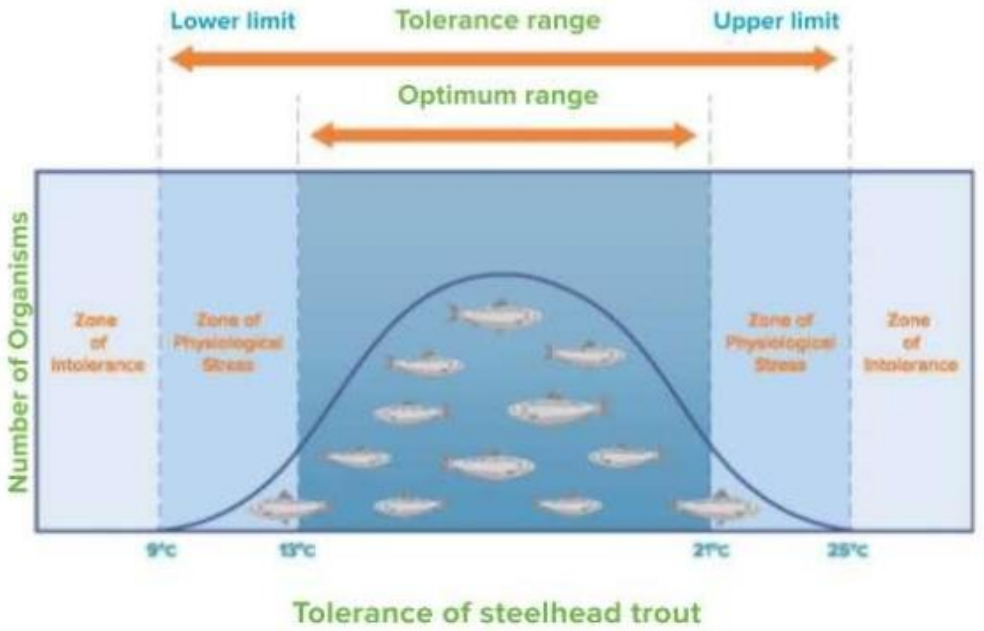


Figure 6 Steelhead trout are limited by the temperature of the water in which they live.
Infer *which other abiotic factors might limit the survival of steelhead trout.*

What is NOT an example of limiting factors?

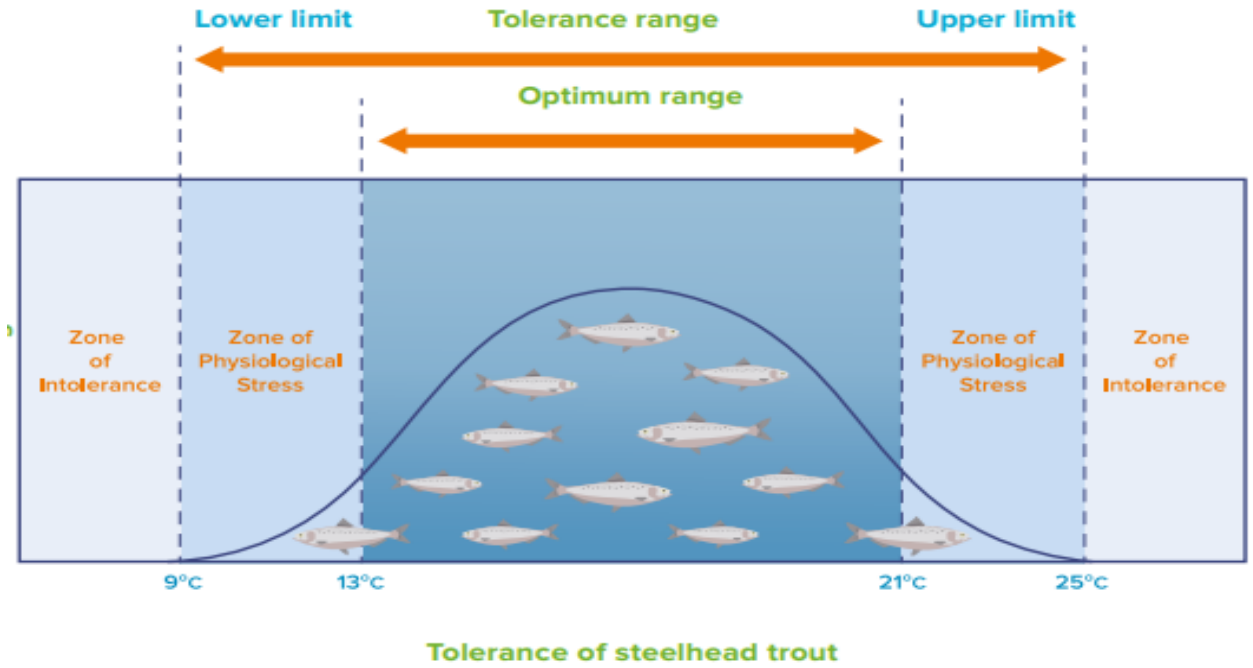
- Predation
- Food Source
- Space
- Migration ✓

Which term describes the range of values an organisms can tolerate or withstand in an ecosystem?

- range of tolerance ✓
- optimum zone
- zone of physiological stress
- zone of intolerance

18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9

Study the graph. Hypothesize the possible behaviors of a school of steelhead trout in water with a temperature of 10°C.



The limiting factor in this case is water temperature.
Trout can tolerate water temperatures between 9˚C and 25˚C.
Most trout live in the optimum zone, which is the temperature range that is best for trout survival.

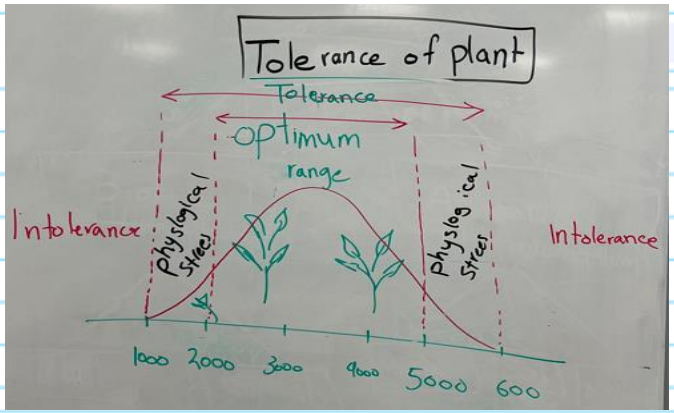
zone of physiological stress lies between the optimum zone and the tolerance limits(9-13)(21-25).

In 10 C Fewer trout live in this zone. Trout that do live in this zone experience physiological stress, such as the inability to grow.

18	Compare and contrast between abiotic and biotic factors; (definitions and examples), and define limiting factor, tolerance range and optimum range	Textbook Biology, Fig. 5 & 6	8, 9

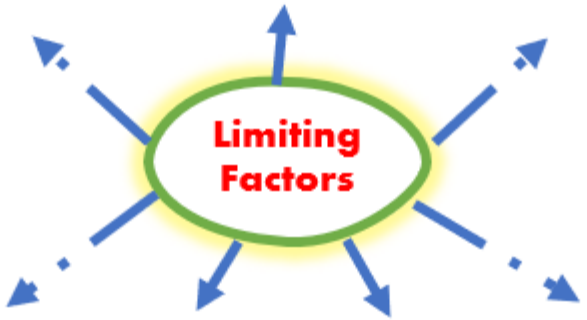
Create a tolerance graph similar to the Tolerance of Steelhead Trout figure in your book. Title your graph *Tolerance of Plant A*. Label the zones. Then label the limits of each zone according to the facts about Plant A listed below.

- can live at an elevation between 1,000 and 2,000 m
- can live at an elevation between 5,000 and 6,000 m
- cannot live above 6,000 m
- grows best between 2,000 and 5,000 m
- cannot live below 1,000 m

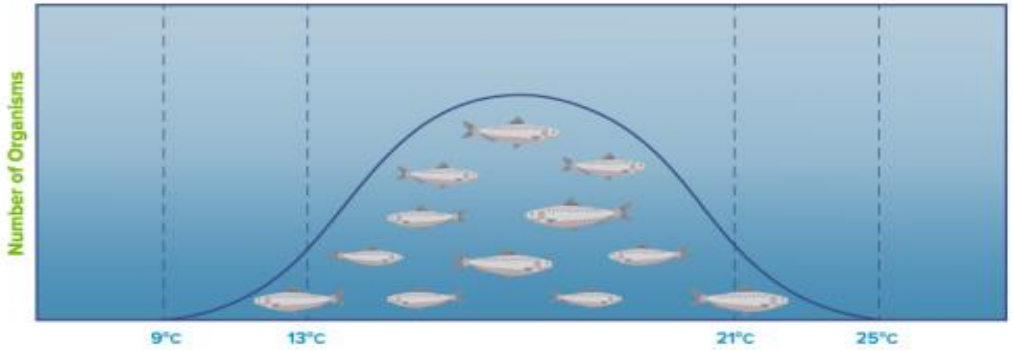


What factors Limit populations in communities?

A limiting factor is any abiotic or biotic factor that restricts the numbers, reproduction, or distribution of organisms.



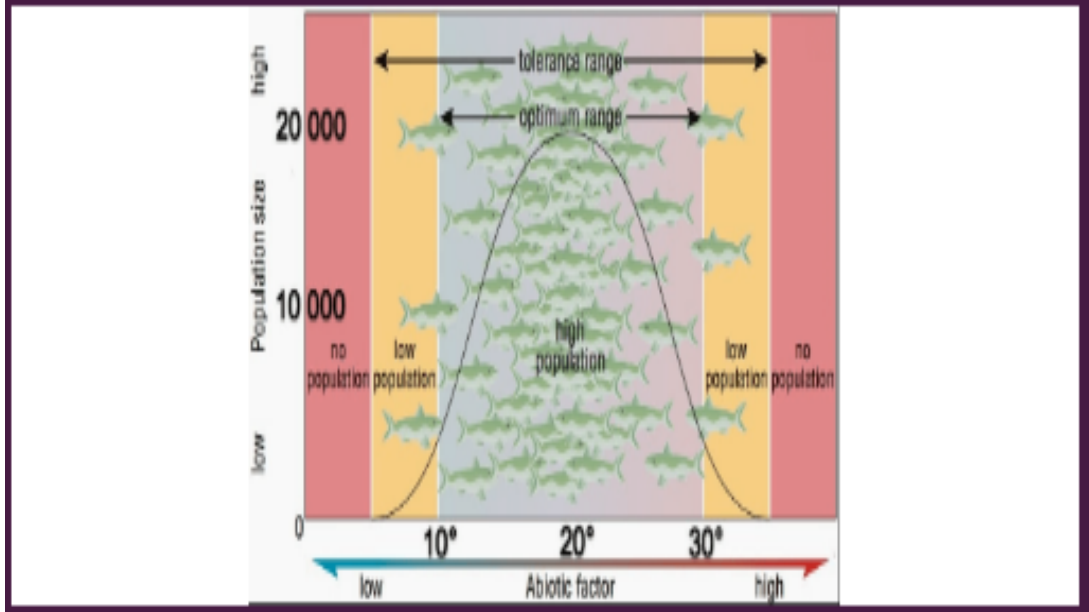
1)



Tolerance of Steelhead Trout

What does portion of the graph from 13°C to 21°C represent?

