

Chapter 2

Solar radiation and the seasons

radiation

wave-particle duality

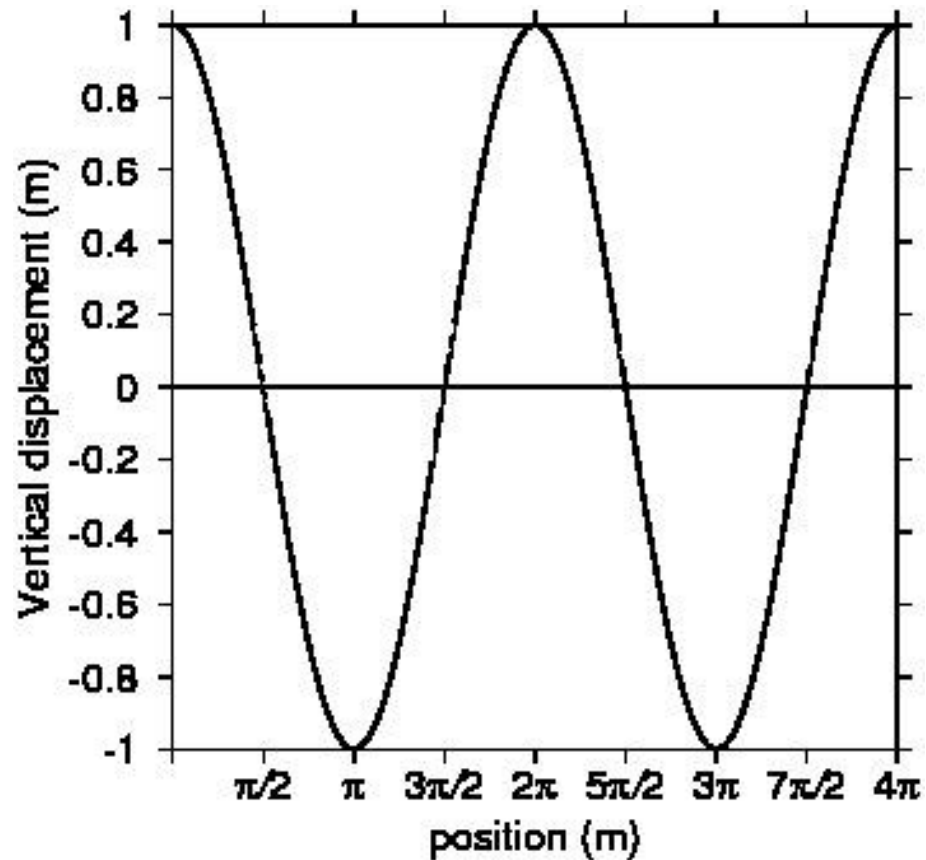
quantum mechanics regression...

