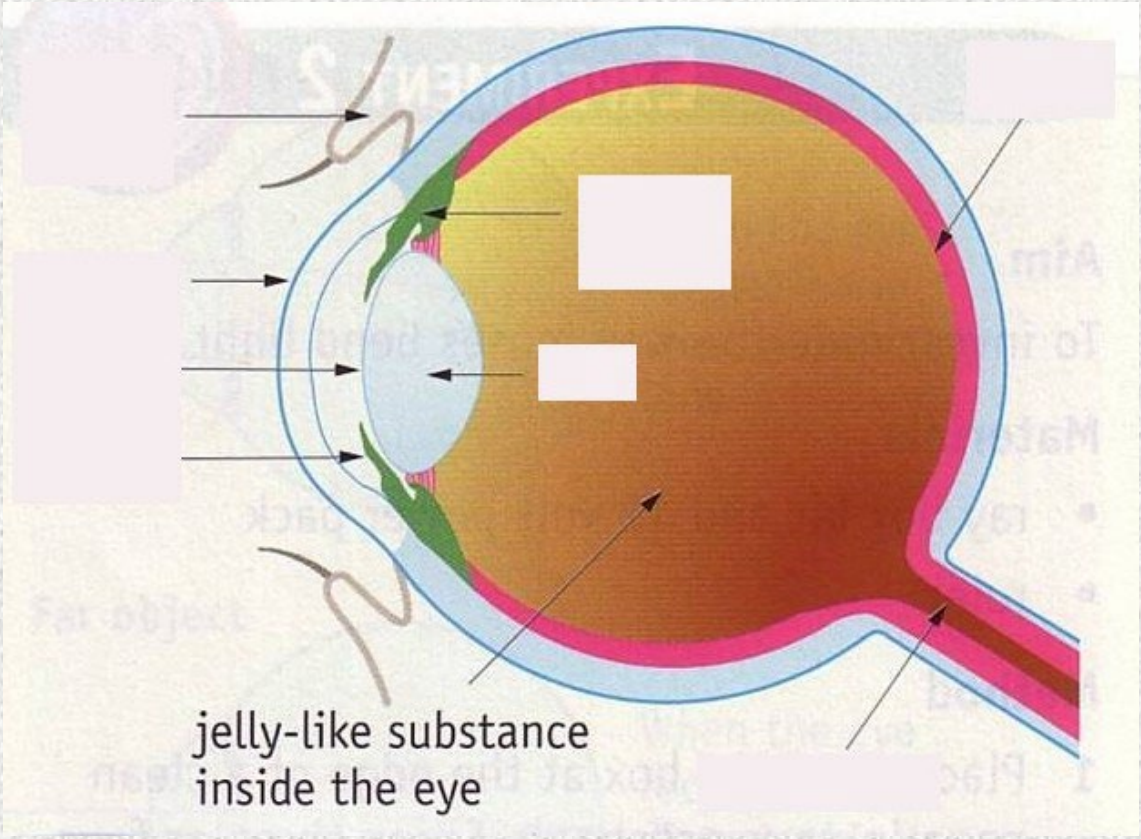
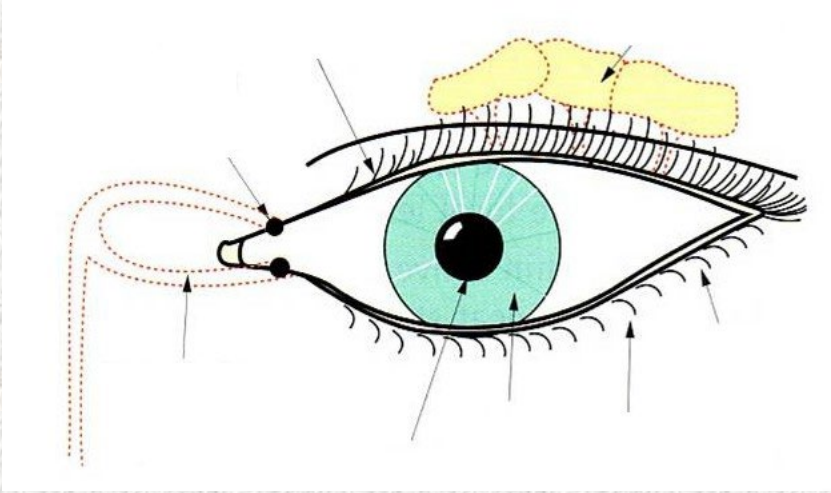
Light – Part 3
Defects in Seeing