- ○ **A)** zone of physiological stress
- ○ **B)** zone of intolerance
- ○ **C)** upper limit
- ● **D)** optimum range



What is the limiting factor shown in this graph?

temperature

abiotic

population size

# of fish

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

The water cycle

Water moves through the biosphere through the water cycle, shown in **Figure 18.**

EARTH SCIENCE Connection Energy from the Sun causes water to constantly evaporate from the Earth's surface. Water enters the atmosphere in a form called water vapor. Approximately 90 percent of water vapor evaporates from oceans, lakes, and rivers; about 10 percent evaporates from the surfaces of plants through a process called transpiration. Clouds form when water vapor rises, cools, and condenses into droplets around dust particles in the atmosphere. Water falls from clouds to the Earth's surface as precipitation in forms such as rain or snow. Some surface water percolates, or moves through, the soil, and enters groundwater. Other water flows over the Earth's surface as runoff, and enters streams, rivers, lakes, and oceans. The cycle then continues.

Get It?

Identify three processes in the water cycle.

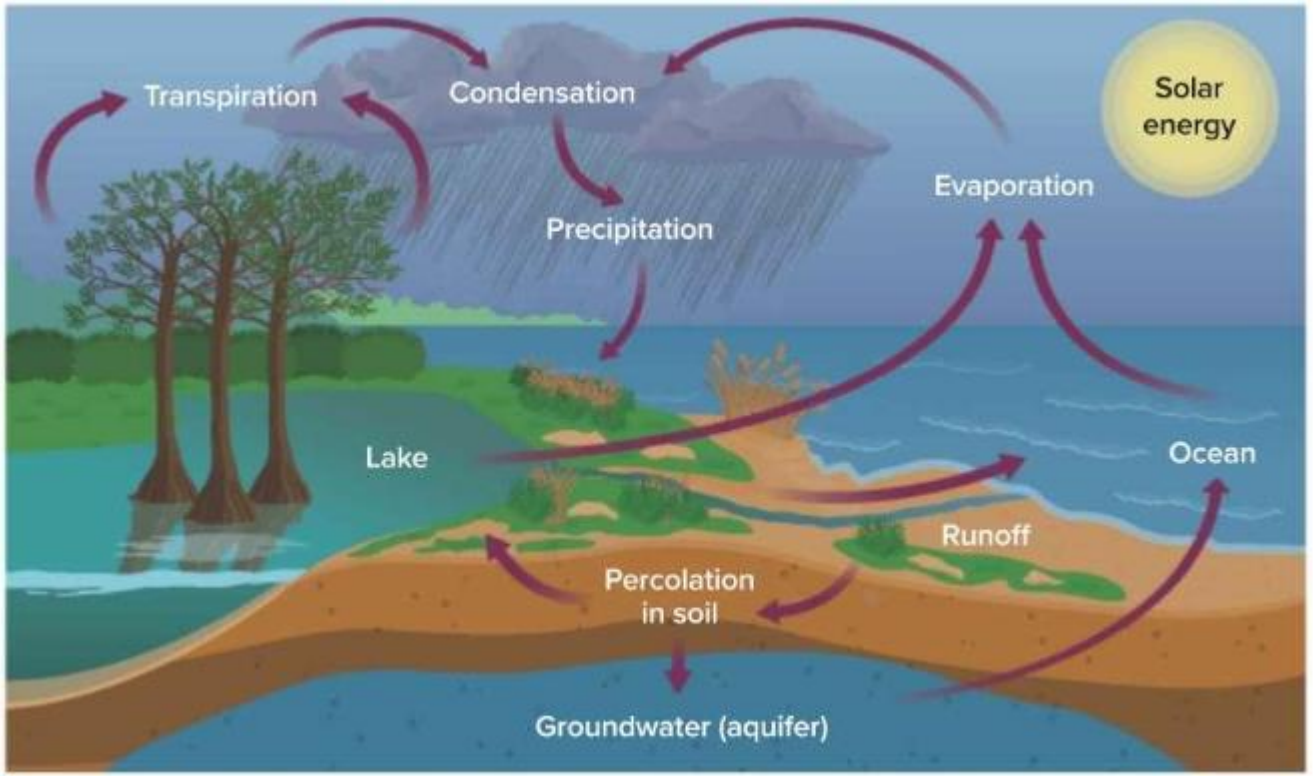


Figure 18 The water cycle is the process by which water is continuously cycled through the biosphere.

5 Which process in the water cycle returns water to Earth's surface?

A evaporation
B precipitation
C runoff
D transpiration

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

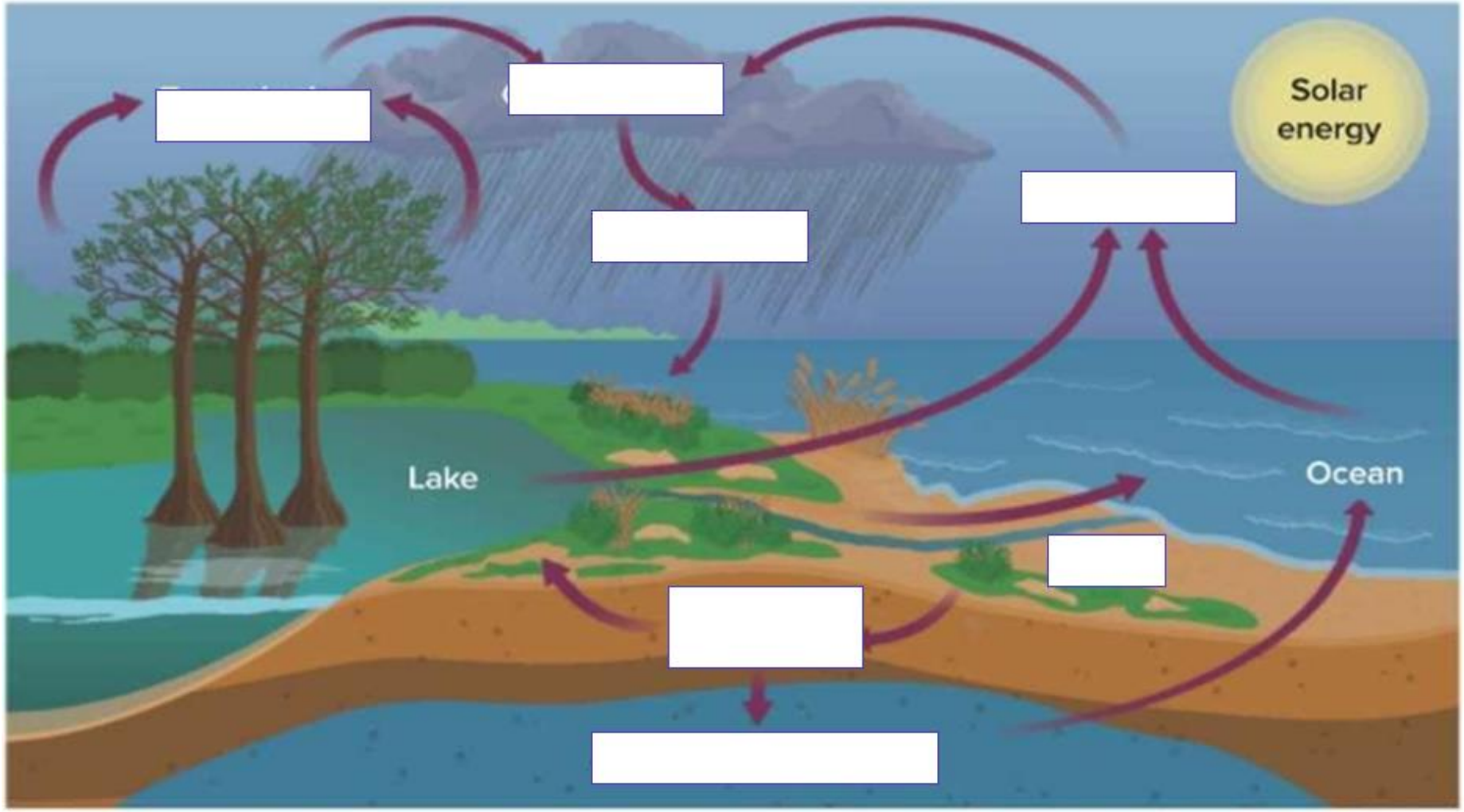


Figure 18 The water cycle is the process by which water is continuously cycled through the biosphere.

Assign on the diagram the following?

1. Transpiration
2. Condensation
3. Precipitation
4. Runoff
5. Percolation
6. Groundwater

Which of the following is NOT a process in the water cycle?

A precipitation

B evaporation

C condensation

runoff

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

The carbon and oxygen cycles

Carbon and oxygen often combine to form molecules essential for life, including carbon dioxide and simple sugars. The cycles of these two elements are shown in **Figure 19**.

Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, and biological processes. During photosynthesis, plants and algae convert carbon dioxide and water into carbohydrates and release oxygen back into the air. Living organisms consume oxygen and release carbon dioxide during cellular respiration. Carbon dioxide also enters the atmosphere as dead organisms decay, and carbon enters the soil through the decomposition of plant and animal matter and animal waste.

Carbon enters a long-term cycle when organic matter is buried underground and converted to fossil fuels such as coal, oil, or gas. Carbon dioxide returns to the atmosphere those fossil fuels combust (burn).

