

TERM 3 EOT  
2021-2022

Grade 5  
subject : science

- CHAPTER 8
- USING ENERGY

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## Read and Respond.....

### How is sound produced?

Have you ever noticed the sound from a low-flying jet rattling the dishes in the kitchen? Perhaps you've noticed something similar when someone plays a stereo system too loudly. What causes objects to shake when there are loud sounds nearby?

When an object makes sound, it vibrates back and forth. The vibrations of a drum alternately squeeze air particles and then spread them out. This creates regions of air that have many particles, called **compressions** (kum-PRE-shunz), and regions of air that have few particles, called **rarefactions** (rer-uh-FAK-shunz). The compressions and rarefactions move through the air, carrying sound energy. Each region of the air is only moved back and forth.

Regions of air that have many particles are called

- A. rarefactions
- B. vibrations
- C. compressions
- D. energy



Sound waves vibrate in the same direction that they travel.

compression

rarefaction

The density of the air, but not the air itself, moves.



peak

dip

The density of the air can be shown as a series of peaks and dips.

Vibrations caused by the helicopter blades produce loud sound waves.



A series of rarefactions and compressions traveling through a substance is called a **sound wave**. The substance through which the wave travels is called the **medium for the wave**. Like all waves, sound waves carry energy. When they pass through a medium, the medium is not permanently moved. Energy, however, is permanently moved from one place to another.

Sound waves vibrate the medium in the same direction that the energy moves. They are called **longitudinal** (lahn-juh-TEWD-nul) waves. We can also represent sound waves as a series of peaks and dips. The peaks show the high density of air in compressions. The dips show the low density of air in rarefactions. However, remember that air does not move up and down like the peaks and dips.

When sound waves hit an object, the object starts vibrating. The object is moved by the energy of the wave. This is how sound from a loud airplane or stereo rattles dishes. You can feel the vibrations caused by such loud sounds.

### Quick Check

- Describe the density of air in a closed room when music is played.

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### How does sound travel?

Sound can travel through solids, liquids, and gases. In fact, sound tends to travel with the greatest speeds in solids and the slowest speeds in gases. For example, sound travels through steel at almost 6,000 m/s. But sound travels through air at only 343 m/s.

These differences in the speed of sound result from how far apart the particles are. The particles carry sound energy, and their collisions are how sound energy travels. In a solid, the particles are close together so they quickly collide and move sound. In gases, particles are far apart. Collisions are less frequent, so sound travels more slowly.

The temperature of the medium also affects the speed of sound. In warmer air, particles move faster. As a result they collide more often and transmit sound faster.

Can sound travel in an area without any particles? No, sound cannot travel without a medium. For example, outer space has few particles, so there is no medium for sound to travel through. Outer space is a **vacuum** (VA-kyewm), a region that contains few or no particles.

**FACT** Sound cannot travel through outer space.



Water is a good medium for sounds like dolphin songs.





## What is volume?

Pretend you are in a room when someone turns up the volume on a radio too much. Is it easy to hear other noises? What makes a sound so loud?

**Volume** refers to the strength or weakness of sound. If you hit a drum with force, it produces a loud sound or noise, but if you hit it gently, the sound it produces will be lower.

Sound travels in air as a series of compressions and rarefactions. Compressions are represented by peaks while rarefactions are represented by dips.

The **amplitude** (AM-pluh-tewd) is the maximum displacement moved by particles of the medium away from their equilibrium position. The loudness, or volume, of a sound depends on the amplitude of the sound's waves.

Scientists measure the volume of sounds with **decibels (dB)**. Sounds above 85 decibels damage your hearing. Wear earplugs if you are near loud sounds!

### Volume of Sounds

Decibel Level	Sound
180 dB	rocket engine at 30 m (98 feet) threshold of pain, train horn at
130 dB	10 m (33 feet)
120 dB	rock concert
110 dB	chainsaw at 1 m (3.3 feet)
100 dB	jackhammer at 2 m (6.6 feet)
85 dB	threshold of damaging hearing
80 dB	vacuum cleaner at 1 m
60 dB	normal conversation
50 dB	rainfall
30 dB	whisper (without talking)
10 dB	human breathing at 3 m (10 feet)
0 dB	threshold of human hearing (with healthy ears)

### Read a Table

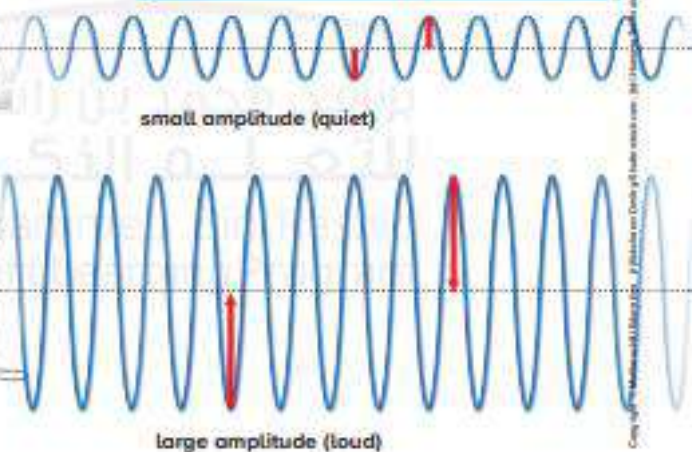
Could the sound from a rocket engine 30 m away cause pain in your ears?

**Clue:** Compare the volume for the rocket engine and the threshold of pain.

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## What is echolocation?

Echoes can be useful. Bats, for example, make sounds that echo off of their prey. The returning echoes tell the bat where the prey is located. Finding food or other objects in this manner is known as **echolocation**. Whales and dolphins also use echolocation to orient themselves and to find food.

Scientists have developed a system called **sonar** that works like echolocation does for animals. Sonar stands for "sound navigation and ranging." It is used under water to find objects. The sonar system sends out sound waves that reflect off of objects. It then detects the reflected sound waves. The return time and direction of the sonar echoes are used to calculate the location of the object.

### Quick Check

5. Could sonar work on land? Why or why not?

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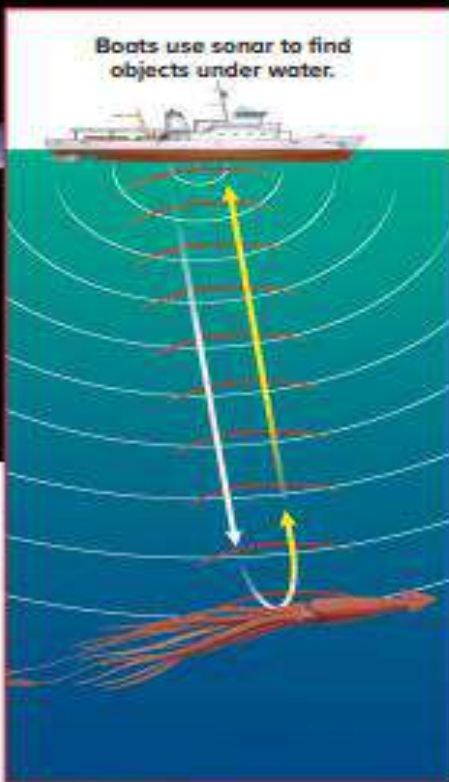
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Bats use echoed sound to locate insects.



Boats use sonar to find objects under water.

# New Words

- **Pitch** – low or high sound – low or high frequency
- **Speed** of sound – how fast the sound moves. Its about **300 m/s** - see the video, and the speed of light is **300** million m/s
- **Loudness** – how **intense**, strong, high amplitude is the sound = **volume**

# Notes about sound properties

- Sound travels faster in warmer media than cooler media, because particles in warmer media contain more energy
- To measure the speed of sound, use this formula :Speed= frequency(f) × Wavelength ( $\lambda$ ) and it is measured in (m/s)
- Sound absorption :taking in the sound by some soft materials like (cotton, fibers, sponge ,etc.)
- Smaller surfaces produce more waves and larger surfaces produce fewer waves
- More than 85 dB will damage your hearing



# Pitch

Low frequency = **low** pitch –  
elephant

100 Hz

High frequency = **high** pitch  
sound – mouse

1400 Hz





# Loudness

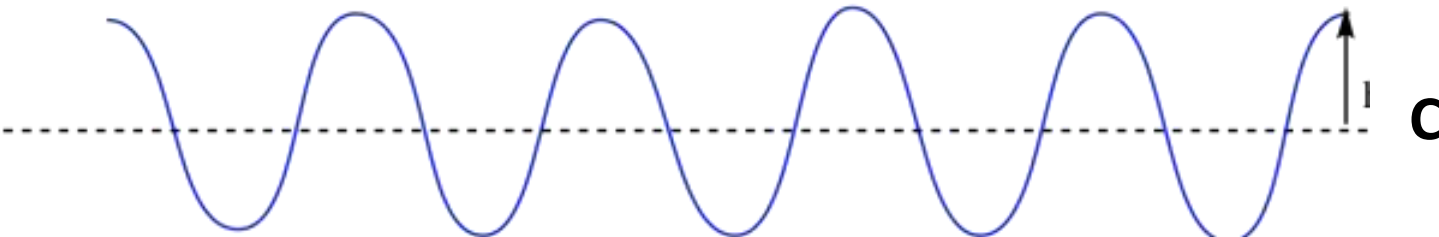
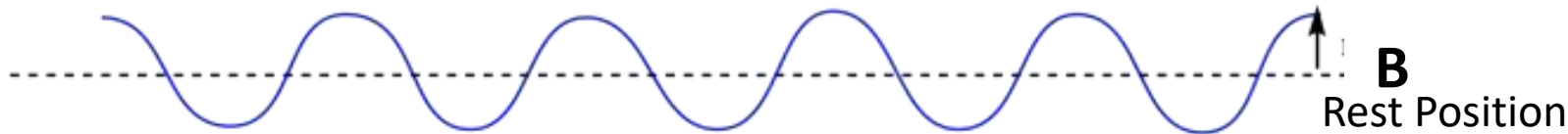
Deci = 1 tenth

Deci dirham = 10 fils

- Loudness is measured in **decibels**
- Loud sounds have higher **amplitude**
- Amplitude is the **distance** from the rest position
- Loudness depends on the distance from the source of the sound. Far away sources are quieter



Bell  
جرس

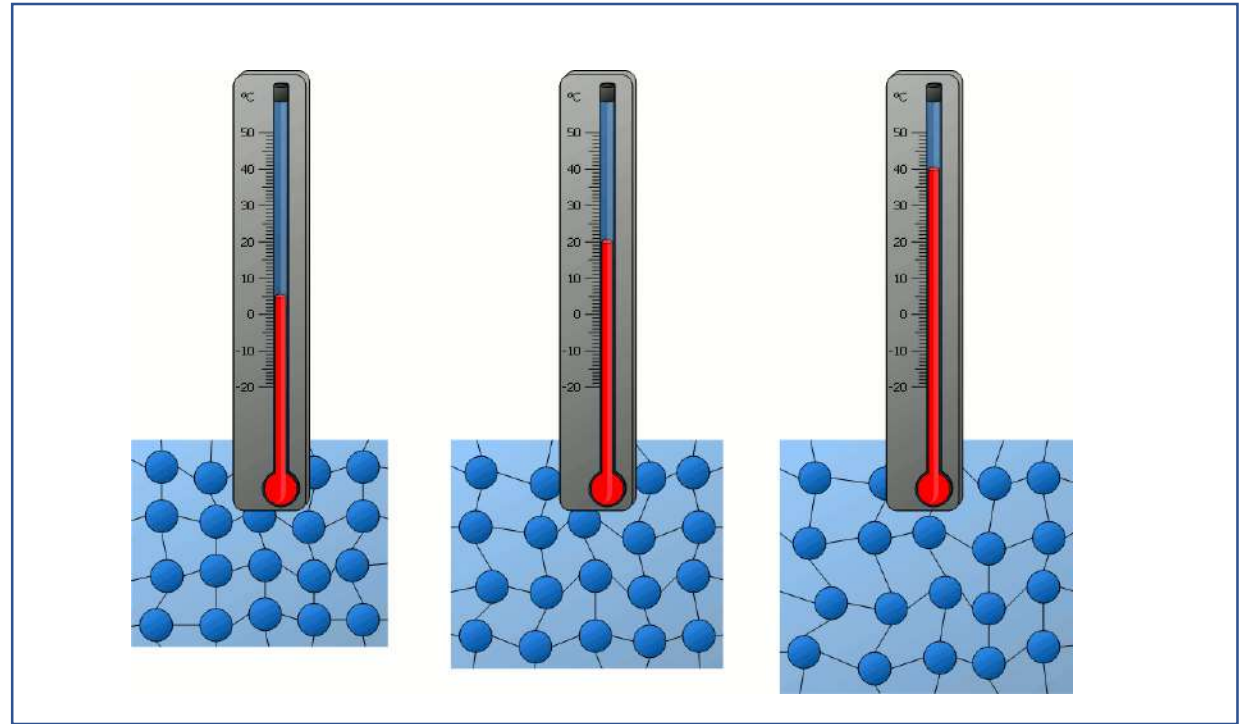
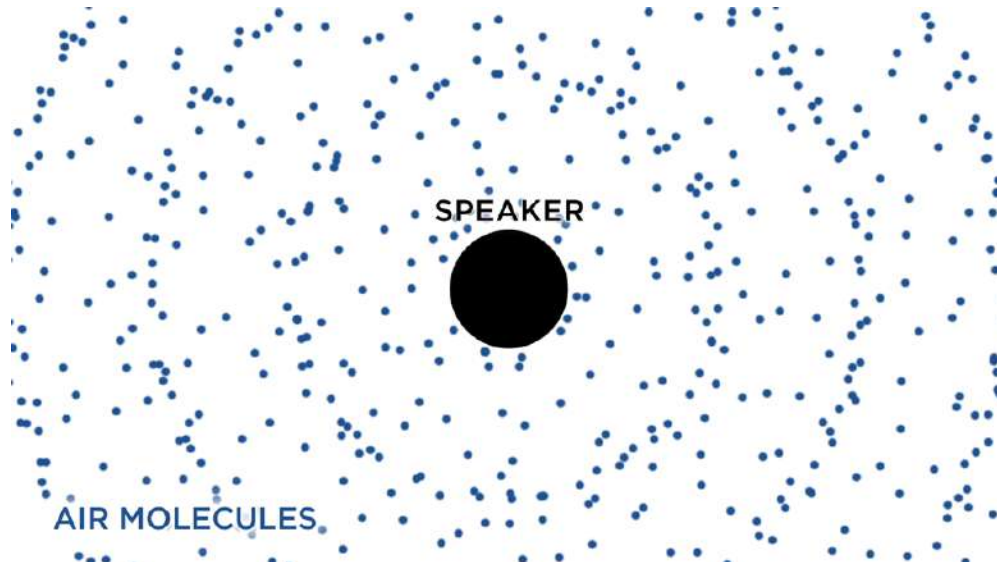


*Which one is louder?*

10 decibel increase = 2 × loudness

# The speed of sound

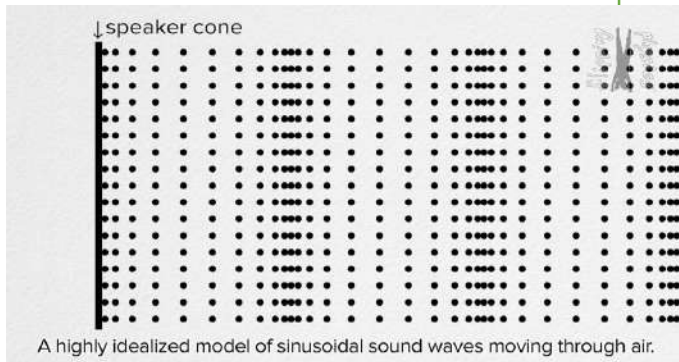
- Depends on 2 things – type of the material, and temperature
- The higher is the temperature – the higher speed of sound for gasses



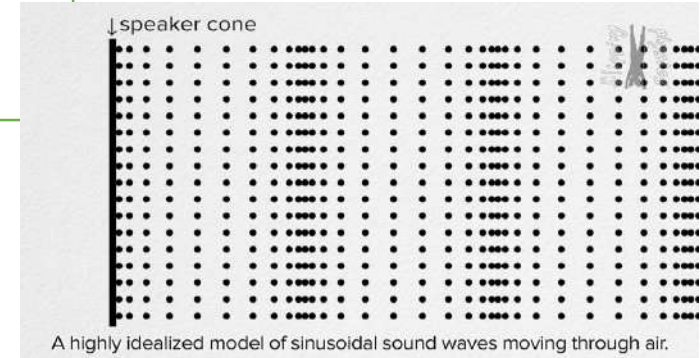
# Sound wave

## Longitudinal Wave :

It is particles vibrate in parallel direction to wave motion and it has 2 parts



Compression (peak) :  
Particles are close to each other



Rarefaction (dip):  
Particles are far from each other



# Sound waves physical properties

```
graph TD; Root[Sound waves physical properties] --> T[Sound period (T)]; Root --> f[Sound frequency (f)]; Root --> λ[Wavelength (λ)]; Root --> a[Amplitude (a)];
```

## **Sound period (T)**

Time is consumed to perform 1 wave  
Measured in (sec/wave)