Year 7 Science

Review from last lesson

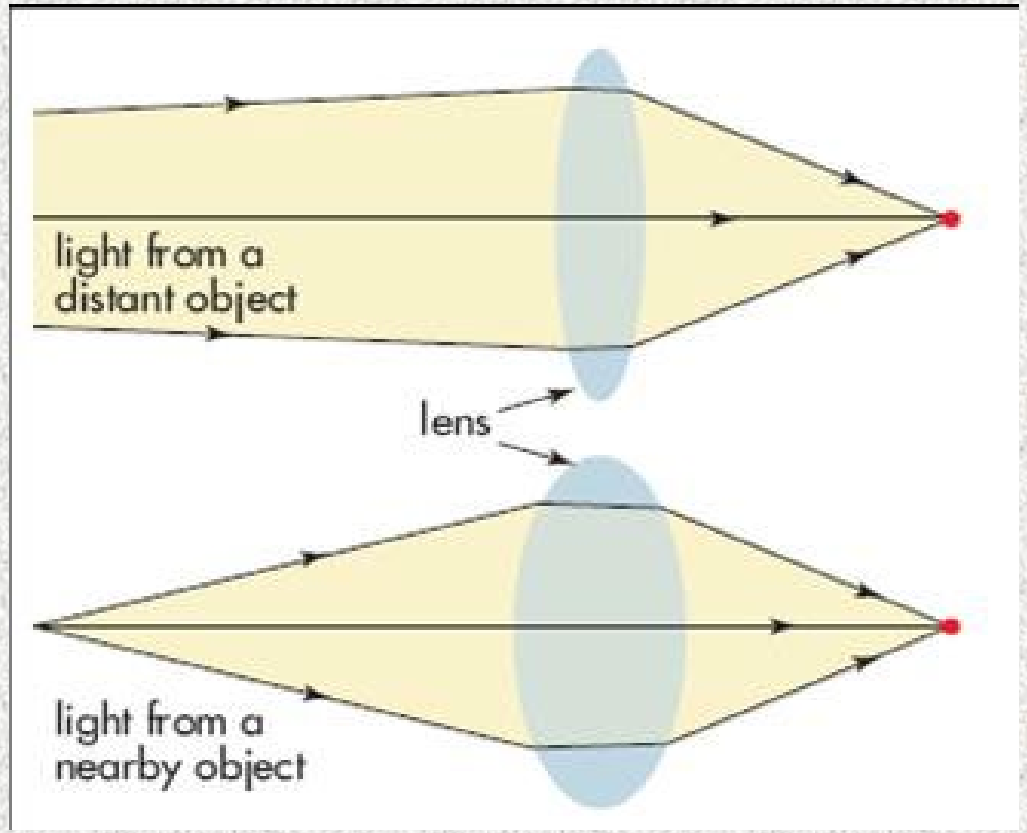
- We learned in our last lesson about the major parts of the eye and their function. We covered:
  - Eyelid
  - Tear glands and tear ducts
  - Cornea
  - Iris
  - Pupil
  - Lens
  - Retina
  - Optic Nerve
- Let us see if we can remember where these parts are and what they do…..


