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28.

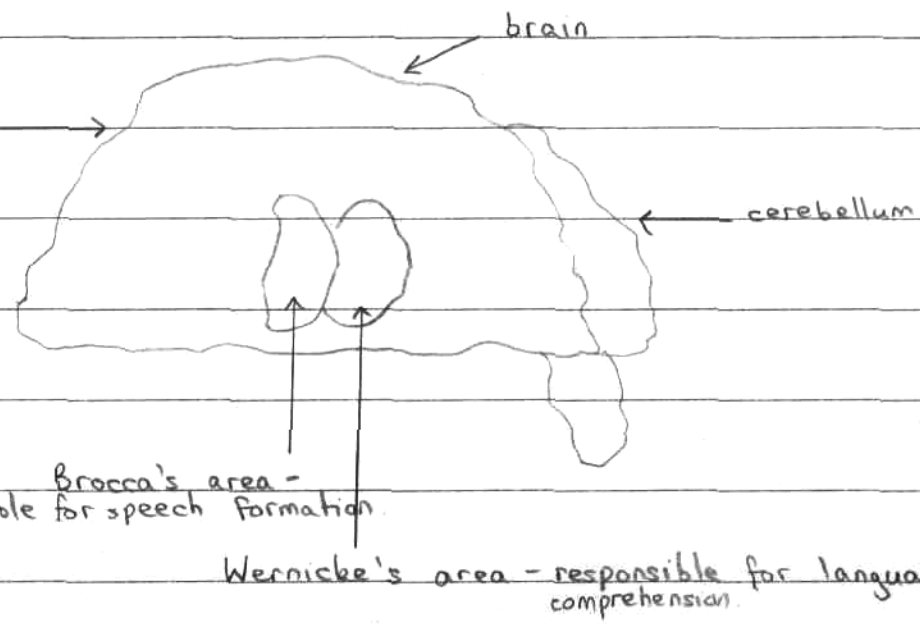
a) i) The organ of Corti contains the hair cells which respond to the vibrations brought about by sound waves & transmit the vibrations into electrochemical signals to be sent to the brain.

ii) The shorter the wavelength, the higher the frequency, the higher the pitch. The longer the wavelength, the lower the frequency & the lower the pitch.

iii) Fish vibrate their swim bladder to produce sound while grass hoppers rub the veins of their legs together to produce sound.

b) i) The medulla oblongata is the brain stem located at the base of the brain. The cerebrum is the front part of the brain, which is the biggest section. The cerebellum is the smaller back part of the brain.

ii)



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c) i)

(28)

ii) As the thickness of the lens increases, the focal length decreases.

iii) Human eyes can focus on objects at different distances through accomodation. In accomodation the lens changes shape, changing the focal length & refractive power of the lens. For objects further away, the lens bulges, decreasing the focal length & refractive power. To look at close objects, the lens contracts, so that the focal length increases & the refractive power increases.

d) Light reaching the retina is transformed into electrochemical signals through the photoreceptor cells, rods & cones. Rods are straighter & longer than cones, which are conical shaped. Both contain pigment attatched to a retinal molecule which absorbs light & transforms it into electro-chemical signals which travel to the brain by nervous impulses. Rods detect movement & shapes. They are more sensitive to light & so require less light to be stimulated. Rods are located mostly on the edge of retina. When light Rods are contain the visual

pigment rhodopsin, which is most sensitive to blue-green light. When they absorb light of this wavelength, the protein in the rod breaks down, sending an electrochemical signal to the brain which interprets the signal & forms a picture.

Cones are used for colour vision & tasks requiring visual acuity. Cones contain photopsin. They require more light to be stimulated. They are mostly found in the fovea region of the retina, which consists of only cones & no rods. In this region each cone is connected to one nerve cell, where as in other parts of the retina there are many rods & cones connected to one nerve. The photopsin in cones is sensitive to light of particulas wavelengths. Cones can either detect red, blue or green light. When a particular wavelength is absorbed by a cone, it transforms it into an electrochemical signal which is transported to the brain via the optic nerve. The wavelengths transformed into electrochemical signals produce a pattern in the

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brain which the brain interprets & constructs a visual image from.

2002 HIGHER SCHOOL CERTIFICATE EXAMINATION

Biology

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