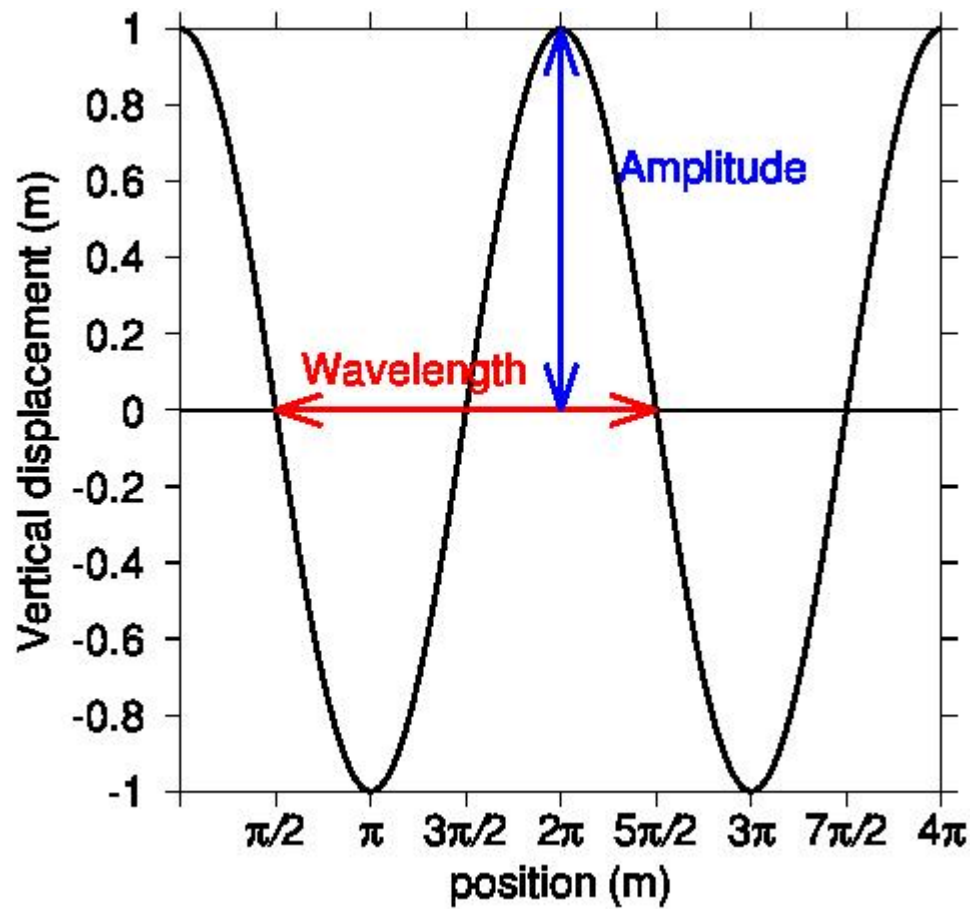
wave-particle duality

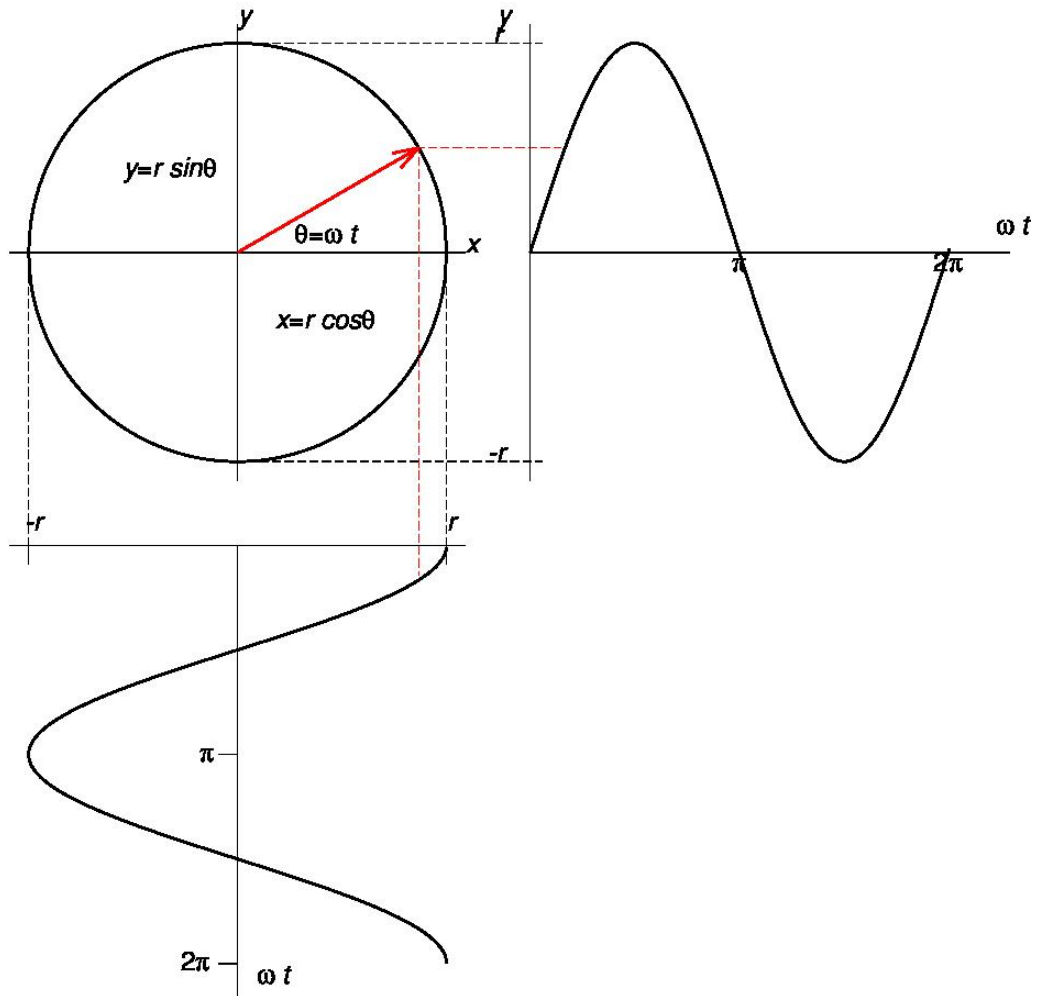
light can behave as a

- wave
- particle

but can't do both at the same time!





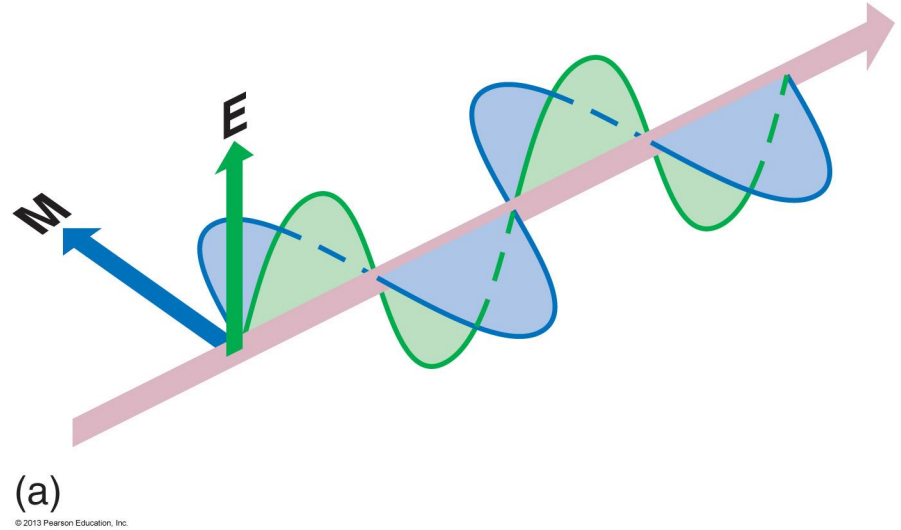


Wave tutorials

[wave apps](#) from textbook

The electric and magnetic fields

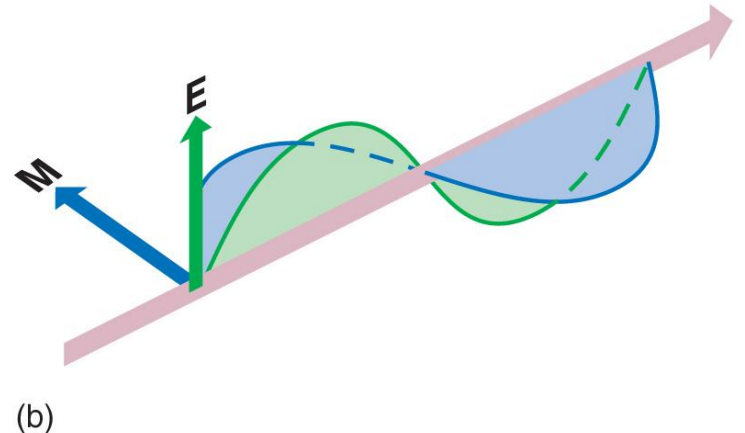
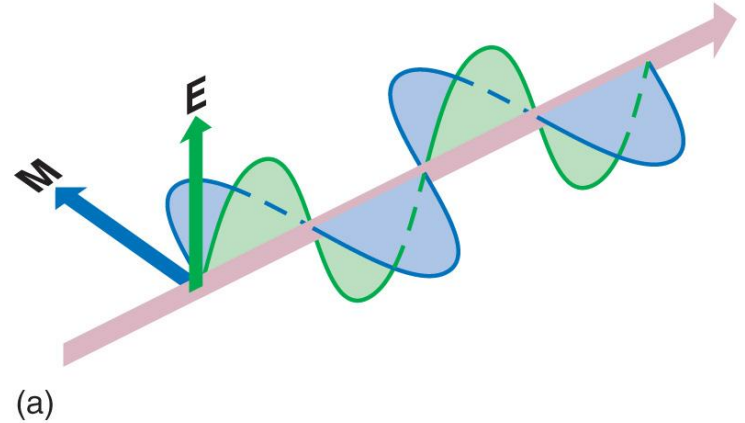
- A. travel together at the speed of light
- B. are oriented perpendicular to each other
- C. carry energy
- D. 2 of the above
- E. all of the above



Q:

Which electromagnetic wave has a larger wavelength?

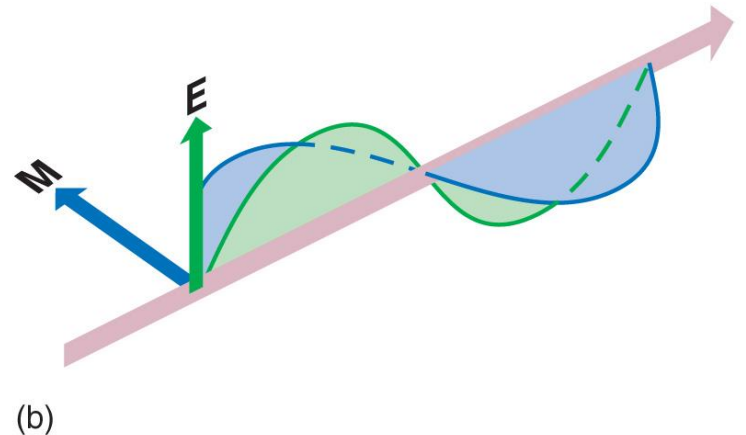
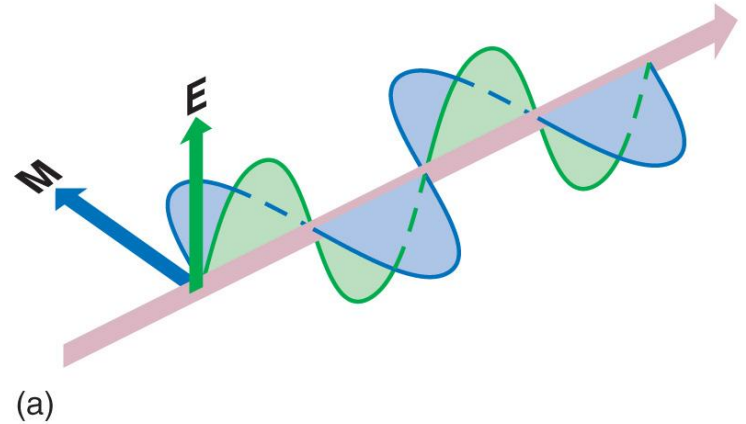
- A. A
- B. B
- C. they are the same