jelly-like substance
inside the eye



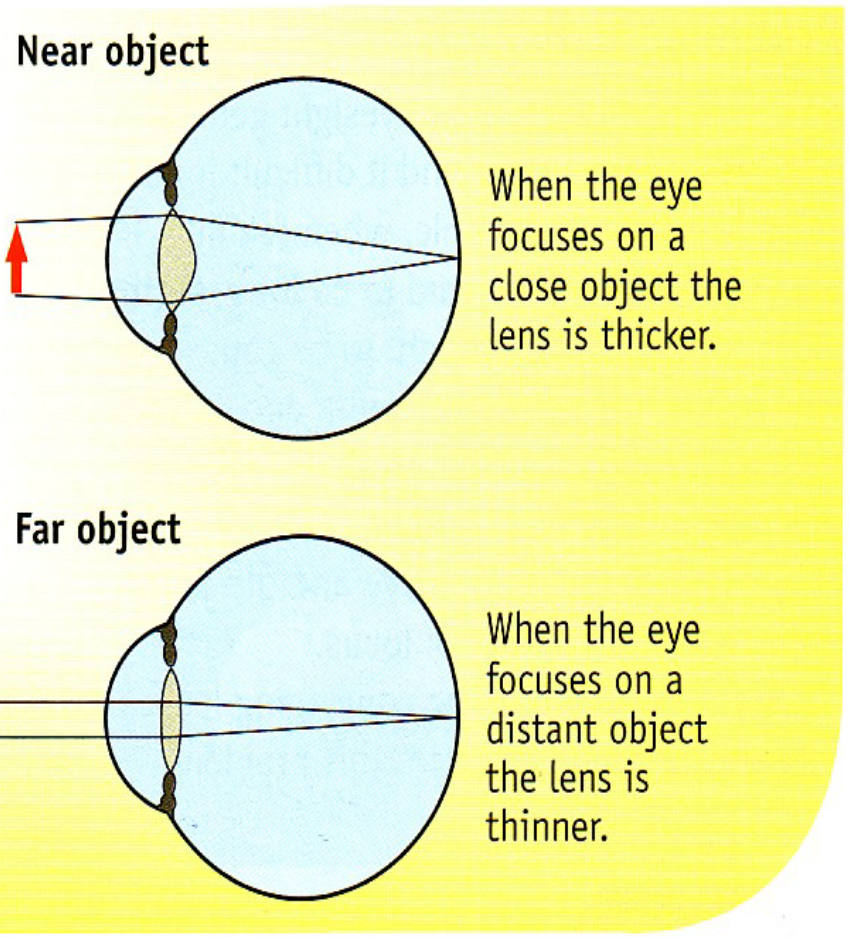
Review from last lesson

- We also covered how the lens focuses images on the back of the retina by using muscles to ‘stretch’ the lens and change its shape.
- To focus **distant** objects the lens is **stretched and appears thin**. To focus **close** objects the lens will be **thicker**.



