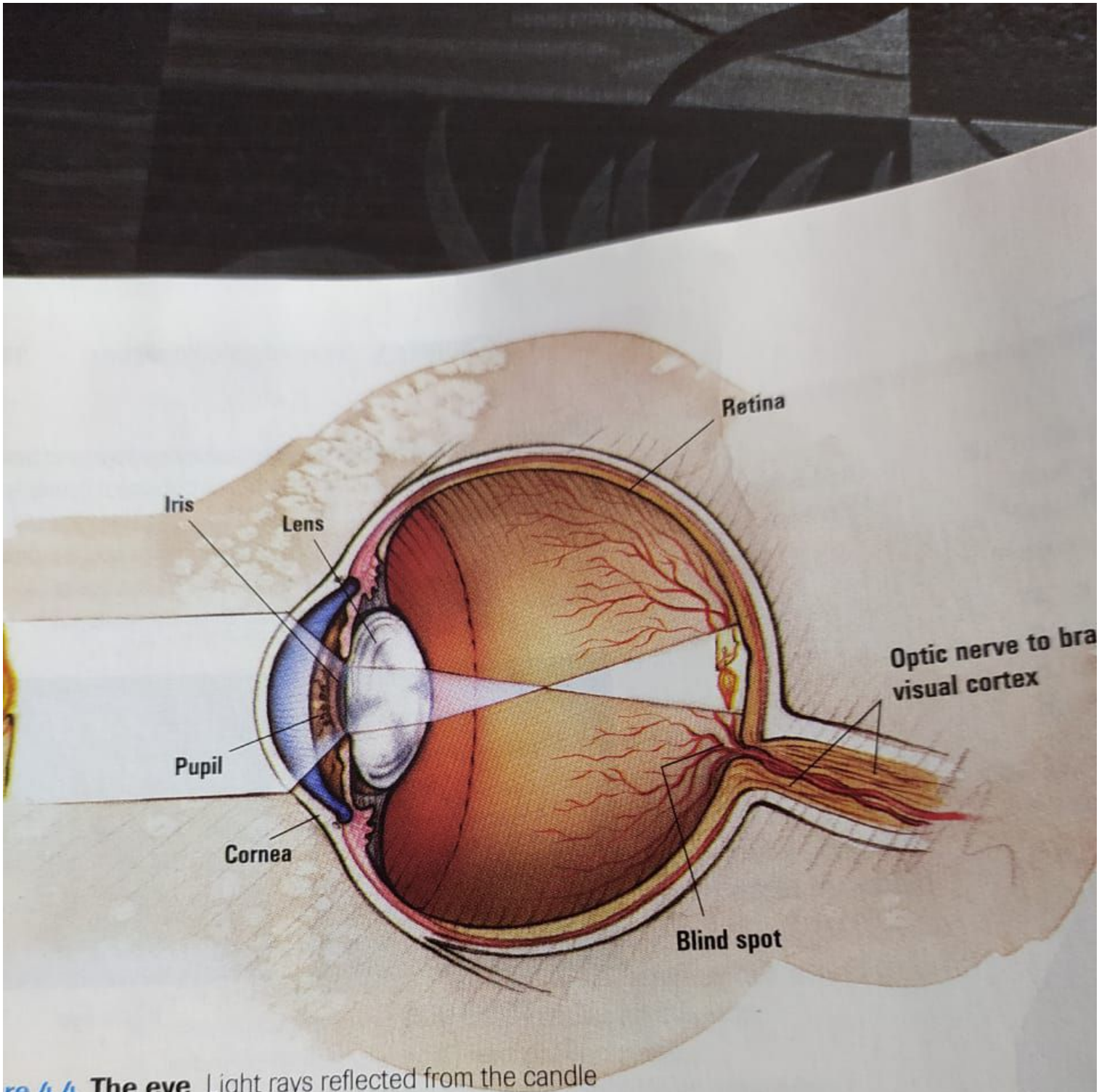


re 4.4 **The eye** Light rays reflected from the candle through the cornea, pupil, and lens. The curvature and ness of the lens change to bring either nearby or distant ts into focus on the retina. Light rays travel in straight So rays from the top of the candle strike the bottom of tina and those from the left side of the candle strike the side of the retina. The candle's retinal image is thus e-do and reversed.

