

STUDENT SAMPLE LEVEL 5

❖ **Sound Energy**

Sit quietly for a moment. What do you hear? A clock ticking? A student coughing? Cars passing outside? Many different sounds are heard continually.

Sound is a form of energy traveling through matter, solids, liquids, and gases. Sound is caused by **vibration** as demonstrated by plucking a stretched rubber band. Vibration caused molecules in the air **next** to the rubber band to jump back causing a chain reaction of movement as air molecules push into each other. These waves continue, like ripples in a pond, until reaching our ears.

The ears were designed like 'cups' to catch sound vibrations. Ear drums convert the vibrations into signals instantly transmitted to the brain. The remarkable brain interprets the impressions as sound it immediately attempts to identify. The brain does all this without conscious effort on our part.



Sound waves physically resemble a rope flung by one end. When the rope rests, it falls into an 'S' shape leaving the rope **closest** to our hand in a tighter 'S' pattern than the rope at the opposite end.

Sound waves have three characteristics:

1. **FREQUENCY:** This is the number of waves that pass a certain point in one second. The **faster** the vibration, the **higher** the frequency or pitch; a **slower** vibration will cause a **low** frequency.



Low Frequency Sound Waves



High Frequency Sound Waves

2. **AMPLITUDE:** This is the **strength** or power of the wave; how loud or soft a sound is. The more **energy** a sound has, the **louder** it will be. The **height** of a sound wave indicates its energy.



Low Pitch

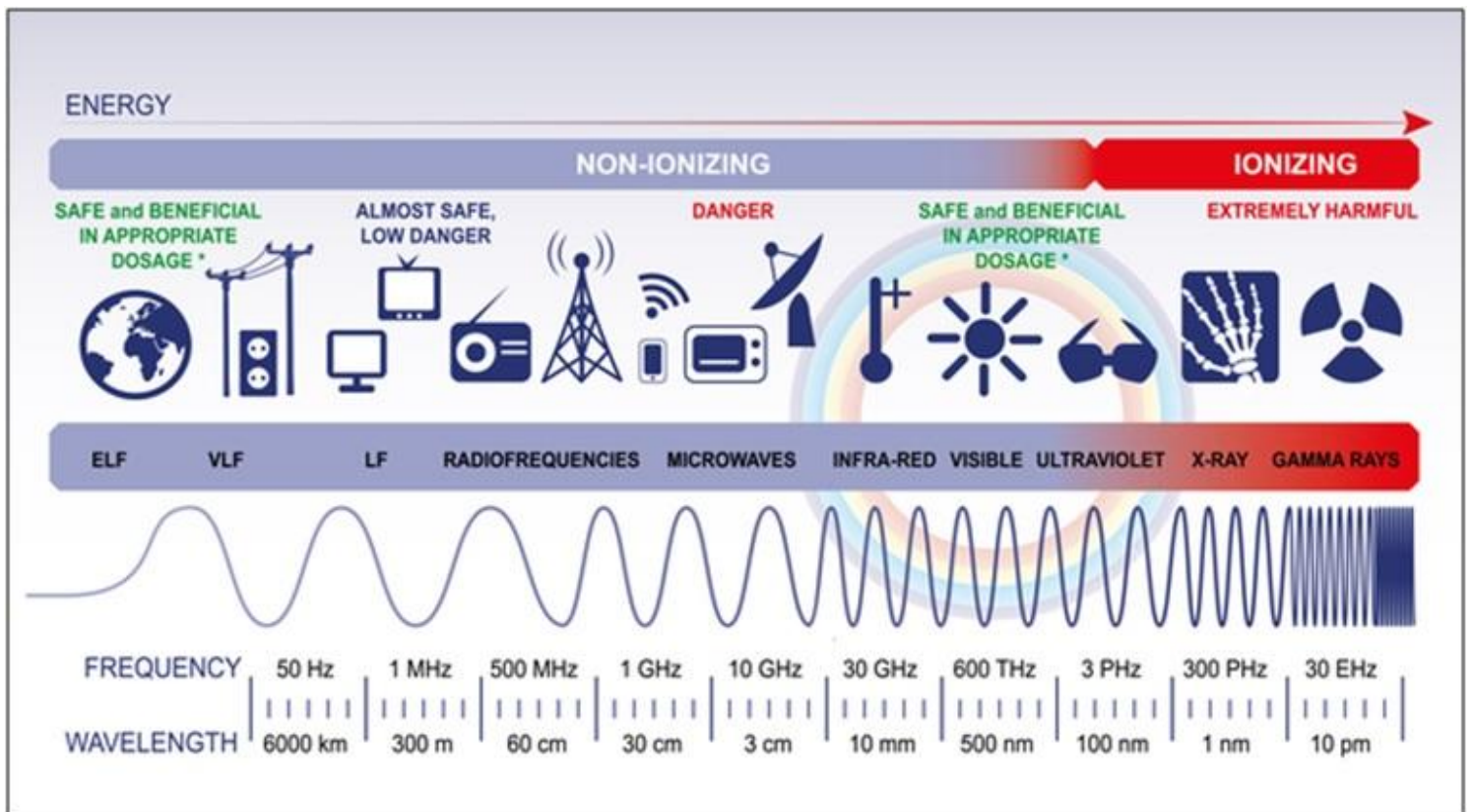
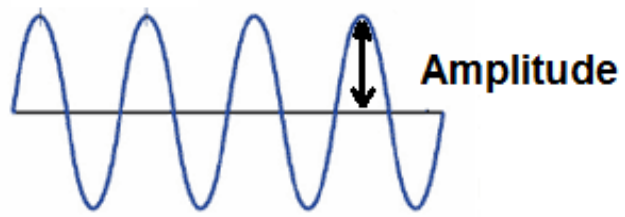
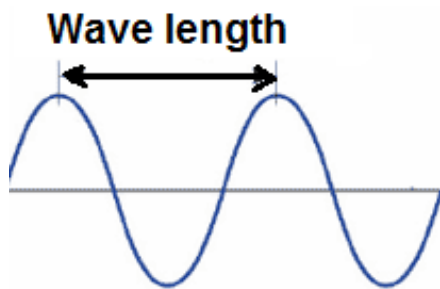