Carbon and oxygen enter long-term cycles when they combine with calcium to create calcium carbonate. When the shells of some sea creatures fall to the ocean floor, they form vast deposits of calcium carbonate in limestone rock, such as those found in the white cliffs pictured in **Figure 20**. Carbon and oxygen remain in these deposits until weathering and erosion release them from the rocks.

Figure 20 The white cliffs in Dover, England, are composed almost entirely of calcium carbonate, or chalk. The carbon and oxygen found in these cliffs are in the long-term part of the cycle for carbon and oxygen.

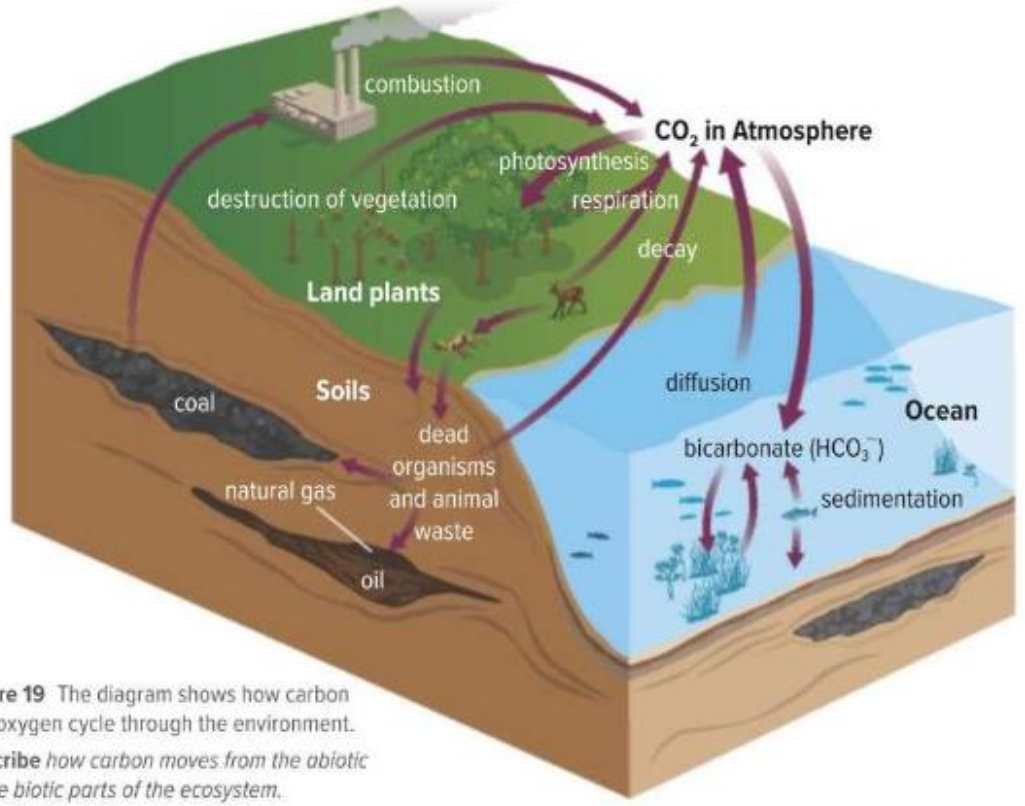


Figure 19 The diagram shows how carbon and oxygen cycle through the environment.

Describe *how carbon moves from the abiotic to the biotic parts of the ecosystem.*

Which of the following is a product of the photosynthesis process? أي من مما يلي يعد من نواتج عملية البناء الضوئي؟

a. Oxygen الأكسجين
b. Carbon dioxide ثاني أكسيد الكربون
c. Nitrogen النتروجين
d. Water vapor بخار الماء

7 **During the carbon cycle, in what form are carbon atoms generally returned to the atmosphere?**

A simple sugars
B carbon monoxide
C methane
carbon dioxide

15 **In an ecosystem, what happens to the atoms of certain chemical elements, such as carbon, oxygen, and nitrogen?**

They move into and out of living systems.
B They are only found in abiotic factors.
C They move out of living systems and do not return.
D They move into living systems and remain there.

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

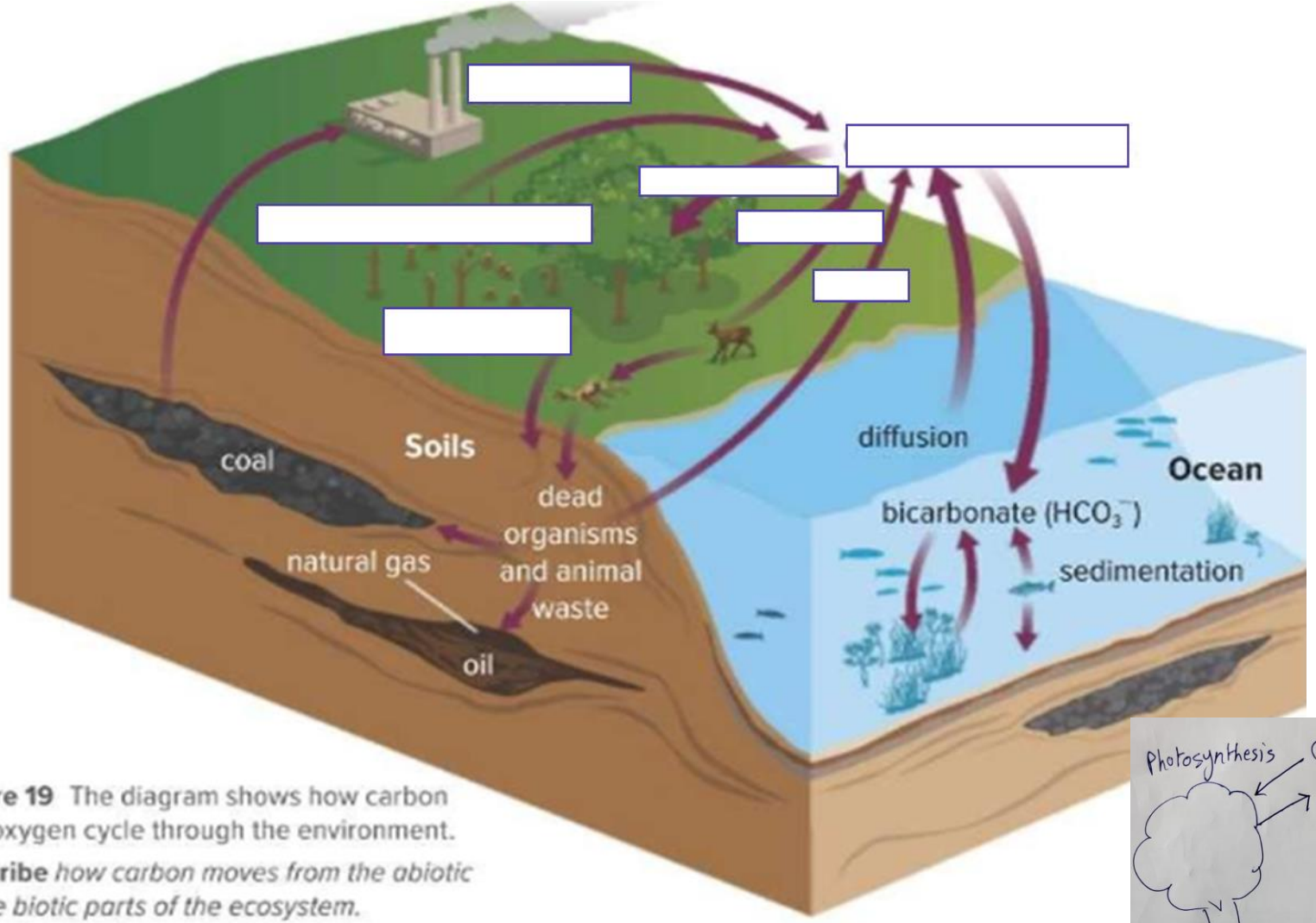
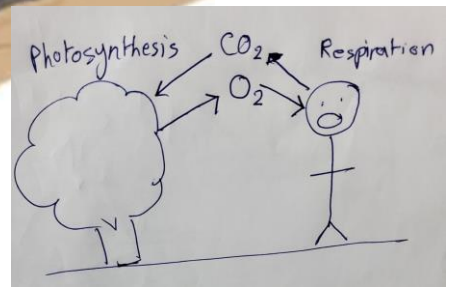


Figure 19 The diagram shows how carbon and oxygen cycle through the environment.

Describe *how carbon moves from the abiotic to the biotic parts of the ecosystem.*

Assign on the diagram the following?

1. destruction of vegetation
2. Photosynthesis
3. Combustion
4. CO2 in Atmosphere
5. Respiration
6. Decay
7. Land plants



Which process locks carbon and oxygen in long-term cycles?