## **Wavelength ( $\lambda$ )**

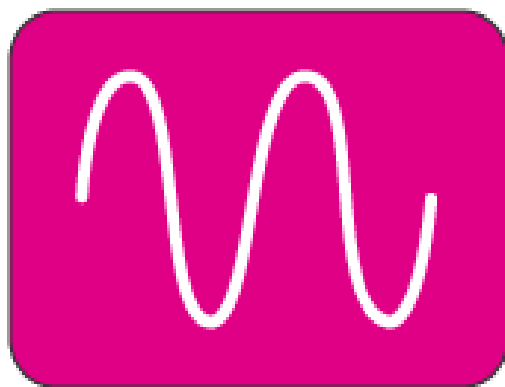
The distance between 2 consecutive  
compressions or refractions  
(measured in meters)

## **Sound frequency (f)**

Number of waves are done per 1 second  
(Measured in hertz or waves/sec)

## **Amplitude (a) :**

It the maximum extent of the  
vibration from rest position  
(measured in meters)

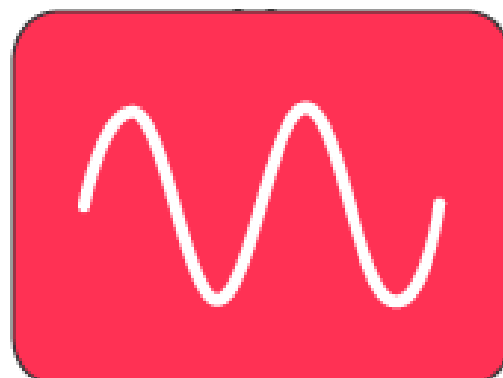


Loudness  
increases

Loudness  
decreases



Same frequencies but  
different amplitudes

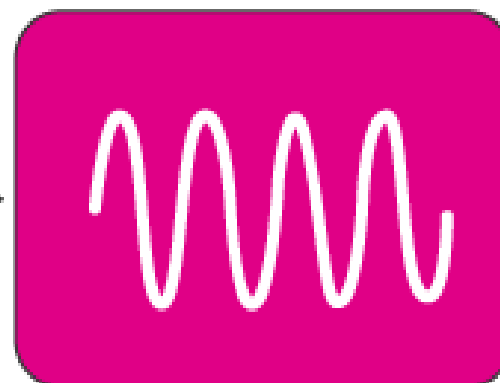


Same amplitudes and  
different frequencies



Pitch  
decreases

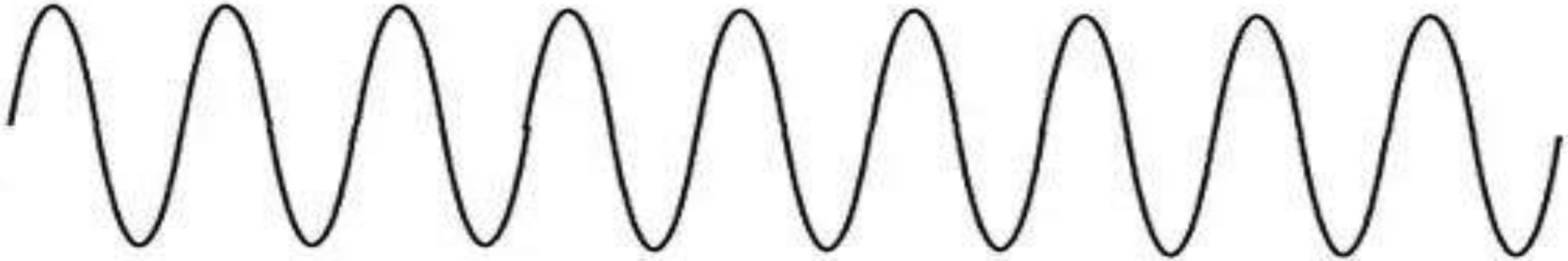
Pitch  
increases



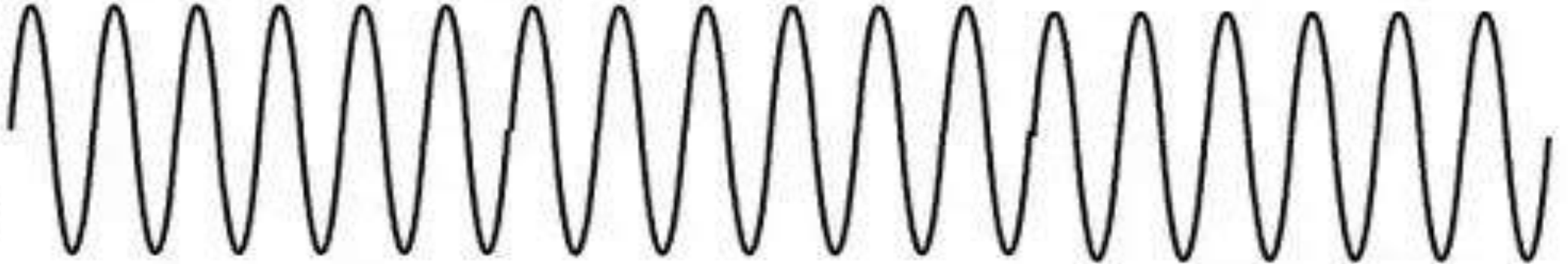
# Compare the frequencies of sound with same loudness:

Sound pitch change due to Doppler effect ( Changing in frequency due to moving away or towards the sound source )

- No motion = No change in frequency so pitch will not change



**Lower** pitch sound with **lower** frequency

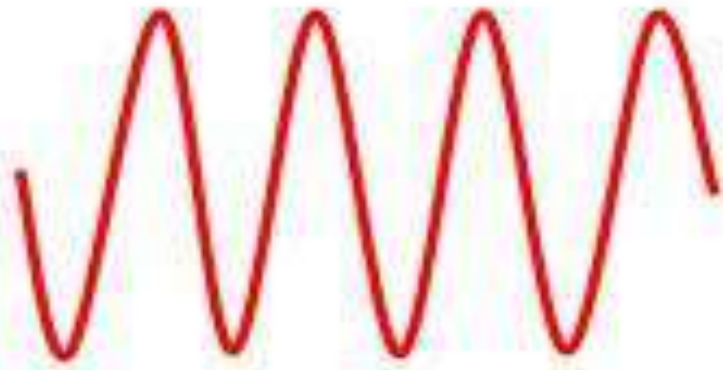


**Higher** pitch sound with **higher** frequency



# Loudness

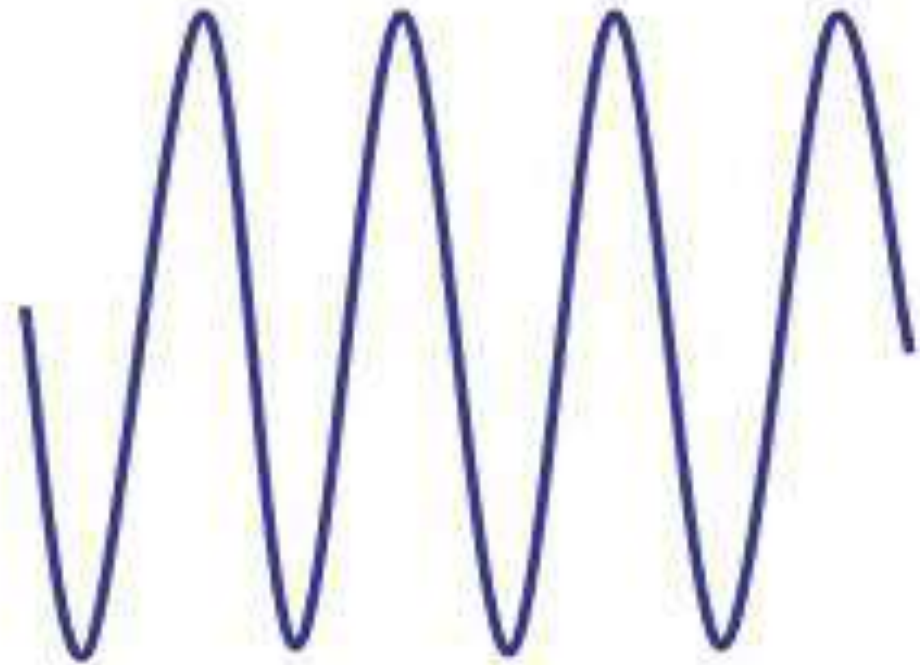
The loudness of a sound increases with the amplitude of the sound wave.



**quiet**

Lower Amplitude and lower energy

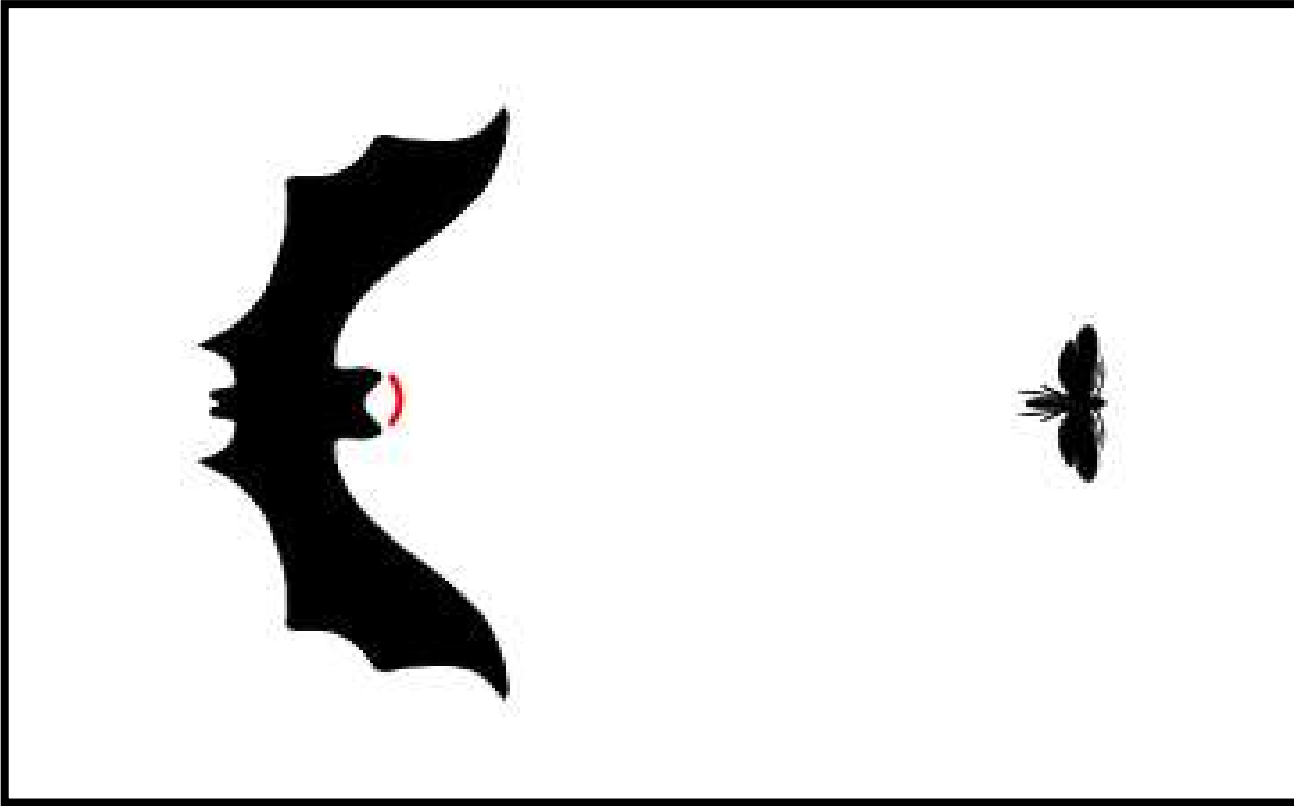
It is measured by decibel (dB)



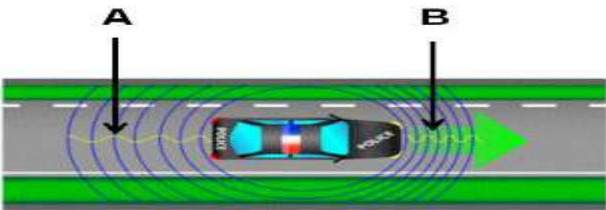
**loud**

Higher Amplitude and higher energy

**Echolocation : use echo to determine the place of any object**



1-Describe sound waves A and B from a police siren as the police car moves forward



☐

A	B
lower frequency, higher pitch	higher frequency, higher pitch

☐

A	B
higher frequency, higher pitch	lower frequency, lower pitch

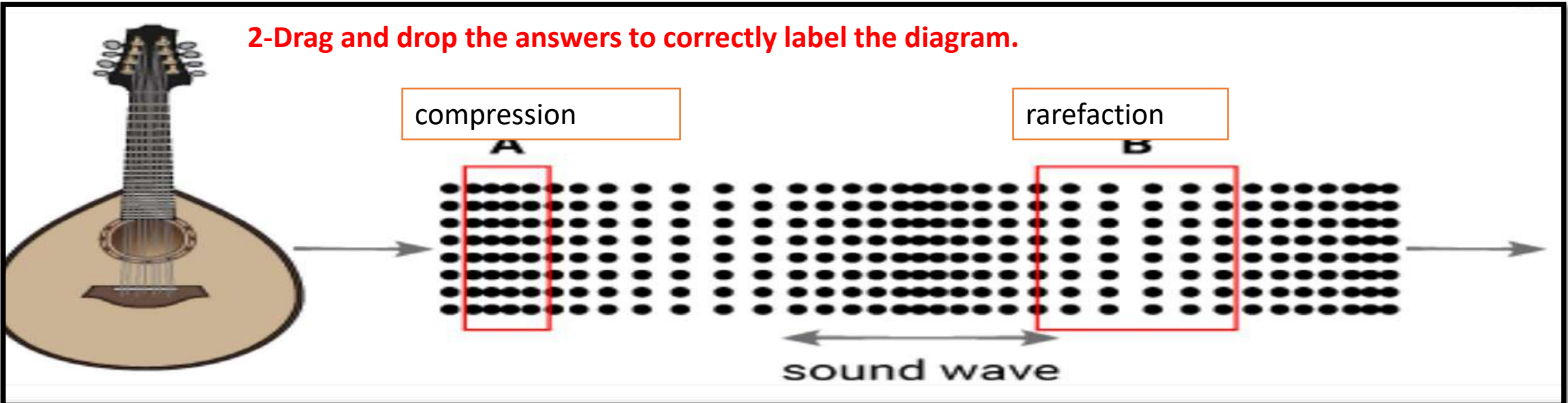
☐

A	B
same frequency, same pitch	

☒

A	B
lower frequency, lower pitch	higher frequency, higher pitch

2-Drag and drop the answers to correctly label the diagram.





3-



Which of the following best describes sound wave A compared to B?

A

A	B
low energy quiet sound	high energy loud sound



A	B
high energy loud sound	low energy quiet sound

C

A	B
low energy low pitch	high energy high pitch

D

A	B
high energy high pitch	low energy low pitch

4-What causes sound?



A-Sound is caused by freezing of particles of matter.

B-Sound is caused by warming of particles of vacuum.

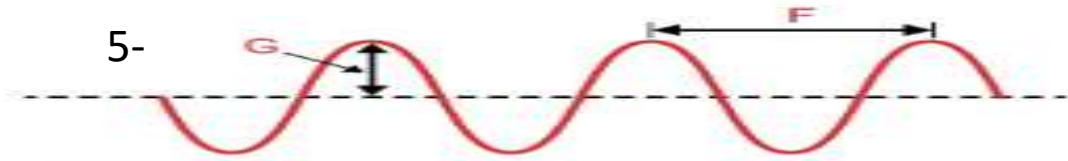
C-Sound is caused by vibrations of particles of matter.



D-Sound is caused by squeezing of particles of matte

B

D



D

In this image, what do the labels F and G represent?

**A** F is the wave's wave speed, and G is its wavelength.

**B** F is the wave's amplitude, and G is its wavelength.

**C** F is the wave's frequency, and G is its amplitude.

☒ **D** F is the wave's wavelength, and G is its amplitude.

What process do dolphins use to locate objects?



A

☒ **A** echolocation

**B** compression

**C** reflection

**D** rarefaction

1. Sound is created by ..... of matter

- ☒ A. Vibrating particles
- B. Diagonal movement
- C. Echoes and sonar
- D. Perpendicular movement

2-The particles in the medium when a sound wave travels through, move ..... because of this, they are called longitudinal waves.

- ☒ A. Up and down
- B. Up only
- C. Back and forth
- D. Down only

**3-The region where the particles are spread out is known as .....**

- A. Compression
- ☒ B. Rarefaction
- C. Amplitude
- D. Frequency

4-What are the areas where rarefactions form as air particles spread apart?

- A. Peaks
- B. Echoes
- C. Vacuums
- ☒ D. Dips

5-..... are the areas where compressions form as air particles squeeze together.

- ☒ A. Dips
- B. Peaks

6-The compressions and rarefactions of a sound wave can also be shown as

- A. Reflections and absorptions
- B. Vacuums and medium
- ☒ C. Peaks and dips
- D. Echoes and non echoes



7-Which of the following is the substance that transmits sound?

- A. Rarefaction
- B. Echo
- C. Compression
- ☒ D. Medium

8-The particles in a longitudinal wave move back and forth, ..... to the direction in which the wave moves.

- ☒ A. Up and down
- B. Perpendicular
- C. Parallel
- D. Sideways

9-..... Travel through any types of solid, liquid and gas.

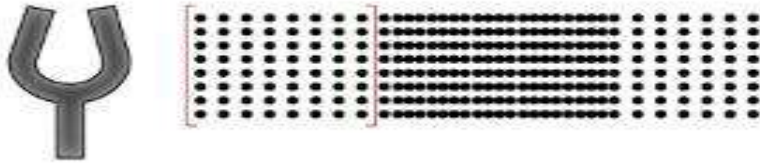
- A. Medium
- B. Vacuum
- ☒ C. Sound waves
- D. Light waves

10-a part of a longitudinal wave in which the particles of matter are closer together is called.....