Quieter



Louder

3. **WAVELENGTH:** This is the distance **between** one point on a wave and the same point on the next wave.



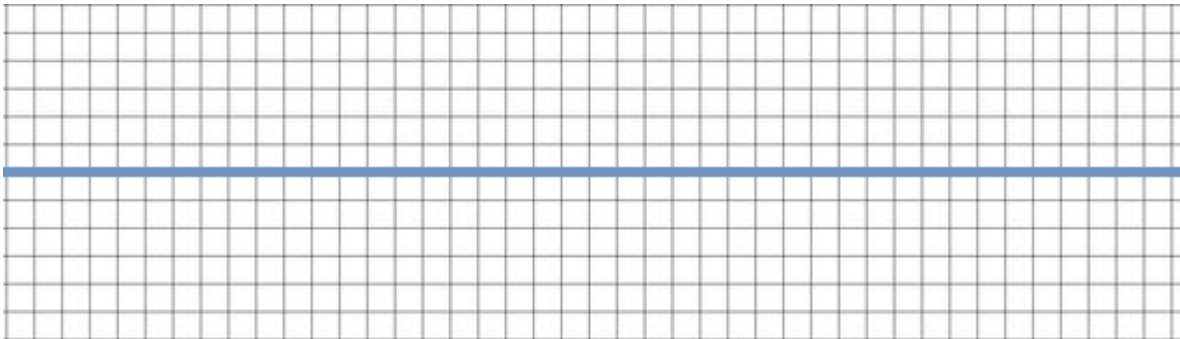
Sound Vibrations Activity

Can we prove sound is caused by vibrations? **Investigate!**

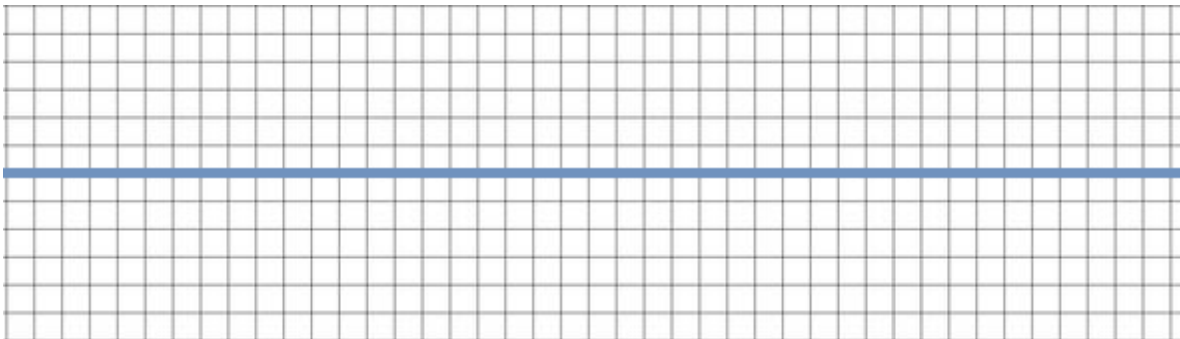
Student Instruction

1. Hold the tuning fork in your hand and hit one of the tines firmly against the heel of your hand. This will cause it to vibrate. Touch the bottom of the tuning fork to something solid, like a desk. It vibrates at a single frequency, giving off a certain pitch.