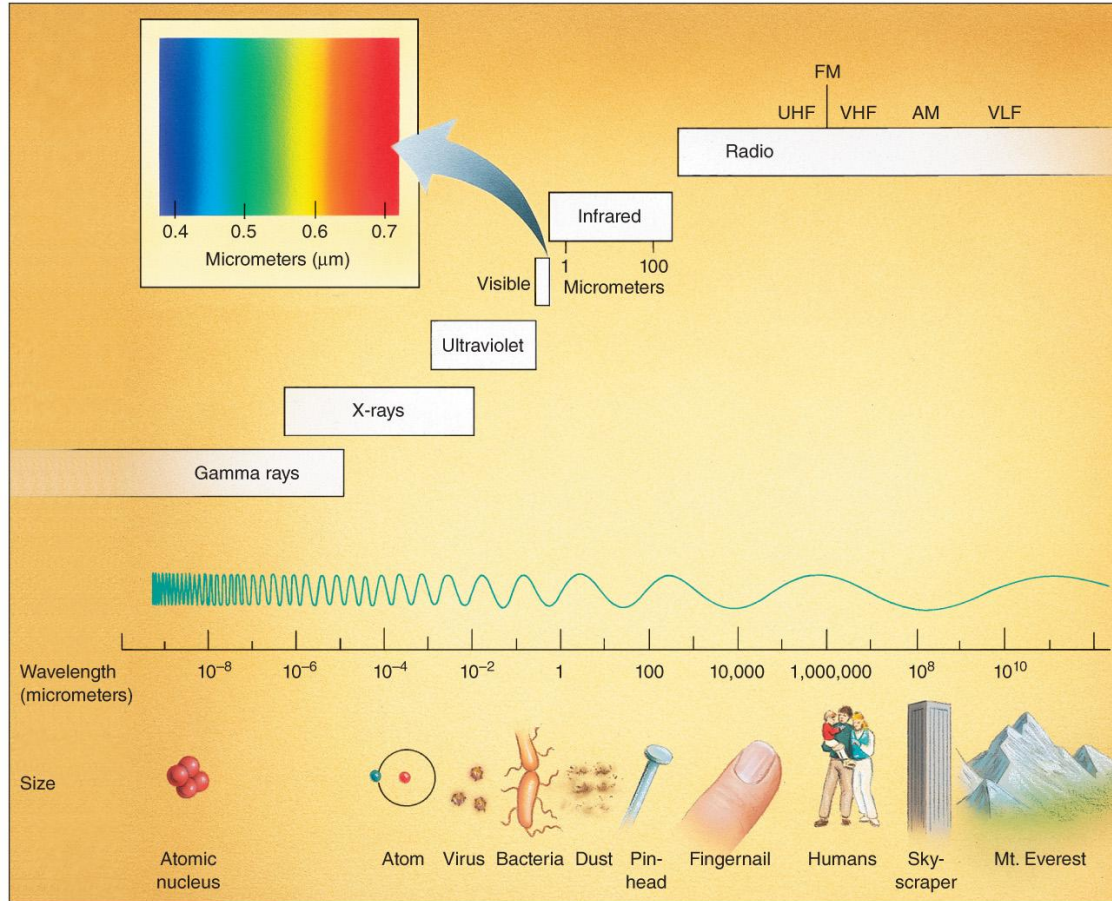


Q:

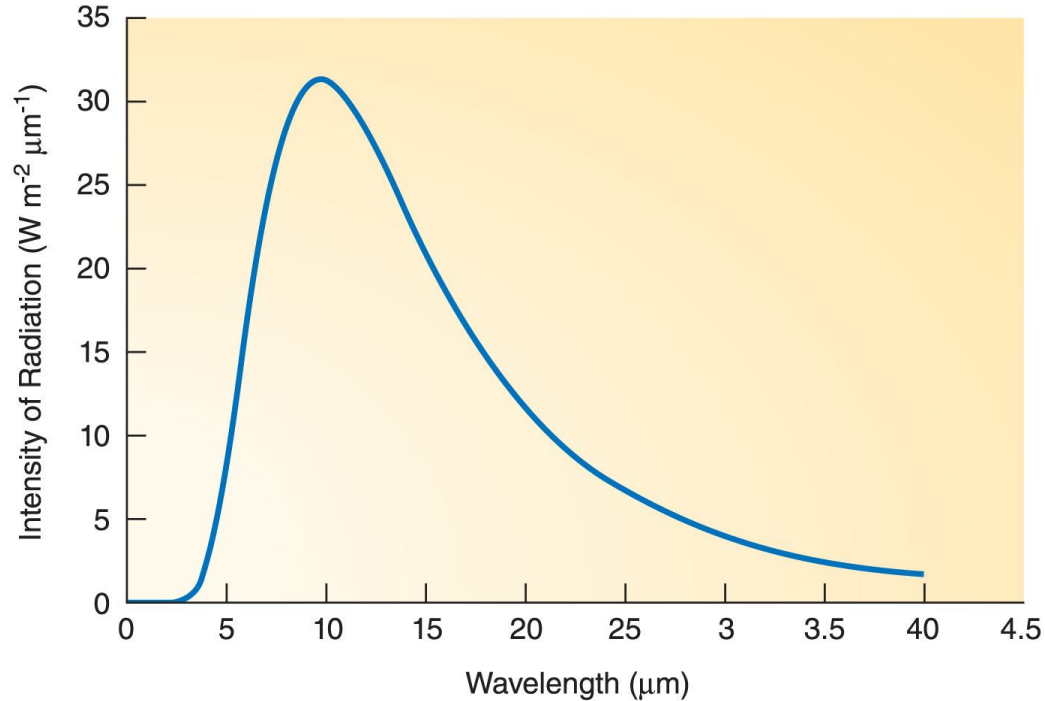
Assuming the amplitudes are the same, which EM wave has higher energy?

