

Question: How can liquid water exist below freezing point?

- need freezing nuclei for liquid water to freeze into ice crystal if temperature is between 0 and -40°C .

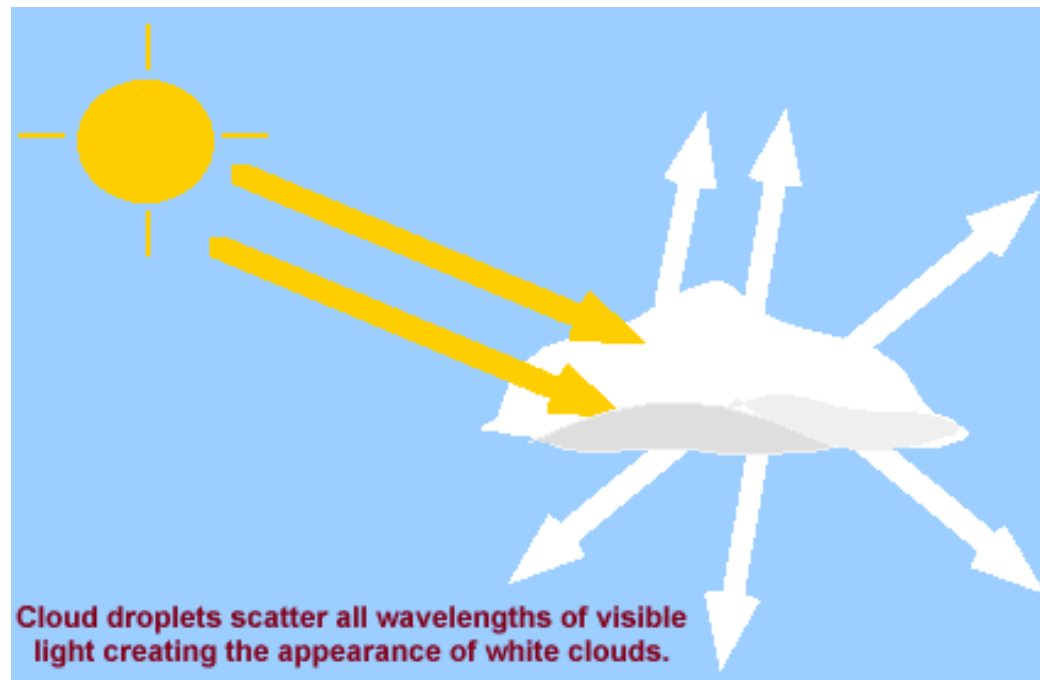
- similar idea as cloud condensation nuclei, except the structure of freezing nuclei must be similar to structure of ice crystal

==> As a result, much fewer freezing nuclei in atmosphere compared to number of cloud condensation nuclei

SCATTERING

Light rays scattered in many different directions

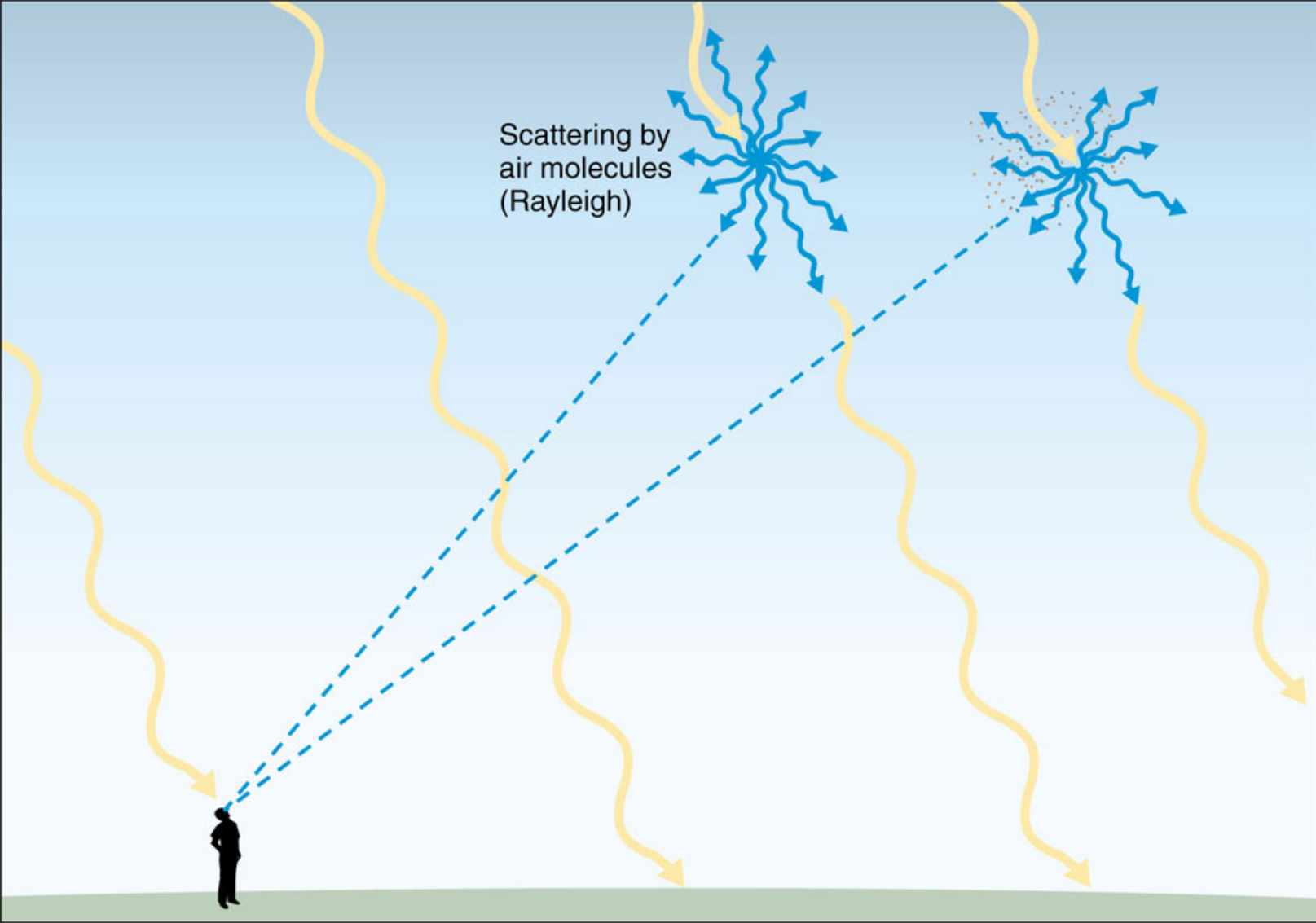
- “Mie” Scattering
 - larger particles (e.g. cloud droplets, haze)
 - scatter all wavelengths
 - scattered light looks white (clouds, hazy days, etc)

