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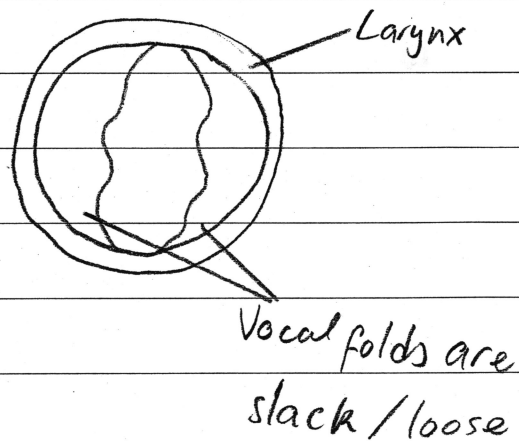
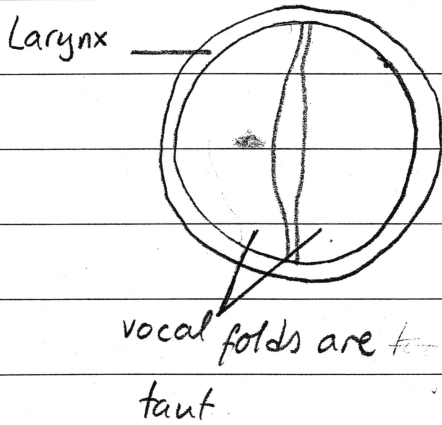
a)

Animal	Structures used to detect vibrations
Fish eg. herring	Hair cells and an otolith detect vibrations
Insects eg. cicada	Orthopterans such as cicadas detect vibrations with a tympanic membrane, located at their knee joints. Other insects detect vibrations with <sup>hair cells on their</sup> antennae.
Mammals eg. human, chimpanzee	Ears detect vibrations, which are funnelled by the pinna <del>into</del> towards the tympanic membrane, so that they are conveyed to the auditory nerve as electrochemical impulses.

b) Vocal Folds During Production of Sound

Singing a high pitched note

singing a low pitched note



c) i) Cone cells

ii) ~~The~~ Cones are present in three types in the retina - red cones, blue cones and green cones, each with slightly different structures. The presence of different structures of cones varies depend on their location in the retina as different colours may be detected at different angles of the eye.

Cones are present throughout the retina and are ~~an~~ present in the greatest number at the fovea, shown to be at  $0^\circ$  on the graph. This position is directly opposite the lens and is the area of greatest visual acuity. Rods are present throughout the rest of the retina, as well as cones, except of the blind spot. This allows rods to detect contrasts between light and dark and to see peripheral vision and motion.

iii) Rods are photo receptor cells that detect light and dark contrasts, motion and ~~give~~ cause the ability of peripheral vision in humans as they are ~~present~~ <sup>mostly</sup> located on the sides of the human retina, ~~etc~~ They contain rhodopsin, a photo pigment made up of opsin and a pigment known as visual purple. When rhodopsin is bleached by light, these components separate so that ~~an electrical signal is sent~~ <sup>light energy is converted to an</sup> electrochemical message that is conveyed to the optic nerve. ~~Thus the role of rhodopsin is to convert light energy to photo chemical messages.~~

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d)

i) The stimuli used to test region X may have not been of sufficient intensity to reach the threshold. This would result in no action potentials occurring, as the threshold is the minimum level of energy needed to generate an action potential.

Nerve damage may also have resulted in the lack of action potentials, as an action potential is conveyed as a change in the charge of a neuron cell membrane. Damage to nerves in the mammal's brain in region X, ~~or~~ could have caused this; - nerve damage to the optic nerve could also result in this ~~damage~~ lack of action potential as region X, the visual region, would not be stimulated by the optic nerve.

ii) The animal's behaviour would change as it would not be able to ~~see~~ process visual communication. This could result in less activity if the animal sought to avoid danger. It could also result in falling <sup>or walking</sup> into ~~things~~ objects, disorientation and ignoring food unless it can smell it.

e) ~~Developments in~~ Our understanding of the eye and ear <sup>includes</sup> ~~includes~~ an understanding of the sound shadows, depth perception and how sounds and sights are received, transmitted and interpreted by the brain. This ~~developments in biological~~ knowledge has resulted in the development of technologies, including 3D movies and surround sound systems, referred to by the newspaper article.

Depth perception occurs as a result of binocular vision in humans. Humans have two eyes, located at the front of their face. The difference between the images that each eye sends to the brain is interpreted to determine the distance between objects in a human's field of vision. This is processed in the occipital lobe of the brain, located in the back of the <sup>cerebrum</sup> ~~cerebellum~~. Depth perception allows humans to interact with their environment more safely and easily. An understanding of depth perception has resulted in the development of technologies such as 3D movies. 3D movies use the knowledge that the different images seen by each eye are processed as one image; this creates the illusion that a movie is 3D when two slightly different images are processed as one image.

A Sound shadow is cast by the head. Additional writing space on back page.



as it blocks the <sup>path of</sup> sound to the ear that is further from the source of the sound. This results in human ability of sound localisation. An ~~under~~ <sup>and</sup> the difference between sounds <sup>heard by</sup> from each ear is interpreted in the temporal lobes of the brain, located on either side of the brain. An understanding of sound localisation and the sound stereo has allowed the development of surround sound systems. These create the illusion that an audience member is part of the action of a film as sounds are processed as coming around the audience member. These sounds correspond to the visual information on the film screen so that the brain ~~processes~~ processes these stimuli as related, creating a more engaging cinematic experience. This understanding of sight and hearing is also used in the development of home surround sound speaker systems and 3D televisions.

~~An understanding of depth perception can be fostered for entertainment through technologies that use optical illusions~~

While an understanding of the eye and ear can be used to develop entertainment technologies, which benefit the quality of life <sup>and thus overall happiness</sup> experienced by society. They can also be used to create remedial technologies, such as

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hearing aids, <sup>and</sup> cochlear implants and glasses and laser <sup>eye</sup> surgery. Hearing aids use an understanding of the ~~process~~ way that the ear works, ~~not~~ ~~not~~ amplify sounds to assist the stimulation of the ear's tympanic membrane. Cochlear implants use the knowledge of the role of the auditory nerve in relaying messages to the brain. Laser eye surgery may be used to correct vision as it uses an understanding of the role of the cornea in refraction. Technologies for entertainment and medical assistance may be developed as a result of ~~the~~ our understanding of the eye and ear.