- A. a reelection
- B. an echolocation
- ☒ C. a compression
- D. a rarefaction

11. what causes sound

- A. sound is caused by freezing of particles of matter
- ☒ B. sound is caused by vibrations of particles of matter
- C. sound is caused by squeezing of particles of matter
- D. sound is caused by warming of particles of vacuum



12-observe the picture and select the correct option

the diagram is highlighting the part of the sound wave called a .....

- A. compression
- ☒ B. rarefaction
- C. reflection
- D. echo

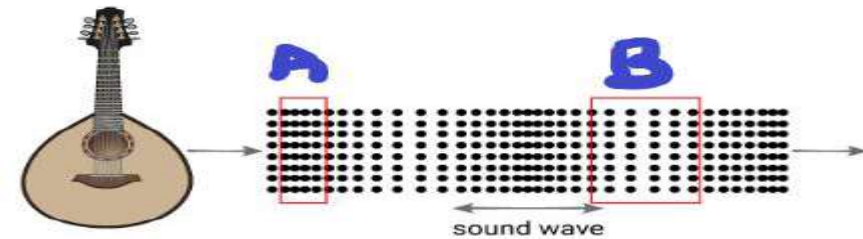
13-Why does sound travel faster in warmer air?

- A. Warmer air has more particles
- B. Warmer air has fewer particles
- C. Warmer air has less energy
- ☒ D. Warmer air has more energy



14-when a drummer strikes a drum, the drumhead ..... moving up and down

- A. Swings
- B. Reacts
- C. Change state
- ☒ D. Vibrates



15-What is the name of the region A and B

- A. reflection and rarefaction
- B. Rarefaction and compression
- ☒ C. Compression and rarefaction
- D. Compression and reflection

16-What is the best medium for a sound wave to travel through?

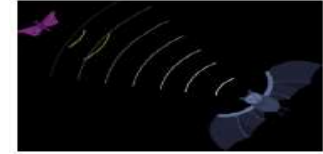
- A. Air in your classroom
- B. A vacuum
- C. Water in a fishbowl
- ☒ D. A metal door

17-Dolphins use sound waves to locate objects, like food. What is the name of this process?

- ☒ A. Echolocation
- B. Compression
- C. Reflection
- D. Rarefaction

18 ..... are sound created when a sound wave hits a solid surface and bounces back to the source.

- A. dips
- B. Compression
- C. Rarefaction
- ☒ D. Echoes



Which of the following **best** describes why sound cannot travel in space?



D

**A** The rays from the Sun remove the sound waves in space.

**B** The gravitational pull of the objects in space absorbs all sound.

**C** Space is full of gases, and sound cannot travel well through gases.

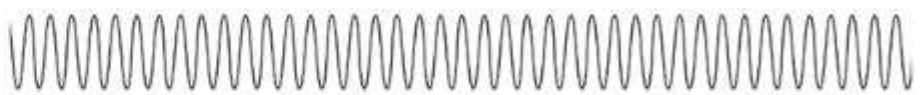
☒ **D** Space is a vacuum, which means it has no particles in it.

Choose the wave that represents the quietest sound.

**A**



**B**

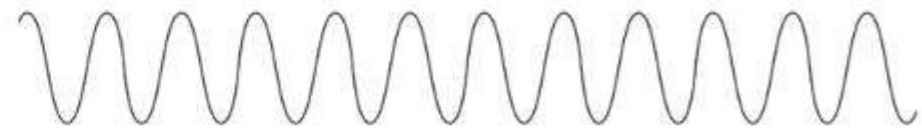


C

☒ **C**



**D**





**1 Vocabulary** The substance through which a wave travels is called a(n) Medium.

**4 Test Prep** At what volume do sounds start damaging hearing?

- A** 10 decibels      ☒ **C** 85 decibels  
**B** 65 decibels      **D** 150 decibels

**5 Test Prep** An echo is an example of a sound wave being

- A** transmitted.      ☒ **C** reflected.  
**B** absorbed.      **D** surfed.

Use the table to answer the question.

Sound	Decibel Level
Rocket Engine at 30 meters	180 dB
Vacuum Cleaner at 1 meter	80 dB
Normal Conversation	60 dB
Rainfall	50 dB

If the threshold of damaging hearing is 85 dB, which of the sounds on the table would be harmful to a human?

**A** Vacuum Cleaner

**B** Rainfall

**C** Rocket Engine

**D** Normal Conversation

C

You are walking home from school. You hear a bell ringing.

You first hear it at 65 dB. Then, you hear it at 75 dB, and finally at 85 dB.

Why might the decibel level of the bell change?

**A** The person plays the bell louder each time you hear it.

**B** The decibel level changes depending on what the person uses to strike the bell.

**C** The bell changes decibel levels when struck in a different place each time.

☒ **D** The decibel level increases the closer you get to the bell.

## Think, Talk, and Write

**1 Vocabulary** The substance through which a wave travels is called a(n) medium.

**2 Fact and Opinion** Should you wear earplugs while using a vacuum cleaner? Support your opinion with facts.

Fact	Opinion
The sound of a vacuum cleaner is not loud enough to damage your ears.	Earplugs are not necessary when using a vacuum cleaner.

**3 Critical Thinking** Is there more energy in a 30 dB or 40 dB sound wave? Why?

There is more energy in the 40 dB sound wave because decibels measure the volume of a sound wave and the louder a sound wave is, the more energy it has.

## Essential Question

What are the properties of sound?

A sound wave is a series of rarefactions and compressions traveling through a medium. Pitch is the perceptual quality which permits the distinction between a low frequency sound and a high frequency sound. The volume of sound depends on the amplitude of the sound's waves.



6	SCI.4.2.02.018 conclude that light is waves that transmit energy and it travels in straight lines, explaining the different behavior of various objects when it falls on them		447
	SCI.4.2.02.018 يستنتج أن الضوء موجات تنقل الطاقة وأن الضوء ينتقل في خطوط مستقيمة مفسراً اختلاف سلوك الأجسام المختلفة		
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## How does light make shadows?

When light strikes an object's surface, photons bounce off at random angles. This is called **scattering** (SKA-tuh-ring) light. We see objects because light has scattered off them and entered our eyes.

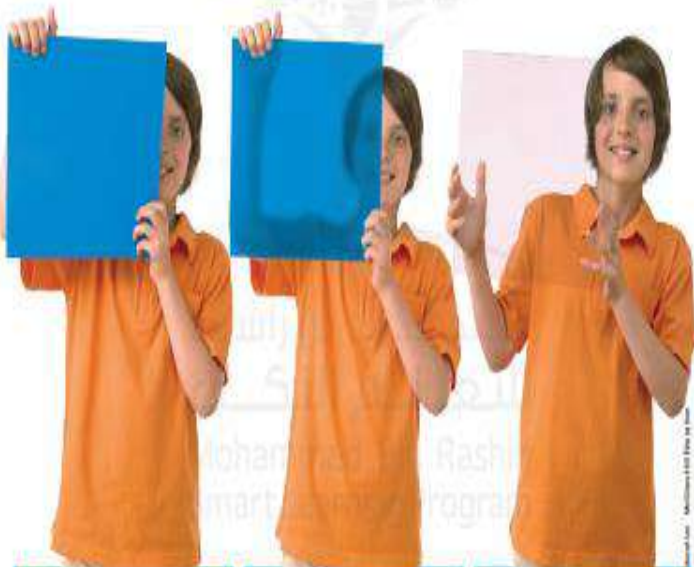
Sometimes when light hits an object, a photon is absorbed. These objects gain energy. The light that is absorbed is usually transformed into heat energy. Darker objects absorb more light than lighter objects.

Light may also pass through objects. Objects that allow most light through are called **transparent**

(trans-PER-unt). Objects that blur light as it passes through are called **translucent** (trans-LEW-sunt). If an object allows little to no light through, it is called **opaque** (oh-PAYK).

Whether an object is opaque, translucent, or transparent depends on its material, its thickness, and the color of the light. Thicker objects have more particles to absorb photons, so they are more likely to be opaque. Some objects will be opaque, transparent, or translucent in only one color of light.

Opaque and translucent objects block light. The area behind these objects is darker—they have a shadow. Shadows are the absence of light.



Opaque objects let little to no light pass through.

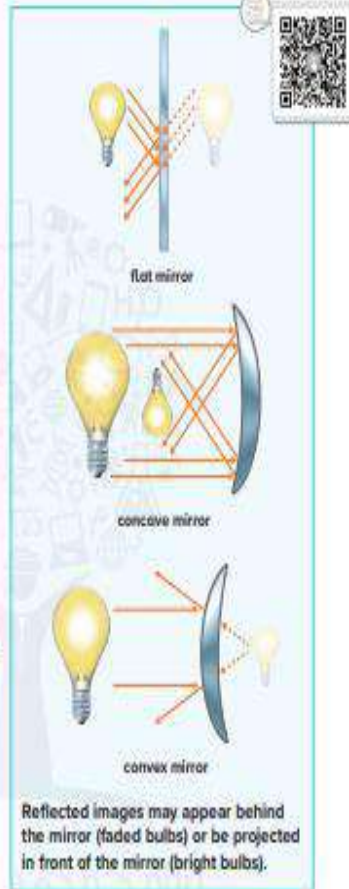
Translucent objects blur light that passes through.

Transparent objects allow almost all light through.

## How does light bounce and bend?

When you look into a mirror, you see an image. An **image** is a "picture" of the light source that light makes when it bounces off a shiny surface. The image in a mirror is clear because most of the light wave reflects the same way off the mirror's smooth surface. Reflection is the organized scattering of a wave.

When light hits a mirror, it obeys the **law of reflection**: the angle of an incoming light ray equals the angle of the reflected light ray. An image in a flat mirror appears to be behind the mirror. The distance to the image is equal to the distance the light traveled from the object to the mirror.



Reflected images may appear behind the mirror (faded bulbs) or be projected in front of the mirror (bright bulbs).



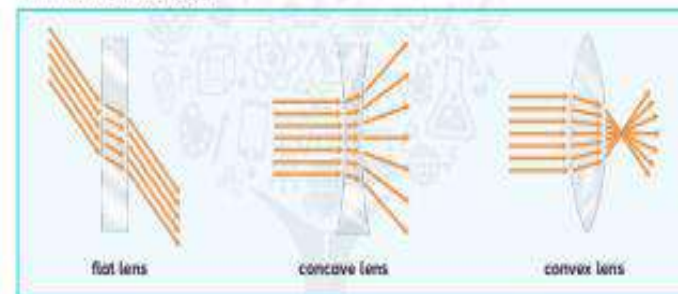
This girl's image was enlarged and upright by using a convex mirror.

## Light Can Bend

When you place an object in a glass of water, it appears to bend. Yet, if you pull the object out, it is still straight. How is this possible? The light from the object is bending, not the object itself.

When light changes mediums, it also changes speed. When waves change speed, they **refract**. **Refraction** (ri-FRAK-shun) is the bending of waves as they pass from one substance into another. Although refraction is not noticeable with sound waves, it is easily seen with light waves.

A pencil in a glass of water shows light refraction.



Rays entering a denser medium bend to make a bigger angle with the surface. However, rays leaving a denser medium bend in the opposite direction.

Lenses use refraction to shape images. Convex lenses work like concave mirrors, and concave lenses work like convex mirrors.

Lenses are used in eyeglasses to make objects appear in focus. We also use lenses in cameras and telescopes to change the size of the image we see. The image's size and location depends on where the object and the lens are in relation to each other.



Eyeglasses focus light to help your vision.

### Quick Check

- What properties do images have if they are formed by concave lenses or convex mirrors?

# Worksheet-LESSON-2-light

student name:-----

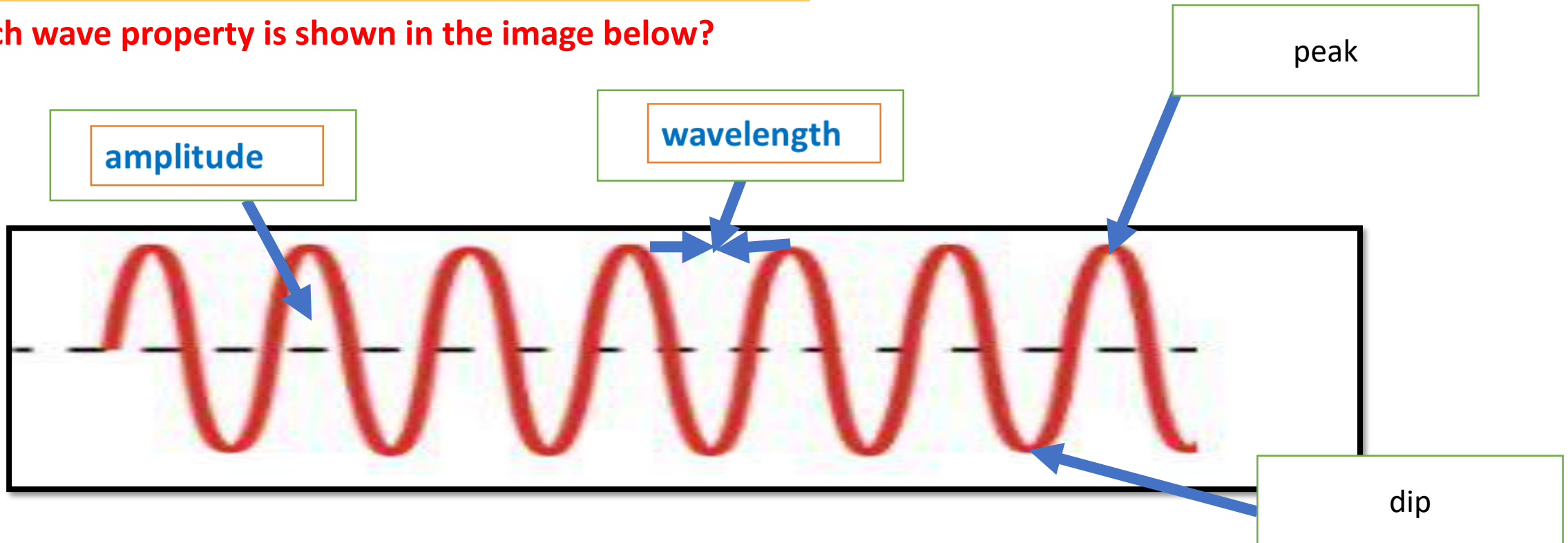
Class-<sup>o</sup> (    )

- Light is energy you can see. It is made of vibrating magnetic and electric energy.
- Light energy is carried by **electromagnetic waves**.
- Light is also made of particles called **photons**.

1

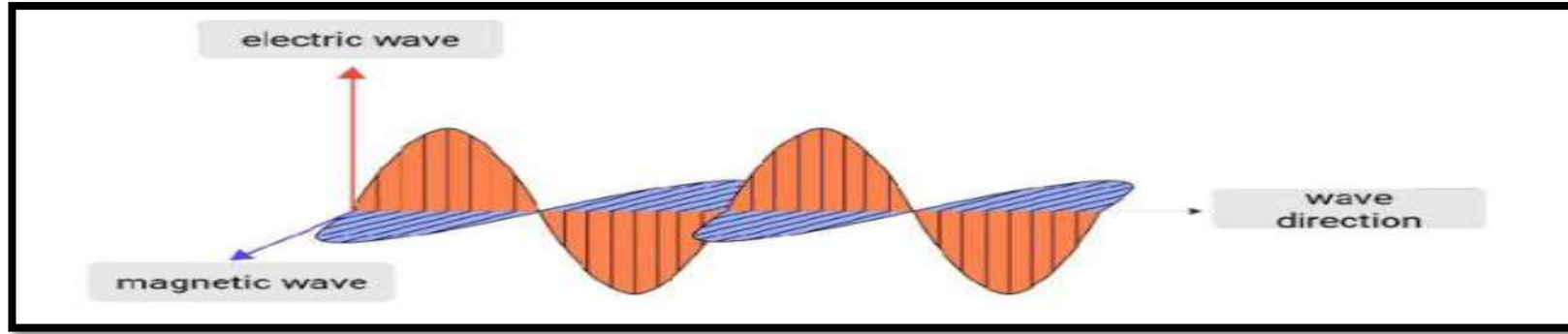
## What are the properties of light waves?

**Which wave property is shown in the image below?**



Light is **electromagnetic wave** that vibrates **perpendicular** to the direction the wave energy is traveling

2



Select the correct answer from the drop-down menus.

1-Light energy travels in ----- **straight** ----- lines  
called ---- **rays** ----light .