2. Hit the tuning fork on your hand again, but this time touch the bottom to the water in the pan. You will see the vibrations in the water. Notice the vibrations begin close together but spread apart as they travel across the water.
3. Repeat steps 1 & 2 with the other fork. Was there a difference in the appearance of the waves between tuning forks? _____

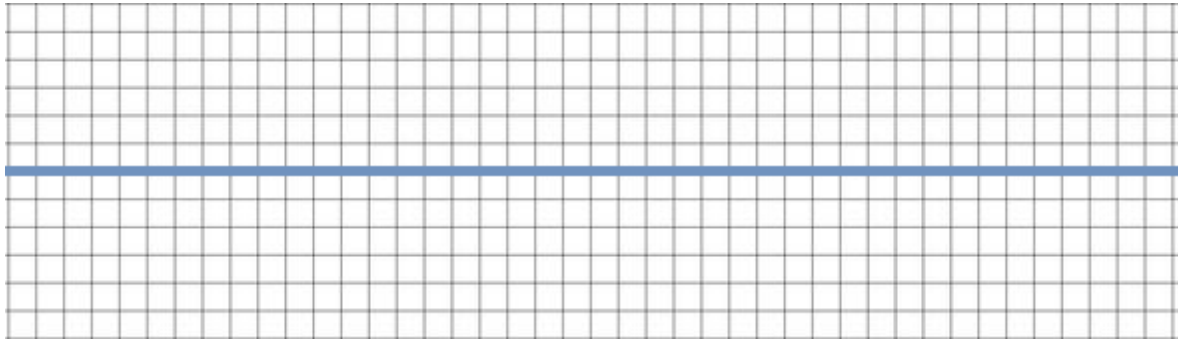
4. Draw a diagram of a high sound such as a shrill bell.



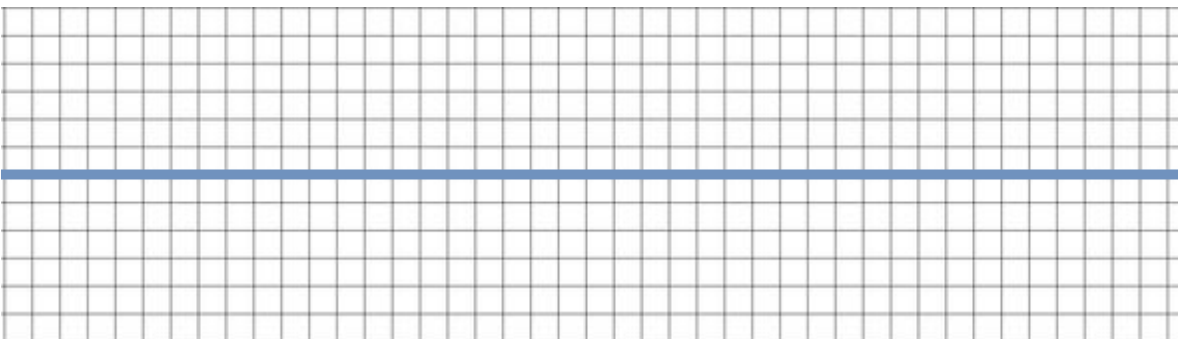
5. Draw a diagram of a low pitch sound, such as a dog's growl.