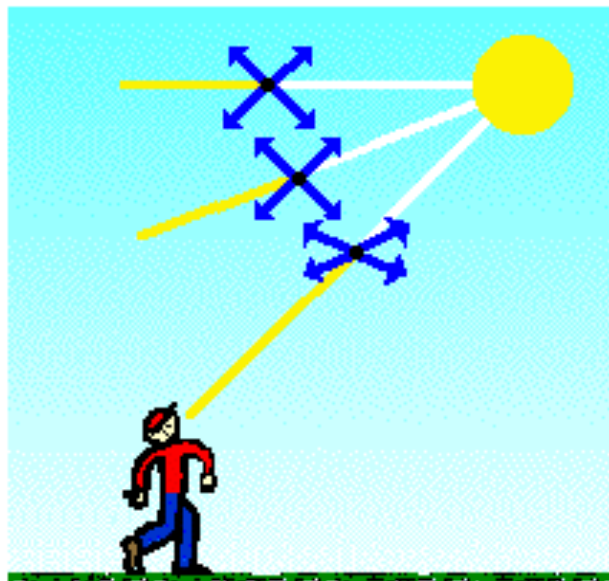
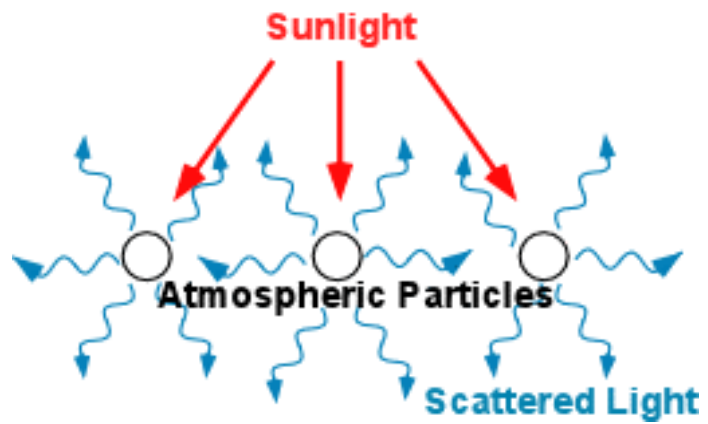


SCATTERING

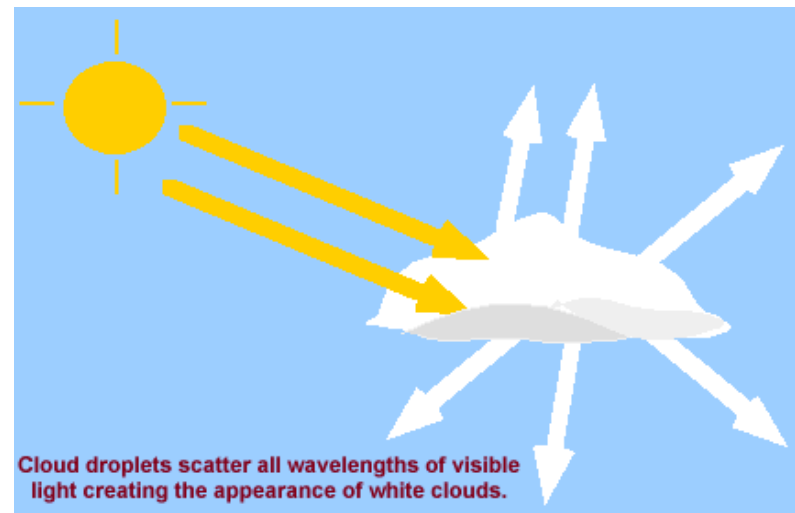
Light rays scattered in many different directions

- **“Mie” Scattering**
 - larger particles (e.g. cloud droplets, haze)
 - scatter all wavelengths
 - scattered light looks white (clouds, hazy days, etc)
- **“Rayleigh” Scattering**
 - smaller particles (N₂, O₂ molecules)
 - scatter primarily shorter wavelengths (violet - blue)
 - why sky looks blue during mid-day





The yellow appearance of the noon-day sun is due to the scattering of the higher frequencies of sunlight.