A. when they combine to form calcium carbonate

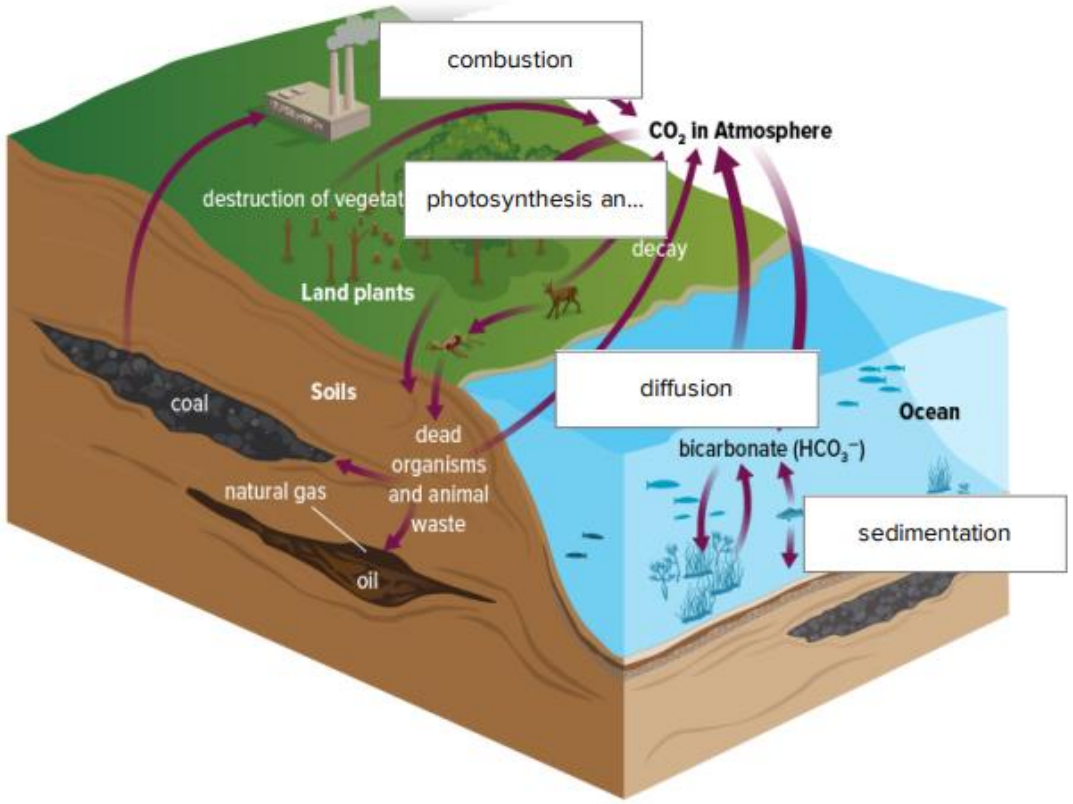
B. during photosynthesis

C. when animals and plants eliminate wastes

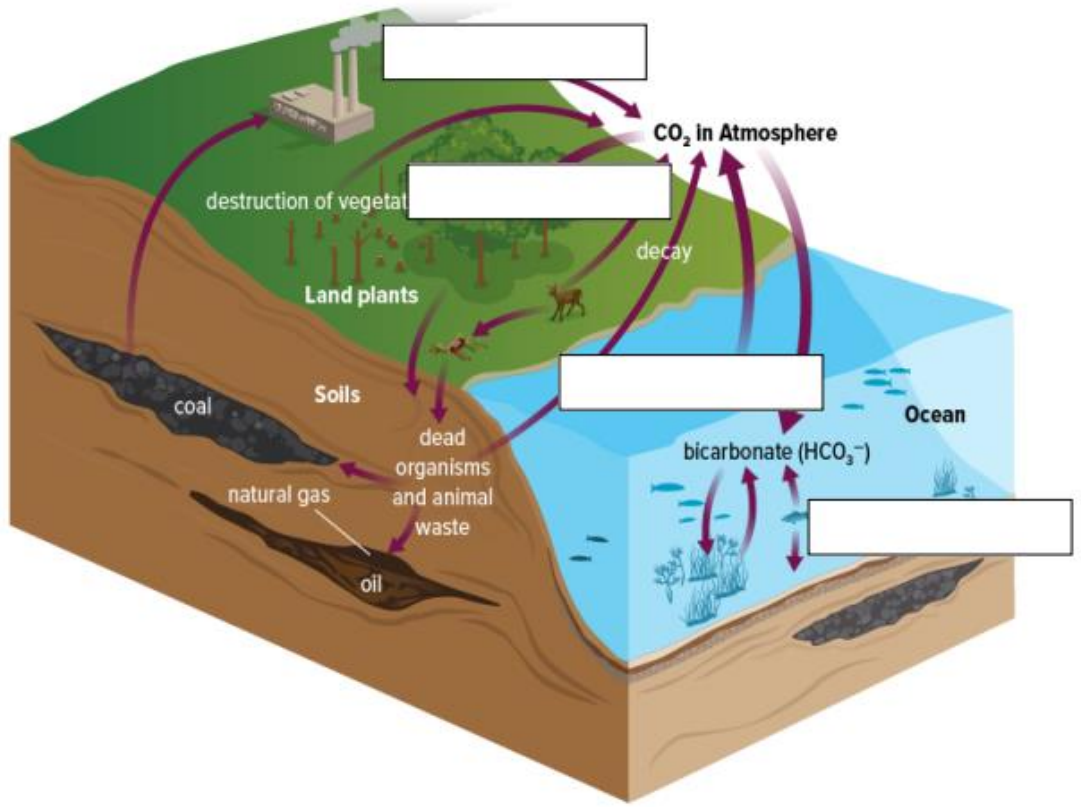
D. during cellular respiration

Assign on a diagram the oxygen-and carbon long-term and short-term processes.

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23



8) Label the image of the carbon and oxygen cycle.



A) photosynthesis and respiration

B) combustion

C) diffusion

D) sedimentation

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

Which of the following is a product of the photosynthesis process?

أي من مما يلي يعد من نواتج عملية البناء الضوئي؟

a. Oxygen الأكسجين

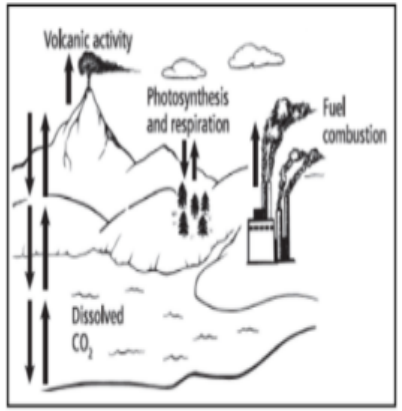
b. Carbon dioxide ثاني أكسيد الكربون

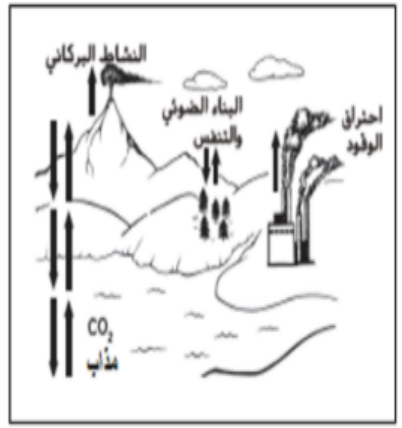
c. Nitrogen النتروجين

d. Water vapor بخار الماء

Which part of the diagram below relates to carbon leaving a long-term cycle?

أي من أجزاء الرسم التالي يرتبط بإطلاق الكربون من دورة طويلة المدى؟





a. Dissolved CO2 ثاني أكسيد الكربون (CO_2) المذاب

b. Fuel combustion احتراق الوقود

c. Volcanic activity النشاط البركاني

d. Photosynthesis and respiration البناء الضوئي والتنفس

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

The nitrogen cycle

Most of the Earth's nitrogen is found in the atmosphere. Before it can be used by plants and animals, this nitrogen must undergo **nitrogen fixation**. In fixation, nitrogen gas, N_2, is converted to ammonium, NH_4^+. Specialized bacteria and other microorganisms perform nitrogen fixation. The nitrogen cycle is shown in **Figure 21**. After fixation, the next step in the cycle is nitrification. Nitrification is the chemical process that turns ammonium, NH_4^+, into nitrogen-oxygen compounds, NO_2^- and NO_3^-. Plants use these compounds to make proteins. Nitrogen-oxygen compounds may also be created by the energy from lightning.

Nitrogen moves through the food web as organisms consume plants and each other. It returns to the soil through animal wastes and by the decomposition of dead matter into ammonia. Organisms in the soil convert ammonia into nitrogen compounds that can be used by plants. In a process called **denitrification**, some soil bacteria convert NO_2^- and NO_3^- back into nitrogen gas (N_2), which returns to the atmosphere. Human activities also play a role in the nitrogen cycle. The high nitrogen content in runoff from fertilizer can create algae overgrowth, call algae blooms. Nitrogen-oxygen compounds released into the atmosphere from factories combine with water to form acid rain.

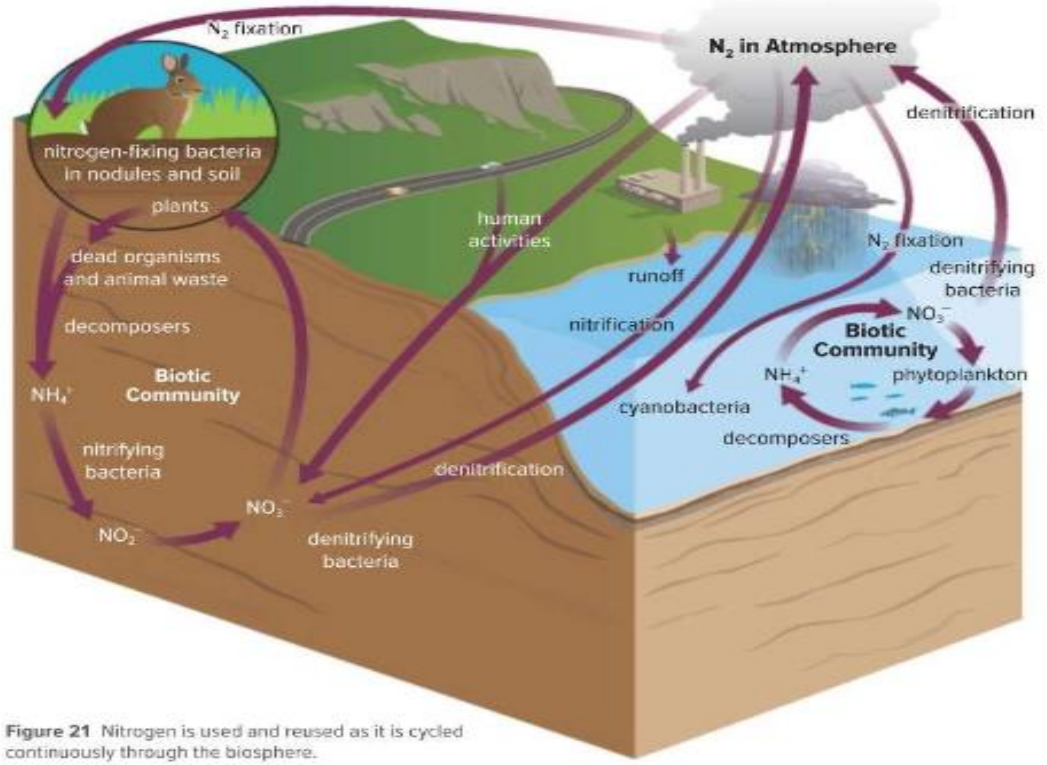


Figure 21 Nitrogen is used and reused as it is cycled continuously through the biosphere.