6. Draw a diagram of a soft whisper.



7. Draw a diagram of a loud siren of an ambulance.



8. What is the definition of wavelength? _____

9. What is the definition of frequency? _____

10. What is the definition of amplitude? _____

❖ Owl Pellets

Would you like to spot a mouse over 50m away in utter darkness? Or how about pinpointing the quiet steps of a mole within millimeters? If your answer is yes, you would have to resemble an owl.

*The cup-shaped depressions giving the owl its heart-shaped face direct light into its eyes. Football players smudge black under their eyes reducing glare, but the owl's framing white feathers do just the opposite. These feathers concentrate and reflect light **back** to the eye for night vision. And because their ears are tucked beneath feathers **behind** each eye, the facial disc also directs sound into their ears. These are just some of the characteristics that make owls so fascinating.*



Barn owls hunt in the vicinity of crops or any ecosystem supporting a rodent population. Owls are predators and one of the most efficient as they swallow food whole; no energy is spent on chewing exceptions being rabbits or skunks which are torn to pieces before eating. When the **nocturnal** owl swallows a rat, it is the equivalent of a one hundred-pound person swallowing a fifteen-pound steak in one gulp! And these meals may be repeated several times a night. Sharp claws seize the prey and positioning it with their talons, place it in their beaks head first. Using quick, upward thrusts of their head and neck, the meal is pulled through the beak into the smooth, flexible esophagus. The animal's carcass protects the owl's throat from sharp bones on the trip down to the glandular stomach where the prey comes to rest. The glandular stomach is a digester separating and dissolving the fleshy portion of the meal, but not the bones.

Eventually, bones must emerge because owls have no teeth to grind them like other carnivores such as the lion or bobcat. But owls do have two stomachs. The indigestible bones and fur are passed to the muscular stomach which compresses the wastes into a pellet. The pellets are expelled through the esophagus and out the mouth.



Owls are also prolific nesters although their nests are not made with sticks and leaves. In warm climates, they may nest year around searching for cavities in barns or trees. When ready, the female spits out her pellets, trampling them into a pile of loose hair and bone where she will lay her eggs.

Owl pellets are perfect for the study of food chains. Because owls swallow food whole, usually complete skeletons can be found; jaw bones, skulls, hip and leg bones, backbones, and even tiny claws, without flesh covering up the good stuff! When dissecting an owl pellet, a good collection of rats, mice, birds, or even a mole skeleton may be found. How many will your pellet include? **Investigate!**



Be careful using sharp instruments!

Owl Pellet Activity 1

Student Materials

- Magnifying Loupe
- Dissecting Set
- Owl Pellet
- *Ruler*
- *Pan*
- *Rubber Gloves*

Student Instruction

1. Put on gloves and place pellet on a paper towel.
2. Measure the length and width of your owl pellet with a ruler and the mass with a scale.

a. Length: _____

b. Width: _____

c. Mass: _____

3. **Carefully** examine the **exterior** of the pellet. Are there any signs of fur? _____

Are there feathers? _____

4. **Carefully** use a probe to open the pellet revealing the interior. Use the probe to expose all bones for identification. **NOTE:** *Black spheres about the size of periods (.) that are found in pellets are caterpillar droppings. The larvae metamorphose so near a furred surface turned the caterpillar into a cocoon.*
5. After separating the bones, make sure the fur is examined for small teeth or claws.
6. Choose two different bones and construct a dichotomous key asking yes and no questions until both are identified. **EXAMPLE:** If a skull is found, does it have teeth? Does it have a beak?
7. **BONE ONE:**

8. **BONE TWO:**

Owl Pellet Activity 2

Use the bone chart on next page to identify bones and complete the chart.

Bones Found

Bone	Type	Number
Skull		
Jaw		
Scapula		
Forelimb		
Hind Limb		
Pelvic Bone		
Rib		
Vertebrae		





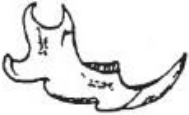









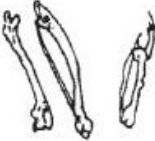



















Did you know?

