

SOUND AND HEARING

{source: Keith Kelly, Science)

1. Match the beginnings of the sentences below with their endings:

Sound waves are longitudinal waves that can	vibrations per second and has units called hertz (Hz).
The loudness and softness of a sound	is measured in units called decibels (dB).
The loudness of a sound	depends on its amplitude.
The frequency of a sound is the number of	the impulse to the brain via the auditory nerve.
Sounds with irregular frequencies	which could lead to permanent deafness.
Sound waves are heard when they are transferred	are classified as noise.
The cochlea contains the sensory cells that transfer	through the structures in the ear to the cochlea.
Very loud sounds may rupture the eardrum	cause air molecules to compress and rarefy as they pass.

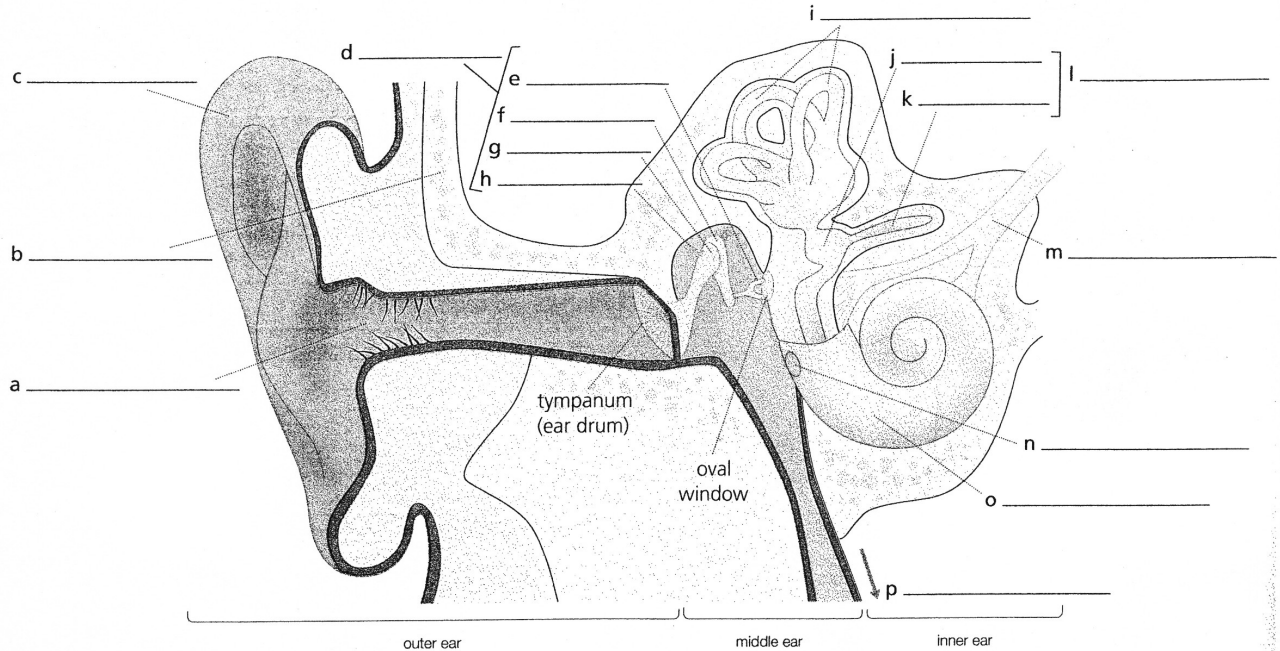
2. Read the text about sound ranges and fill in the gaps with appropriate words or phrases, then listen to the recording and check your answers.

Humans are usually able to hear sounds ranging between 1_____. Animals, such as cats, bats and dogs are sensitive to sounds of 2_____. Sounds with frequencies exceeding the range normally heard by humans are often referred to as ultrasound. Although we cannot hear it, we have scientific instruments that use ultrasound for a wide range of important 3_____. Ultrasound is safer to use than 4_____ when trying to "see" inside the body as it does not damage 5_____, so we use it for: monitoring the growth and development of a 6_____; detecting 7_____ (cancer) in the body; detecting brain damage. Sounds with frequencies below the normal range heard by humans are very 8_____ and are called infrasound. It is believed that some birds, such as pigeons, use infrasound for 9_____. Infrasound has also important uses. For example, it is used to move air around in 10_____. At very high intensities, these low frequency sounds may cause 11_____ to vibrate, which can result in 12_____ such as nausea and internal injury.

3 The structure of the ear

Label the diagram with these words.

anvil auditory canal auditory nerve bones of skull cochlea hamner muscle attached to ossicle ossicles
pinna round window saccule semicircular canals stirrup to throat utricle vestibular apparatus



B Working with sentences

4 Structure and function of the ear

Put these sentences in the correct order.

We are able to hear sounds because they stimulate the auditory cells of the ear.

