

**Q. 9. What happens to the image distance in the eye when we increase the distance of an object from the eye?**

**Ans.** The distance between eye lens and retina is the image distance inside the eye. The image distance is fixed. It cannot be changed at all. Therefore, when we increase the distance of an object from the eye, there is no change in the image distance, inside the eye.

**Q. 10. Why do stars twinkle?**

**Ans.** The twinkling of a star is due to the atmospheric refraction of starlight. The atmospheric refraction occurs in a medium of gradually changing refractive index.

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Since the atmosphere bends starlight towards the normal, the apparent position of the star is slightly different from its actual position. This apparent position of the star is not stationary, but keeps on changing slightly, as the physical conditions of the earth's atmosphere are not stationary. Since the stars are very distant, they approximate point-sized sources of light. As the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering the eye flickers—the star sometimes appear brighter, and at some other time, fainter, which is the twinkling effect.

**Q. 11. Explain why the planets do not twinkle.**

**Ans.** The planets are much closer to the earth, and are thus seen as extended sources. If we consider a planet as a collection of a large number of point-sized sources of light, the total variation in the amount of light entering our eye from all the individual, point-sized sources will average out to zero, thereby nullifying the twinkling effect.

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**Q. 12. Why does the sun appear reddish early in the morning?**

**Ans.** In the early morning (at the time of sunrise), when the sun is near the horizon, the sunlight has to travel the greatest distance through the atmosphere to reach us. During this long journey of sunlight, most of the blue colour and shorter wavelength present in it is scattered out and away from our line of sight. So, the light reaching us directly from the rising sun consists mainly of longer wavelength, red colour due to which the sun appears reddish early in the morning.

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**Q. 13. Why does the sky appear dark instead of blue to an astronaut?**

**Ans.** The sky appears dark instead of blue to an astronaut because there is no atmosphere containing air in the outer space to scatter sunlight. As there is no scattered light to reach our eyes in outer space, so, the sky appears dark.