Set Frequency to "AB"

Clicker Question

Suppose there is a cloud made up of some unknown particles that absorb rather than scatter visible radiation. What color would this cloud appear during the day?

- (A) blue
- (B) white
- (C) black
- (D) red

Smoke particles are much larger than cloud drops and absorb visible light.



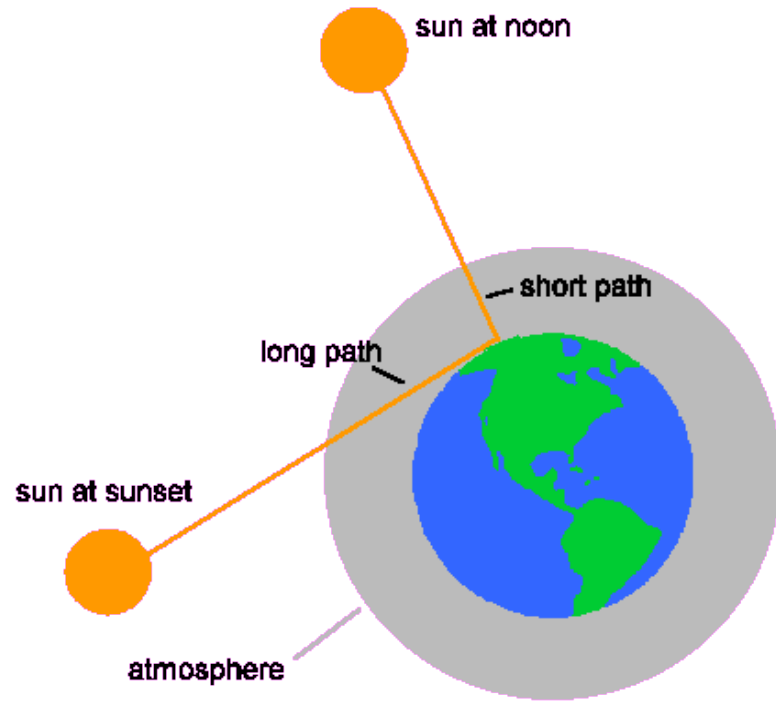
Set Frequency to "AB"

Clicker Question

The moon has no atmosphere. What color is the sky on the moon?

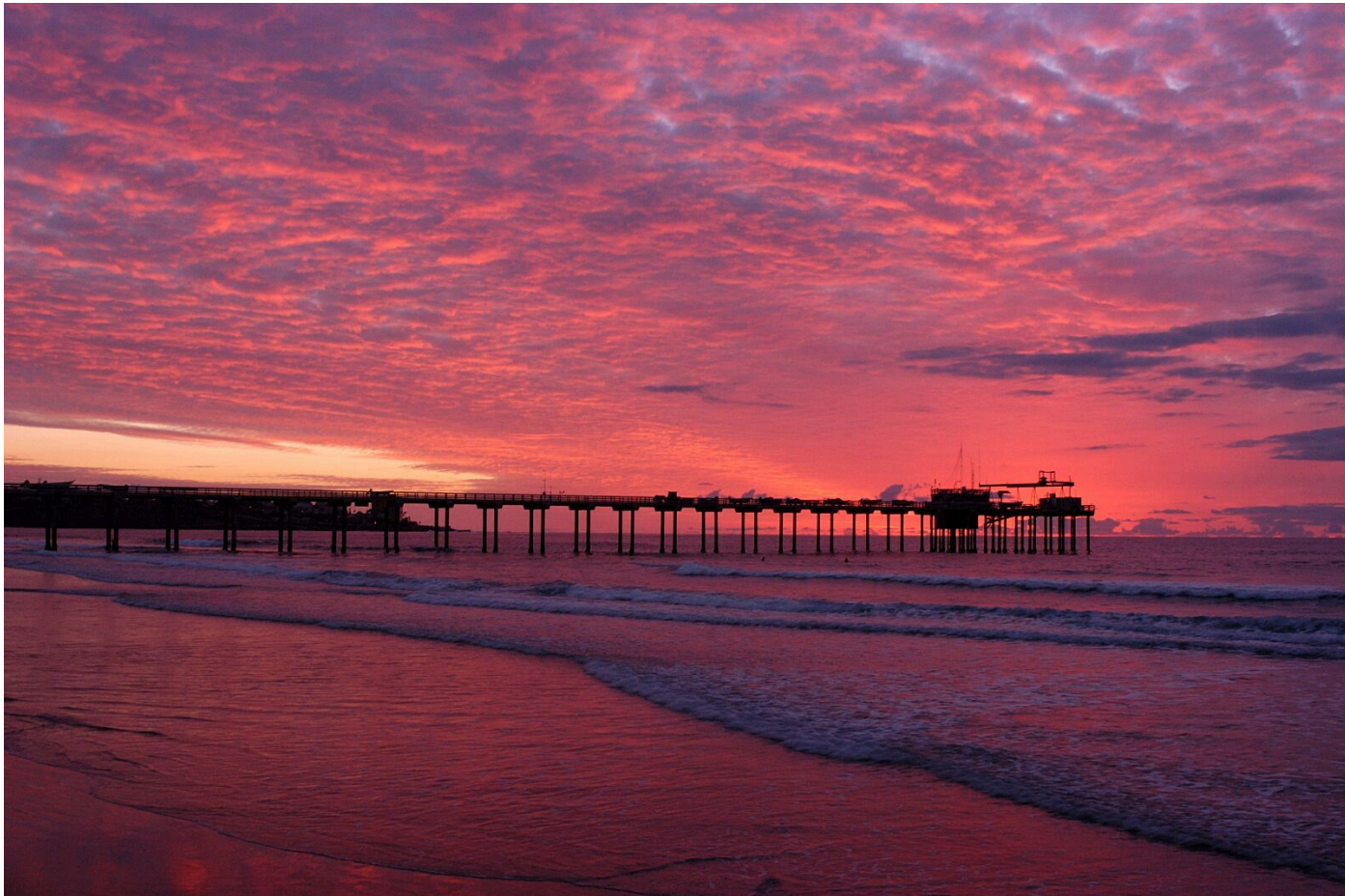
- (A) blue
- (B) white
- (C) black
- (D) red