There are 206 bones in the adult human body and there are 300 in children. This is because some children's bones fuse together as they grow!

Some frogs can pull their eyes into their throats to help push food down!

And those are science facts!

Pellet Bone Sorting Chart

	Rodent	Shrew	Bird	Mole
Skull				
Jaw				
Scapula				
Forelimb				
Hindlimb				
Pelvic Bone				
Rib				
Vertebrae				
	Caterpillar Larvae and Cocoons 		Caterpillar Droppings 	

TEACHER SAMPLE LEVEL 5

1. Sound Energy

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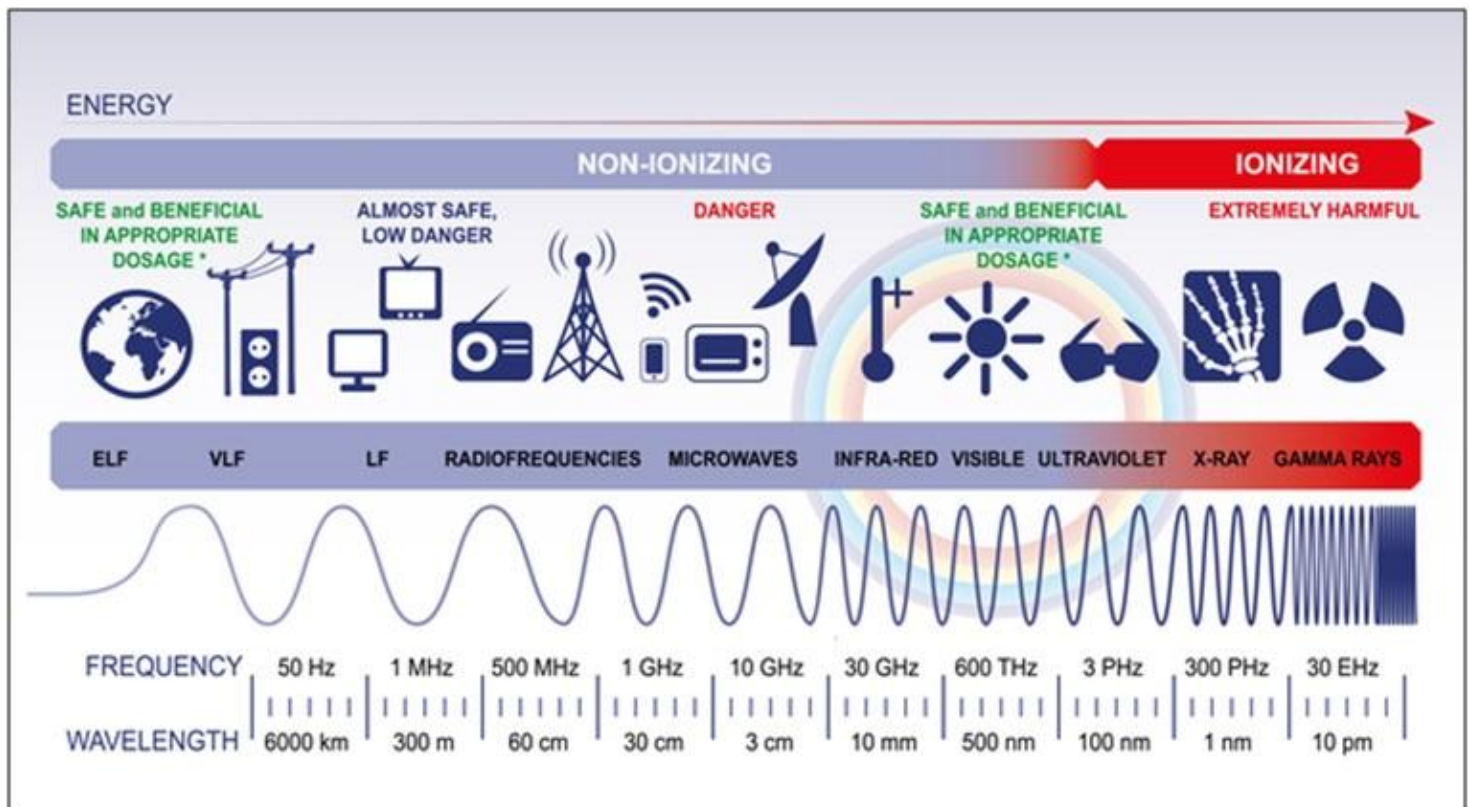
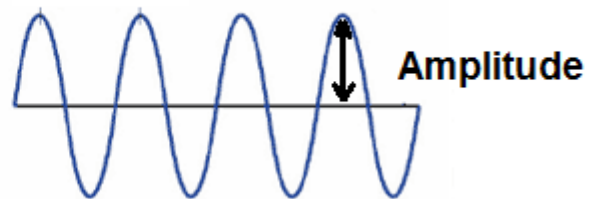
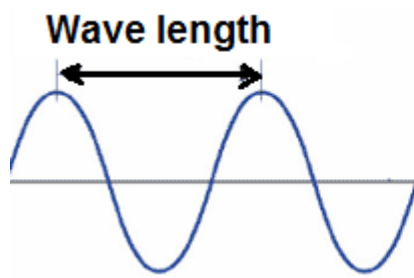


