

| Human eye | | structure | | Functions | | Functions (cont) | |
|--------------------------|---|---|--|-----------|--|------------------|---|
| Eyebrows | prevent sweat from running into the eyes | Orbit | socket in the skull | Sclera | tough white coat | | made up of muscles which controls the size of pupil to regulate the amount of light entering the eyes |
| Eyelash | traps dust and prevent it from running into the eyes | | attached by 3 pairs of eye muscles | | protects inner structure | | |
| Eyelid | protect eyes from dirt and strong light | 3 eye muscles | allow eyeball to rotate in different direction | | maintain shape of eyeball | | contains pigment that determine the colour of iris |
| | spread tears over eye surface when blinking | Conjunctiva | transparent membrane | | surface for the attachment of eye muscle | | |
| Tear gland | produces tears (sodium, chloride..) kills bacteria | | keeps front of eyes lubricated and moist | Cornea | transparent layer of tissue | Pupil | an opening at centre of the iris |
| Tear duct | drains tear into nasal cavity | Types of photoreceptors | | | allows light to enter the eye | | allows light to enter the eyes |
| | | Rod cells | Cone cells | | a curved surface to help refract and focus light on retina | | size is controlled by iris |
| | | more numerous | less numerous | | no capillaries since it obtains nutrients from aqueous humour | Retina | innermost layer of eyeball |
| | | sensitive to low light intensity | sensitive to high light intensity | Choroid | middle layer of eyeball | | contains many photoreceptors and nerve fibres |
| | | important for dim light vision | important for bright light vision | | contains black pigment that absorbs light | | photoreceptors : rod or cone cells |
| | | black and white vision | color vision (red, green, blue) | | pigment reduces reflection of light within the eye and helps form sharp images | Optic nerves | nerve fibres in retina grouped |
| | | Distribution of photoreceptors on retina | | | rich in capillaries as it supplies nutrients to sclera and retina | | transmits nerve impulses from photoreceptors to cerebrum of brain |
| | | Rod cells | periphery of the retina | Iris | continuous with the choroid | Yellow spot | high density of cone cells |
| | | | none at yellow spot and blind spot | | | | no rod cells |
| | | Cone cells | concentrated at yellow spot | | | Blind spot | no photoreceptors |
| | | | a few present on periphery of retina | | | Lens | transparent , elastic , biconvex |
| | | | | | | | refracts and focuses light on retina |
| Process of seeing | | | | | | | |
| 1 | light rays from object enters the eye | | | | | | |
| | refracted and focused onto retina | | | | | | |
| by | cornea, aqueous humour, lens , vitreous humour | | | | | | |
| cornea | most of the refraction | | | | | | |
| lens | fine focusing | | | | | | |
| 2 | real and inverted image formed on retina | | | | | | |
| 3 | photoreceptors stimulated by light generate nerve impulse | | | | | | |
| | nerve impulse travel along optic nerve to visual centre | | | | | | |
| 4 | visual centre in cerebrum interpret nerve impulse as an upright image of object | | | | | | |



| Functions (cont) | | Drawing ray diagrams | | Near objects | | Long sighted | |
|---------------------|---|-------------------------------|--|------------------------|--|------------------------|--------------------------------------|
| | thickness adjusted by ciliary body living cells with no nuclei | Light rays (distant) | parallel | Ciliary muscles | contract | Vision problem | cannot see near objects clearly |
| | no capillaries as it obtains nutrients from aqueous humour | Light rays (near) | come from the same point of object | Tension | reduced | Cause | lens too thin eyeball too short |
| Suspensory ligament | connected to ciliary body | Reminders | add arrows dotted lines behind retina | Suspensory ligaments | slackened | Image | formed behind the retina |
| Ciliary body | contains ciliary muscles | | | Lens | thicker (more convex) refracts more light | Correction | convex lens (converge light) |
| | controls tension of suspensory ligaments | Seeing in dim light | | Eye strains | ciliary muscles contracting for a long time | Color blindness | |
| | controls thickness of lens | Circular muscles of iris | relaxes | | | Problem | cannot distinguish colors |
| Aqueous humour | watery fluid produced by ciliary body between cornea and lens | Radial muscles | contracts | Distant objects | | Cause | deficiency of one or more cone cells |
| | supplies nutrients and o ₂ to cornea and lens by diffusion | Pupil | dilates | Ciliary muscles | relaxes | Correction | no cure wear lenses |
| Vitreous humour | jelly like fluid between lens and retina | Result | more light enters eyes | Tension | increases | | |
| Both | refracts lights on retina maintain shape of eyeball | Importance | allow photoreceptors to be stimulated so a clear image forms | Suspensory ligaments | tightened | | |
| | | Seeing in bright light | | Lens | thinner (less convex) refracts light less | | |
| | | Circular muscles of iris | contracts | Short sighted | | Vision problem | cannot see distant object clearly |
| | | Radial muscles | relaxes | Cause | lens too thick eyeball too long | | |
| | | Pupil | constricts | Image | formed in front of retina | | |
| | | Result | less light to enter eye | Correction | concave lenses (diverges light) | | |
| | | Importance | prevent photoreceptors from being damaged by bright light | | | | |