8 **Which is not a pathway by which plants obtain nitrogen in a usable form?**

A chemical fertilizers
B lightning
photosynthesis
D symbiotic bacteria

11 **In the nitrogen cycle, nitrogen is continuously recycled. Which types of organisms break down nitrogen compounds in dead organisms and recycle them into the soil?**

A autotrophs
bacteria
C green plants
D herbivores

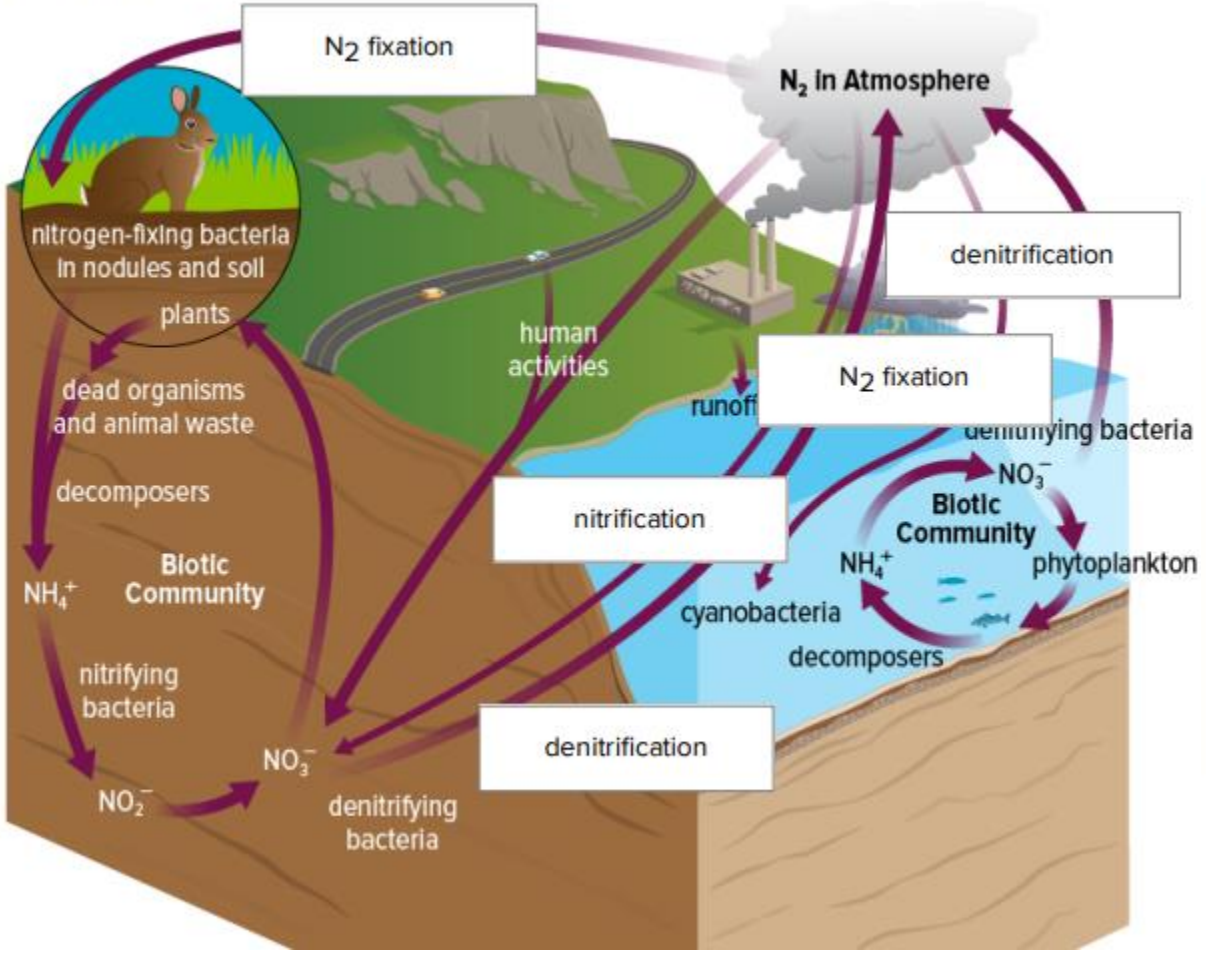
What is the name of the process in which bacteria and lightning convert Nitrogen into compounds that are useful to plants?

ما اسم العملية التي تحوّل فيها البكتيريا والبرق النيتروجين إلى مركبات مفيدة للنباتات؟

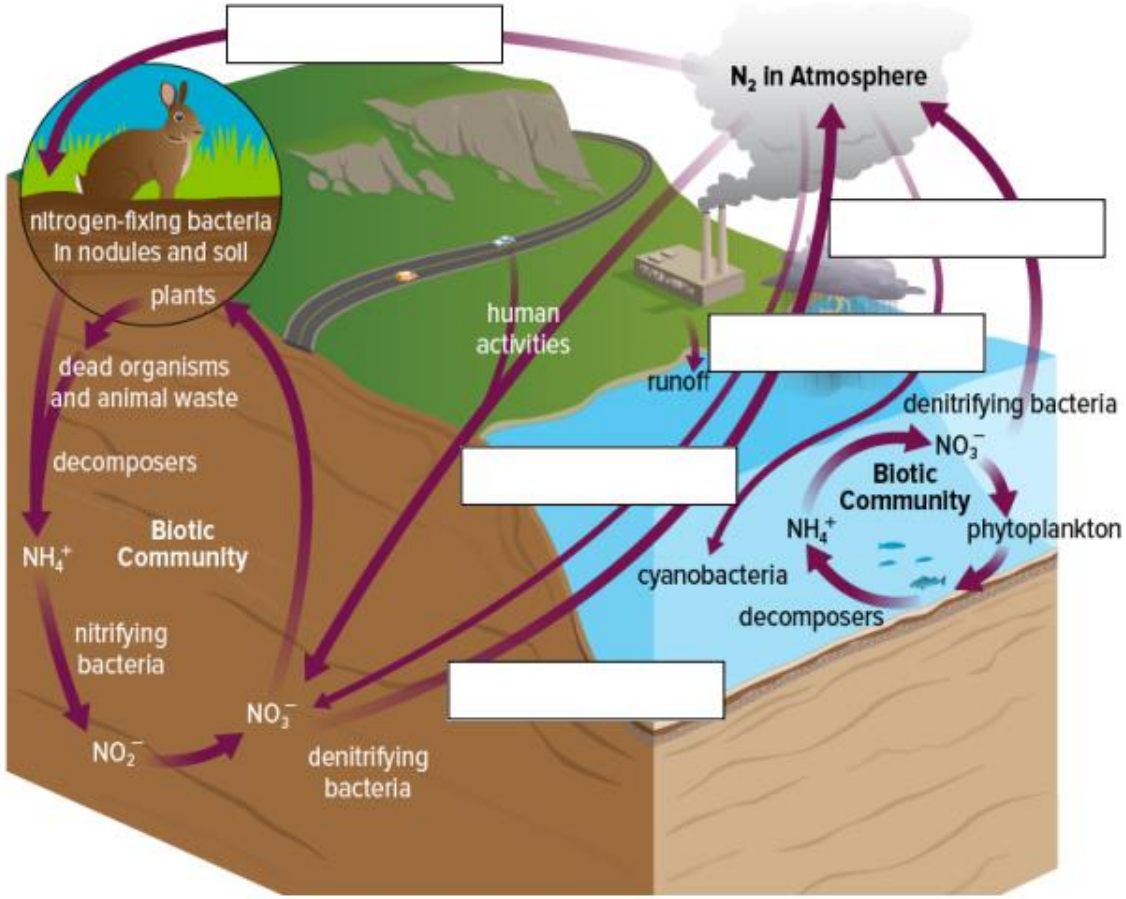
a. denitrification إزالة النيتروجين
b. nitrate cycling تدوير النيترات
c. ammonification إنتاج الأمونيا
d. nitrogen fixation تثبيت النيتروجين

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

Correct Answer



9) Label the processes in the nitrogen cycle.



A) N_2 fixation

B) N_2 fixation

C) denitrification

D) denitrification

E) nitrification

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

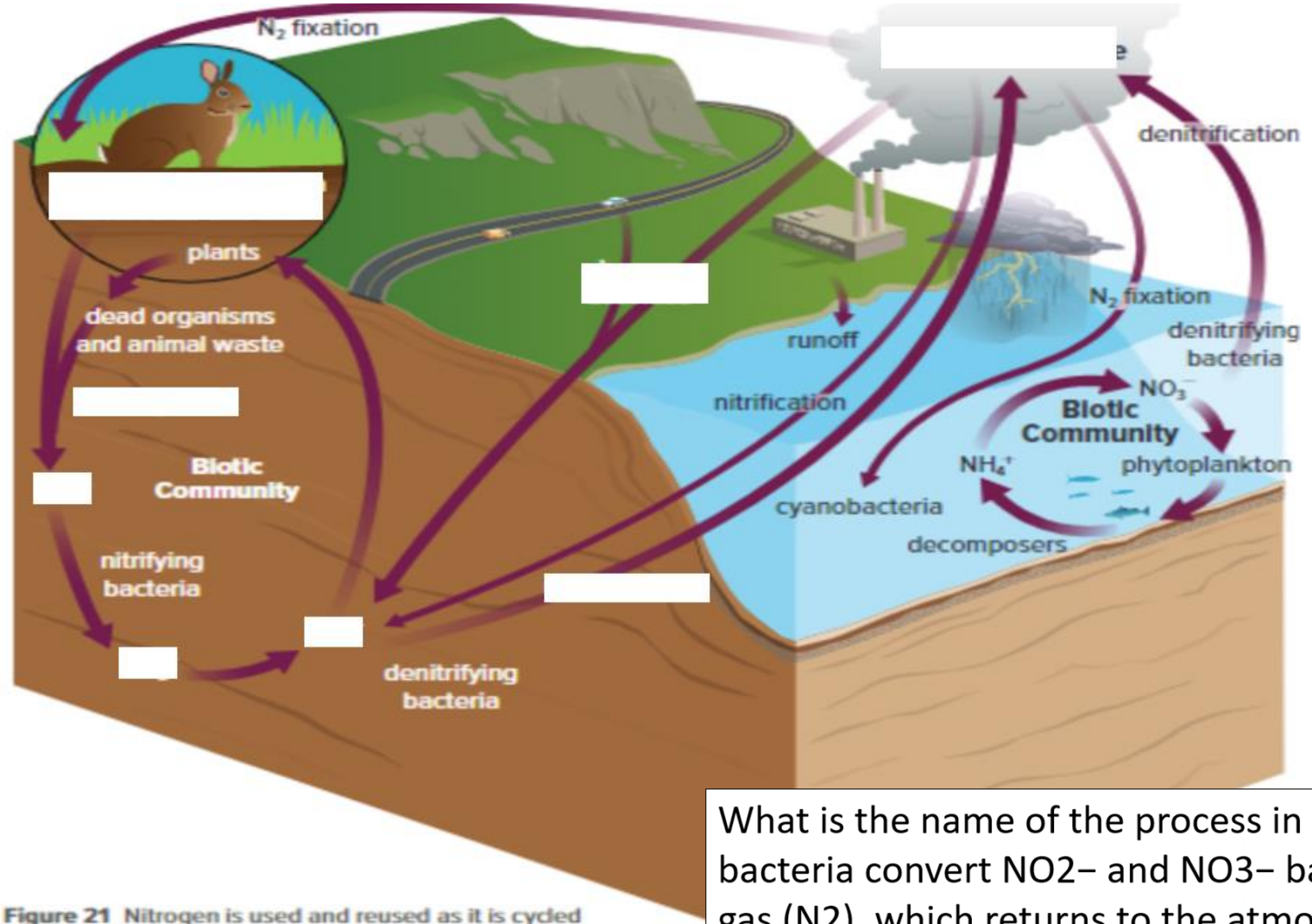


Figure 21 Nitrogen is used and reused as it is cycled continuously through the biosphere.