- A. A
- B. B
- C. same
- D. not enough information





intensity radiated by the Earth

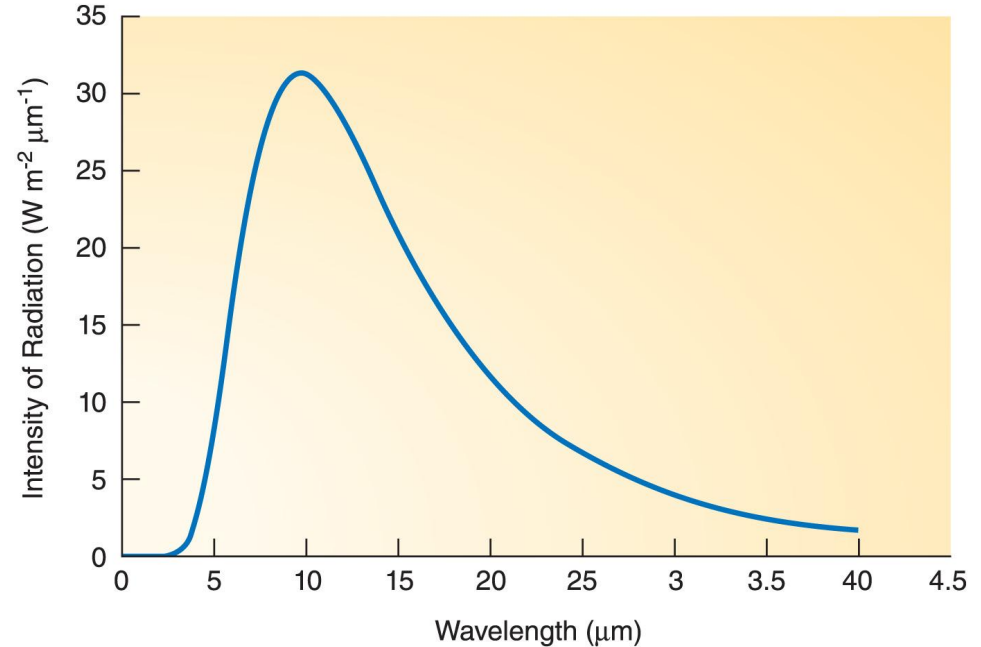


(b)

Q:

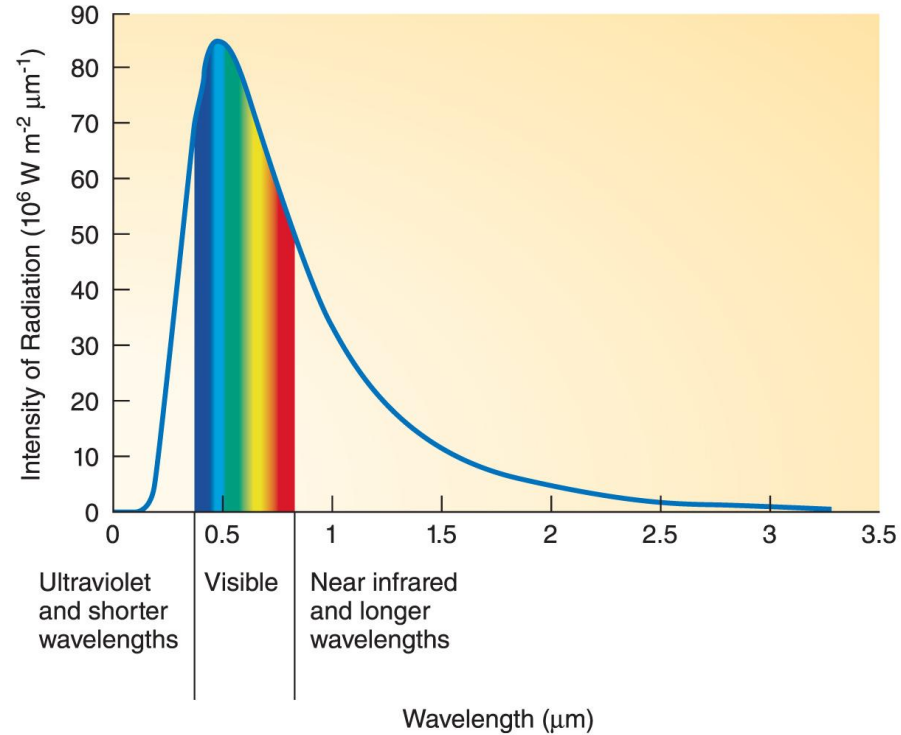
What wavelength does earth emit most radiation?

- A. 0.5 microns
- B. 1.0 microns
- C. 10 microns
- D. 25 microns



(b)

intensity of radiation emitted by sun

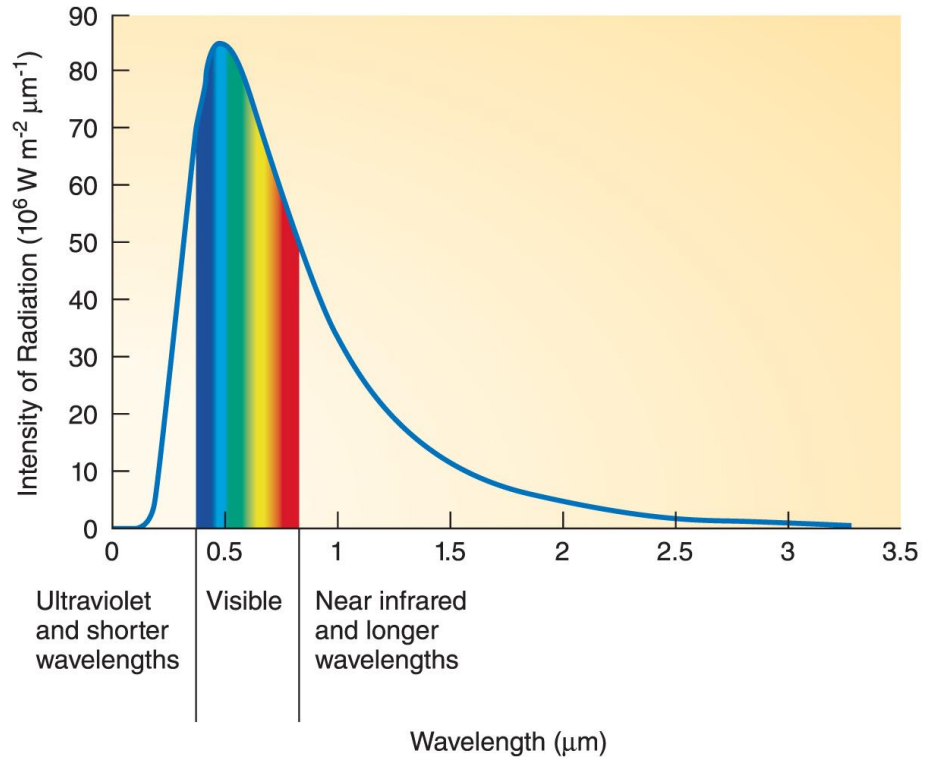


(a)

Q:

What wavelength does the sun emit most radiation?