2-Both light waves and sound waves can travel through----- **medium** -----  
however, only light waves can travel through - **vacuum** -

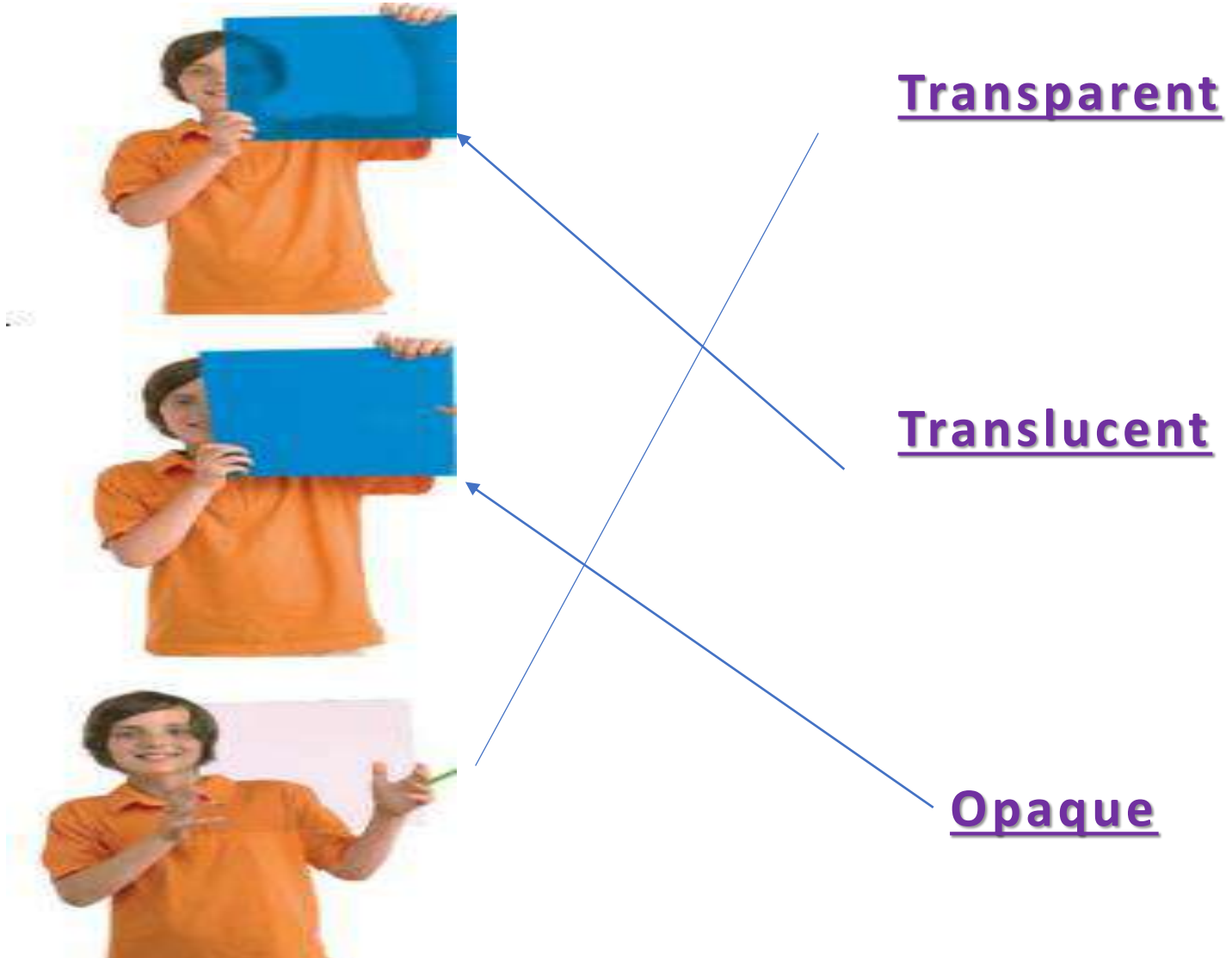
3-The properties of light waves -- **amplitude** -- and ----- **wavelength** ----- and ----- **frequency** -----  
.



## Light scattering

Depends on the surface

✓ Match the words with the appropriate pictures

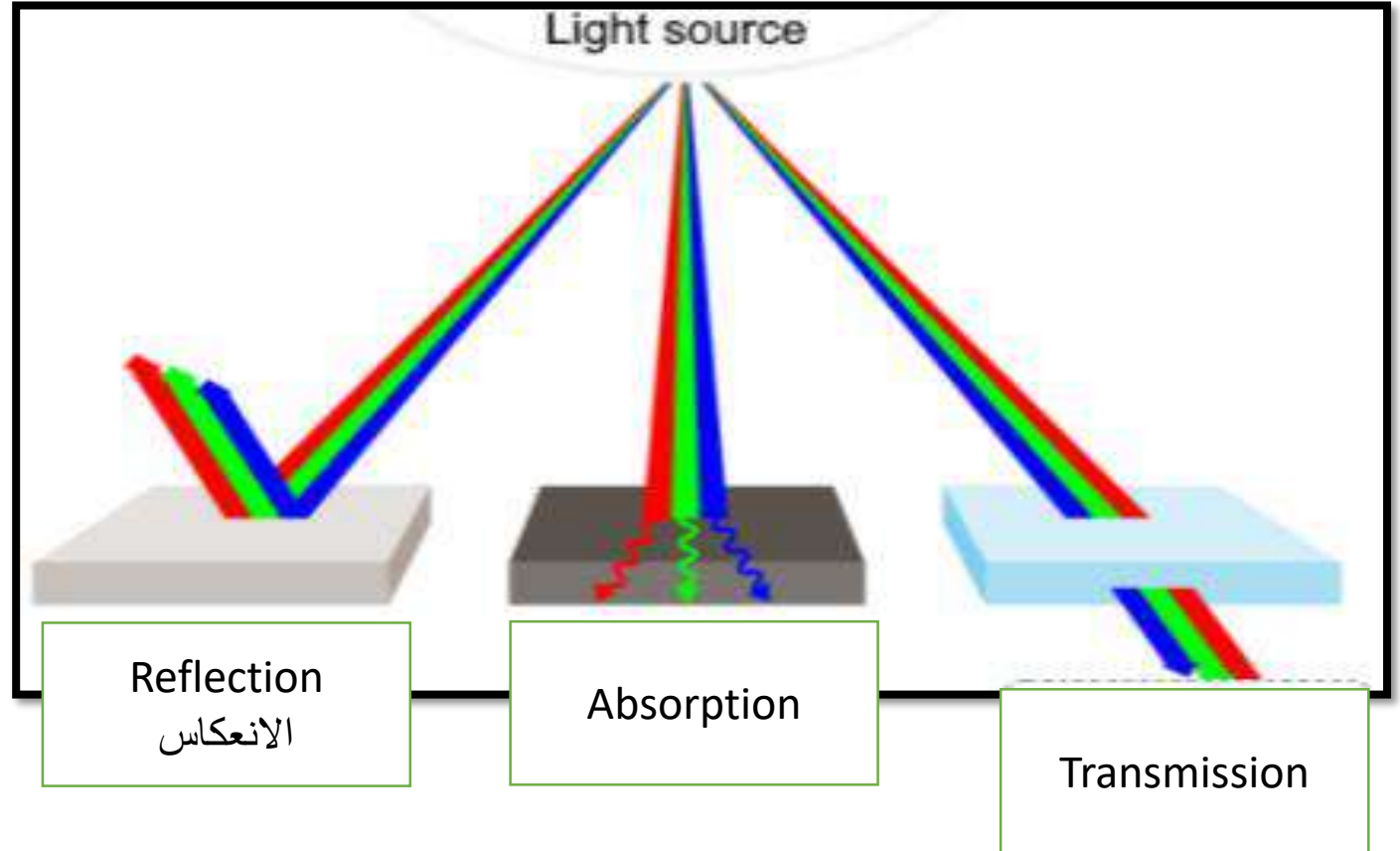


# How materials affect light ?

4

Choose the correct answer for each picture

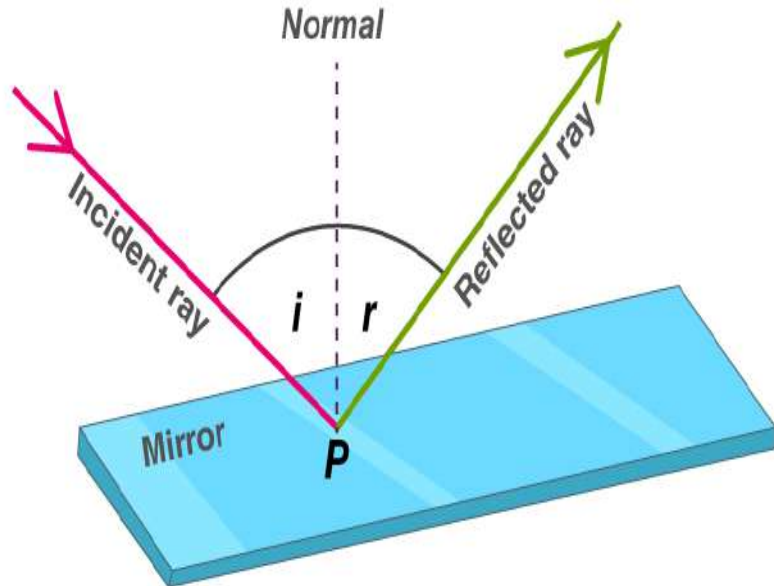
1. Transmission الانتقال
2. Reflection الانعكاس
3. Absorption الامتصاص



# Properties of light

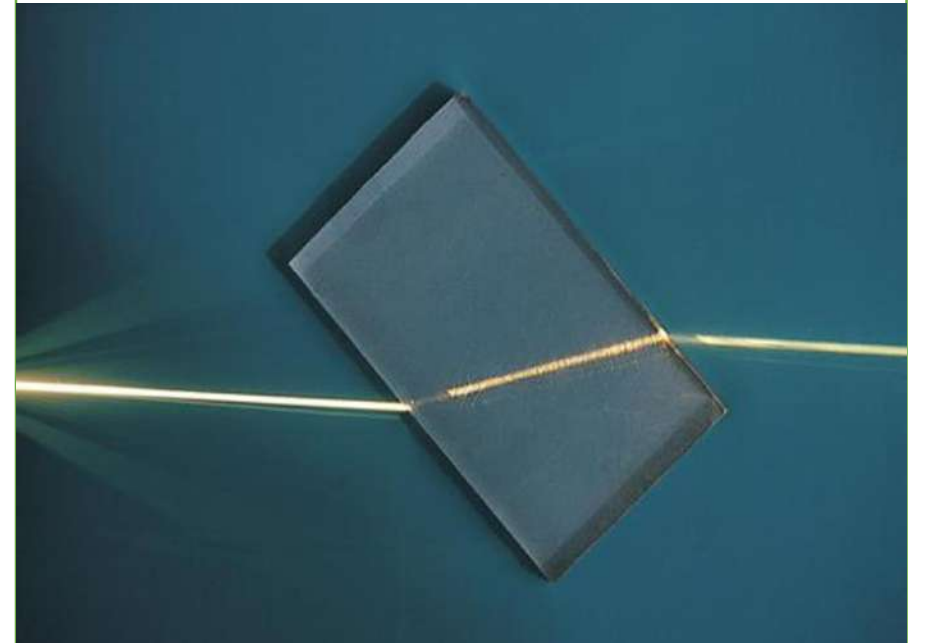
## Reflection :

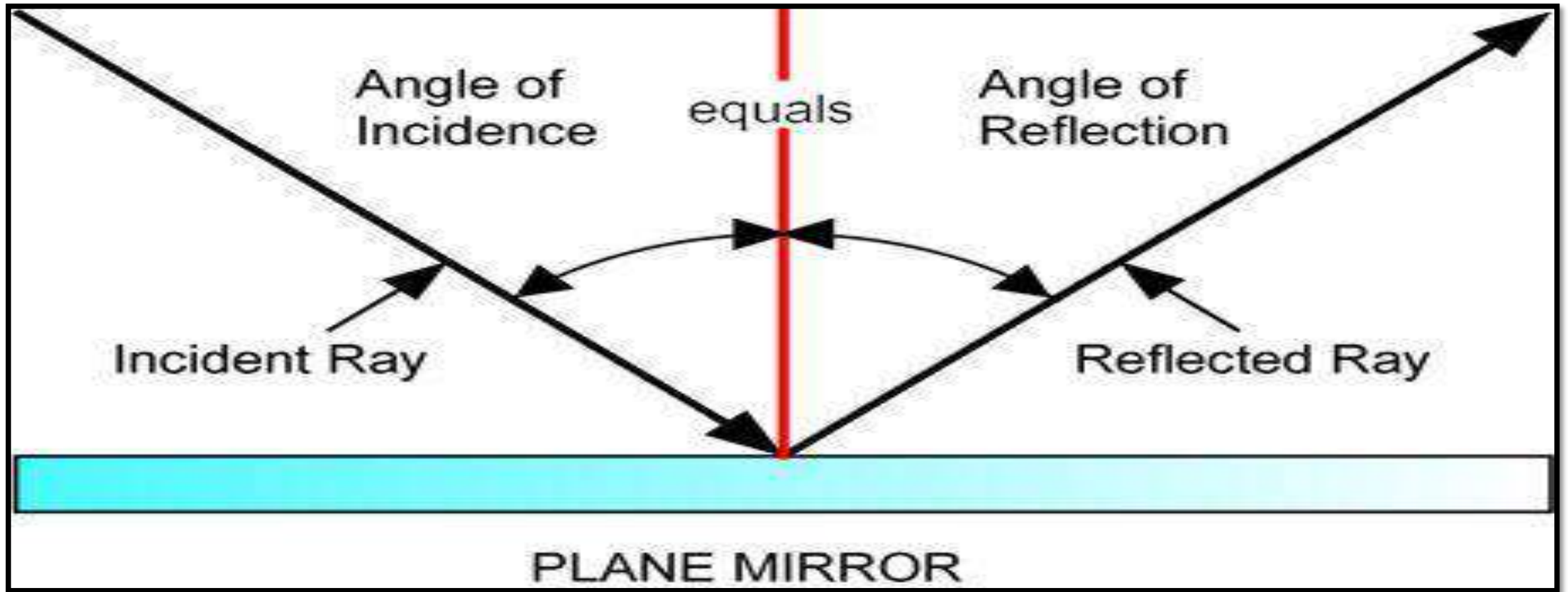
Light bounces off an object and it will produce an image or picture



## Refraction :

Bending of light rays when they travel through different Media



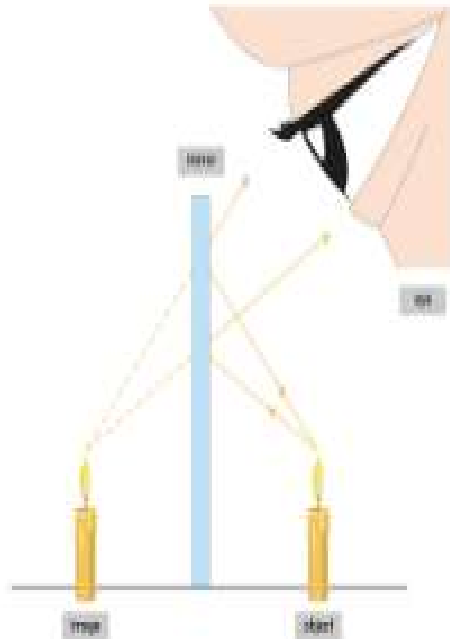


REFLECTION OF LIGHT  
LAW OF REFLECTION :  
**ANGEL OF INCIDENT LIGHT =ANGEL OF REFLECTED  
LIGHT**



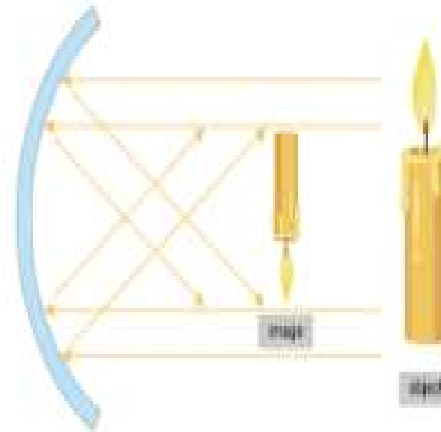
# Describe the image using 3 types of mirrors

Flat Mirror



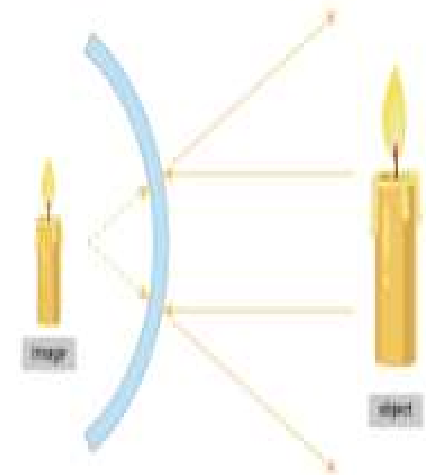
- flat surface
- produces right-side up images the same size as the object and same distance from the mirror

Concave Mirror



- curves inward
- produces upright or upside down images that are larger or smaller