Assign on the diagram the following?

1. Human activities
2. Decomposers
3. N2 in Atmosphere
4. Denitrification
5. nitrogen-fixing bacteria in nodules and soil
6. NH4+ 7. NO2− 8. NO3−

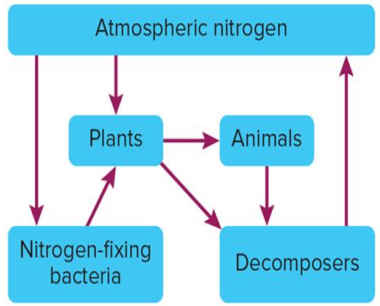
Where is the largest concentration of nitrogen found?

A animals

C bacteria

atmosphere

D plants



What is the name of the process in which some soil bacteria convert NO2− and NO3− back into nitrogen gas (N2), which returns to the atmosphere.?

A ammonification

C nitrate cycling

denitrification

D nitrogen fixation

What is the name of the process in which bacteria and lightning convert nitrogen into compounds that are useful to plants?

A ammonification

B denitrification

C nitrate cycling

nitrogen fixation

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

What is the name of the process in which bacteria and lightning convert Nitrogen into compounds that are useful to plants?

ما اسم العملية التي تحوّل فيها البكتيريا والبرق النيتروجين إلى مركبات مفيدة للنباتات؟

a. denitrification إزالة النيتروجين

b. nitrate cycling تدوير النيترات

c. ammonification إنتاج الأمونيا

d. nitrogen fixation تثبيت النيتروجين

The process of changing nitrates to nitrogen Gas is called:

عملية تحويل النترات الي نيتروجين تسمى:

a. Denitrification إزالة النيتروجين

b. Nitrogen fixation تثبيت النيتروجين

c. Ammonification تكوين الامونيا

d. Nitrogen cycle دورة النيتروجين

19	**Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)**	**Textbook Biology, Fig.18, 19, 21, 22**	**20, 21, 22, 23**

The phosphorous cycle

Phosphorus is an element that is essential for the growth and development of organisms. **Figure 22** shows both the short-term and long-term phases of the phosphorus cycle. In the short-term cycle, phosphorus in phosphates in solution are cycled from the soil to producers and then from the producers to consumers. When organisms die or produce waste products, decomposers return the phosphorus to the soil where it can be used again.

Phosphorus moves from the short-term cycle to the long-term cycle through precipitation and sedimentation to form rocks. Phosphorus that settles into sediment in aqueous environments is transferred to the land by geological changes and uplift. Phosphorus that undergoes sedimentation does not become available to land organisms again until weathering or erosion of rocks that contain phosphorus slowly adds phosphorus to the soil.

Human activities, such as phosphate mining, sewage treatment, and fertilizer production, increase the amount of phosphate cycling through the environment. Too much phosphate can result in algae overgrowth, called algae blooms, like that shown in **Figure 23**, and upset the balance of an ecosystem. Algae blooms can occur in freshwater or marine ecosystems.

Figure 23 Increased amounts of nitrogen and phosphorus that enter the environment from mining, sewage, or fertilizers can cause algae overgrowth like that seen in this pond.

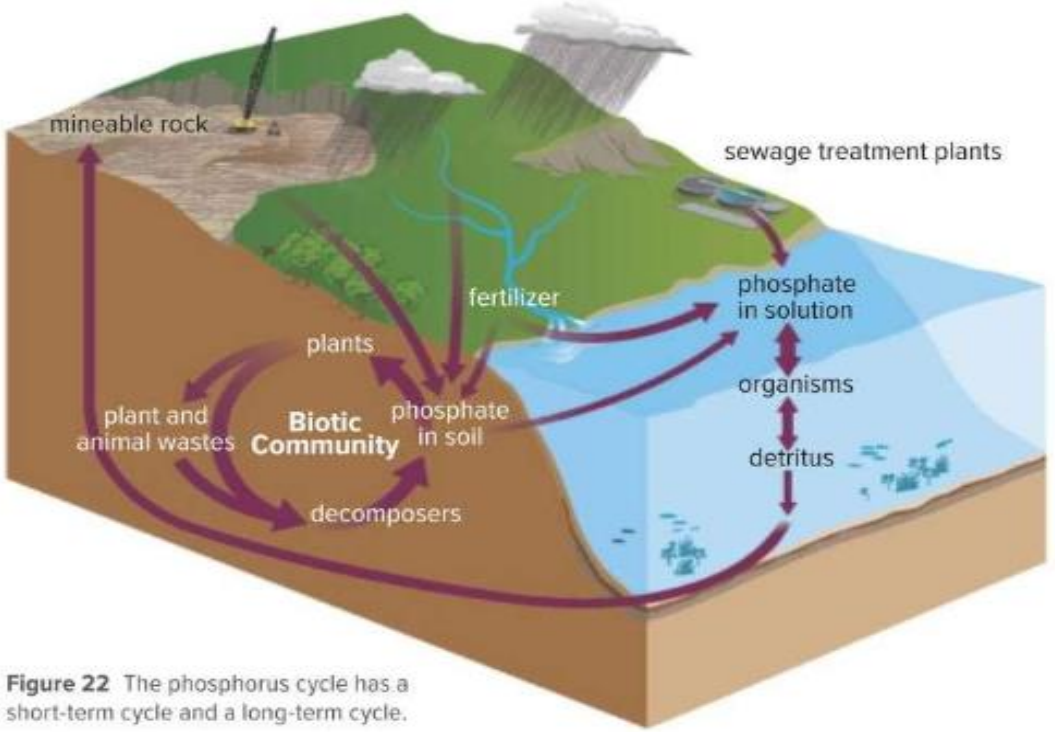


Figure 22 The phosphorus cycle has a short-term cycle and a long-term cycle.

Which process locks phosphorus in a long–term cycle?

ما العملية التي تحبس الفوسفور في دورة طويلة المدى؟

a. تعرية الجبال بالأمطار
Rain eroding mountains

b. طرح الحيوانات والنباتات لفضلاتها
Animals and plants eliminating wastes

c. انتقال الفوسفات إلى التربة
Phosphates released into the soil

d. طمر المواد العضوية في قاع المحيطات
Organic materials buried at the bottom of oceans

19	Assign on a diagram the processes that occur in a biogeochemical cycle (water, oxygen and carbon, nitrogen, and phosphorous)	Textbook Biology, Fig.18, 19, 21, 22	20, 21, 22, 23

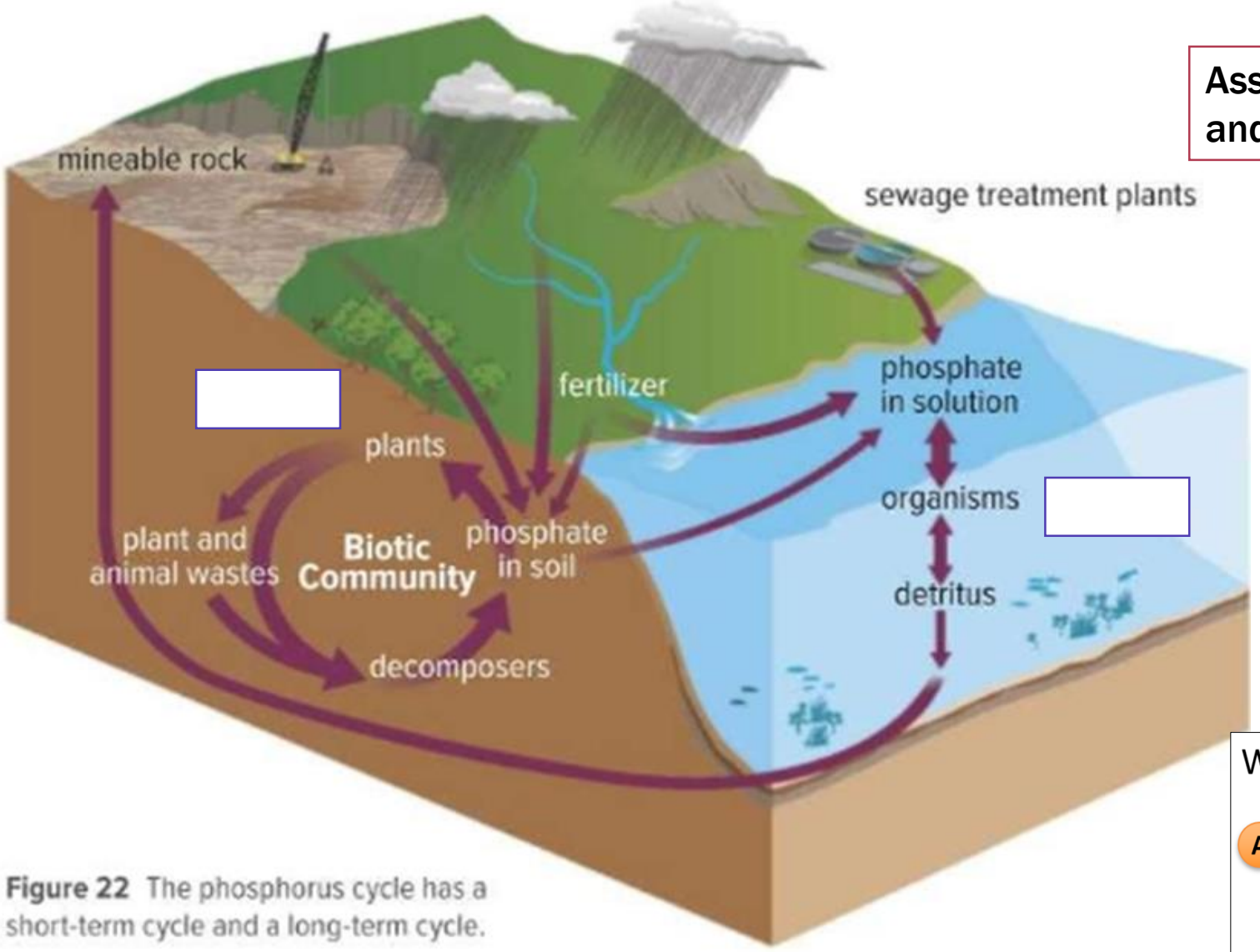


Figure 22 The phosphorus cycle has a short-term cycle and a long-term cycle.