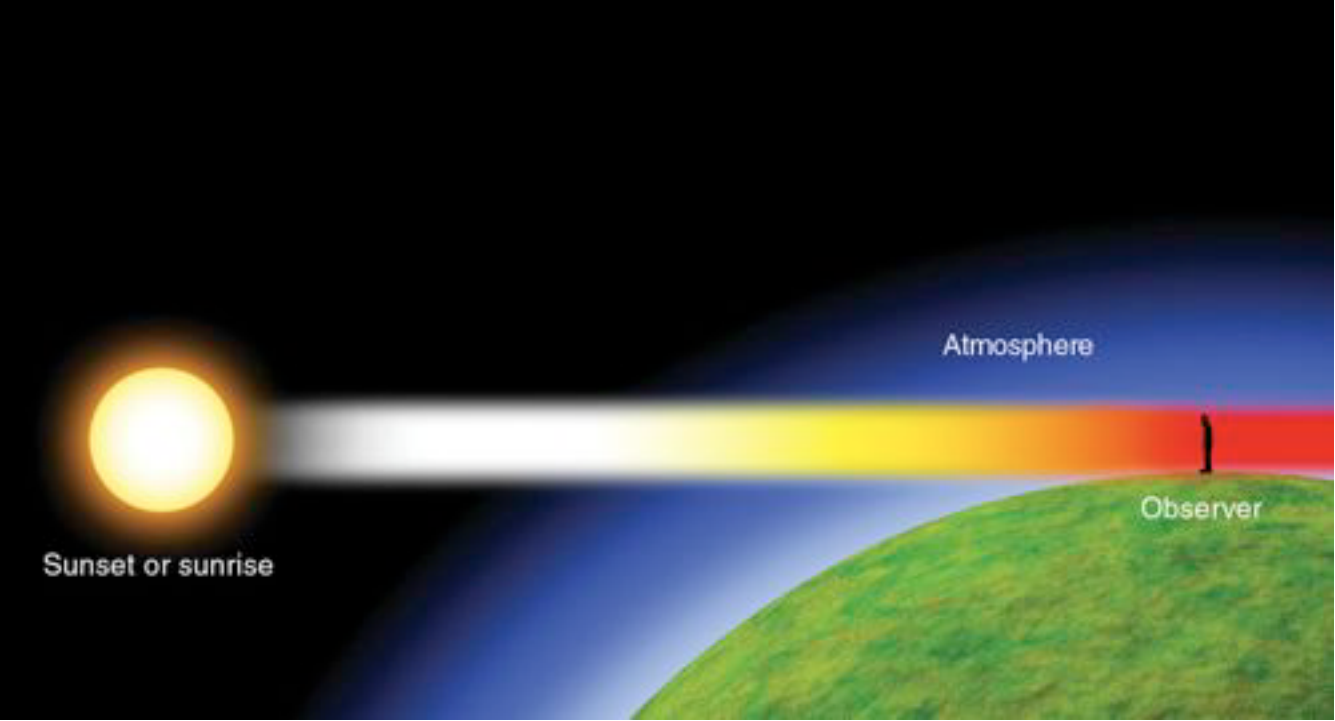


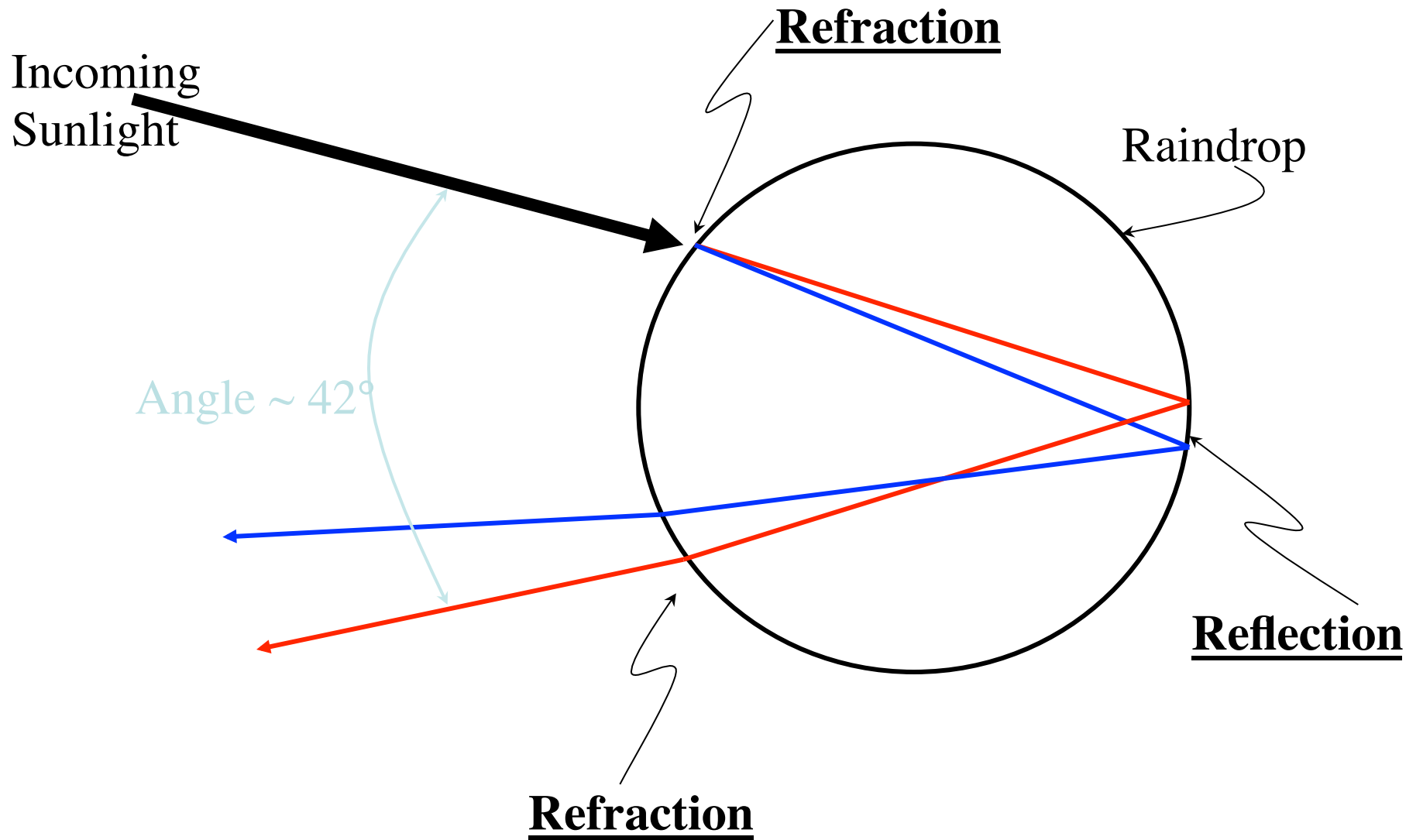


Red Sunsets and Sunrises:

