Where Light Lands

Use an eye model to explain three causes of blurred vision.

HS-AP6-2 "Make and/or use a model of the anatomy of the eye; then construct an explanation for hyperopia, myopia and astigmatism using the model."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each mention of the cornea, pupil, lens, and retina, then number those four structures in the order light reaches them. Circle descriptions of where rays meet compared with the retina so you can use those positions in your answers.

A Model of Focus

1. When a streetlight shines into your eye, light first bends at the clear cornea. It passes through the pupil, an opening whose size is controlled by the iris. Next, the flexible lens bends the light again. In a useful model, draw these parts along a path toward the retina, the light-sensitive layer at the back of the eye. The retina converts light into nerve signals; the optic nerve carries those signals to the brain. For a sharp image, rays from one point on an object must meet at one point on the retina.

2. Your model can show blur by moving the place where rays meet, called the focus. In myopia, or nearsightedness, a distant object's rays focus in front of the retina when the eye is relaxed. The eyeball may be too long, or its cornea may bend light too strongly. A diverging corrective lens spreads incoming rays so they meet farther back, on the retina. In hyperopia, or farsightedness, the eye may be too short or bend light too weakly. Without enough accommodation, rays from a near object would meet behind the retina. A converging corrective lens brings their focus forward.

3. Astigmatism changes the model in a different way. A cornea or lens with uneven curvature bends rays differently across directions, so they do not share a single focus on the retina. Lines in some directions may look clearer than lines in others, at both near and far distances. A toric corrective lens has different powers in different directions and can bring those rays together on the retina. When you sketch any of these conditions, keep the retina in the same place within each before-and-after pair. Change the ray paths or add a corrective lens to show why the image sharpens.

2 ANSWER WITH EVIDENCE

Use the passage

1. A model shows rays from a distant scoreboard crossing before they reach the retina. Which condition does it show? Name one change in the eye that could cause this.

2. In a model of an eye viewing a nearby phone, rays would meet beyond the retina without enough accommodation. Which condition does this show, and how would a corrective lens move the focus?

3. A model shows rays in two directions meeting at different distances from the lens. Which condition does this suggest? Explain why a corrective lens needs different powers in different directions.

4. A classmate's model puts light through the pupil, cornea, lens, and retina, in that order. Correct the path and explain what the retina does when light reaches it.

3 YOUR TURN

Your own words

Sketch three panels showing the same eye with myopia, hyperopia, and astigmatism before correction. In each panel, label the cornea, pupil, lens, and retina, trace rays to show where they meet, and write one sentence explaining how a corrective lens would change the focus.

ANSWER KEY

Where Light Lands

HIGH SCHOOL · HS-AP6-2

PART 1 · READ AND MARK

Underline each mention of the cornea, pupil, lens, and retina, then number those four structures in the order light reaches them. Circle descriptions of where rays meet compared with the retina so you can use those positions in your answers. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A model shows rays from a distant scoreboard crossing before they reach the retina. Which condition does it show? Name one change in the eye that could cause this.	**Myopia. The eyeball could be too long, or the cornea could bend light too strongly.**
2	In a model of an eye viewing a nearby phone, rays would meet beyond the retina without enough accommodation. Which condition does this show, and how would a corrective lens move the focus?	**Hyperopia. A converging lens would bring the focus forward onto the retina.**
3	A model shows rays in two directions meeting at different distances from the lens. Which condition does this suggest? Explain why a corrective lens needs different powers in different directions.	**Astigmatism. Uneven curvature bends rays differently by direction, so a toric lens uses different powers to bring them to one focus on the retina.**
4	A classmate's model puts light through the pupil, cornea, lens, and retina, in that order. Correct the path and explain what the retina does when light reaches it.	**Light passes through the cornea, pupil, and lens before reaching the retina. The retina converts light into nerve signals.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Myopia panel: The labeled eye shows rays meeting in front of the retina. A diverging lens would move their focus back onto the retina. Hyperopia panel: The labeled eye shows rays continuing toward a meeting point behind the retina. A converging lens would bring their focus forward onto the retina. Astigmatism panel: The labeled eye shows two direction-labeled groups of rays meeting at different points. A toric lens would bend the groups by different amounts so they meet on the retina.

Accept sketches with simplified ray paths if they correctly place the focus for each condition and keep the anatomical path in order. For astigmatism, look for different focal positions for rays in different directions, not just one focus before or behind the retina.