Assign on the diagram the phosphorus long-term and short-term processes.

1. Fertilizer, precipitation and lighting.
2. Phosphate in soil
3. Plants
4. plant and animal wastes
5. Decomposers

1. sewage treatment plants, Fertilizer, precipitation.
2. Phosphate in solution
3. organisms
4. Detritus
5. mineable rock

Which process locks phosphorus in a long-term cycle?

A organic materials buried at the bottom of oceans

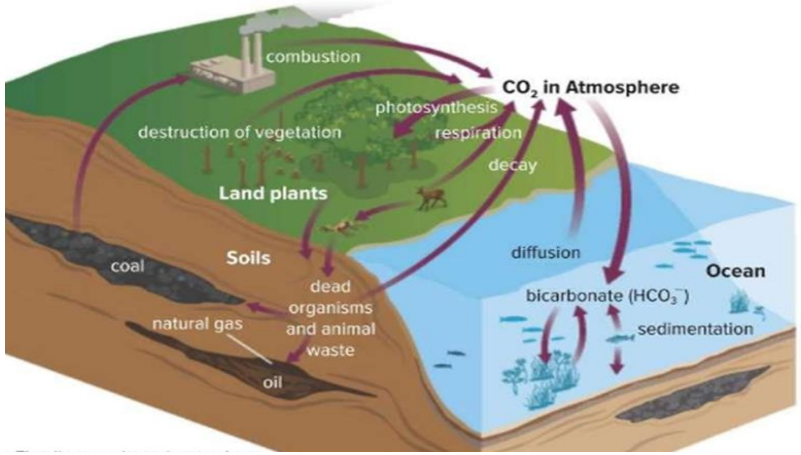
C animals and plants eliminating wastes

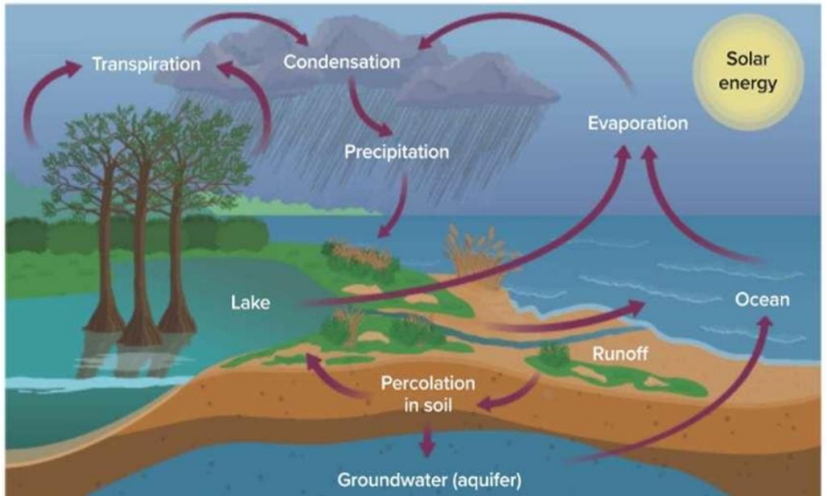
B phosphates released into the soil

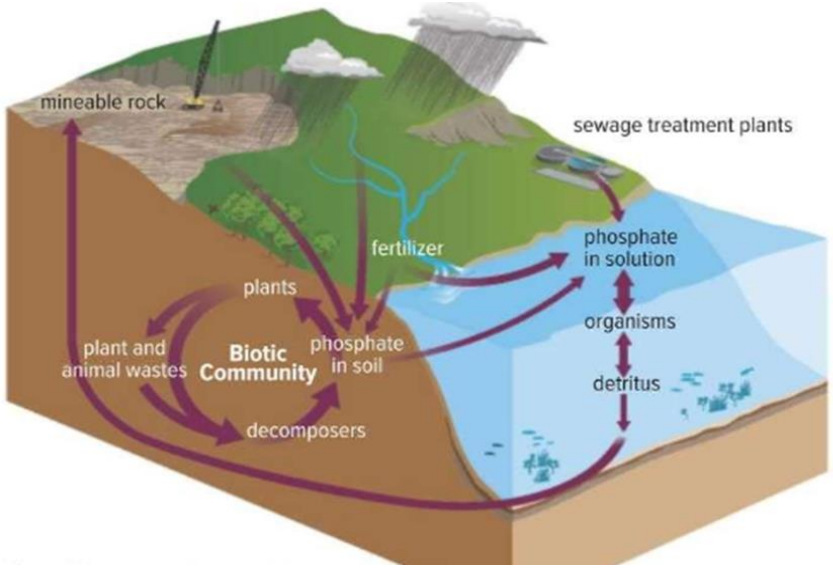
D rain eroding mountains

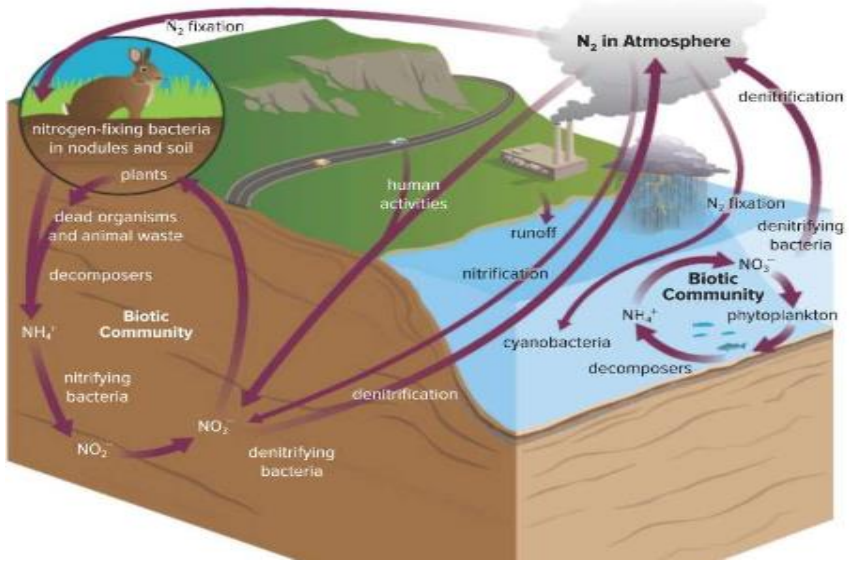
Assign on the diagram the processes that occur in a biogeochemical cycle

1. water cycle
2. oxygen and carbon cycle
3. nitrogen cycle
4. phosphorous cycle









NAME THE STEP IN A BIOGEOCHEMICAL CYCLE. USE THE LETTERS OF EACH FASE:

a. CELLULAR RESPIRATION b. CONDENSATION c. PHOTOSYNTHESIS d. TRANSPIRATION
e. DECOMPOSITION f. EVAPORATION g. NITROGEN FIXATION h. DENITRIFICATION
i. PRECIPITATION

____ Process in which nitrogen gas from the atmosphere is converted into ammonia by bacteria that live in the soil and on the roots of plants called legumes

___ Process in which soil bacteria convert nitrogen compounds in soil back into nitrogen gas which is released into the atmosphere

_____ Process in which sunlight is used to change atmospheric carbon into biomolecules used for energy by living things

____ Process in which water evaporates from the surface of plant leaves

____ Process in which nutrients in dead organisms are returned to the soil

_____Process in which the break down of sugars in living things returns carbon to the atmosphere as CO_2

___ Process in which liquid water changes into gas form

_____Process in which water vapor (gas) changes into liquid water

_____ Process in which condensed water in clouds falls to the Earth's surface

20	**Link biodiversity to healthy ecosystem, highlight the importance of biodiversity, and List all the economic (Direct, Indirect), aestheic and scientific values of biodiversity**	**TextbookBiology**	**33, 34, 35**

The Importance of Biodiversity

Sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Humans depend on the living world for resources and other benefits provided by diversity. There are economic, aesthetic, and scientific reasons for preserving biodiversity.

Direct economic value

Maintaining biodiversity has a direct economic value to humans. Humans depend on plants and animals to provide food, clothing, energy, medicine, and shelter. Preserving species that are used directly is important, but it also is important to preserve the genetic diversity in species that are not used directly. Those species serve as possible sources of desirable genes that might be needed in the future.

The reason there might be a future need for desirable genes is that most of the world's food crops come from just a few species. These plants have relatively little genetic diversity and share the same problems that all species share when genetic diversity is limited, such as lacking resistance to disease. In many cases, close relatives of crop species still grow wild in their native habitat. These wild species serve as reservoirs of desirable genetic traits that might be needed to improve domestic crop species.

The distant relative of corn, teosinte, shown in **Figure 5**, is resistant to the viral diseases that damage commercial corn crops. Using this wild species, plant pathologists developed disease-resistant corn varieties. If this wild species had not been available, this genetic diversity would have been lost, and the ability to develop disease-resistant corn varieties would also have been lost.

In addition, biologists are able to transfer genes that control inherited characteristics from one species to the other. This process is sometimes referred to as genetic engineering. Crops have been produced that are resistant to some insects, that have increased nutritional value, and that are more resistant to spoilage. Most wild species of plants and animals have not been evaluated for useful genetic traits. The opportunity to benefit from these genes is lost forever if wild species of plants and animals become extinct. This increases the importance of species that currently have no perceived economic value because their economic value might increase in the future.

