

a) i) photo receptor cells in the eye called rods and cones are located on the retina at the rear of the eye.

ii) "A" is the cornea and it refracts light images onto the retina.

"B" is the Iris and it controls the amount of light entering the eye by contracting or releasing, changing the width of its diameter.

- b. ii)
- Search ~~to~~ online for specific animals and 'how they produce sound'
 - Gather books on specific animals and find the sound sections
 - Encyclopedia - search for specific structures eg larynx

iii) Compare between the different sources to see if the information is similar without contradictions. If there are contradictions, ~~newer version of~~ books published most recently are more reliable and internet websites are less. Relevance ~~should~~ ^{can} be assessed by restricting information of a certain structure or animal.

c) Cataracts occur when the lens becomes clouded over and the person is ~~is~~ unable to see once the cataracts have completely covered the lens. Cataracts are caused by old age mostly but can also be caused by diseases such as diabetes mellitus also drug use and injury. There is also congenital cataracts where the person is born with the disease.

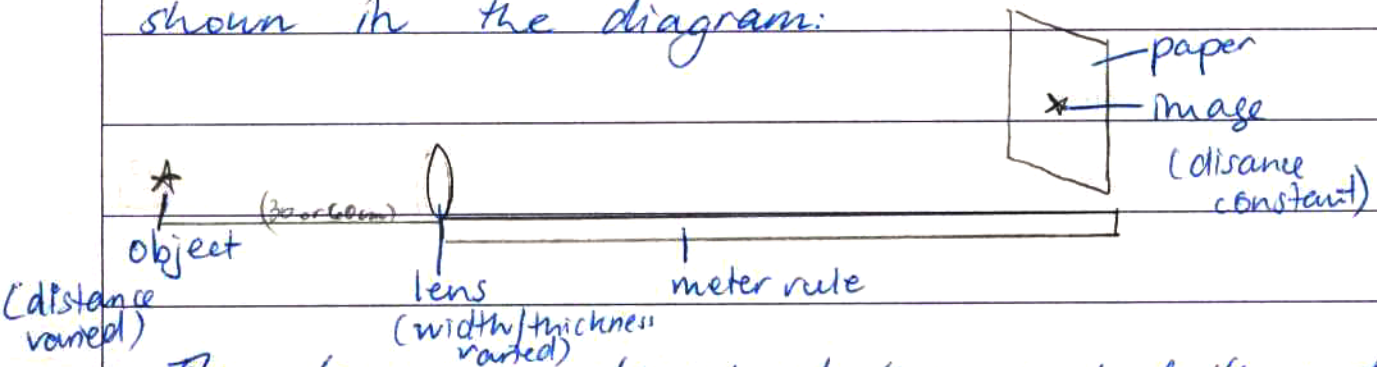
Cataracts are treated using technology by replacing the diseased lens with a new one

A small incision is made in the cornea. The lens is shattered with a laser. The lens is then removed using suction. The new artificial crystalline lens is folded ~~and~~ so it can fit through the tiny incision in the cornea. Once inserted through the cornea the new lens is unfolded. The patient has to wear a patch over their eyes but once it is taken off the patient's vision is restored.

This surgery can be performed as day surgery. Cataracts was once extremely common. Most people in African countries died after 4 years of going completely blind. The use of technology has improved the lives of people with cataracts, restored their sight and life span.

d) The procedure involved the use of glass lenses of different thickness, a meter rule ^{an object} and a piece of paper. The experiment was set up as

shown in the diagram:



~~The lens was placed at the end of the meter rule and the object was placed 30 cm from the lens. The image focused onto the paper by moving the paper back & forth. This procedure was then repeated using a lens of thicker density. The distance of the~~

The object was placed 30 cm from the end of the meter rule. The paper was placed at a constant distance, at the end of the rule. A lens was then used to focus the image on the paper, the density or thickness required was the thickest lens. The object was then moved to a distance of 60 cm from the end of the rule & the paper distance was held constant. It was necessary for a much thinner lens to ~~the~~ ^{be} used to focus the image on the paper (when keeping it in the same place on the rule as the first lens). This illustrated that



The thickness of the lens must be altered in order for the objects at different distances to be focused. — accommodation. The closer object required a thicker lens to bend the light more, so it was focused upon the paper. The further away object required a lens denser lens as the light did not need such extreme bending to be focused. This illustrates the process of accommodation performed in the eye with the paper representing the retina & the glass lenses; the varying thickness of the lens in the eye. This procedure was effective but ~~was~~ could be improved by measuring the focal length of obtaining ~~the~~ ^{one} lens that could be altered rather than changing the lens used.

e) A hearing aid is used most commonly by people with hearing impairment. The hearing aid is a battery operated device that uses a microphone and an ear piece to amplify sounds that individuals hear. This amplification of sounds, i.e. making them louder allows people who have hearing impairment to hear sounds they normally wouldn't. This is because the amplified sounds directed into the ear via the ear piece stimulate the tiny hairs in the organ of corti, that pick up sound and turn them into electrical impulses that are sent via the auditory nerve for the brain to interpret. Hearing aids do largely benefit

and are appropriate for this type of hearing loss although their are limitations to hearing impaired people although their are limitations to their effectiveness. Such as they are easily damaged by ear wax or ear drainage. They also if not fitted correctly produce, static or back ground wisteling sounds.

Cochlea implants are used by profoundly deaf people who dont benefit at all from hearing aids. This is because people who are profoundly deaf have damaged most of the tiny hairs in the organ of corti so the amplification of sound by the hearing aid does nothing for them, as they are unable to convert sound into electrical impulses, thus the brain doesn't interpret it.

A cochlear implant works again through battery power and a device that is surgically implanted in the ear with a microphone receptor that picks up sound behind the ear. The implant via the microphone detects sounds and the implant converts these sounds into electrical impulses which directly stimulate the auditory nerve. Thus they bypass the organ of corti + the damaged hairs.

and send direct signals to the brain which are interpreted as sound.

These devices have limitations also as they can never be as good as normal hearing and there is large costs involved in the surgical implantation of the device.

Although the benefits of both these devices outweigh the costs as they are appropriate in allowing individuals to hear sounds that they would not normally.