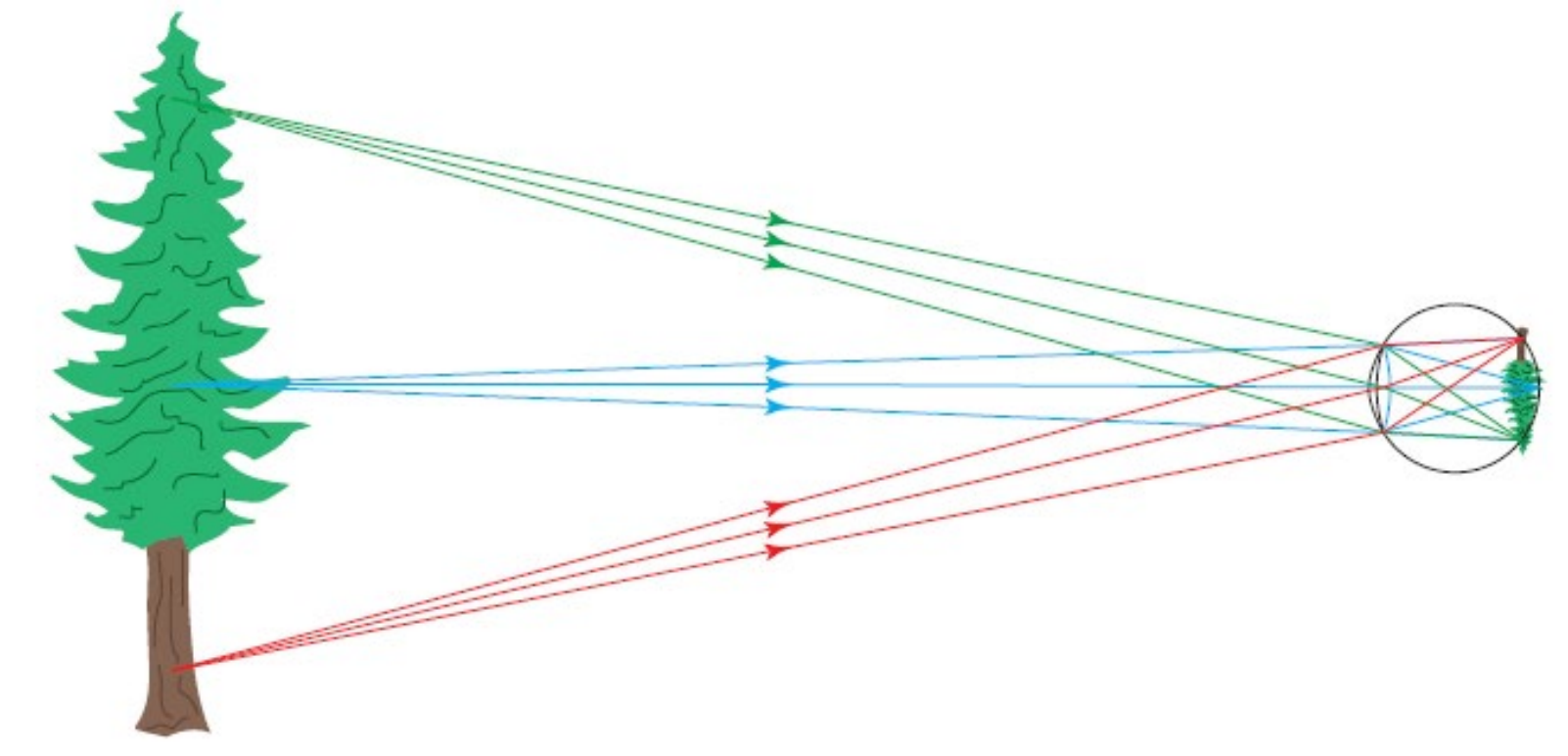
How the eye focuses

Light is focused onto the retina by the cornea and the lens. Both of these parts of the eye act as converging lenses. However, your lens is much better than a glass lens because it can change shape to focus near objects and distant objects. To focus on close objects, tiny muscles around the lens make it thicker and more sharply curved. When focusing on distant objects the lens becomes thinner and flatter.



Review from last lesson

- Also note that the image that falls on the retina is **inverted**. The brain then processes this information and corrects this.

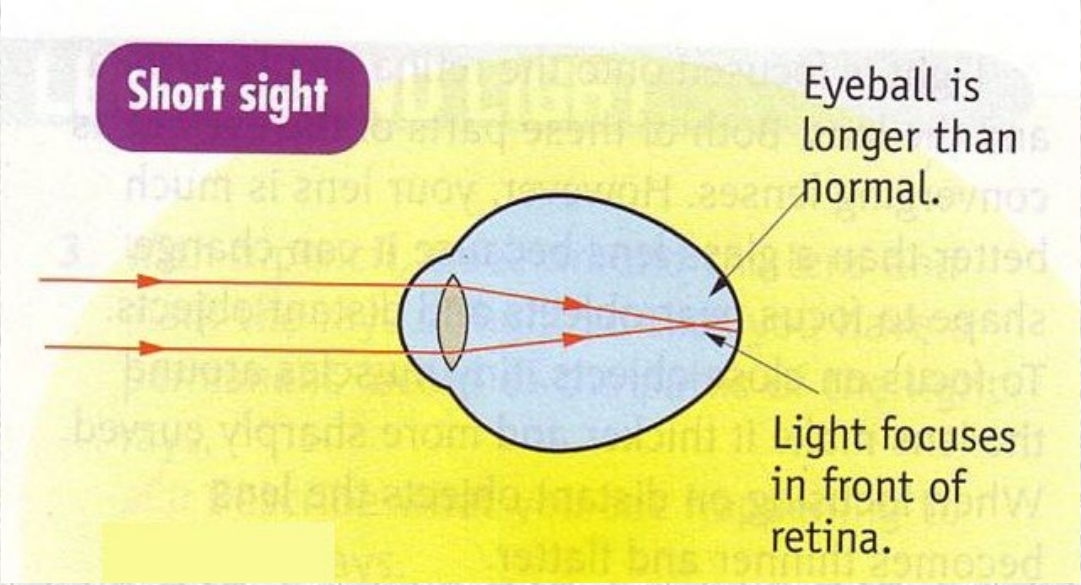


Common Defects of the Eye

- In this lesson we will look at some common defects of the eye. We will look at:
- Short-sightedness
- Long-sightedness
- Astigmatism
- Cataracts
- Colour blindness