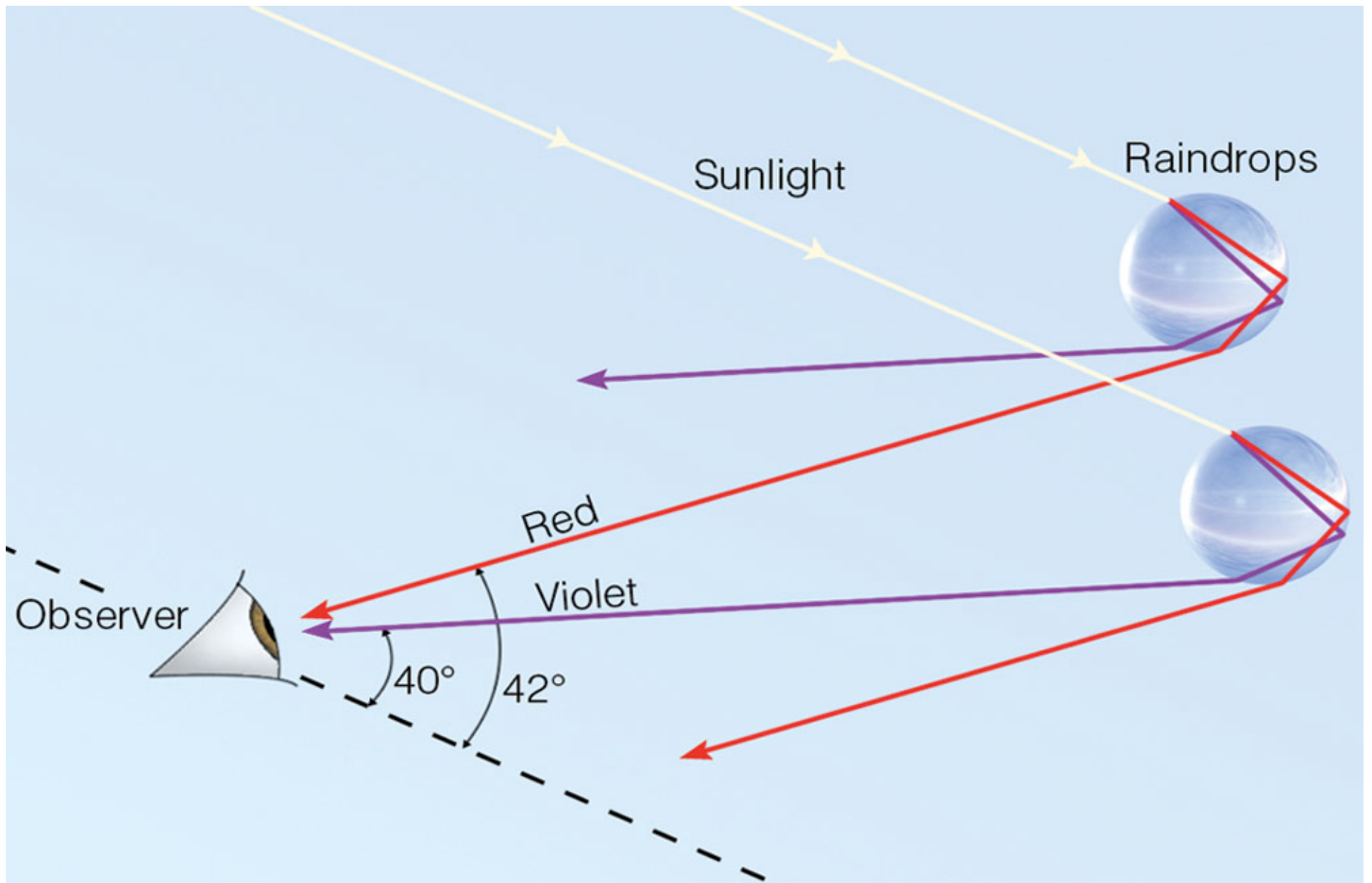
Longer path through atmosphere = more blue light scattered away
remaining light is more reddish



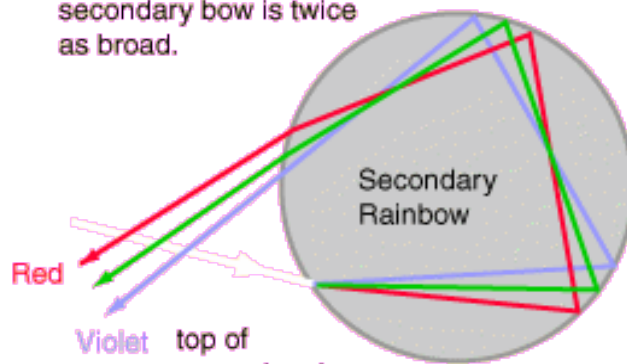






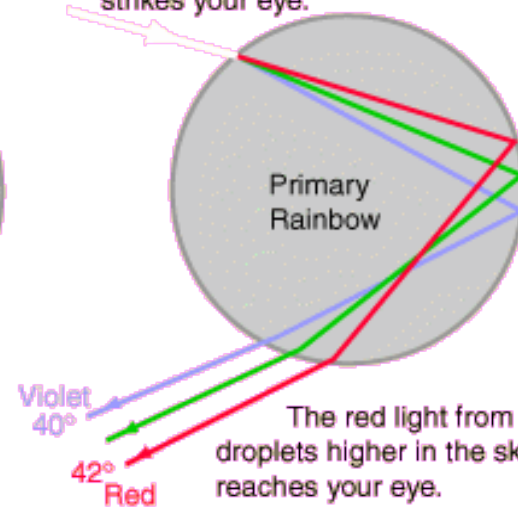


The colors of the secondary rainbow are reversed from the primary bow, and the secondary bow is twice as broad.