- a) As the oval window picks up the vibrations, it transfers them to the cochlea in the inner ear.
- b) As the vibrations pass between the ossicles they are amplified.
- c) At the end of this passage is the eardrum or tympanic membrane. As the sound waves hit the eardrum, they cause it to vibrate.
- d) Hearing begins with the outer ear, when the pinna or earflap collects sound waves and directs them down the external auditory passage (ear canal),
- e) The base of the stirrup vibrates against the oval window, which is a membrane that separates the middle ear from the inner ear.
- f) The cochlea contains the sensory cells that produce impulses in the auditory nerve.
- g) The vibrations from the eardrum are received by the hammer, which passes them to the anvil and then to the stirrup.
- h) These impulses are transmitted to the brain where they are interpreted. At the end of the cochlea is the round window which functions as a pressure 'safety valve' releasing the pressure in the cochlea caused from the vibrations of the oval window.
- i) These are called the hammer, anvil and stirrup.
- j) The vibrations of the eardrum are picked up by three small bones in the middle ear called the ossicles.

1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ 7 ____ 8 ____ 9 ____ 10 ____

5 Loudness of sound

Put the phrases in the correct order to make sentences.

1. A ruler that _____ and _____ produces sound, _____ at the edge of a table _____ is flicked _____ vibrates _____

2. _____ by the ruler _____ the distance _____ moved up and down _____ of the vibration, _____ the amplitude _____ We call _____

3. _____ loud _____ of a sound wave _____ or soft. _____ The amplitude _____ the sound is _____ whether _____ will determine _____

4. _____ a small amount of energy _____ If _____ is flicked only a little, _____ is supplied _____ the ruler _____ then _____ to the ruler. _____

5. _____ a small amplitude _____ a soft sound _____ and _____ causes _____ in vibration _____ is heard. _____ This _____

6. _____ and _____ and a large energy _____ However, _____ if the ruler _____ is larger _____ is flicked more strongly, _____ is supplied, _____ louder. _____ the amplitude _____ the sound will be _____

7. _____ on the ruler, _____ that occurs. _____ The harder _____ the louder _____ the sound _____ you pluck _____

8. _____ a guitar. _____ applies _____ of _____ on the strings _____ The same _____ to plucking _____

9. _____ can be _____ cycle _____ graphically. _____ of represented _____ The complete _____ the vibrations _____

10. A _____ a _____ amplitude. _____ greater _____ has _____ louder _____ sound _____

6 Frequency or pitch of sounds

Match the beginnings and endings of sentences.

Beginnings	Endings
1 Pitch is a musical term which is similar	a commonly referred to as the pitch of a sound.
2 The frequency of a sound represents the number	b cycles per second or hertz (Hz).
3 However the sensations of these frequencies are	c in meaning to the scientific term frequency.
4 Objects that vibrate more rapidly, that is have more vibrations per second,	d of vibrations that occur in one second.
5 So, on a guitar, the strings that produce notes with a higher pitch	e vibrate faster than those with a lower pitch
6 The unit for frequency is	f will have a higher pitch than objects that vibrate more slowly.

1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____

C Working with texts

7 AM and FM radio

Read the text and make notes on the advantages and disadvantages of AM and FM radios.

There are two ways of modifying the carrier wave. Amplitude modulation (AM): here the strength (amplitude) of the carrier wave is altered to show the sound information. Three separate frequencies are transmitted, the carrier frequency which is constant, a lower sideband (LSB) below the carrier frequency, and an upper sideband (USB) above the carrier frequency. These sidebands are 'mirror images' of each other and contain the same sound information. Frequency modulation (FM) is the method where it is the frequency of the carrier, not its amplitude, which is altered. Amplitude modulation and frequency modulation each have their own advantages and disadvantages. AM signals have a long range and provide good coverage of the area outside the transmitter. AM has the advantage of being easy to produce in a transmitter and AM receivers are simple in design. Disadvantages of AM include its susceptibility to static and other forms of electrical noise. Despite this, AM is simple to tune on ordinary receivers, which is why it is used for almost all short-wave broadcasting. The big advantage of FM is its audio quality and immunity to noise. Most forms of static and electrical noise (for example, lightning) is naturally AM, and a FM receiver will not respond to AM signals. But FM signals are readily obstructed and in some areas good antennae may be needed to receive signals at all.

	Advantages	Disadvantages
AM		
FM		

8 Complete the crossword.

						1		2											
								3											
	4			5		6													
								7											
					8														
	9																		
					10														

Across

- a unit for measuring the frequency of sound waves and radio waves
- the high or low quality of a sound that is controlled by the rate of the vibrations that produce it
- stretched tight
- a fluid-filled cavity in the inner ear that helps us keep our balance
- any sound that has no regular pattern or frequent
- the unpleasant noise that you hear on a radio, television, or telephone that is caused by electricity in the air
- a unit for measuring how loud a sound is

Down

- burst or tear suddenly
- a piece of electronic equipment that is used for sending radio, television, or telephone signals through the air
- a small bone in the middle ear between the hammer and the stirrup