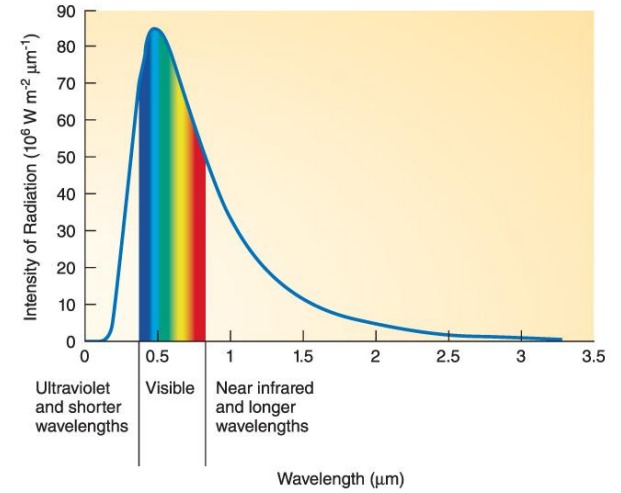
- A. 0.5 microns
- B. 1.0 microns
- C. 10 microns
- D. 25 microns



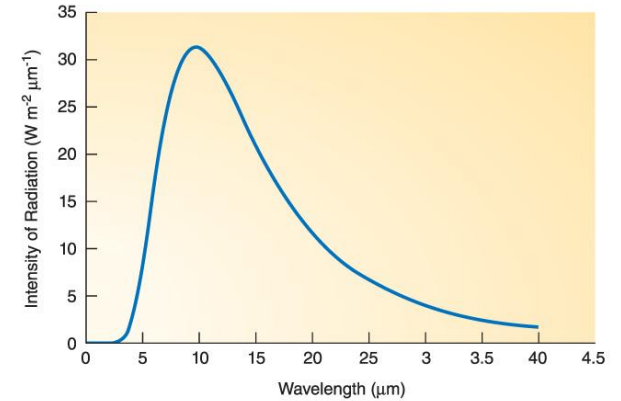
(a)

compare Earth & sun

[app link](#)

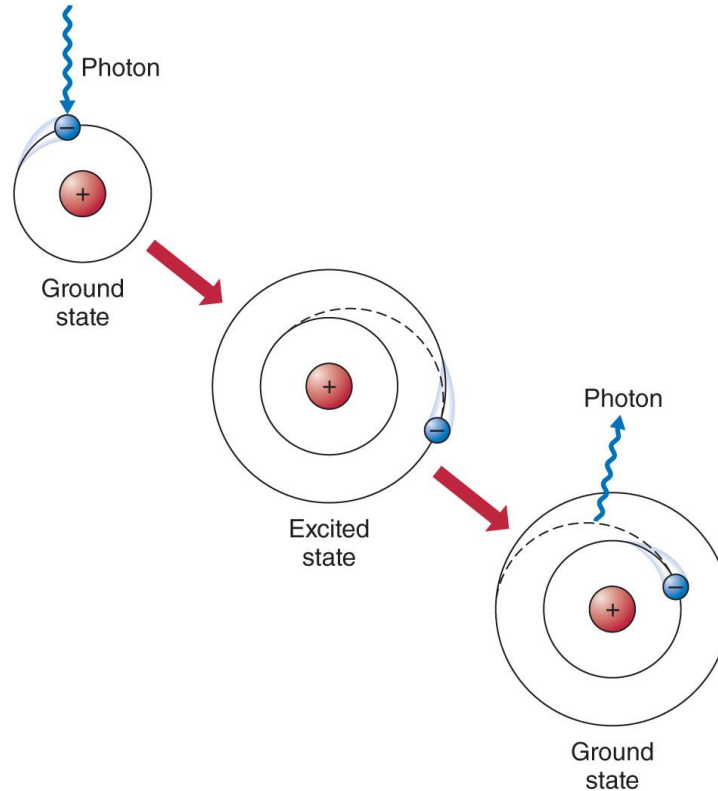


(a)



(b)

absorption and emission of a photon

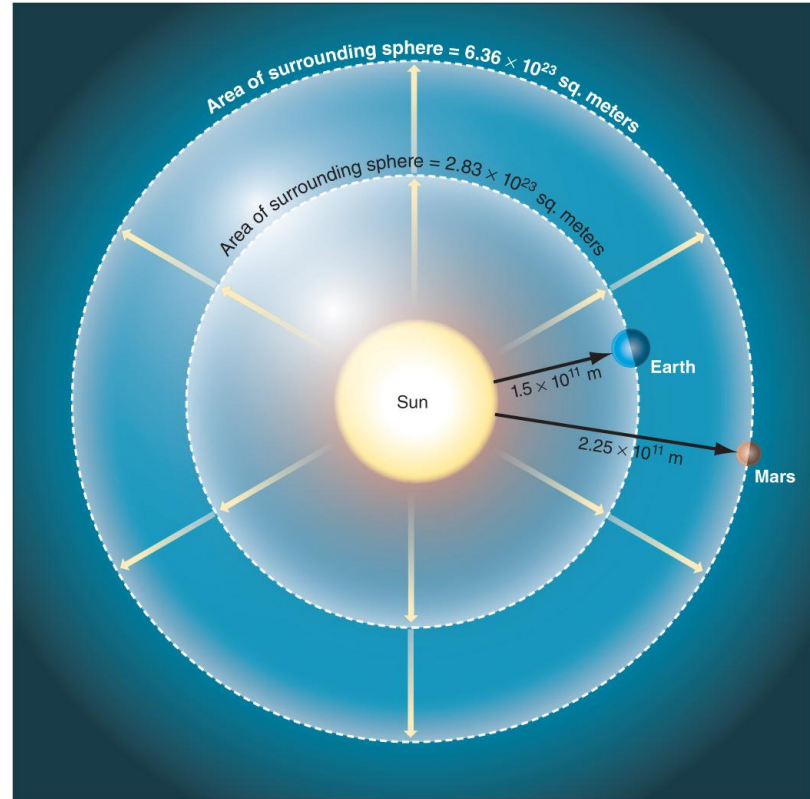


How much solar radiation hits the surface of the earth?

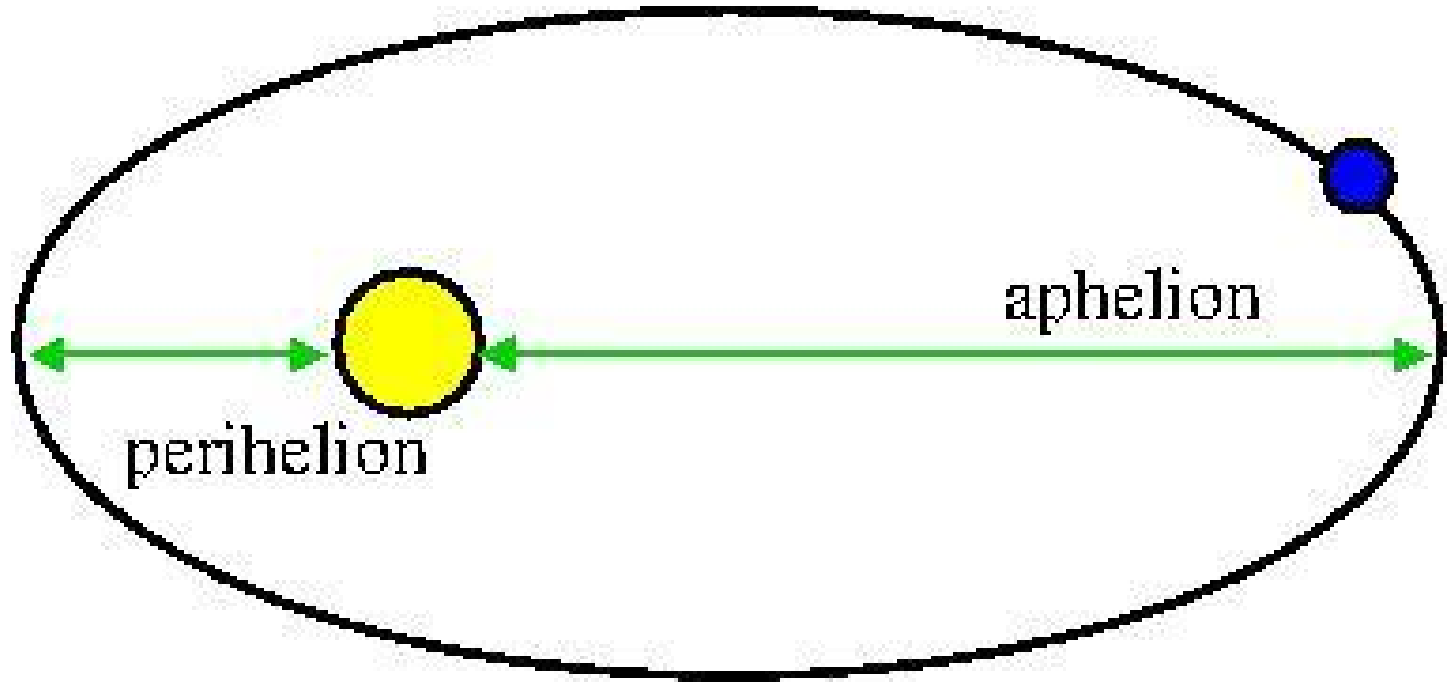
Total solar emission:

$$3.865 \times 10^{26} \text{ W}$$

**What happens to solar radiation
as it travels through space?**



Revolution

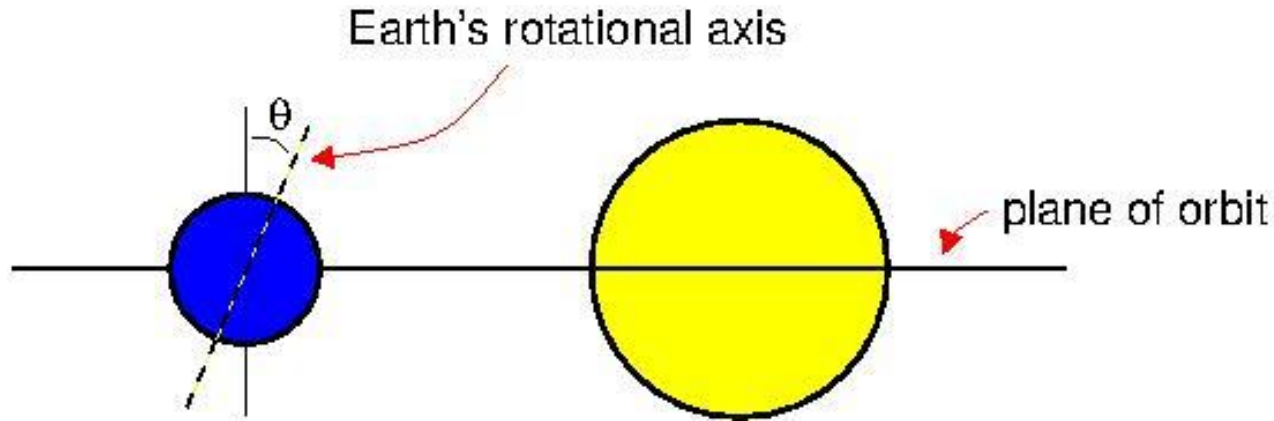


Q:

The earth is at its perihelion (closest to sun) on

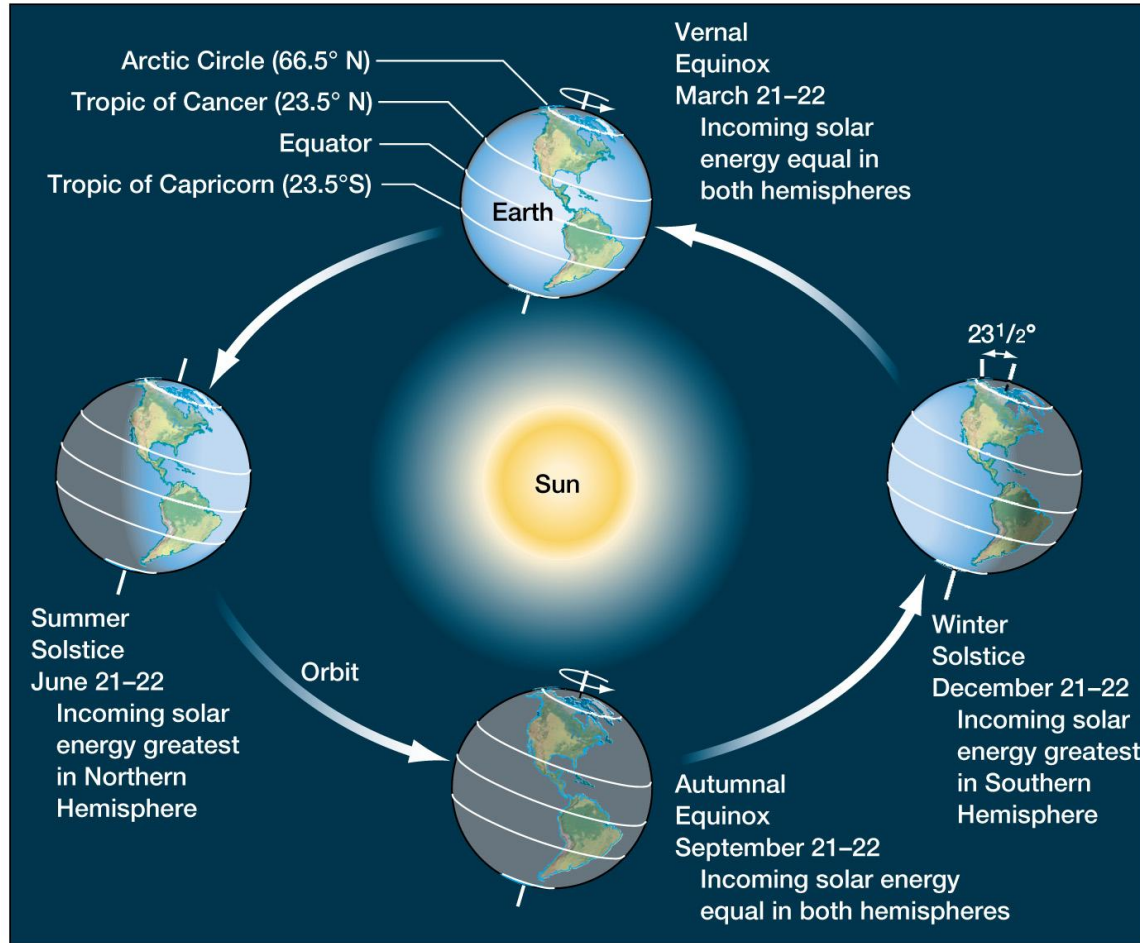
- A. June 21 (summer solstice)
- B. January 4
- C. December 21 (winter solstice)
- D. June 4
- E. an equinox (March 21 or September 21)

Q:

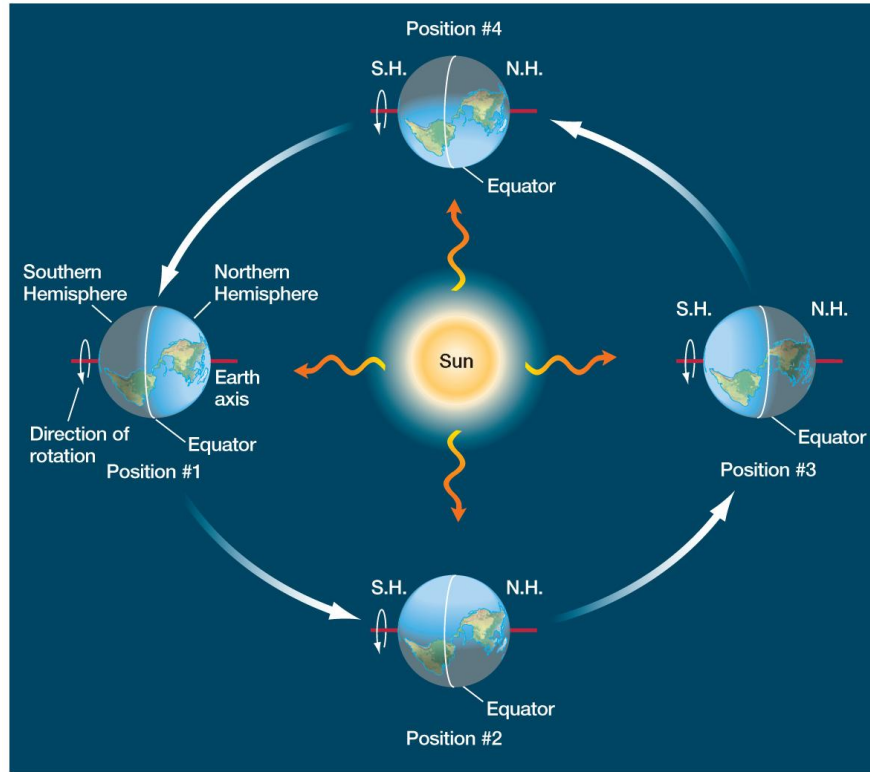


As the Earth orbits the sun, the tilt of the Earth's axis

- A. Is a constant 23.5°
- B. Varies between 0° and 23.5°
- C. Varies between -23.5° and 23.5°
- D. Has no influence on weather

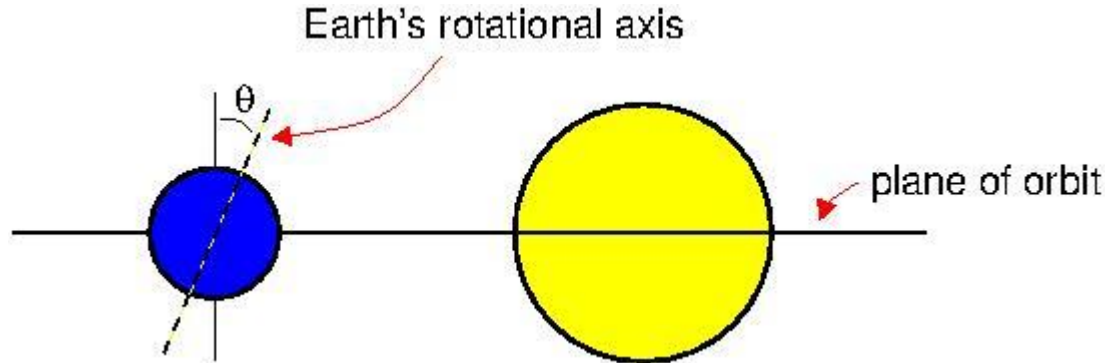


What if rotation axis was 90°?



If Earth's axis was not tilted, how would length of day in tropics compare to near the north pole?

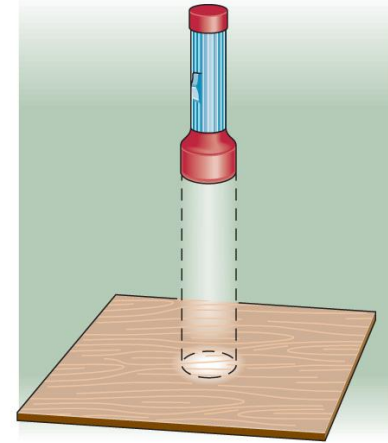
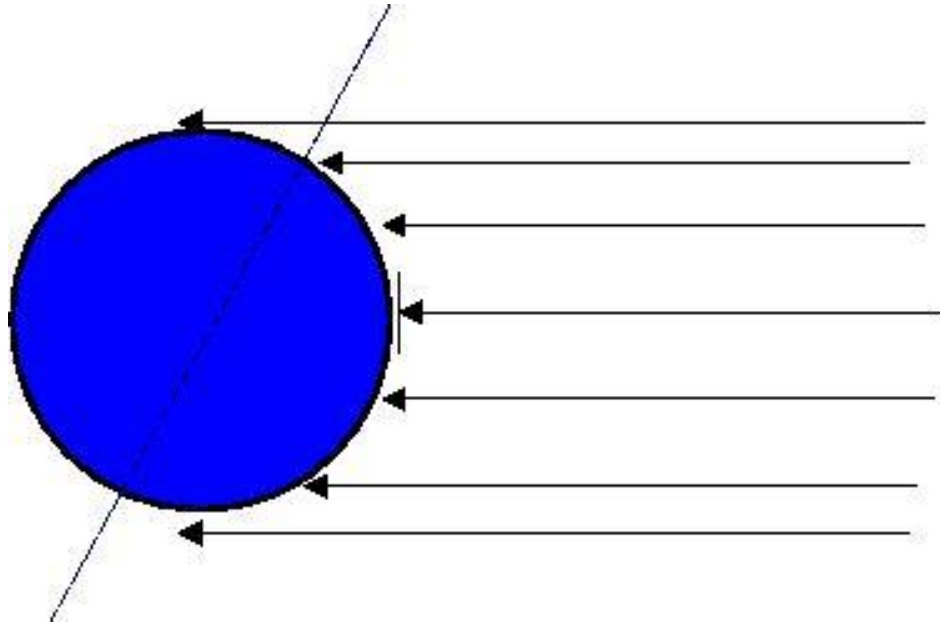
- A. Depends on where earth is in its orbit
- B. depends on rate of rotation about axis
- C. they would be the same (12 hours)



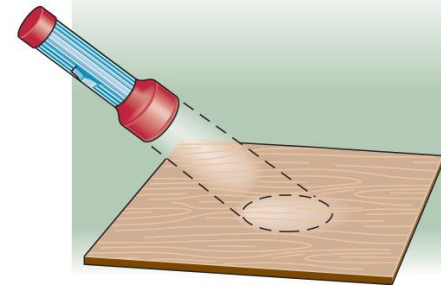
The primary cause of the earth's seasons is

- A. the distance between earth & sun
- B. tilt of earth's axis
- C. sun spots
- D. variations in sun's intensity
- E. rotation of earth about its own axis

