

The eye

Revision notes · How the cornea, lens, iris, rods and cones work, and the causes and correction of cataracts, long-sightedness, short-sightedness and colour blindness.

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

The eye

Spec 2.15B-2.17B

Triple only

Structure and function of the eye

Spec 2.15B

The eye is a sensory receptor organ that detects light. Light is refracted (bent) so that it is focused on the retina, which contains the receptor cells.

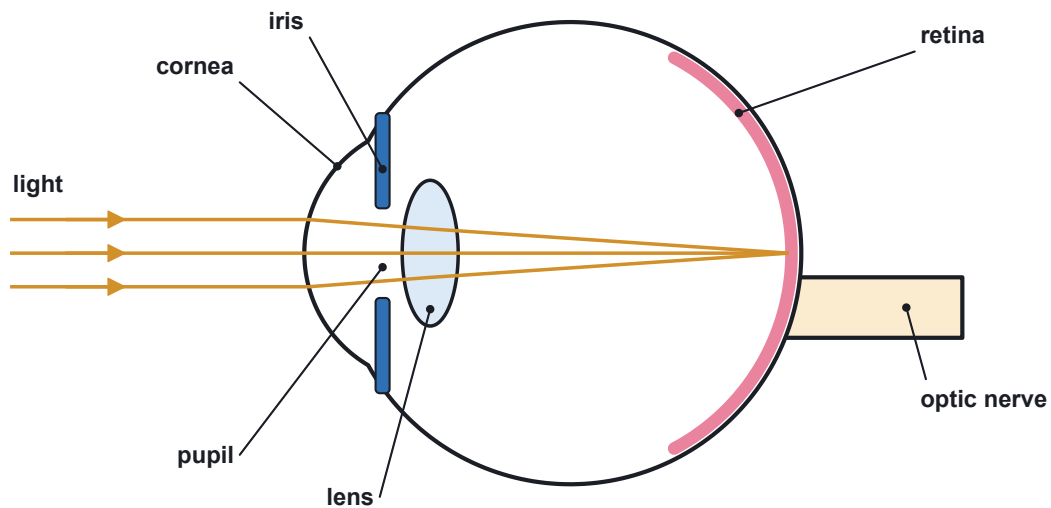
Parts of the eye	
Part	Function
Cornea	Refracts (bends) light as it enters the eye
Lens	Refracts light to focus it on the retina
Iris	Changes the size of the pupil, so controls how much light enters the eye
Rod cells	Sensitive to dim light. They do not detect colour
Cone cells	Detect colour and work in bright light
Retina	Contains the rod and cone cells. Impulses go to the brain along the optic nerve

The iris

The iris is the coloured ring of muscle around the **pupil**. Its muscles change the size of the pupil. In bright light the pupil gets smaller, so less light enters and the retina is protected from damage. In dim light the pupil gets larger, so more light enters and you can see better.

Rods and cones

Rod cells work in dim light but only give black and white vision. There are three types of cone cell, sensitive to red, green or blue light. Together they give colour vision. Cones need brighter light.



Light is refracted by the **cornea** and **lens** and focused on the **retina**.

Defects of the eye Spec 2.16B

Defects of the eye	
Defect	What happens
Cataracts	The lens becomes cloudy, so less light reaches the retina. Vision is blurred and can be lost.
Long-sightedness	The person can see distant objects clearly but not near objects. Light from near objects is focused behind the retina.
Short-sightedness	The person can see near objects clearly but not distant objects. Light from distant objects is focused in front of the retina.
Colour blindness	The person has difficulty telling some colours apart, such as red and green, because one or more types of cone cell are missing or not working properly.

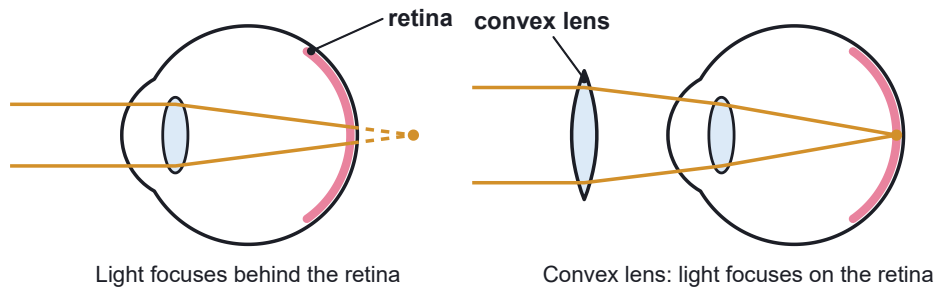
Long-sightedness happens when the eyeball is too short, or the lens and cornea refract light too little. Short-sightedness happens when the eyeball is too long, or the lens and cornea refract light too much.

Common mistake: Do not mix up the two. Long-sighted people have a problem with near objects. Short-sighted people have a problem with distant objects.

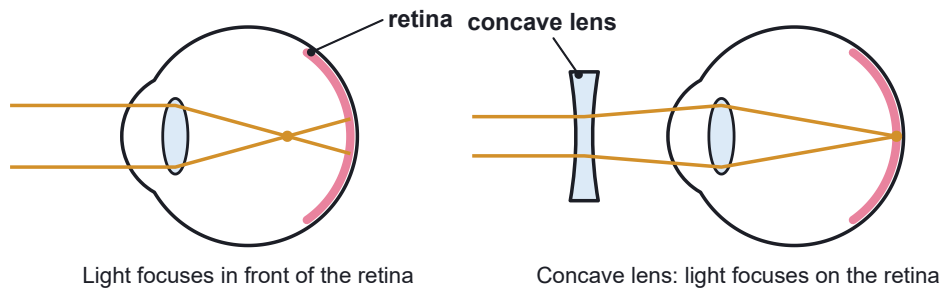
Correcting eye defects Spec 2.17B

How eye defects are corrected	
Defect	Correction
Long-sightedness	A convex lens (glasses or contact lenses) bends light inwards before it enters the eye, so it focuses on the retina instead of behind it.
Short-sightedness	A concave lens (glasses or contact lenses) spreads the light out before it enters the eye, so it focuses on the retina instead of in front of it.
Long- or short-sightedness (other option)	Laser eye surgery changes the shape of the cornea, so that light is focused on the retina.
Cataracts	Surgery removes the cloudy lens and replaces it with an artificial lens.

Long-sightedness



Short-sightedness



A **convex lens** corrects long-sightedness; a **concave lens** corrects short-sightedness. Both make light **focus on the retina**.

Exam tip: Always say where the light is focused before the correction and where it is focused after. The aim is to focus it on the retina.

Quick check

1. What does the iris do?
2. What is the difference between rod and cone cells?
3. What causes cataracts?
4. What type of lens corrects short-sightedness?
5. Why can some people not tell red and green apart?

Quick check answers

The eye

1. It controls how much light enters the eye.
2. Rods work in dim light and do not detect colour. Cones detect colour and work in bright light.
3. The lens becomes cloudy, so less light reaches the retina.
4. A concave lens.
5. One or more types of cone cell are missing or not working properly.