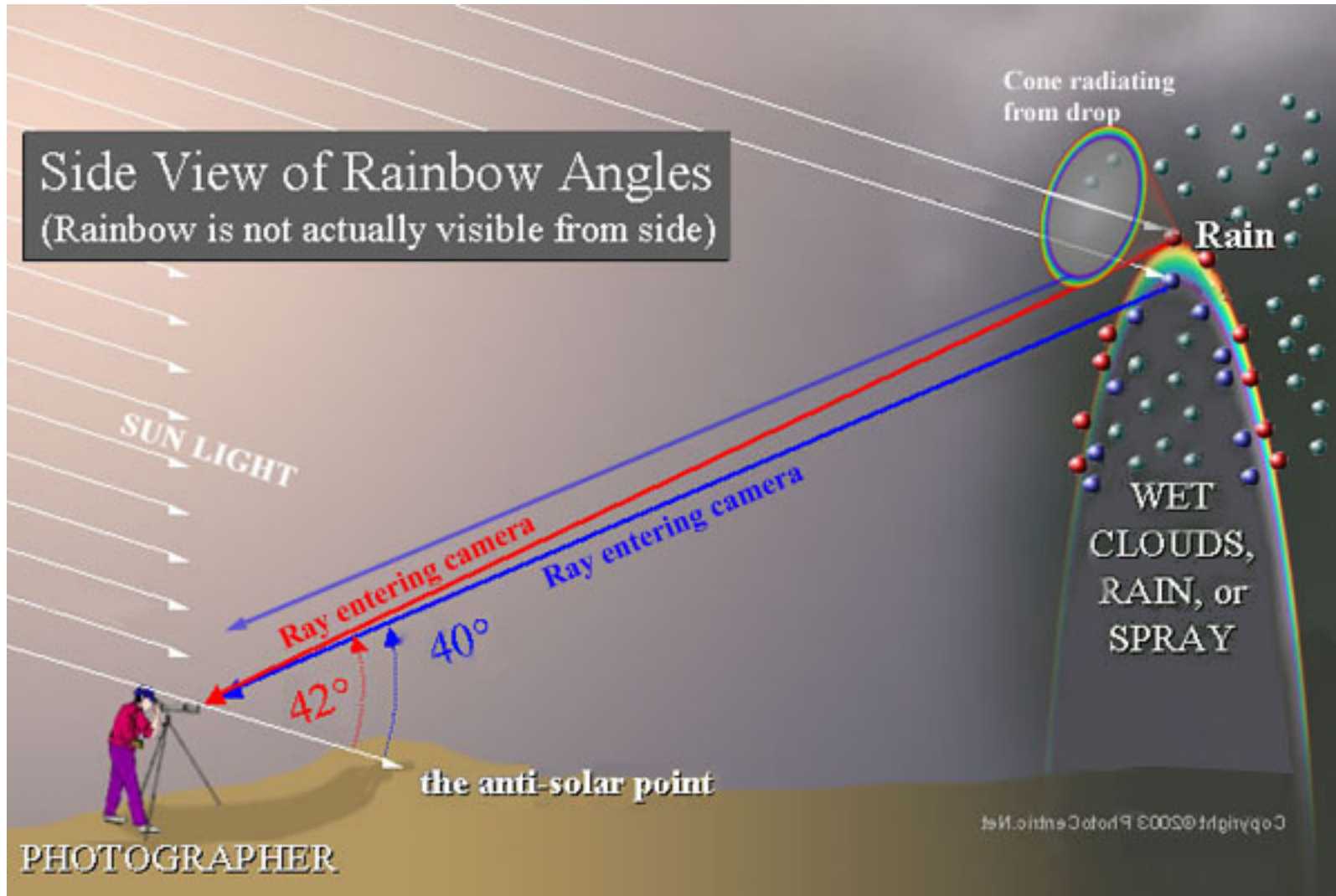
Violet top of secondary bow since it comes to the eye from higher drops.

Violet light is bent more and comes out higher from the droplet. It appears at the bottom of the rainbow since violet light from lower droplets strikes your eye.