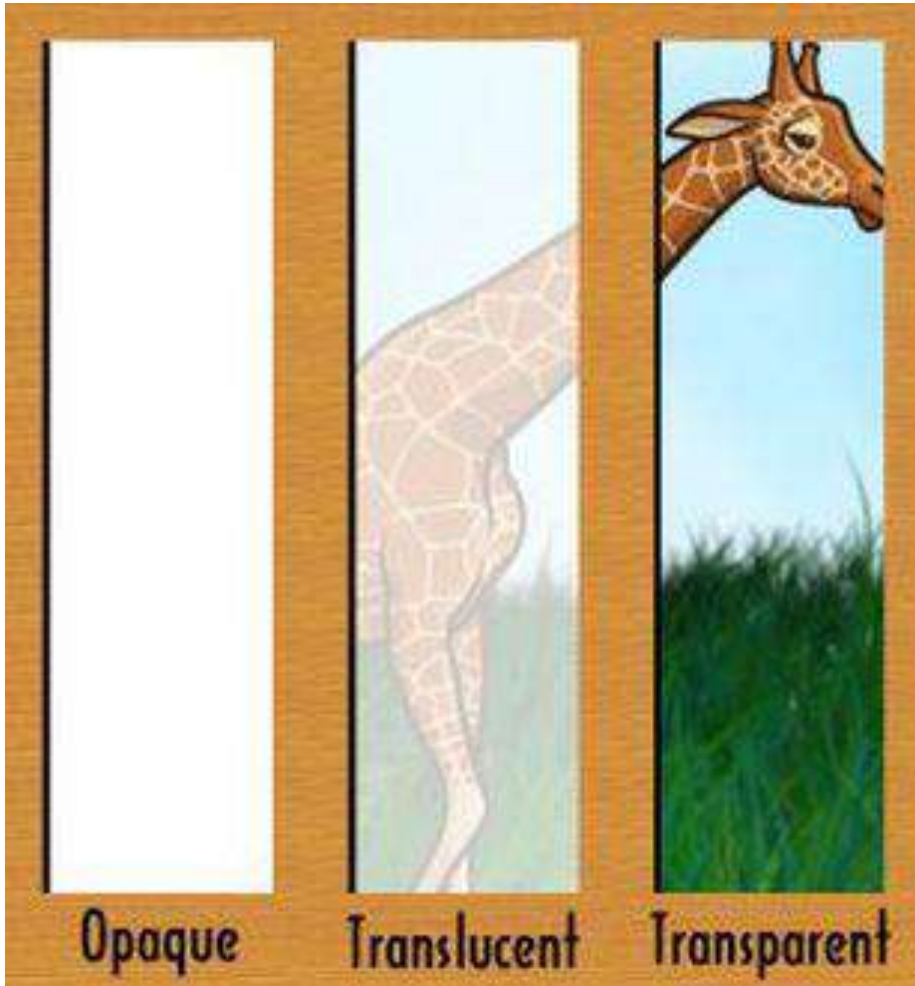
Convex Mirror



- curves outward
- produces images that are upright and smaller than the object

**Describe** how can you see the picture through the 3 types of surfaces

## Scattering



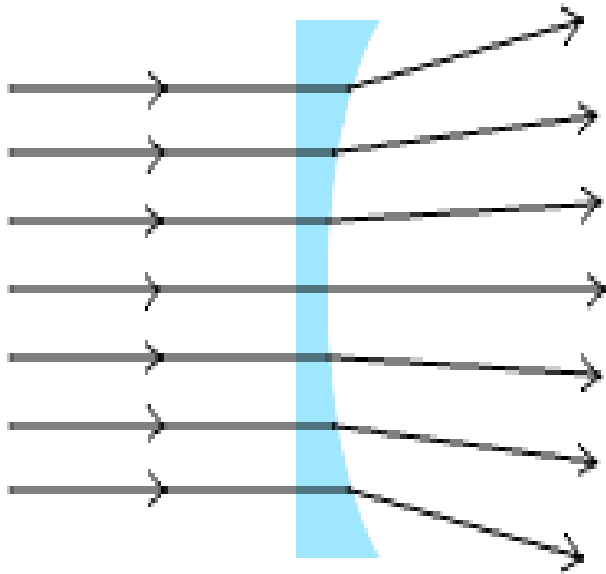
- **Scattering** – photons bouncing off at random angles from an object's surface.
- Sometimes light can also pass through an object.
  - **Transparent** object – most light passes through;
  - **Translucent** object – light is blurred as it passes through;
  - **Opaque** object – little to no light passes through.

# Light refraction application

## Lenses

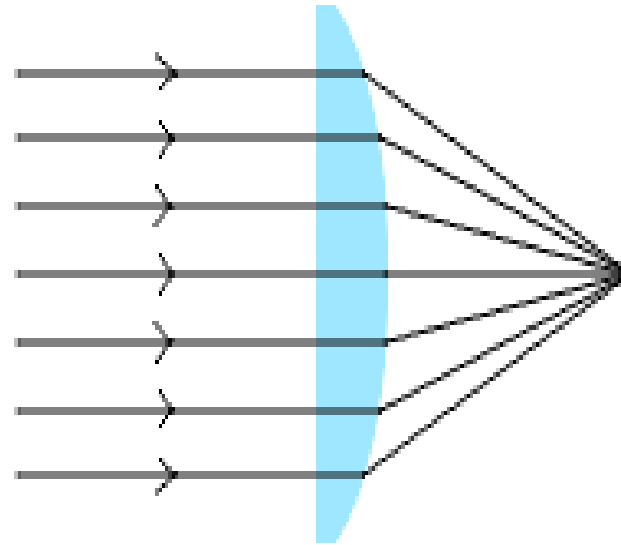
Image depends on : medium and distance from the medium

Image is same as convex mirror



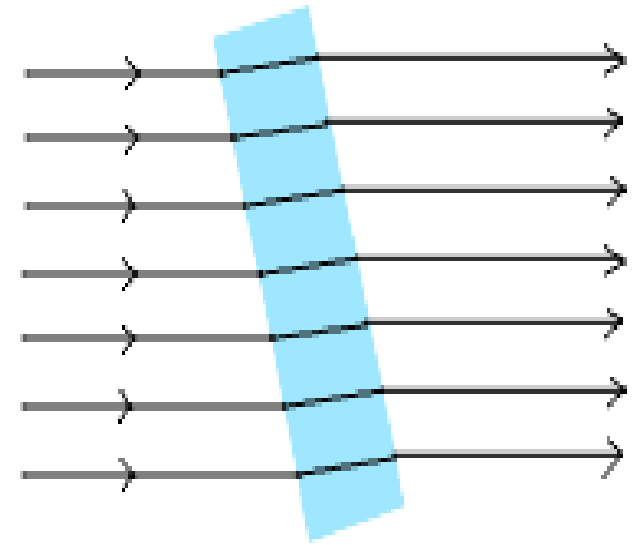
Standard Concave Lens

Image is same as concave mirror



Standard Convex Lens

Image is same as flat mirror



Standard Flat Plate

Which of the following correctly classifies this mirror?

D



A

Type of Mirror	Reason
Concave	The image is upright and larger than the object.

B

Type of Mirror	Reason
flat	The image is upright and the same size as the object.

C

Type of Mirror	Reason
Concave	The image is upside down and smaller than the object.

☒ D

Type of Mirror	Reason
Convex	The image is upright and smaller than the object.



Which statement **best** describes this mirror?

A

Convex.  
The image is smaller than the object.

B

Convex.  
The image is upside down.

C

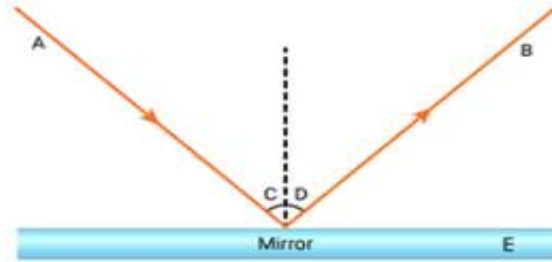
Flat.  
The mirror is very small in size.

☒ D

Concave.  
The image is larger than the object.

D

The image shows the reflection of a light ray.  
Which letter correctly represents the **incoming ray**?



☐ D

☐ C

☐ B

☒ A

Which of the following correctly represents the law of reflection?

☐ angle of the incoming ray  $>$  angle of the reflected ray

☐ angle of the incoming ray  $<$  angle of the reflected ray

☐ angle of the incoming ray  $\geq$  angle of the reflected ray

☒ angle of the incoming ray  $=$  angle of the reflected ray



Which statement **best** describes reflection?

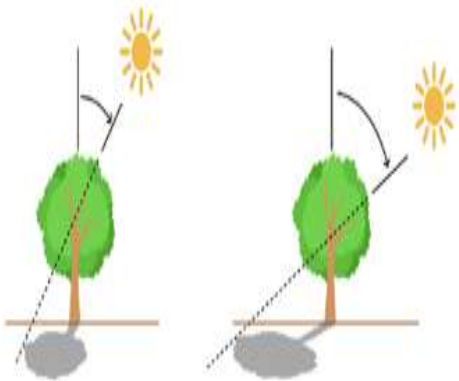
A

☒ the bouncing back of light waves when they hit a surface

☐ the bending of light through a transparent medium

☐ the absorption of light by a medium

☐ the scattering of light from a surface



B

Which of the following correctly describes how **the angle between the light source and the object** affects the length of the **shadow**?

☐ The larger the angle, the shorter the shadow.

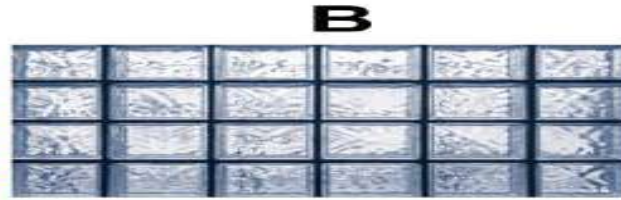
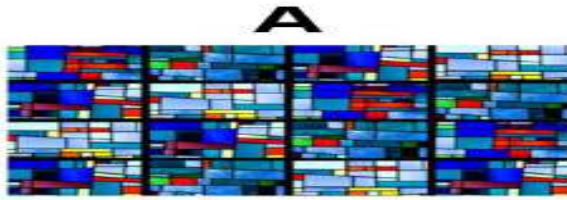
☒ The larger the angle, the longer the shadow.

☐ The smaller the angle, the longer the shadow.

☐ The angle size has no effect on the length of the shadow.

A dentist is looking for glass for the windows in his office to let light in and give his patients privacy.

B



Which glass would be the most suitable and why?

**A**

Glass A because it is transparent and would allow a lot of light in and create clear images.

**B**

Glass A because it is colorful would make the office look attractive.

**C**

Glass B because it is translucent and would let some light in so objects look blurred.

**D**

Glass C because it is opaque and would let no light into the office.

What happens when light cannot pass through or bend around an object?

**A**

The light's wavelength increases.

**B**

A shadow is formed behind the object.

**C**

Fewer photons are released.

**D**

The light is reflected off the object.

B

**1 Vocabulary** A material or an object that blocks light completely is

Opaque.

- 4 Test Prep** The law of reflection states that incoming and outgoing angles are
- ☒ always the same.
  - B** never the same.
  - C** always large.
  - D** always small.
- 5 Test Prep** Which kind of light has a wavelength shorter than green light?
- A** red light
  - B** radio waves
  - ☒ X-rays
  - D** yellow light



1. The original sound is louder than its echo because some of the energy from the original sound wave is

- ☐ A reflected.
- ☐ B compressed.
- ☒ C amplified.
- ☐ D absorbed.

2. Unlike sound waves, light waves can travel through a

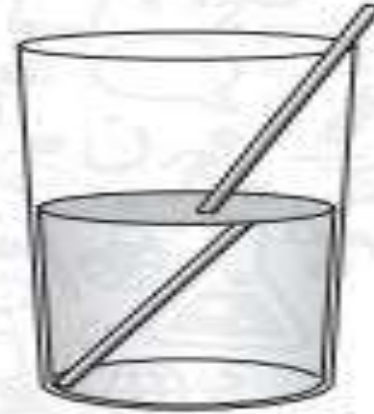
- ☒ A vacuum.
- ☐ B liquid.
- ☐ C solid.
- ☐ D gas.

3. Which unit is used to measure the volume of sound?

- ☐ A hertz (Hz)
- ☐ B ohm ( $\Omega$ )
- ☒ C decibel (dB)
- ☐ D ampere (A)

4. Which process causes the straw below to appear broken?

- ☐ A reflection
- ☒ B absorption
- ☐ C refraction
- ☐ D electromagnetism



5. Visible light and Gamma rays are two different types of electromagnetic rays. What common characteristics do these two forms of rays have?

- ☐ A They have the same wavelength.
- ☐ B They have the same frequency.
- ☐ C They have the same color.
- ☒ D They travel at the same speed.

mirror

المِرآة

clear glass

الزجاج الشفاف

colored glass

الزجاج الملون

wood

الخشب

steel

الفولاذ

water

الماء

air

الهواء

cotton

القطن

أي العناصر التالية تُعد شبه شفافة؟

Which of the following items is translucent?

ما المادة التي ينتقل من خلالها الصوت بشكل أسرع؟

Through which material does sound travel the fastest?



ما الوحدة التي يتم استخدامها لقياس حجم الصوت؟  
Which unit is used to measure the volume of sound?

Learning Outcomes Covered

o 4.3.2.1

Hertz (Hz) الهرتز

Ohm ( $\Omega$ ) الأوم

Decibel (dB) الديسيبل

Ampere (A) الأمبير

بخلاف الموجات الصوتية، تستطيع الموجات الضوئية أن تنتقل من خلال:  
Unlike sound waves, light waves can travel through a

Learning Outcomes Covered

o 4.3.2.1

Liquid السائل

Solid الصلب

Gas الغاز

Vacuum الفراغ.

أي مما يلي أفضل في امتصاص الموجات الصوتية؟  
Which material below is best for absorbing sound waves?

Learning Outcomes Covered

- o 4.3.2.1
- o 4.3.2.2
- o 4-3-2-1

- a. wool blanket بطانية صوف
- b. wood floor أرضية خشبية
- c. metal chair كرسي معدني
- d. Air الهواء

الصوت الأصلي أكثر ارتفاعًا من صداه لأن بعض الطاقة من الموجة الصوتية الأصلية قد:  
The original sound is louder than its echo because some of the energy  
From the original sound wave is

Learning Outcomes Covered

- o 4.3.2.1

- a. Reflected انعكست.
- b. Compressed انضغطت.
- c. Amplified تم تكبيرها.
- d. Absorbed. تم امتصاصها

يتص قانون الانعكاس على أن زوايا السقوط والانعكاس:

The law of reflection states that incoming and outgoing angles are:

Learning Outcomes Covered

o 4-3-2-1

- a. Always the same. تكون متساوية دائمًا.
- b. Never the same لا تكون متساوية مطلقًا.
- c. Always large. تكون كبيرة دائمًا. تكون
- d. Always small. صغيرة دائمًا.

الضوء المرئي وأشعة جاما هما نوعين مختلفين من الإشعاع الكهرومغناطيسي. ما الأشياء المشتركة بين هذين الشكلين من الإشعاع؟

Visible light and Gamma rays are two different types of electromagnetic Rays. What common characteristics do these two forms of rays have?

Learning Outcomes Covered

- o 4.3.2.1
- o 4.3.2.2
- o 4-3-2-1

- a. They have the same wavelength. لهما نفس طول الموجة.
- b. They have the same frequency. لهما نفس التردد.
- c. They have the same color. لهما نفس اللون.
- d. They travel at the same speed. ينتقلان بنفس السرعة.

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- d. Always small. صغيرة دائمًا.

- CHAPTER 9
- MINERALS, ROCKS,  
AND SOIL



11	SCI.2.3.03.007 Conduct a variety of experiments to determine minerals physical properties.		468
	SCI.2.3.03.007 يجري تجارب متنوعة لتحديد الخصائص الفيزيائية للمعادن		
12	SCI.2.3.03.007 Conduct a variety of experiments to determine minerals physical properties.	الشكل صفحة ٤٦٨	468
	SCI.2.3.03.007 يجري تجارب متنوعة لتحديد الخصائص الفيزيائية للمعادن	Figure page 468	
13	SCI.2.3.03.008 Explain properties used to determine minerals	الشكل صفحة ٤٧١	471
	SCI.2.3.03.008 يشرح الخصائص المستخدمة في تحديد المعادن	Figure page 471	
14	SCI.2.3.03.008 Explain properties used to determine minerals		474
	SCI.2.3.03.008 يشرح الخصائص المستخدمة في تحديد المعادن		

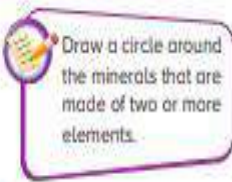
## What are minerals?

If you collect rocks, you might find a rock with red chunks in it. The red chunks are minerals. A **mineral** is a solid, natural material made from nonliving substances in Earth's crust.

Minerals, like all kinds of matter, are made up of elements. An element is a pure substance that cannot be broken down into a simpler substance. Gold is an element, as are aluminum, oxygen, sulfur, and iron. Some minerals, such as copper, are made of a single element. Other minerals are made of two or more elements. For example, the mineral pyrite is made of iron and sulfur. Topaz, feldspar, and quartz are examples of other minerals that are made up of two or more elements.

Minerals form naturally. Materials made by people are not considered minerals. Diamonds that form deep beneath Earth's surface are minerals. However, people can make diamonds in a laboratory. These diamonds are not minerals.

Although minerals are found in nature, they do not contain anything that was once alive, such as plant parts. Coal, for example, is made of ancient compressed plant material. Because the plants that turned into the coal were once alive, coal is not a mineral.



Properties of Minerals						
Mineral or Mineral Group	Color (more common colors)	Luster (type of shine)	Streak (powder from scratch test)	Cleavage (number of planes)	Hardness (on Mohs' scale)	Density (compared to water)
Gypsum	colorless, gray, white, brown	pearly	white	varies	2	2.3
Quartz	colorless, various colors	glassy or greasy	white	none	7	2.6
Pyrite	brassy, yellow	metallic	greenish black	none	6	5.0
Calcite	varies widely; colorless, white, pale blue, green	glassy	colorless, white	3	3	2.7
Galena	steel gray	metallic	gray to black	1	2.5	7.5
Feldspar	pink, gray, green, yellow, white	glassy or pearly	colorless	2	6	2.6
Mica	colorless, silver black	pearly or metallic	white	1 (thin sheets)	2-3	3.0
Hornblende	green to black	glassy or pearly	gray to white	2	5-6	3.4
Basalt rock	gray, red, brown, white	none	gray	none	1-3	2.0-2.5
Hematite	black, gray, reddish brown	metallic	red, reddish brown	none	5-6	5.3

**Luster** (LUS-tur) is the way a mineral reflects light. Minerals with a metallic luster appear shiny, like metal. Minerals with a nonmetallic luster look dull. These minerals can be described as glassy, pearly, oily, earthy, waxy, or silky. Graphite has a metallic luster. Quartz has a glassy luster, and talc has an oily luster.