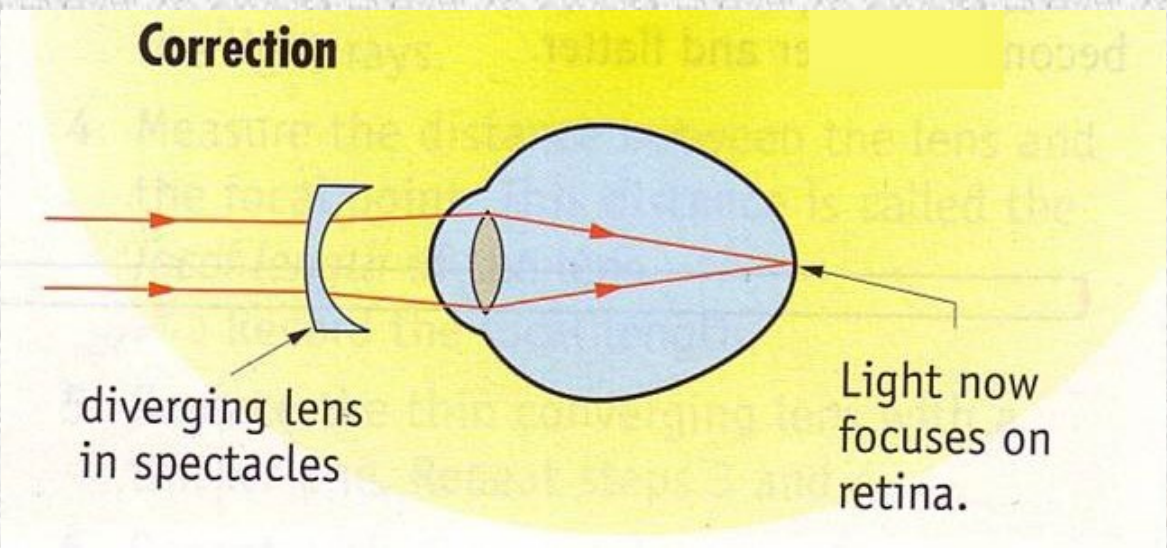
Short Sightedness (Myopia)

- Short sightedness means that a person can focus on things up close but not distant objects. The condition is called **Myopia**.
- The focusing power of their eyes are too strong and the image is focused in front of the retina.



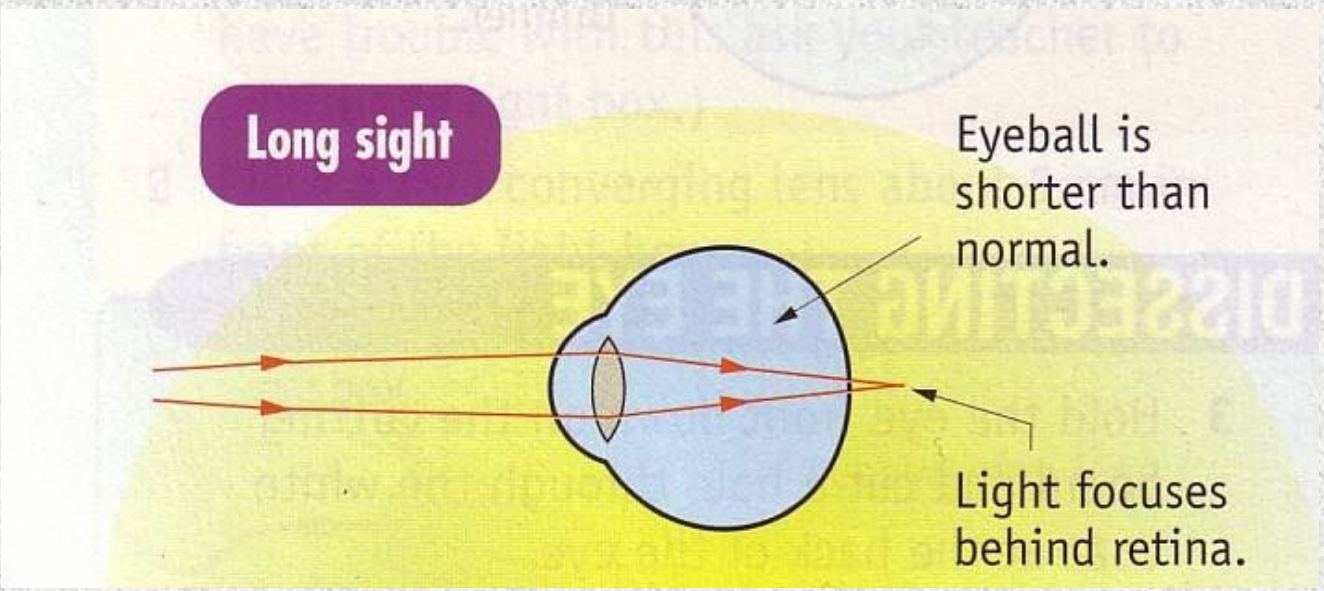
Correcting Short-sightedness (Myopia)

- Short sightedness can be corrected with glasses with **diverging** lenses. The diverging lenses used in glasses are a special type of lens called convexo-concave lenses.