The red light from droplets higher in the sky reaches your eye.

Side View of Rainbow Angles (Rainbow is not actually visible from side)



Copyright © 2003 Photo Centre Ltd

Set Frequency to "AB"

Clicker Question

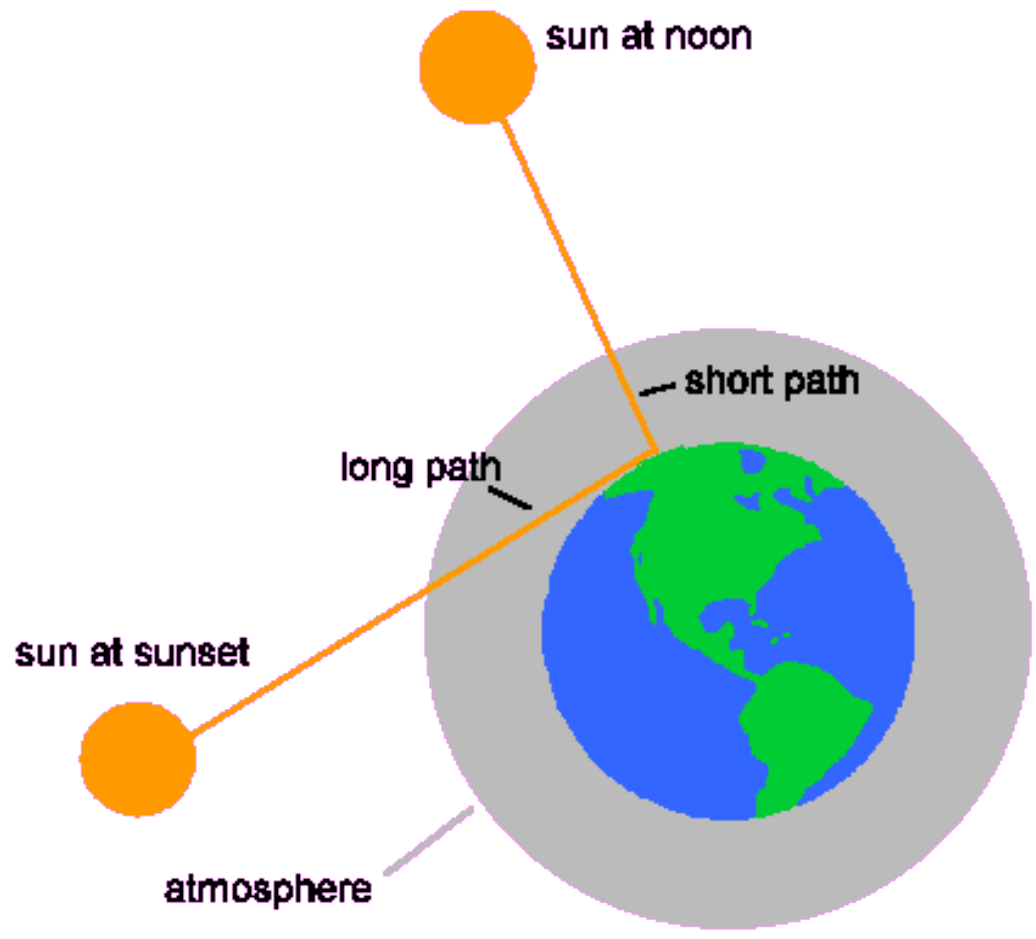
At sunset in San Diego, in which direction are you most likely to see a rainbow?