Quieter



Louder

6. **WAVELENGTH:** This is the distance **between** one point on a wave and the same point on the next wave.



Sound Vibrations Activity
Student Workbook Page 107

Can we prove sound is caused by vibrations? **Investigate!**

Teacher Materials

- **TUNING FORK, 100Hz**
- **TUNING FORK, 4096Hz**
- **PAN OF WATER**

Student Instruction

8. Hold the tuning fork in your hand and hit one of the tines firmly against the heel of your hand. This will cause it to vibrate. Touch the bottom of the tuning fork to something solid, like a desk. It vibrates at a single frequency, giving off a certain pitch.
9. Hit the tuning fork on your hand again, but this time touch the bottom to the water in the pan. You will see the vibrations in the water. Notice the vibrations begin close together but spread apart as they travel across the water.
10. Repeat steps 1 & 2 with the other fork. Was there a difference in the appearance of the waves between tuning forks? **YES. THE WAVES PRODUCED BY THE HIGH PITCH TUNING FORK WERE TIGHTER AND MORE NUMEROUS THAN THE WAVES PRODUCED BY THE LOWER PITCHED TUNING FORK.**
11. Draw a diagram of a high sound such as a shrill bell.



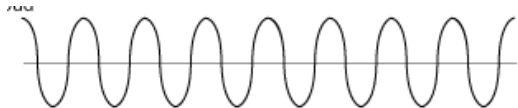
12. Draw a diagram of a low pitch sound, such as a dog's growl.



13. Draw a diagram of a soft whisper.



14. Draw a diagram of a loud siren of an ambulance.



15. What is the definition of wavelength? **THIS IS THE DISTANCE BETWEEN ONE POINT ON A WAVE AND THE SAME POINT ON THE NEXT WAVELENGTH.**
16. What is the definition of frequency? **FREQUENCY IS THE NUMBER OF TIMES WAVES REPEAT THEMSELVES IN ONE SECOND.**
17. What is the definition of amplitude? **IS THE STRENGTH OF THE SOUND OR HOW LOUD OR SOFT THE SOUND IS.**

2. Owl Pellets

Would you like to spot a mouse over 50m away in utter darkness? Or how about pinpointing the quiet steps of a mole within millimeters? If your answer is yes, you would have to resemble an owl.

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Owl Pellet Activity 1
Student Workbook Page 156

Teacher Materials	Student Materials
<ul style="list-style-type: none">• DIGITAL SCALE• WEIGH DISH• PAPER TOWELS	<ul style="list-style-type: none">• MAGNIFYING LOUPE• DISSECTING SET• OWL PELLETT• RULER• PAN• RUBBER GLOVES

TEACHER NOTE: Each student has 1 owl pellet. Numbers 7 & 8 chart are not included in Teacher Book. Materials are used for both Activity 1 and 2.

Student Instruction

1. Put on gloves and place pellet on a paper towel.
2. Measure the length and width of your owl pellet with a ruler and the mass with a scale.
 - a. Length:
 - b. Width:
 - c. Mass:
3. **Carefully** examine the **exterior** of the pellet. Are there any signs of fur? **ANSWERS WILL VARY.**
Are there feathers? **ANSWERS WILL VARY.**
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