Figure 5 The teosinte plant contains genes that are resistant to viral diseases that affect corn plants. These genes have been used to produce virus-resistant commercial corn varieties.

HEALTH Connection Many of the medicines that are used today are derived from plants or other organisms. You probably know that penicillin, a powerful antibiotic discovered in 1928 by Alexander Fleming, is derived from bread mold. Ancient Greeks, Native Americans, and others extracted salicin, a painkiller, from the willow tree. Today, a version of this drug is synthesized in laboratories and is known as aspirin. **Figure 6** shows a Madagascar periwinkle flower, which was found to yield an extract that is useful in treating some forms of leukemia. This extract has been used to develop drugs that have increased the survival rate for some leukemia patients from 20 percent to more than 95 percent.

Figure 6 Medicines developed from an extract from Madagascar periwinkle, *Catharanthus roseus*, are used to treat forms of leukemia.

Summarize *Why is it important to maintain biodiversity for medical reasons?*

Scientists continue to find new extracts from plants and other organisms that help in the treatment of human diseases. However, many species of organisms are yet to be identified, especially in remote regions of Earth, so their ability to provide extracts or useful genes is unknown.

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Indirect economic value

A healthy biosphere provides many services to humans and other organisms that live on Earth. For example, green plants provide oxygen to the atmosphere and remove carbon dioxide. Natural processes provide drinking water that is safe for human use. Substances are cycled through living organisms and nonliving processes, providing nutrients for all living organisms. As you will soon learn, healthy ecosystems provide protection against floods and drought, generate and preserve fertile soils, detoxify and decompose wastes, and regulate local climates.

It is difficult to attach an economic value to the services that a healthy biosphere provides. However, some scientists and economists have attempted to do just that. In the 1990s, New York City was faced with the decision of how to improve the quality of its drinking water. A large percentage of New York City's drinking water was supplied by watersheds, as shown in **Figure 7**. Watersheds are land areas where the water on them or the water underneath them drains to the same place. The Catskill and Delaware watersheds did not meet clean water standards and no longer could supply quality drinking water to the city.

The city was faced with two choices: build a new water filtration system for more than $6 billion or preserve and clean up the watersheds for approximately 1.5 billion dollars. The economic decision was clear in this case. A healthy ecosystem was less expensive to maintain than using technology to perform the same services.

Figure 7 New York City's drinking water is supplied by the Catskill and Delaware watersheds.

Infer *What types of human activities could affect a watershed and decrease its water quality?*

This example shows that nature can provide services, such as water that is safe for human consumption, at less expense than using technology to provide the same service. Some scientists think the natural way should be the first choice for providing these services. Research indicates that when healthy ecosystems are preserved, the services the ecosystems provide will continue to be less expensive than performing the same services with technology.

Aesthetic and scientific values

Biodiversity and healthy ecosystems have aesthetic and scientific values. Sustaining biodiversity helps humanity by preserving landscapes of recreational or inspirational value, such as the ecosystem shown in **Figure 8**.

Figure 8 This photo of Lake Tahoe's Emerald Bay shows the aesthetic value of preserving the environment.

The body of water shown in **Figure 8** is Lake Tahoe's Emerald Bay in California. This area is an environment with many aesthetic qualities. Lake Tahoe was once pristine, but urbanization, increased runoff, and other forms of pollution have harmed the environment's health. Invasive species such as clams, pond weed, and even domestic goldfish have also upset the lake's ecosystem. Many groups are working together to remedy these problems, and to try to keep Lake Tahoe healthy and beautiful.

There is also value in scientific study of the environment. Every human on the planet is part of Earth's biosphere, so study of the environment has the potential to benefit everyone. Attempting to solve a problem often brings diverse groups of people together. Each group can have their own ideas about how to approach the situation. Bringing together these different perspectives not only increases the likelihood of finding a solution, it can also lead to a greater understanding of other cultures or groups. Bringing together people to study the environment can also lead to the formation and development of new technologies.

Sometimes the scientific benefits of biodiverse ecosystems can be difficult for people to see or understand. However, many scientists are finding ways to show the value in protecting and studying the environment.

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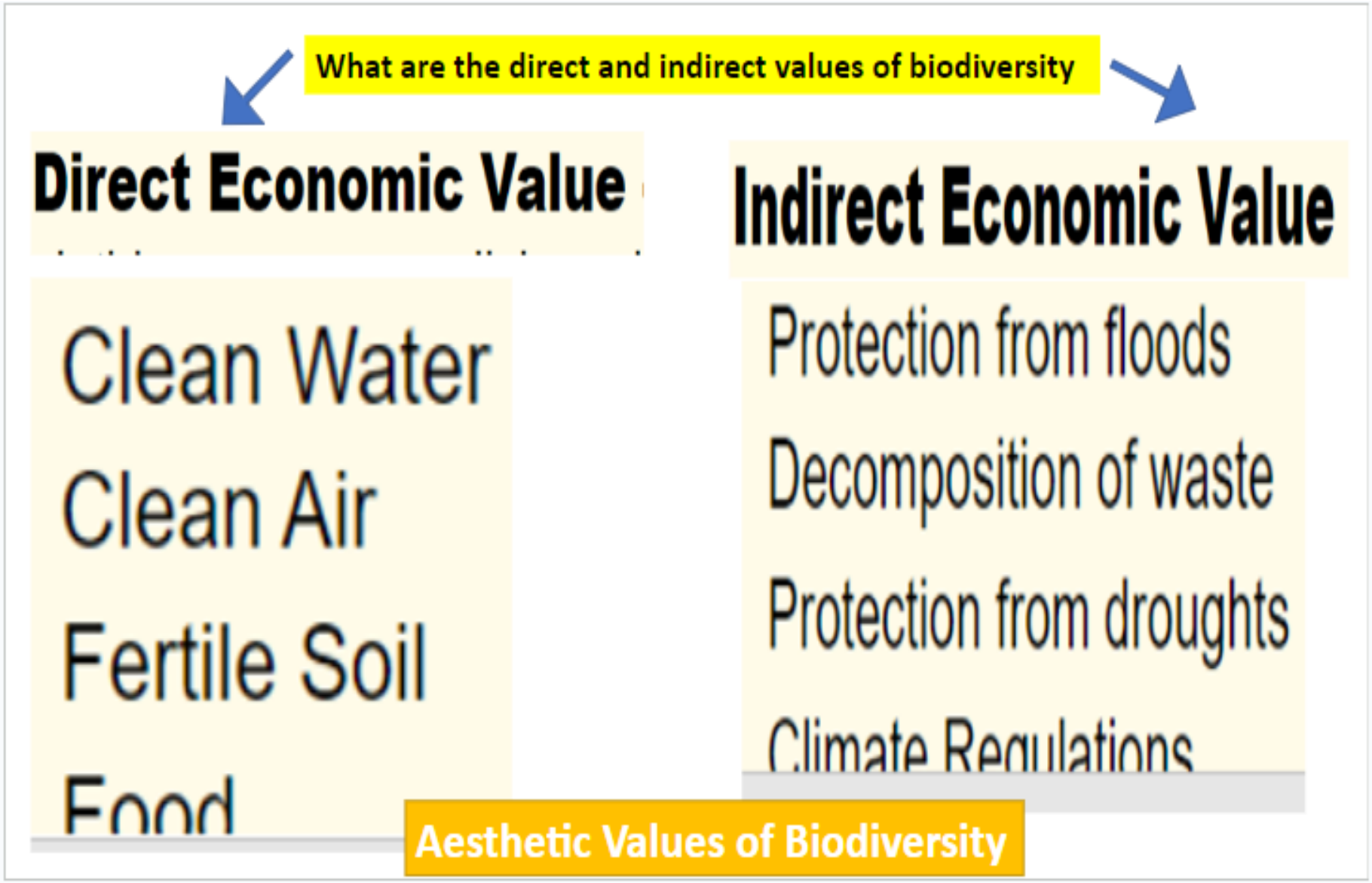

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Q1: Why should we keep the species that we do not use directly?

Because they consider as a gene resources for future.

Q2 : Give examples of how humans use genes in genetic engineering.

Production of crops that are resistant to disease, insect and damage.

Example: resistance corn

Q3 : The two images represent a region of Al-Mbazara in the city of Al Ain, A : before planting and the B : after its planting, which two images added to biodiversity? And why?

Image B , because it has aesthetic value

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Q4: What is an example of a direct economic value of biodiversity?

A. diseases caused by bacteria
B. vaccines created from bacteria
C. release of oxygen by green plants
D. drinking water provided by watersheds

Q5 : The idea that forests should be preserved because of their beauty refers to ____.

A. medicinal value
B. scientific value
C. direct economic value
D. aesthetic value

Q 6: When does the aesthetic value of an ecosystemm become most apparent?

A. when scientists begin to study the ecosystem
B. when the ecosystem has been destroyed
C. when the ecosystem is given economic value
D. when the ecosystem provides useful services

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Q7 : Since people depend on other living things, preserving the genetic diversity of species that people use directly or indirectly is not important

A. True
B. False

Select the correct answer.

Planting trees in urban environments provide indirect economic value by _____.

- ◉ exchanging gases in the air ✓
- ○ reducing water usage
- ○ providing flood control
- ○ providing natural resources

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Select the correct answer.

In the United States, an estimated 6 million tons of agricultural products have been foraged from the wild instead of farmed per year. These include maple syrup, blueberries, and nuts.

Is this an example of a direct or indirect economic value of biodiversity?

- It is a direct value because it saves money by decreasing spending on waste management.
- It is an indirect value because it does not involve human activity such as genetic engineering.
- It is an indirect value because it involves a natural process performed by the ecosystem.
- It is a direct value because it involves resources received from the ecosystem for human use. ✓

- Which represents an indirect economic value of biodiversity?

A- food

B- clothing

C- flood protection

D- medicines

19) Which is an example of the aesthetic value of a healthy ecosystem?

- **A)** excess oxygen
- **B)** a wide variety of genes
- **C)** a beautiful waterfall
- **D)** fertile topsoil

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Select the correct answer.

An example of preserving the biodiversity that has a direct economic value would be:

- ○ Plants help to clean the air during their photosynthesis process.
- ○ Natural filtration processes in watersheds help to improve water quality.
- ○ Organisms break down dead material to make the soil more fertile for crops.
- ◉ Natural resources can be used to make clothing, shelter, and other goods. ✓