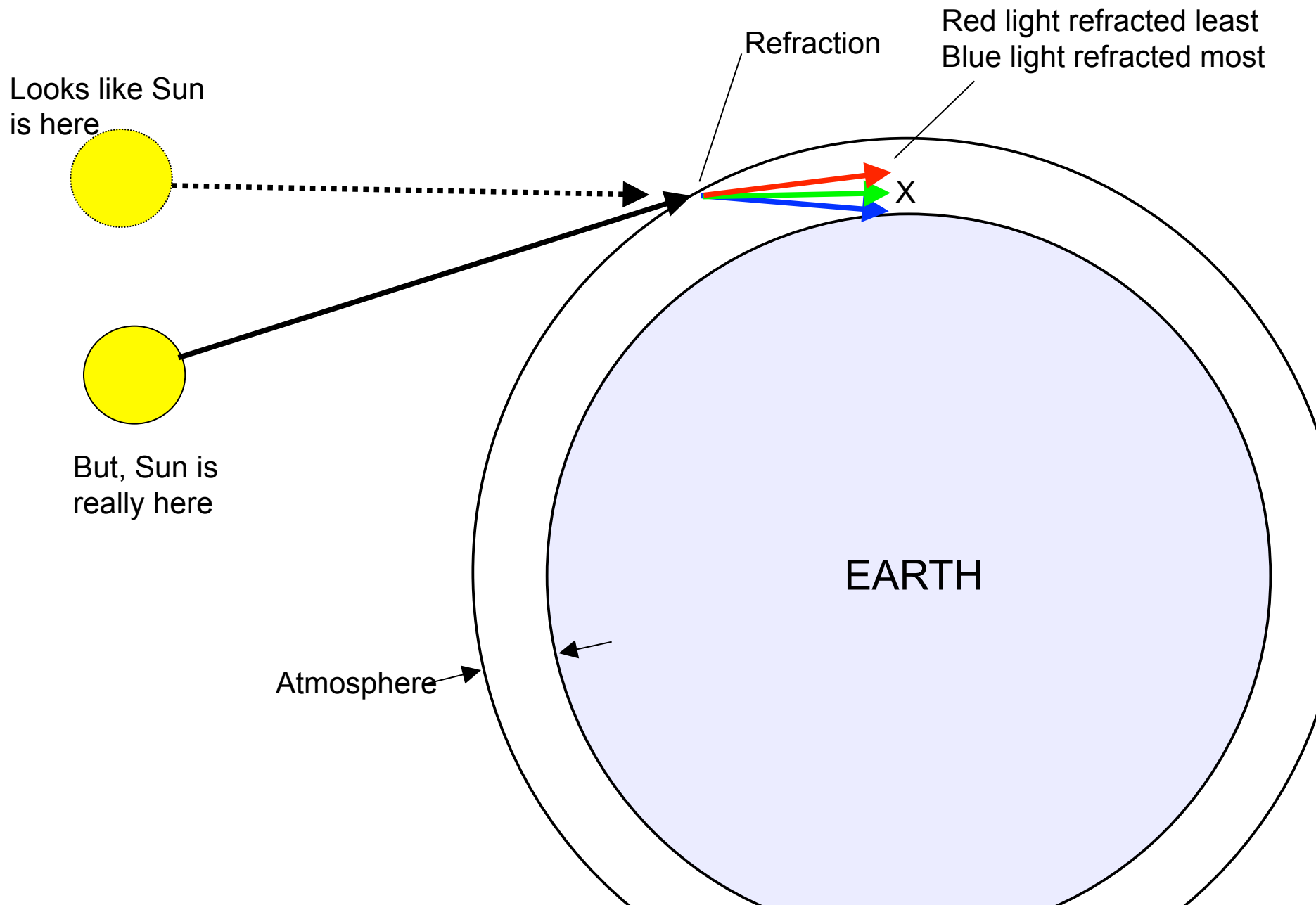
(A) north

(B) south

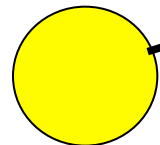
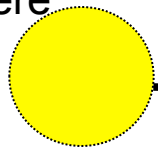
(C) east

(D) west





Looks like Sun
is here



But, Sun is
really here

Refraction

Red light refracted least
Blue light refracted most

X

EARTH

Atmosphere

Green Flash