Long Sightedness (Hyperopia)

- Long sightedness means that a person can focus on things in the distance but not close objects. The condition is called **Hyperopia**.
- The focusing power of their eyes is not strong enough and the image falls behind the retina.
- The lens muscles have to work harder to reshape the lens therefore people with this defect will often have head aches and tired eyes.



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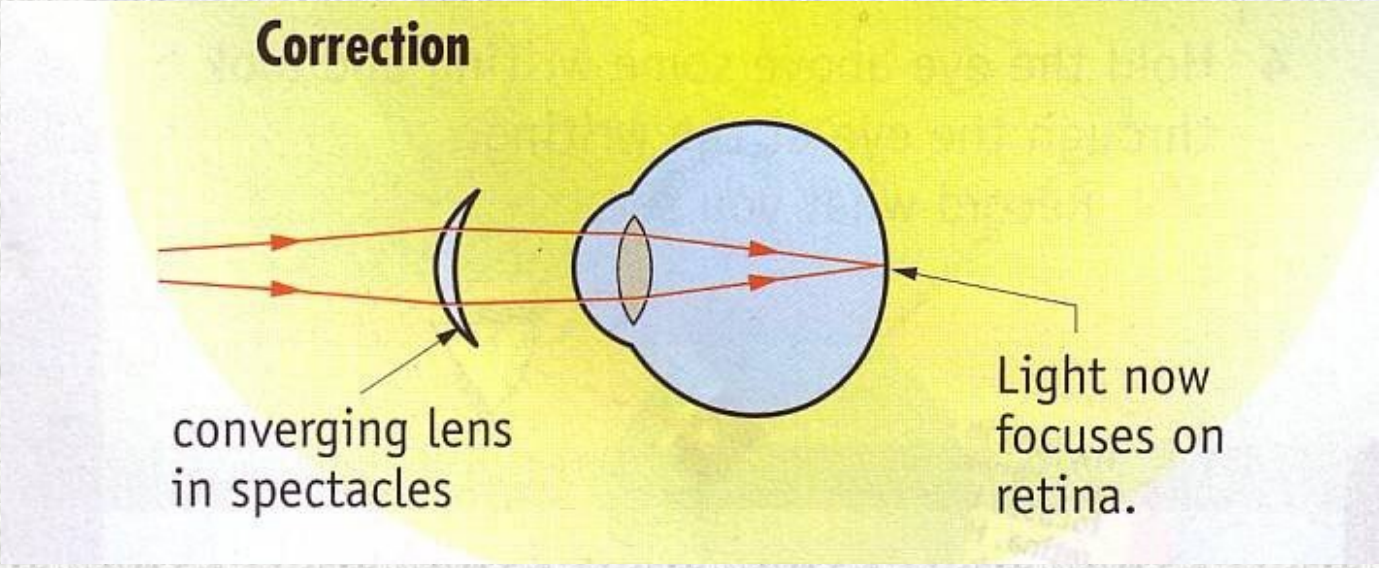


