

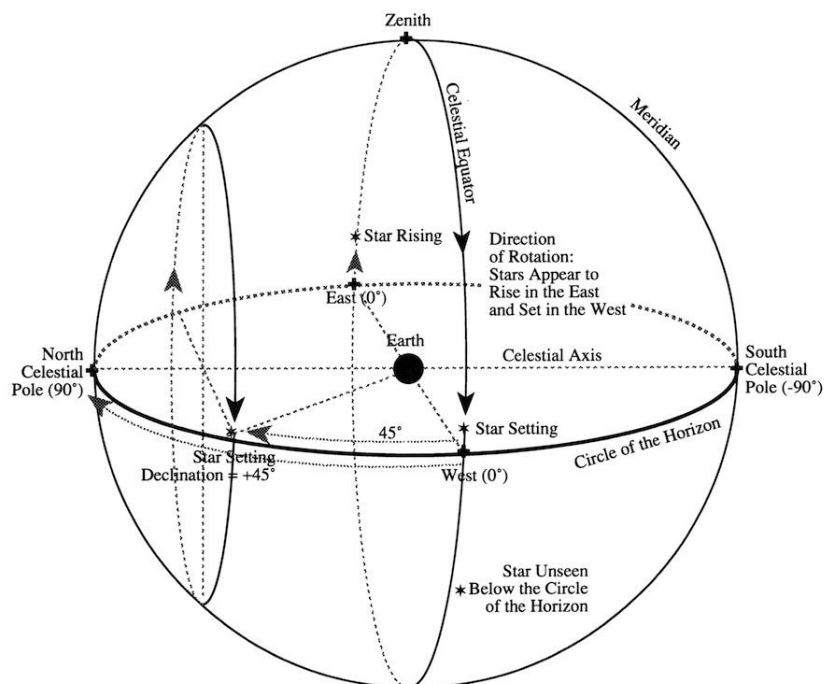
## Answer on Question #61086, Physics / Astronomy | Astrophysics

Explain the following terms with the help of a diagram, wherever needed celestial sphere, zenith, circumpolar stars, diurnal circle, resolving power of a telescope.

### Solution:

#### Celestial sphere, zenith

The **celestial sphere** is an imaginary sphere of gigantic radius with the earth located at its center. The poles of the celestial sphere are aligned with the poles of the Earth. The celestial equator lies along the celestial sphere in the same plane that includes the Earth's equator. An astronomer can only see half the sky at a time, that is, only half the sky is above the horizon at any time. But the sky keeps moving as the earth rotates. Just as the sun rises and sets every day, so does every star in the sky each night. The celestial sphere is a large sphere surrounding the earth and with it we can keep references to where celestial bodies lie in the sky.



*Celestial Equator* – The earth's equator, but at a much greater radius.

*Horizon* – The horizon changes depending on your position on earth.

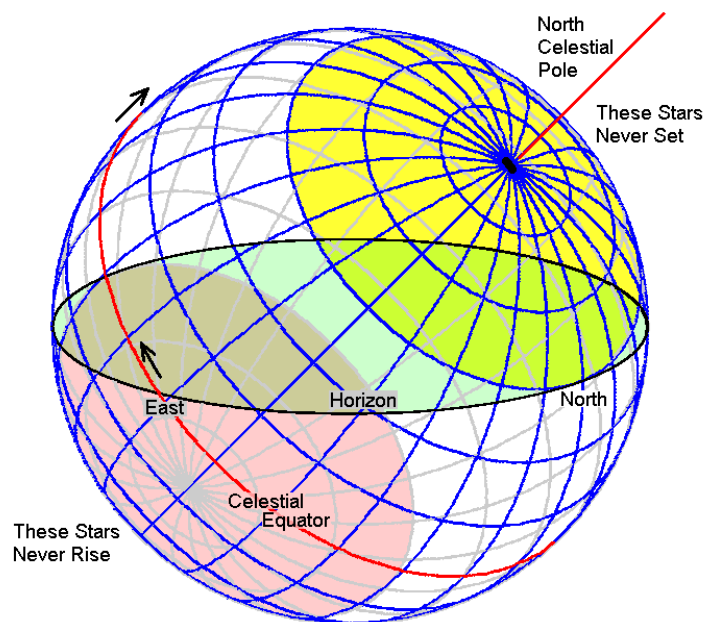
**Zenith** – The point on the celestial sphere directly overhead.

*Meridian* – The line that extends from the north point on the horizon upwards through the zenith and then downward to the south point on the horizon.

## Circumpolar stars

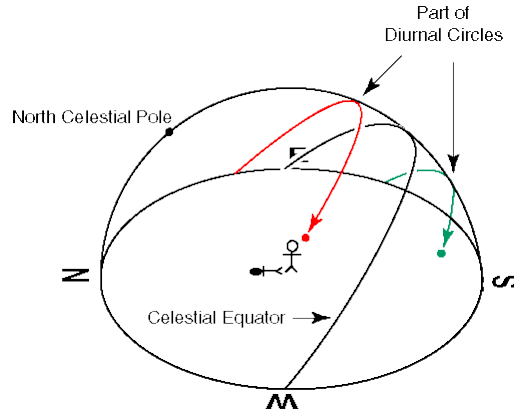
A **circumpolar star** is a star that, as viewed from a given latitude on Earth, never sets (that is, never disappears below the horizon), due to its proximity to one of the celestial poles. Circumpolar stars are therefore visible from said location toward nearest pole for the entire night on every night of the year (and would be continuously visible throughout the day too, were they not overwhelmed by the Sun's glare).

As Earth spins daily on its axis, the stars appear to rotate in circular paths around one of the celestial poles (the north celestial pole for observers in the northern hemisphere, or the south celestial pole for observers in the southern hemisphere). Stars far from a celestial pole appear to rotate in large circles; stars located very close to a celestial pole rotate in small circles and hence hardly seem to engage in any diurnal motion at all. Depending on the observer's latitude on Earth, some stars — the circumpolar ones — are close enough to the celestial pole to remain continuously above the horizon, while other stars dip below the horizon for some portion of their daily circular path (and others remain permanently below the horizon).



## diurnal circle

Term referring to the apparent daily motion of stars around the Earth, or more precisely around the two celestial poles. It is caused by the Earth's rotation on its axis, so every star apparently moves on a circle, that is called the **diurnal circle**.



## resolving power of a telescope

This is a telescope's property to give the image of two separately alongside located, bright object points.

The **linear resolution** is defined as the minimum distance between two separate objects point at which they are perceived as separate objects, but do not merge together.

The **angular resolution** is the minimum angle between point objects when they are treated as separate objects.

The telescope's resolution can be limited either by aberration or by diffraction causing blurring of the image.

Telescope's resolving power:

$$\theta = 1.22 \frac{\lambda}{D} (1),$$

where  $\theta$  is the **angular resolution** (radians),

$\lambda$  is the wavelength of light,

D is the diameter of the lens' aperture.