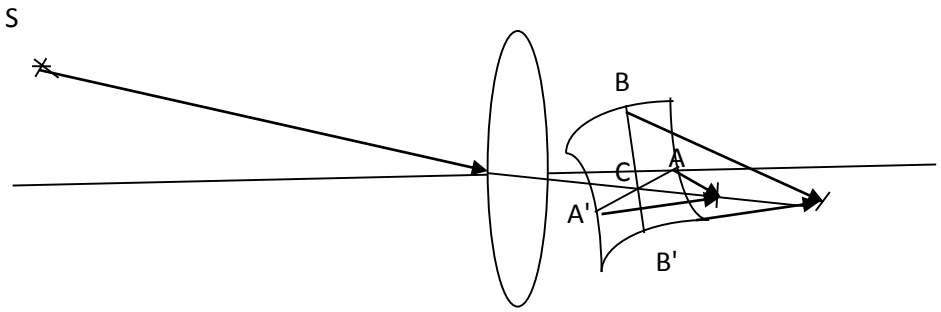
Answer on Question #60345, Physics / Optics

Could you please explain the following with an illustration: Astigmatism results when a lens is unable to bring light passing through one part of a lens to the same focal point as light passing through another part.

Solution:

Astigmatism occurs during the image formation of luminous point which located at a considerable distance from the main optical axis of the lens. In this case, in order to get the images necessary to use the oblique light rays. These rays form a significant angle to the main optical axis of the lens. But this light rays go from one point and not converge at one point (Figure).



For any curve surface there are two mutually perpendicular sections. One of them has the smallest radius of curvature (ACA'), the second – the largest (BCB'). Rays of the first section (and all section parallel to it) will be collected the nearest, rays of the second (and all section parallel to it) – farthest. These line segments are mutually perpendicular. Thus the slanting beam of light rays after refraction in lens collect in two mutually perpendicular line segments (not a one point). Then the image of luminous point is not the point. Elimination astigmatism: build optical system with lenses of different curvature and different refractive indices.