Some minerals have other special properties that can be used to help identify them. For example, arsenic gives off an odor of garlic when it is heated. Calcite fluoresces, or glows, when it is exposed to ultraviolet light. Copper is a good conductor of electricity and heat. Quartz gives off sparks when its surface is scratched with a steel pin. Calcite fizzes when acid is dropped on it. Magnetite is magnetic and attracts steel objects.



Magnetite, or lodestone, attracts these metal objects.

## Quick Check

2. Why should you test several properties when identifying minerals?

---




---



---

## Visual Summary

Complete the lesson summary in your own words.



Properties of Minerals

---



---



---



---



---



Hardness of Minerals

---



---



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---



---



Crystals

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---



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When you rub a mineral against a rough surface, it leaves a powder.

What is that powder called?



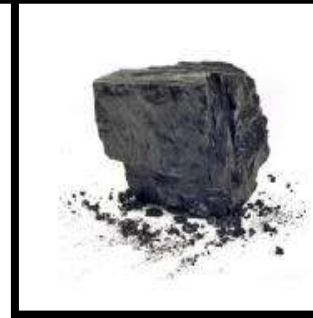
☐ rocks

☐ fracture

☒ streak

☐ line

Coal is found deep within the Earth's surface, but it is not a mineral. Why?



**A** It consists of only one type of element.

☒ **B** It is formed from living organisms.

**C** It occurs naturally.

☐ **D** It does not produce a streak.



These different colored minerals produce the same colored streak when rubbed on a rough surface.

D



What can you conclude?

**A** They are all made from one type of element.


**B** They are all formed from living things.

**C** They are all different minerals.

☒ They are all the same mineral.

Look at the table showing the characteristics of the mineral gold.

D

Gold	Characteristics
	state of matter: solid
	color: yellow/gold
	crystal structure: isometric
	made of: the element gold (Au)
	found: in natural rock formations

Which of the characteristics in the table is the **least** useful when defining minerals?

**A** crystal structure

**B** the elements it contains

**C** state of matter

☒ **D** color



You go for a walk and notice a very shiny mineral on the ground.  
Which property are you observing?



C




**A** hardness

**B** structure

**C** luster

**D** streak

According to the table, which mineral is both soft and has fluorescent properties?

Mineral	Color	Streak	Hardness	Cleavage	Special Property
Calcite 	colorless, white, pale blue, or green	white	3	3	glows under ultraviolet light
Magnetite 	black	black	5.5 – 6.5	none	has magnetic properties so it can attract steel objects
Quartz 	colorless or various colors	white	7	none	forms sparks when scratched with a steel pin


**A** calcite only

**B** magnetite only

**C** magnetite and calcite

**D** quartz and calcite

Based on the Mohs hardness scale, which are two minerals that can scratch quartz?

Mohs Hardness	01	02	03	04	05	06	07	08	09	10
Image										
Minerals	Talc	Gypsum	Calcite	Fluorite	Apatite	Feldspar	Quartz	Topaz	Corundum	Diamond

حدد خيارين (2)

☐ A apatite

☐ B flourite

☐ C calcite

☐ D talc

☒ topaz

☒ diamond

E-F

What is the **softest** mineral? Justify your answer.

C

Mohs Hardness	01	02	03	04	05
Image					
Minerals	Talc	Gypsum	Calcite	Fluorite	Apatite

Mohs Hardness	06	07	08	09	10
Image					
Minerals	Feldspar	Quartz	Topaz	Corundum	Diamond

A

Quartz because it has a Mohs hardness value of 7 and can be easily scratched by talc.

B

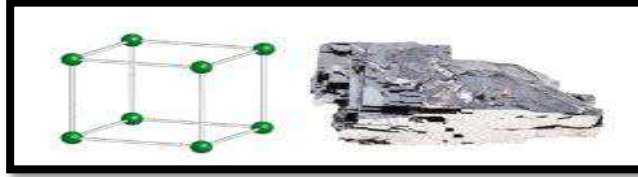
Gypsum because out of the 10 minerals in the table, it is the easiest to crumble.

D

Diamond because it has a Mohs hardness value of 10 and can easily scratch all other minerals.

Talc because it has a Mohs hardness value of 1 and can easily be scratched by all other minerals.

Which of the following correctly describes the appearance and structure of this mineral?



A

Luster	Crystal Structure
metallic	hexagonal

B

Luster	Structure
nonmetallic	orthorhombic

C

Luster	Crystal Structure
nonmetallic	cubic



D

Luster	Crystal Structure
metallic	cubic

D



15	SCI.2.3.03.009 Describe the properties of the three types of rocks and connect these porperties according its formation	الشكل صفحة ٤٨٥	485
	SCI.2.3.03.009 يصف خواص الأنواع الثلاثة للصخور ، ويربط هذه الخصائص بمنشأ هذه الصخور الأصلي	Figure page485	
16	SCI.2.3.03.009 Describe the properties of the three types of rocks and connect these porperties according its formation		486
	SCI.2.3.03.009 يصف خواص الأنواع الثلاثة للصخور ، ويربط هذه الخصائص بمنشأ هذه الصخور الأصلي		
17	SCI.2.3.03.010 Classify rocks and minerals according to their different physical properties		487
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## The Rock Cycle



weathering →

deposition →

pressure and heat →

magma and lava →

igneous rock

sedimentary rock

metamorphic rock

### Read a Diagram

What causes an igneous or sedimentary rock to become a metamorphic rock?

**Clue:** Look at the key to find out what the arrow means.

485

## What are igneous and sedimentary rocks?

Since at least 50,000 years ago, people have used rocks to make weapons and start fires. How did these rocks form? What other uses have people found for rocks?

### Igneous Rocks

When an igneous rock forms from magma inside Earth, it is called an **intrusive** (in-TREW-siv) rock. Below Earth's surface, intrusive rocks cool slowly. They may take 100 years or more to cool a few degrees. This often produces large crystals. If you find an igneous rock with large crystals in it, you can conclude that the rock is intrusive.

Granite is a common intrusive rock. It is often used as a building material. The minerals that make up gems, such as rubies, may form in intrusive rocks. They can also be used to make jewelry.



Pink granite is an intrusive igneous rock, while obsidian is an extrusive igneous rock.

Because of its rough surface, people use pumice to remove dead skin cells.



An igneous rock that forms from lava on Earth's surface is called an **extrusive** (ik-STREW-siv) rock. On Earth's surface, lava is exposed to air or water, causing it to cool and harden very rapidly. Lava may cool in minutes when it spills into the sea or in a number of days as it flows over land. Large crystals do not have time to form. The crystals that form in these rocks are very small and difficult to see. **Basalt**, the most common extrusive rock, is made of many small crystals.

Some extrusive rocks develop so quickly that they do not contain any crystals. **Obsidian**, which is also called volcanic glass, is an example of an extrusive rock that has no crystals. Its surface is smooth and glassy. People have used **obsidian** to make sharp tools and weapons. **Rhyolite** is another example of an extrusive igneous rock.

**Pumice** is another type of extrusive rock. As pumice forms, gases bubble through the rock. The holes that are left behind make pumice light and rough. Because it is rough, pumice is often used for grinding or polishing.

486

EXPLAIN

## Sedimentary Rocks

Sedimentary rocks are made of different materials that have been compacted and cemented together. Some sedimentary rocks contain minerals that were once dissolved in water. The minerals formed crystals among the sediments that came together to form the rock.

Some sedimentary rocks are made from smaller rounded stones that have been cemented together. This type of rock is called a **conglomerate** (kun-GLAHM-rut) rock.

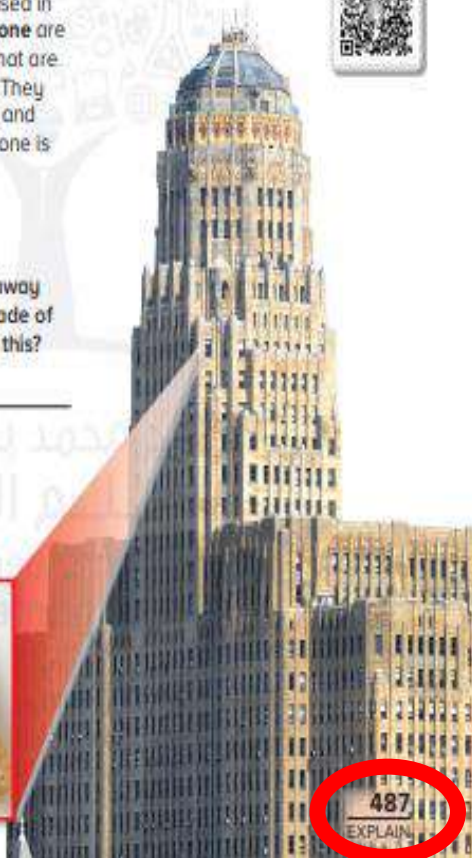
Sedimentary rocks are often used in buildings. **Limestone** and **sandstone** are two types of sedimentary rocks that are used on the outside of buildings. They are also used for making statues and other decorations. Ground limestone is an ingredient in concrete.



### Quick Check

- You are driving along a highway cut through walls of rock made of layers. What type of rock is this?

This building is covered with sandstone and limestone.



487

EXPLAIN



## What are metamorphic rocks?

If sedimentary and igneous rocks are put under heat and pressure, the shape or the size of the crystals within them can change. The crystals may also change position to form layers. Heat and pressure may even change one of the minerals in the rock into another mineral. The high pressure also squeezes the particles in the original rock more tightly together.

If you look closely at limestone, you can often see fossil fragments in the rock. As limestone changes into marble under heat and pressure, the fossils are usually crushed. **Marble** is a more compact rock than limestone, with crystals that are locked together like pieces of a jigsaw puzzle. The color in marble comes from the minerals in the original piece of limestone.

**Slate** is a type of metamorphic rock in which the minerals are tightly packed together, making it waterproof. When **slate** is broken, it shows cleavage as it breaks into thin sheets. This makes **slate** useful as a roofing material as well as for stepping stones and outside floors.

Marble is a shiny metamorphic rock that contains minerals that give it brilliant colors. Marble is easy to carve or shape, making it useful for fashioning statues, floors, kitchen counters, and monuments.

### Quick Check

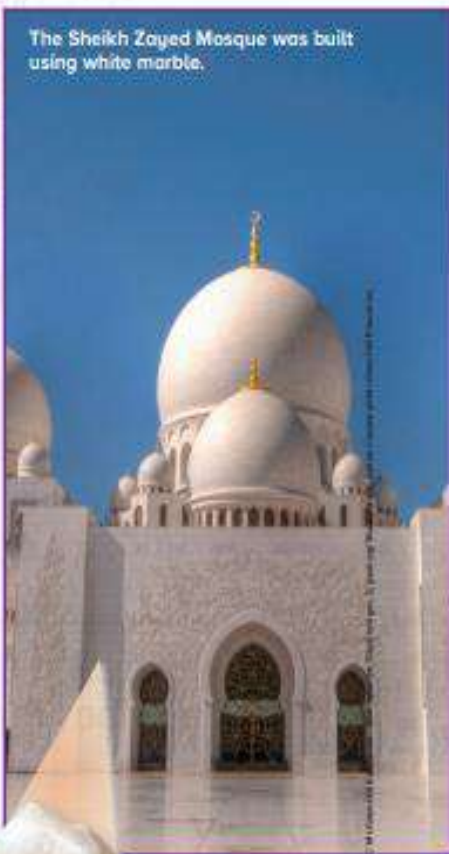
6. What happens to the fossils in limestone as the limestone turns into marble?

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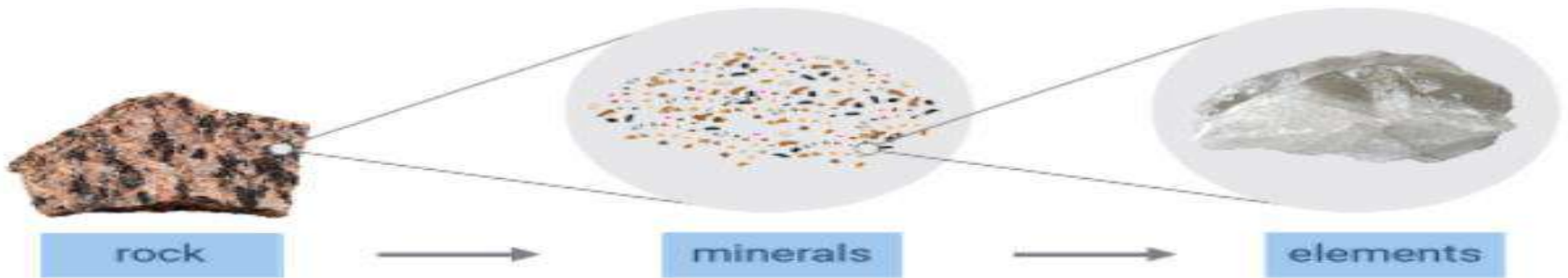
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The color in this marble was caused by mineral impurities in the limestone from which it formed.



The Sheikh Zayed Mosque was built using white marble.



Rocks	Both	Minerals
<ul style="list-style-type: none"><li>• made of 1 or more minerals</li><li>• can contain living matter</li><li>• unorganized structure</li></ul>	<p>solid</p> <p>naturally occurring</p>	<ul style="list-style-type: none"><li>• made of 1 or more elements</li><li>• only contains nonliving matter</li><li>• organized crystal structure</li></ul>

a **granite** is made of

**quartz + feldspar + biotite**

quartz =  
**silicon + oxygen**



# Formation



Igneous  
صخور نارية

Formed when lava  
cools and hardens  
into solid



Sedimentary  
صخور رسوبية

Formed from cementation  
and compaction of sediments  
and they are cemented by  
melted minerals



Metamorphic  
صخور متحولة

Formed from changing of  
igneous or sedimentary rocks  
20 km below surface and  
under high temperature and  
pressure without melting



## Extrusive

- formed from lava
- cools quickly on Earth's surface
- has small mineral crystals
- examples:



**Basalt**



**Obsidian**

## igneous rock

## Intrusive

- formed from magma
- cools slowly deep inside Earth
- has large mineral crystals
- examples:

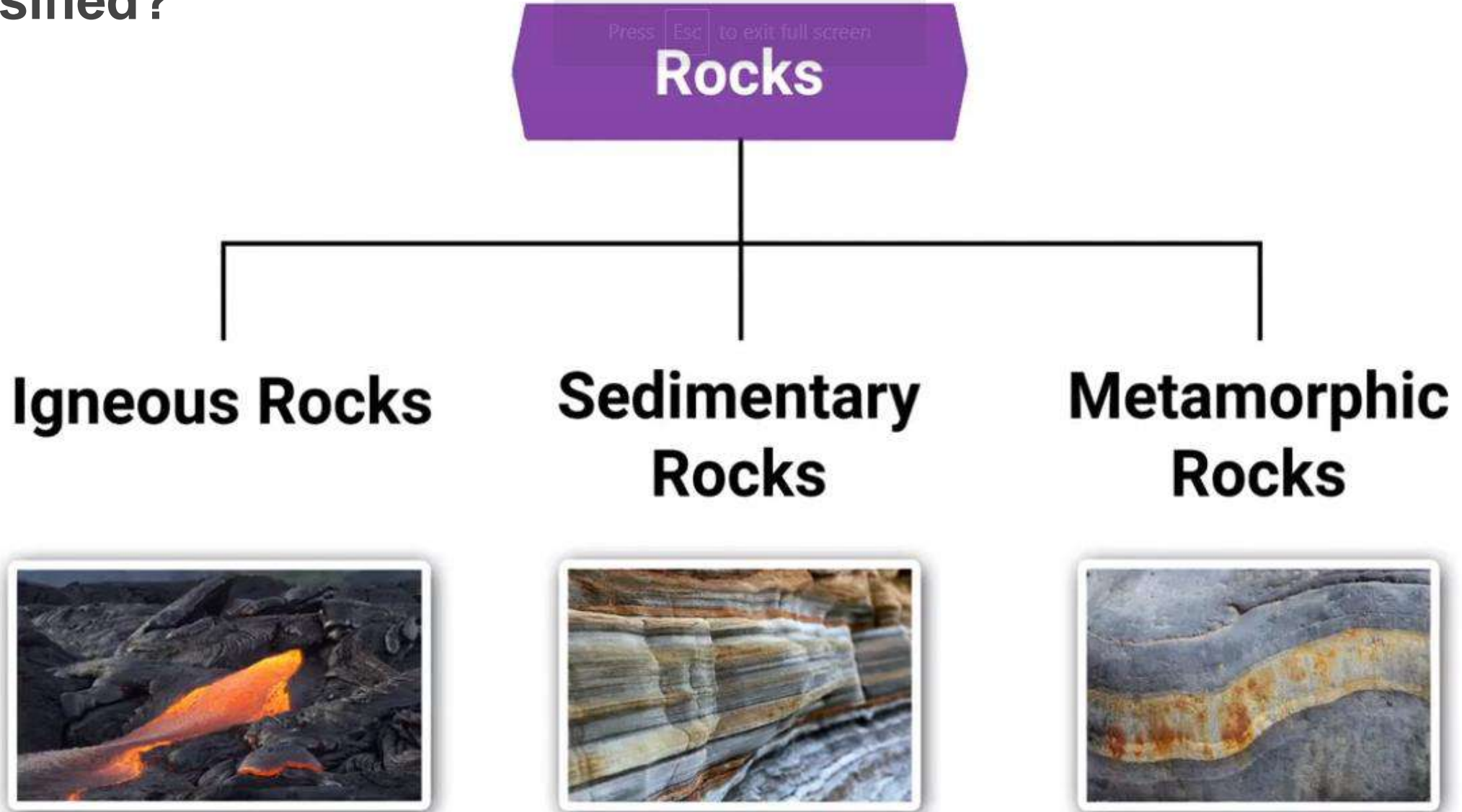


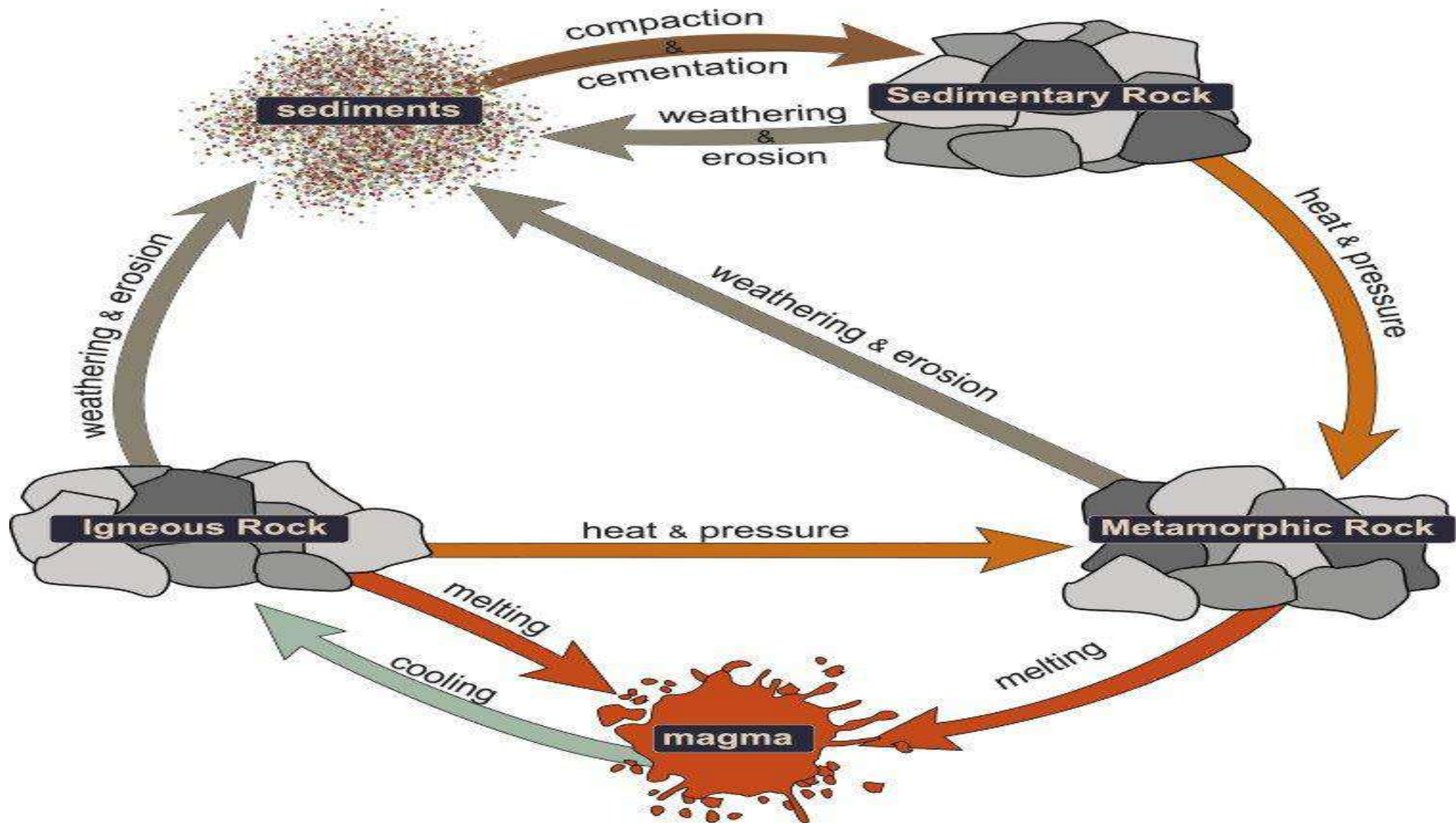
**Granite**



**Gabbro**

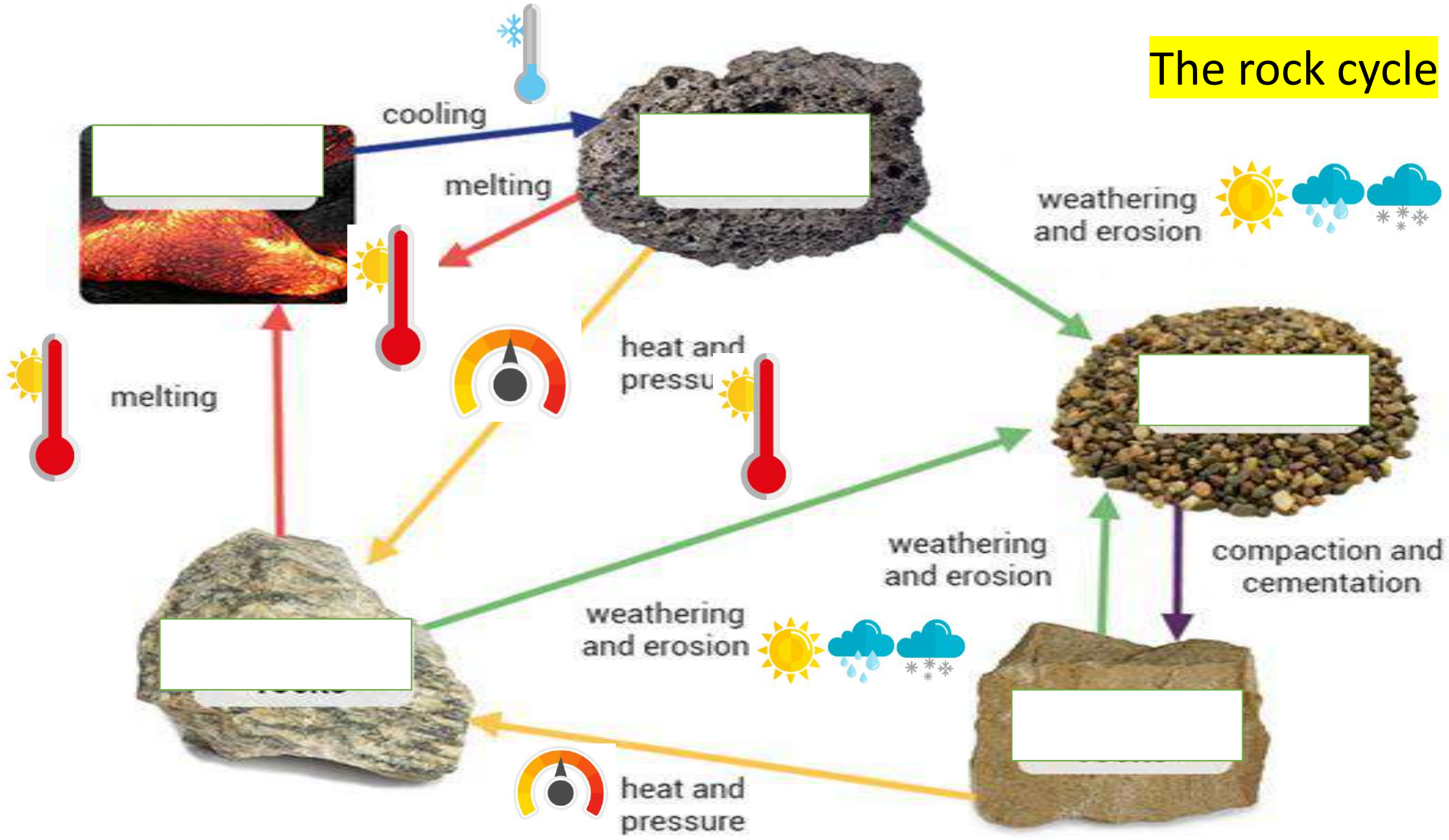
# How are rocks classified?







# The rock cycle



Use the table with Mohs Hardness Scale to answer the question.

A

Which mineral is the hardest and can scratch corundum?



diamond

**B**

quartz

**C**

calcite

**D**

gypsum

Mohs' Hardness	01	02	03	04	05	06	07	08	09	10
Image										
Minerals	Talc	Gypsum	Calcite	Fluorite	Apatite	Feldspar	Quartz	Topaz	Corundum	Diamond



Use the table to select the properties that describe quartz.

Mineral	Luster	Streak	Cleavage
Calcite	glassy	colorless, white	3
Quartz	glassy or greasy	white	none
Mica	pearly or metallic	white	1
Hematite	metallic	red, reddish-brown	none

حدد خيارين (3)

☐ A pearly or metallic luster

☐ B cleavage = 3

☐ C metallic luster

☐ D red, reddish brown streak

☐ E cleavage = 1

☐ F white streak

☐ G no cleavage

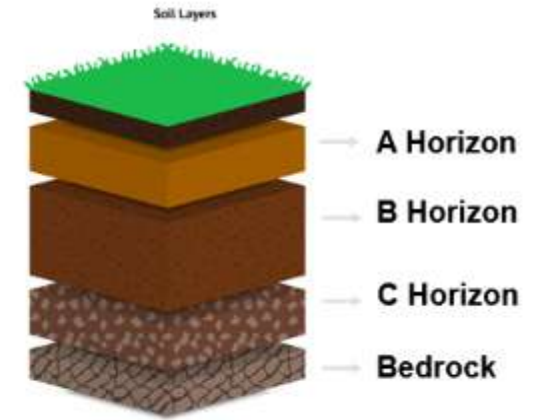
☐ H glassy or greasy luster

*Drag and drop the terms that best describe each horizon layer.*

The A Horizon

The B Horizon

The C Horizon



⊕ slate

⊕ supersoil

⊕ topsoil

⊕ weathered rock

⊕ decayed soil

⊕ subsoil

Which soil profile would **most likely** have the largest soil community?

A



B



C



D



D

Which is the horizon of soil made of?

أي من الخيارات التالية تُصنع الطبقة الأفقية  
من التربة؟

- a. clay الطين
- b. humus الدبال
- c. bedrock صخر الأديم
- d. large rocks الصخور الكبيرة

All are changes that happen in the rock  
cycle except:

جميع التغيرات التالية تحدث خلال دورة الصخور  
بإستثناء:

- a. الصخور المتحولة ← الصهارة  
metamorphic rock → magma
- b. الصخور النارية ← الرواسب  
igneous rock → sediments
- c. الرواسب الصخور ← الرسوبية  
sediments → sedimentary rock
- d. الصُّهارة ← الصخور الرسوبية  
magma → sedimentary rock

Which is strip farming?

ما هي الزراعة الشريطية؟

- a. حفر الرفوف في التلال  
cutting shelves in hills
- b. إضافة السماد للتربة  
adding fertilizer to soil
- c. زراعة الأعشاب بين صفوف المحاصيل  
planting grasses between crop rows
- d. زراعة الأشجار حول المحاصيل  
planting trees around crops



From which material does an extrusive rock form?

أي من المواد التالية تشكل الصخور السطحية؟

- a. magma الصهارة
- b. mineral المعادن
- c. sediment الرواسب
- d. lava الحمم البركانية

From which material does an extrusive rock form?

أي من المواد التالية تشكل الصخور السطحية؟

- a. intrusive igneous الصخور النارية المتداخلة
- b. extrusive igneous الصخور النارية السطحية
- c. metamorphic الصخور المتحولة
- d. sedimentary الصخور الرسوبية

الطريقة التي يعكس بها المعدن الضوء تسمى: mineral reflects light is called:

المخرجات التعليمية المرتبطة

2-1-1-3 o

The streak المخدش .a

The fracture المكسر .b

The Luster البريق .c

The cleavage الانقسام .d

أي مما يلي هو أفضل وصف لتربة الغابات؟  
The following is the best of forest soil?

طبقة الدبال رقيقة والمعادن قريبة من السطح  
Thin humus layer, minerals close to the surface .a

نسبة قليلة جدًا من الدبال والغنى بالمعادن  
Very little humus, rich in minerals .b

نسبة قليلة جدًا من الدبال وقلة المعادن  
Very little humus, few minerals .c

طبقة الدبال رقيقة والمعادن عميقة تحت السطح  
Thin humus layer, minerals deep beneath the surface .d

كيف تساعد الدورة الزراعية في الحفاظ على التربة؟

تحتفظ بالمياه بالقرب من جذور النباتات.  
It holds water near the roots of plants .a

تحافظ على التربة من التطاير  
It keeps soil from blowing away .b

تُزيل مغذيات التربة  
It removes soil nutrients .c

تُعيد المغذيات إلى التربة  
It returns nutrients to soil .d

ما الذي يسبب تغيّر صخور نارية إلى صخور متحوّلة؟  
How does an igneous rock to a metamorphic rock?

المخرجات التعليمية المرتبطة

2-1-1-4 ○

- .a العوامل الجوية والتآكل Weathering and erosion
- .b الضغط والتلاحم Compaction and cementation
- .c الإذابة والتبريد Melting and cooling
- .d الحرارة والضغط Heat and pressure

Is an igneous rock to  
a metamorphic rock?

ما الذي يسبب تغير صخور نارية إلى صخور متحوّلة؟

المخرجات التعليمية المرتبطة

2-1-1-4 ○

a. العوامل الجوية والتآكل Weathering and erosion

b. الضغط والتلاحم Compaction and cementation

c. الإذابة والتبريد Melting and cooling

d. الحرارة والضغط Heat and pressure

In which layer of soil are **most** living organisms, such as worms, beetles, and plants, found?

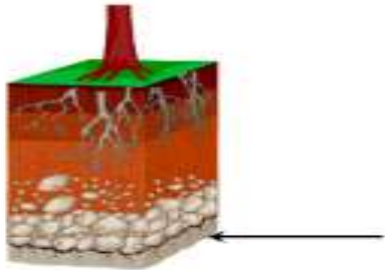
**A** weathered parent rock layer

**B** topsoil

**C** subsoil

**D** unweathered bedrock layer

B



What is the name of the layer that is **below the C horizon** layer of soil?

**A** parent rock

**B** subsoil

**C** topsoil

**D** bedrock

D





Which characteristics are true about the **A horizon** identified in the diagram?

A

Name of the Layer	Features
topsoil	least humus, least nutrients

C

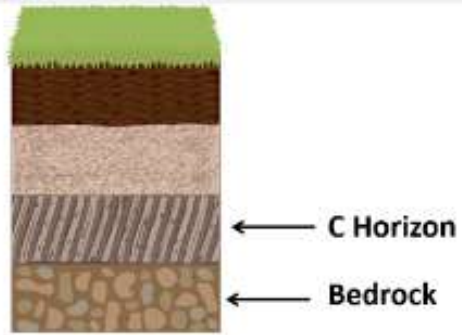
Name of the Layer	Features
bedrock	least humus, least nutrients

B

Name of the Layer	Features
topsoil	most humus, most nutrients

D

Name of the Layer	Features
subsoil	most humus, most nutrients



Which of the following comparisons are true for parent rock and bedrock?

A

C horizon	bedrock
consists of larger pieces of weathered rock	consists of unweathered rock

B

C horizon	bedrock
contains the most humus	contains the least humus

C

C horizon	bedrock
consists of rock particles, clay, and less humus	consists of the most humus

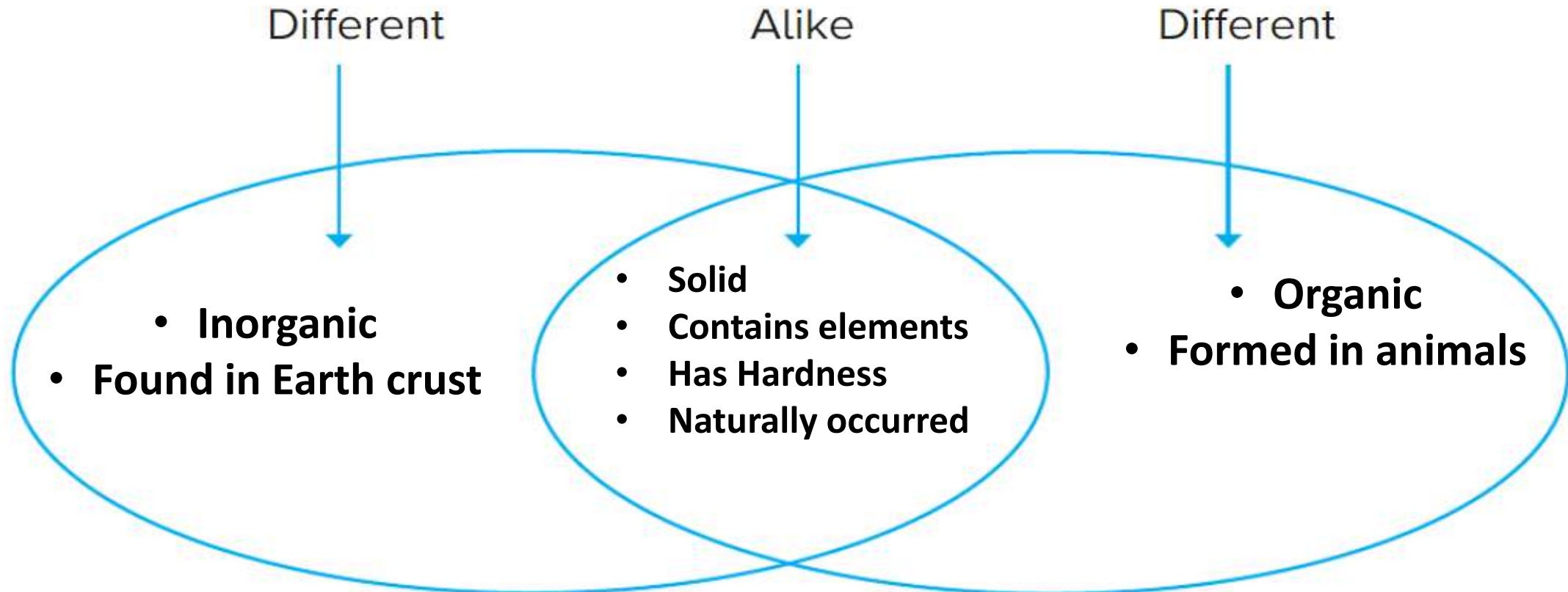
D

C horizon	bedrock
consists of unweathered rock	consists of weathered rock

# Think, Talk, and Write

**1 Vocabulary** The color of a mineral's powder is called its streak.

**2 Compare and Contrast** Bones contain elements found in minerals. Why is bone not considered a mineral?



**3 Critical Thinking** Give an example of an object you use daily that is made from a mineral.

Coins , knives , steel nail , stainless steel tools and wires

**4 Test Prep** Which property describes minerals that break along smooth surfaces?

- A** hardness    **C** fracture  
**B** color       ☒ cleavage

### Essential Question

What are the properties of minerals and how are they identified?