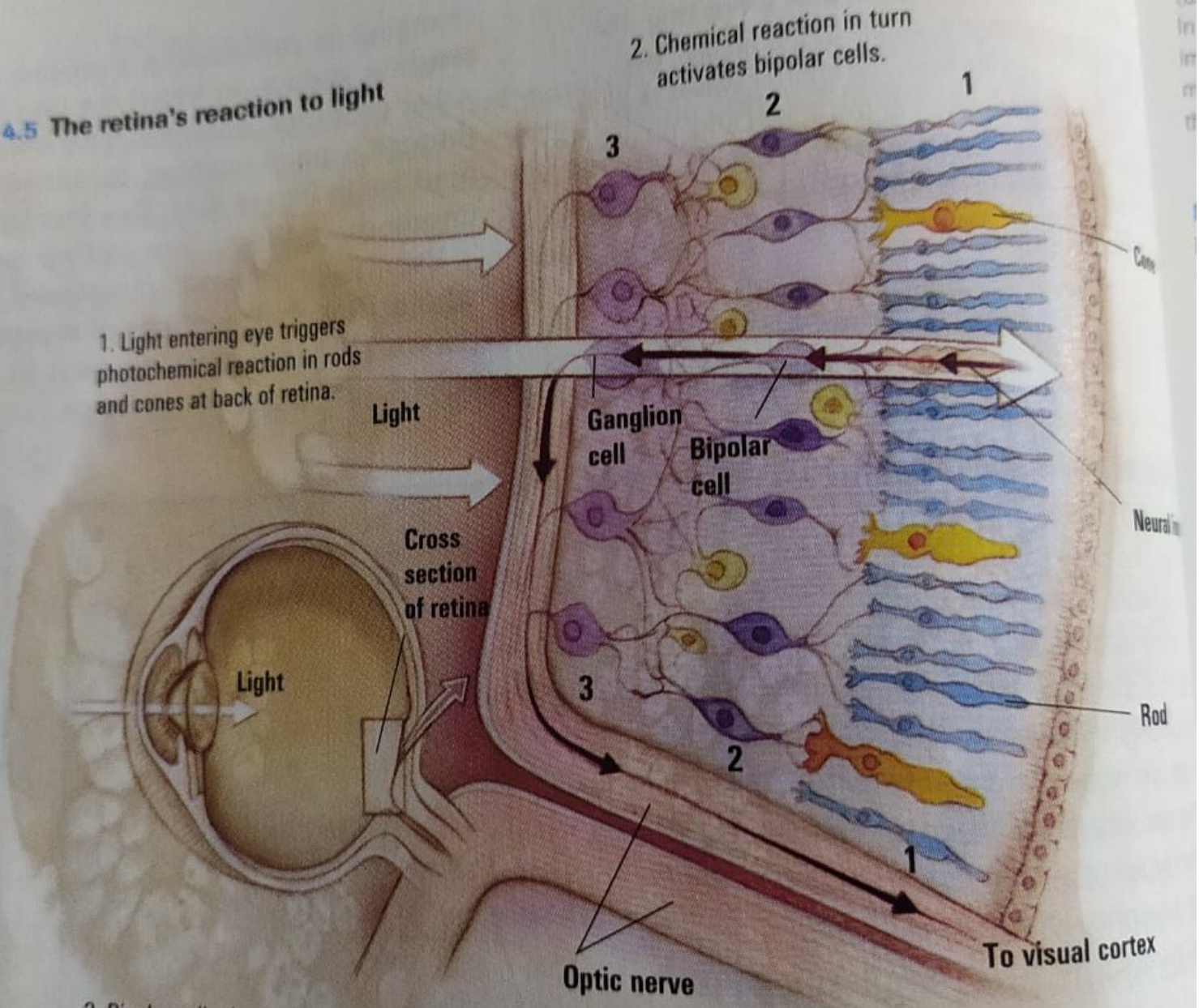
ables hearing, carries m
Where the optic nerve
blind spot (Figure 4.6).

Rods enable black-an
nation diminishes, the
sensitive in dim light,
dim light onto a sing

Where the optic n
blind spot (Figure 4.6).

Rods enable black-and-white vision, however, re
nation diminishes, the cones become ineffectual. Th
sensitive in dim light, because several rods will funnel their faint energy
dim light onto a single bipolar cell. That is why you don't see colors in
light. When you enter a darkened theater or turn off the light at night,
pupils dilate to allow more light to reach the rods in the retina's periphery.
ically it takes 20 minutes or more before our eyes fully adapt.

e 4.5 The retina's reaction to light



3. Bipolar cells then activate the ganglion cells, the axons of which converge to form the optic nerve. This nerve transmits information to the visual cortex in the brain's occipital lobe.

2/7/2020

TDC Part I

The Eyes

Light enters the eyes through the 'cornea', a transparent protector, then travels through the 'pupil', a small adjustable opening. The pupil's size, and therefore the amount of light entering the eye, is regulated by the 'iris', a coloured muscle surrounding the pupil. Behind the pupil is a 'lens' that focuses the incoming rays into an image on a light-sensitive surface. It does so by changing its curvature in a process called "accomodation". The eye ball's light-sensitive surface on which the rays focus is the 'retina', a multilayered tissue.

When the image of a candle passes through a small opening, its mirror image appears inverted on a dark wall behind. Scientists discovered that the retina doesn't read the images as a whole. Rather, its millions of receptor cells convert light energy into neural impulses. These impulses are sent to the brain and constructed here into a perceived object.

Seeing images

The Retina

If we were to follow a single particle of light energy into the eye, we would see that it first makes its way through the retina's outer layer of cells to its buried receptor cells, the 'rods' and 'cones'. Light energy striking the rods and cones produces chemical changes that generate neural signals. These signals activate the neighboring bipolar cells, which in turn activate the neighbouring ganglion cells. The axons from the network of ganglion cells converge like the strands of a rope to form an optic nerve. That carries information to the brain. Nearly a million messages can be sent by the optic nerve at once, through nearly one million ganglion fibers.

Where the optic nerve

leave the eye there are no receptor cells - creating a blind spot.

Rods enable black and white vision; cones enable us to see colours. As the light decreases the cones become ineffectual. The rods, however remain sensitive in dim light, because several rods will be effective in pooling energy and from dim light into a single bipolar cell. That is why we don't see colour in dim light. When we turn off light at night the pupil dilate to allow more light to reach the rods in the retina's periphery. Typically it takes 20 minutes or more before our eyes fully adapt.