Astigmatism

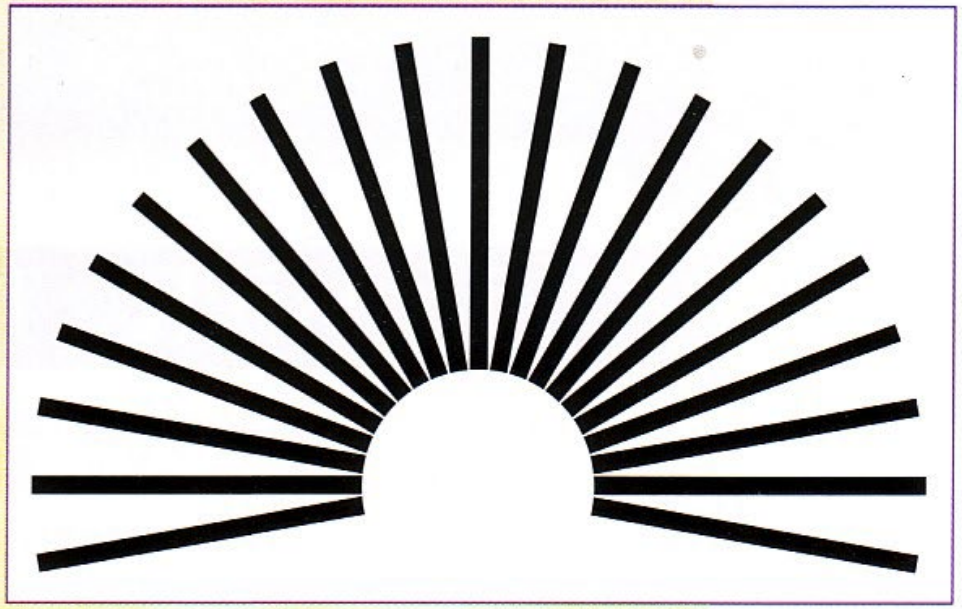
- Astigmatism is a condition where the light coming from one direction is bent more than the light from another direction.
- Astigmatism is caused by an irregular shaped cornea or lens.
- This can be corrected with lenses with a special curvature to correct the misshaped cornea or lens.

Try this test for Astigmatism..

Try this

IS IT CLEAR?

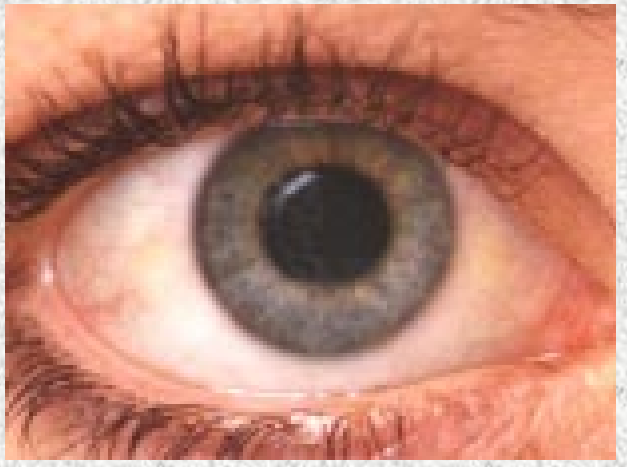
The astigmatic fan chart on the right can be used to test for astigmatism. Look at the chart from a distance of about 50 cm. If your vision is affected by astigmatism, some of the lines will appear more clearly than others. Test one eye at a time, covering the other eye with your hand.



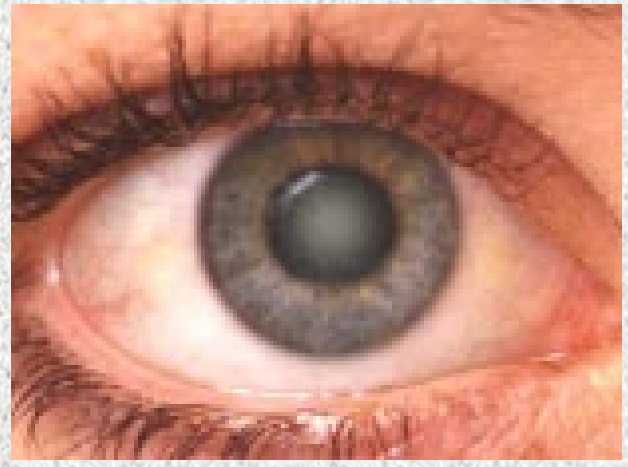
Astigmatic fan chart

Cataracts

- As the lens becomes less flexible with age, it can become less transparent. Small cloudy spots, called **cataracts**, can develop in parts of the lens.
- They cause blurred vision and in severe cases blindness.



Without cataracts



With cataracts

Vision with cataracts

Normal vision

Vision through a cataract

Colour blindness

- Most colour-blind people are unable to distinguish between red and green colours.
- Almost all colour blindness is inherited and cannot be cured.
- In Australia, about 9% of males are colour blind, while only 0.4% of female are colour blind!
- Various tests have been developed for colour blind testing

Normal vision

Red deficit

Green deficit

Various tests for color blindness