1- Hardness and streak : by rubbing and scratching

2- Luster , Shape of breaking and Color : by viewing and observing

3- Shape of crystals : by microscopes

20	SCI.2.3.03.011 Explain how the interaction between earth systems leads to the formation of sedimentary,igneous and metamorphic rocks		499
	SCI.2.3.03.011 يفسر كيف يؤدي التفاعل بين الأنظمة الأرضية التي تشكل الصخور النارية والرسوبية والمتحولة والتربة		
21	SCI.2.3.03.011 Explain how the interaction between earth systems leads to the formation of sedimentary,igneous and metamorphic rocks		502
	SCI.2.3.03.011 يفسر كيف يؤدي التفاعل بين الأنظمة الأرضية التي تشكل الصخور النارية والرسوبية والمتحولة والتربة		
22	SCI.2.3.03.011 Explain how the interaction between earth systems leads to the formation of sedimentary,igneous and metamorphic rocks		502
	SCI.2.3.03.011 يفسر كيف يؤدي التفاعل بين الأنظمة الأرضية التي تشكل الصخور النارية والرسوبية والمتحولة والتربة		



## Soil Horizons

Each layer of soil is called a **soil horizon** (huh-RYE-zuh-n). In some places, the layers of soil might look like the ones on this page.

The **A** horizon, which holds the most nutrients, contains humus (HYEW-mus). **Humus** is the part of the soil that is made of decayed organic materials. These materials are the remains of dead plants and animals that are decayed by microscopic organisms. Humus contains nutrients that feed plants. Humus also soaks up and holds water more easily than bits of rock.

The soil in this horizon is called **topsoil**. Most plant roots grow in this soil. The roots absorb nutrients and water from humus.

The **B** horizon is called subsoil. You will find less humus in subsoil and lots of fine particles of rock, such as the particles that make up clay.

Next is the **C** horizon, which is made mostly of larger pieces of weathered rock. These soil horizons rest on solid, unweathered bedrock.

Different areas will have different depths of soil horizons. Some areas may not have one of these soil horizons.

### Quick Check

1. What are the main steps in the formation of soil?

---



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**FACT** Soil is made of nonliving and once-living things.

## Soil Horizons

A

B

C



495

EXPLAIN

## How is soil conserved?

The preservation or protection of natural resources, including soil, is called **conservation** (kahn-sur-VAY-shun). Listed below are some methods of conserving soil:

**Fertilization** Fertilizers containing one or more nutrients can be added to soil to replace nutrients used up by previous crops.

**Crop Rotation** Farmers can plant different crops on the same land in different years. They can choose crops that add the nutrients that have been removed by other crops.

### Contour Plowing



#### Read a Photo

How does the method shown in the photograph conserve soil?

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---

502

EXPLAIN

**Strip Farming** Plant roots help prevent soil from being washed or blown away. For this reason, farmers may plant grasses between rows of other crops.

**Contour Plowing** Rainwater flows swiftly down hills and can carry away rich topsoil. Farmers can slow the speed of water flowing down the hill by contour plowing. Instead of plowing up and down the slope of the hill, farmers plow furrows across the slope.

**Terracing** Terraces are flat shelves that are cut into a hillside. Crops are planted along each terrace. This also slows the speed of water flowing down a slope.

**Wind Breaks** Farmers plant tall trees along the edges of farmland to slow the speed of wind across the ground. Where there are trees, the wind is less likely to blow away topsoil.

**Laws** Governments may pass laws to stop the pollution of soil.

**Individual Efforts** You can avoid polluting soil with trash and help clean up land that has already been polluted.

**Education** You can help inform people of the value of soil and how to conserve it.

### Quick Check

3. What might cause mountaintops to have little or no topsoil?

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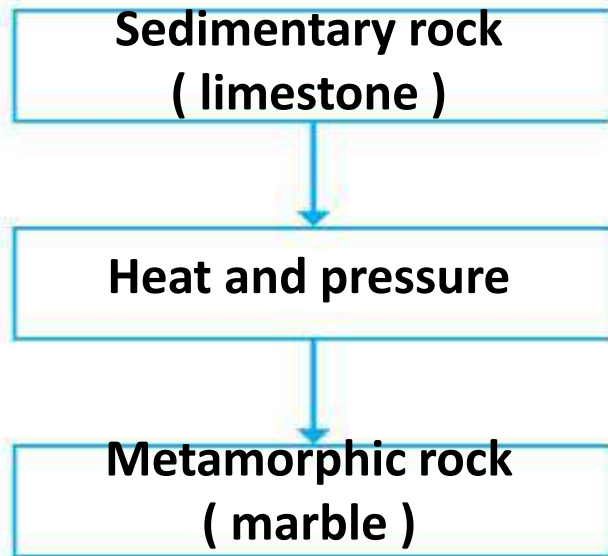
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## Think, Talk, and Write

- 1 **Vocabulary** When magma or lava hardens, igneous rock is produced.
- 2 **Sequence** What are the steps by which a sedimentary rock turns into a metamorphic rock?



- 3 **Critical Thinking** What steps of the rock cycle involve heat?

1- Rocks melt by heat to form magma then the magma cools to form igneous rocks

2- Sedimentary and igneous rocks are transformed to metamorphic rocks by heat and pressure



**4 Test Prep** From which material does an extrusive rock form?

- A** magma      **C** mineral
- ☒ lava      **D** sediment

**5 Test Prep** A conglomerate is an example of which type of rock?

- A** intrusive igneous
- B** extrusive igneous
- ☒ sedimentary
- D** metamorphic

### **Essential Question**

What are the properties of rocks and how are they classified?

- 1- Texture : Shape and size of grains (glassy , fine and coarse )
- 2- Shape : fragmental and angular
- 3- Structure : angular and crystalline
- 4- Formation : Igneous , metamorphic and sedimentary

### ✓ Quick Check

1. What are the main steps in the formation of soil?

weathering of rock, breakdown

of rock by microorganisms, plant

growth, decay of plants and animals

### ✓ Quick Check

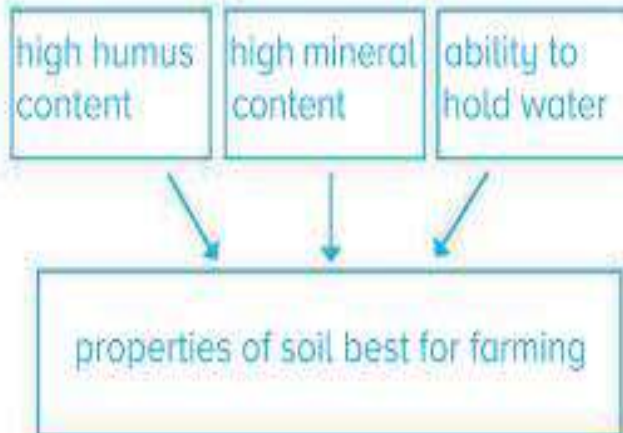
3. What might cause mountaintops to have little or no topsoil?

Topsoil is on the surface of the land. On a mountaintop, rain can easily wash soil down the slope.

Copyright © McGraw-Hill Education Tim McCreary, USDA, NPS

### ✓ Quick Check

2. What properties of soil are best for farming?





## **What Is Soil?**

**Mixture of weathered rocks with decayed living things**



## **Soil Use**

**Used to grow plants because it contains nutrients and minerals and these compounds replaced after death of plants**



## **Conserving Soil**

**By terracing , strip farming , contour plowing , crop rotation , fertilization , wind breaks and people awareness**



- Which mineral property describes how easily a mineral can be scratched?
  - A** streak
  - ☒ **B** hardness
  - C** cleavage
  - D** reaction to acid
- All are changes that happen in the rock cycle EXCEPT \_\_\_\_\_.
  - ☒ **A** magma → sedimentary rock
  - B** igneous rock → sediments
  - C** metamorphic rock → magma
  - D** sediments → sedimentary rock
- A student tested the hardness of four mineral samples by using each sample to scratch the others. Mineral 1 scratched Mineral 2 but would not scratch Mineral 3. Mineral 2 would not scratch any of the others. Mineral 4 scratched Mineral 3. Which list shows the mineral samples in order from softest to hardest?
  - A** 1, 2, 3, 4
  - B** 1, 3, 4, 2
  - ☒ **C** 2, 1, 3, 4
  - D** 2, 4, 1, 3
- Which properties are most helpful in identifying minerals?
  - A** weight and shape
  - B** size and ability to float
  - ☒ **C** luster and streak
  - D** shape and color

Use the chart below to answer question 5.

Rock Group	Characteristics
	forms as melted rock cools and hardens into a solid
	forms when rocks are exposed to increases in heat and pressure
	forms when pieces of rocks and minerals are cemented together

- The chart above lists characteristics of the three main rock groups. Which order correctly fills in the left column (top to bottom)?
  - A** igneous, sedimentary, metamorphic
  - B** lava, igneous, metamorphic
  - C** sedimentary, metamorphic, igneous
  - ☒ **D** igneous, metamorphic, sedimentary

6. Study the table below.

Hardness	Mineral
1	talc
2	gypsum
3	calcite
4	fluorite
5	apatite
6	feldspar
7	quartz
8	topaz
9	corundum
10	diamond

Copper has a hardness of 3. Which minerals would copper most likely scratch?

- A** topaz and talc
- B** apatite and diamond
- ☒ **C** gypsum and talc
- D** feldspar and quartz

7. You are trying to find out what kind of mineral you have. You will need a white tile to find out which property?

- A** color
- B** hardness
- C** luster
- ☒ **D** streak

8. What causes an igneous rock to change into a metamorphic rock?
- A** weathering and erosion
  - ☒ **B** heat and pressure
  - C** compaction and cementation
  - D** melting and cooling
9. A student placed a liquid on a mineral and the mineral began to fizz and bubble. What property was the student investigating?
- A** cleavage
  - B** hardness
  - C** luster
  - ☒ **D** reaction to acid
10. Rocks are changed by conditions above and below Earth's surface. Explain how a sedimentary rock can become an igneous rock.

1- Sedimentary rocks are melted by heat to form magma

2- The magma cools to form igneous rock

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# •CHAPTER 10

Technology and design



23	SCI.1.2.01.008 Recognize the impact of technological evolution on the changing desires and needs of people with time	تمرين ٢ exercise 2	523
	SCI.1.2.01.008 يبين أثر التطور التكنولوجي على تغير رغبات وحاجات الناس مع الزمن		
24	SCI.1.2.01.005 Analyze and interpret the technological and engineering problems	الشكل صفحة ٥٣٤	534
	SCI.1.2.01.005 يحلل ويفسر المشكلات التكنولوجية والهندسية	Figure page534	
25	SCI.1.2.01.005 Analyze and interpret the technological and engineering problems		534
	SCI.1.2.01.005 يحلل ويفسر المشكلات التكنولوجية والهندسية		



The invention of the microscope allowed cells to be discovered.

### Quick Lab

To learn more about the factors that change the brightness of a lightbulb, do the Quick Lab in the Activity Lab Manual.

### Quick Check

1. How is technology involved in scientific advances?

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2. Why are pencils and paper considered technology?

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You may have noticed that the words *science* and *technology* are often used together. This is because technology depends on science. Before a solution to a problem can be developed, humans must understand the scientific principles behind the problem. For example, doctors have to understand the causes of diseases before they can treat them.

Humans also use technology to gain more scientific knowledge. For example, technology like computers, CAT scans, and MRIs allow doctors to learn more about the human body. This allows people to develop new technology to treat diseases. Science and technology go hand in hand.

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EXPLAIN

## Read and Respond

### How can technology mimic nature?

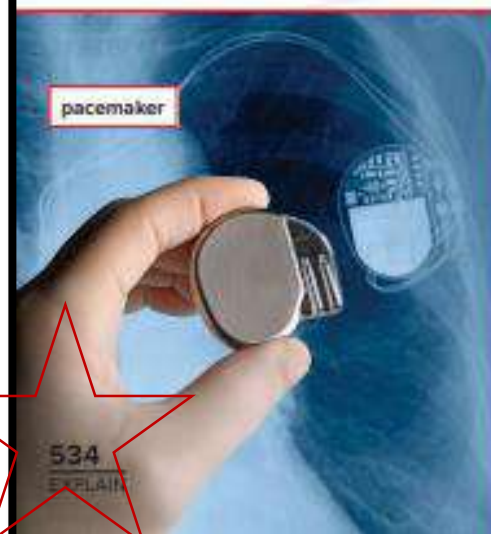
When you think of technology, computer chips, robots, televisions, and spacecraft might come to mind. Nature seems to have nothing to do with technology—or does it? In fact, nature plays an essential role in the invention of many new technologies.

Underline three objects that imitate objects that occur in nature.

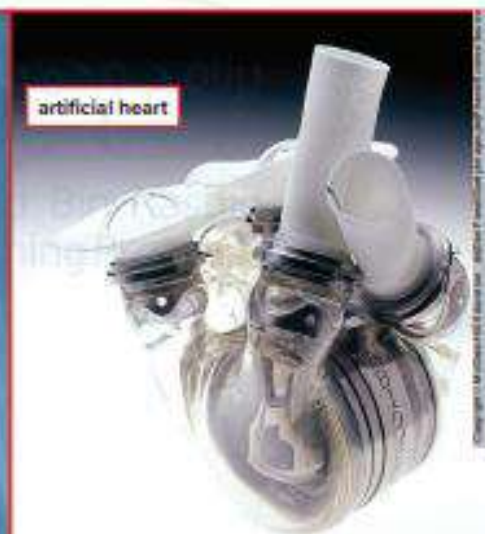
Many types of technology are created to mimic, or imitate, objects that occur in nature. Artificial lungs “breathe” air like real lungs. An electronic implant, such as a hearing aid, enhances the ear’s ability to hear. A pacemaker helps a heart maintain its correct rhythm.

Technology does not necessarily have to be complex to be effective. A pair of tweezers or forceps, for example, is very simple. It doesn’t have a motor, wires, or a computer chip in it. Yet when we use tweezers or forceps to grasp a small object, they mimic the motion of two fingers.

These technologies are designed to mimic nature. A pacemaker regulates a human’s heartbeat. An artificial heart can replace a person’s natural heart.



pacemaker



artificial heart

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EXPLAIN

**Test Prep** Which is an example of technology?

- ☒ **A** lumber
- B** apple
- C** soil
- D** tree

A patient has an irregular heartbeat. Which technology might she benefit from?

- A** a prosthesis
- B** a bionic lung
- ☒ **C** a pacemaker
- D** a robotic muscle

The tool shown below is used to pick up small objects.



Which human body part was the tool most likely designed to mimic?

- A** hands
- B** feet
- C** arms
- ☒ **D** fingers

An engineer is designing a new lower-leg prosthesis. Which material would be best to represent the skeletal system?

- ☒ **A** a light but strong metal material
- B** a flexible plastic material
- C** a comfortable, soft rubber material
- D** a strong, heavy wood material

What need does a robot that performs surgery most likely meet?

- A** It mimics a human arm.
- ☒ **B** It is able make precise movements that the human hand cannot.
- C** It makes scientific discoveries.
- D** It performs a dangerous job that a human cannot do.



- Complete the graphic organizer below with the parts of a prosthetic limb that represent the human body systems listed.

Body System	Part of Prosthetic Limb
Muscular	cables and motors
Skeletal	hinges and pylons

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Best 20 answers out of 25 will count.

Example: 14 correct answers yield a grade of 70/100, while 20 and 23 correct answers yield a (full) grade of 100/100 each.

\*

نحتسب أفضل ٢٠ إجابة من ٢٥.

مثال: ١٤ إجابة صحيحة تعطي علامة ٧٠/١٠٠ بينما ٢٠ أو ٢٣ إجابة صحيحة تعطي العلامة الكاملة أي ١٠٠/١٠٠.