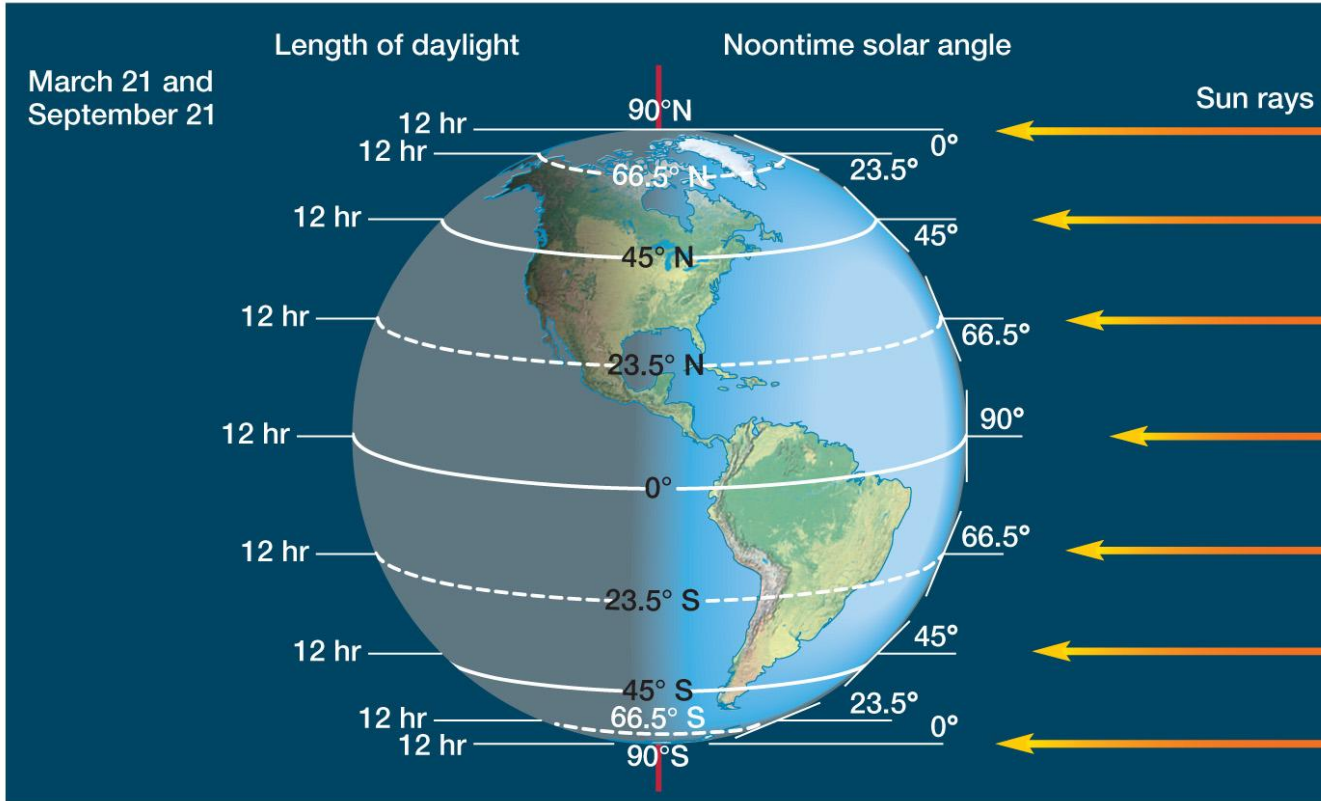
Insolation depends on angle that photons hit surface



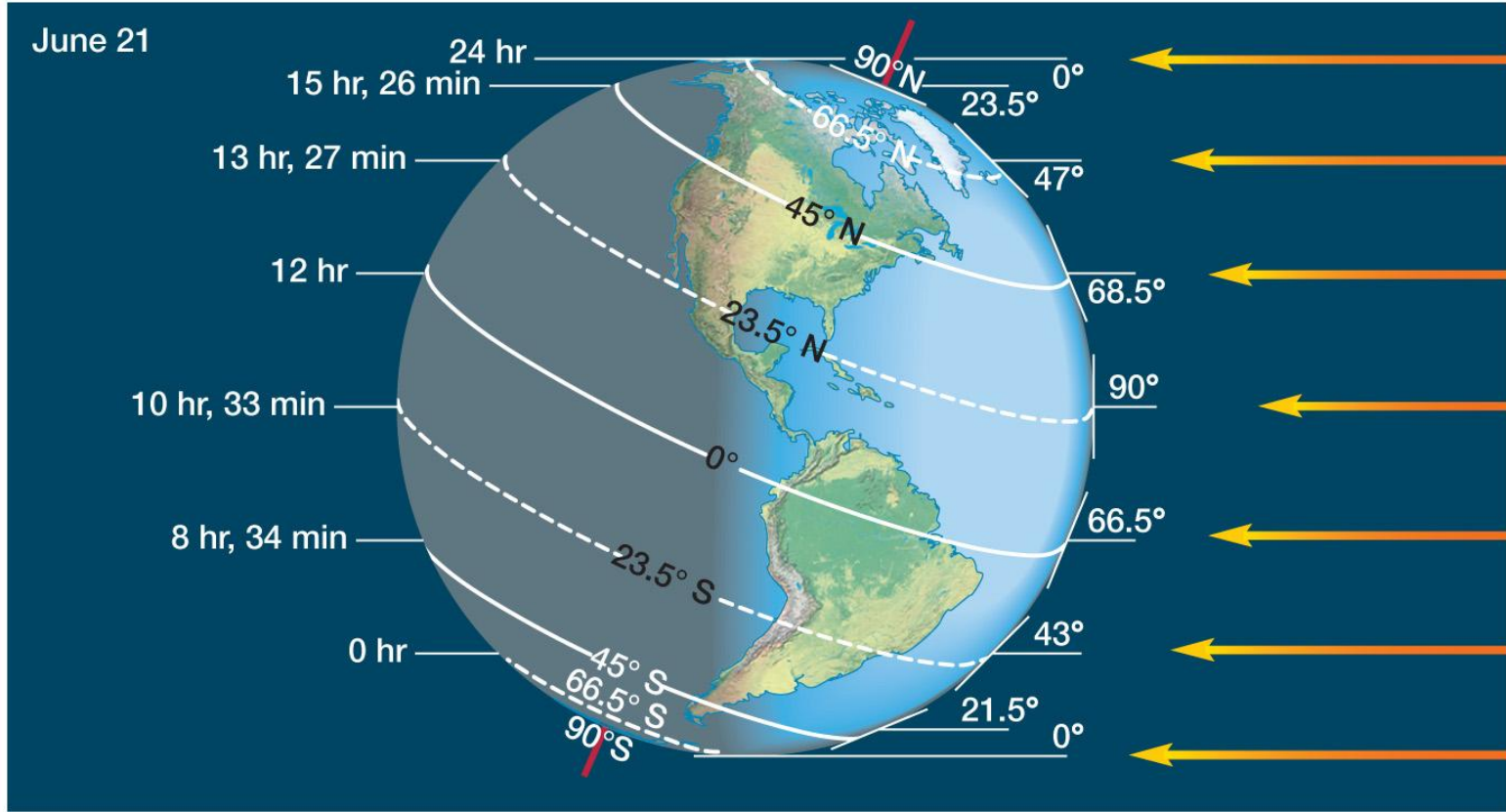
(a)



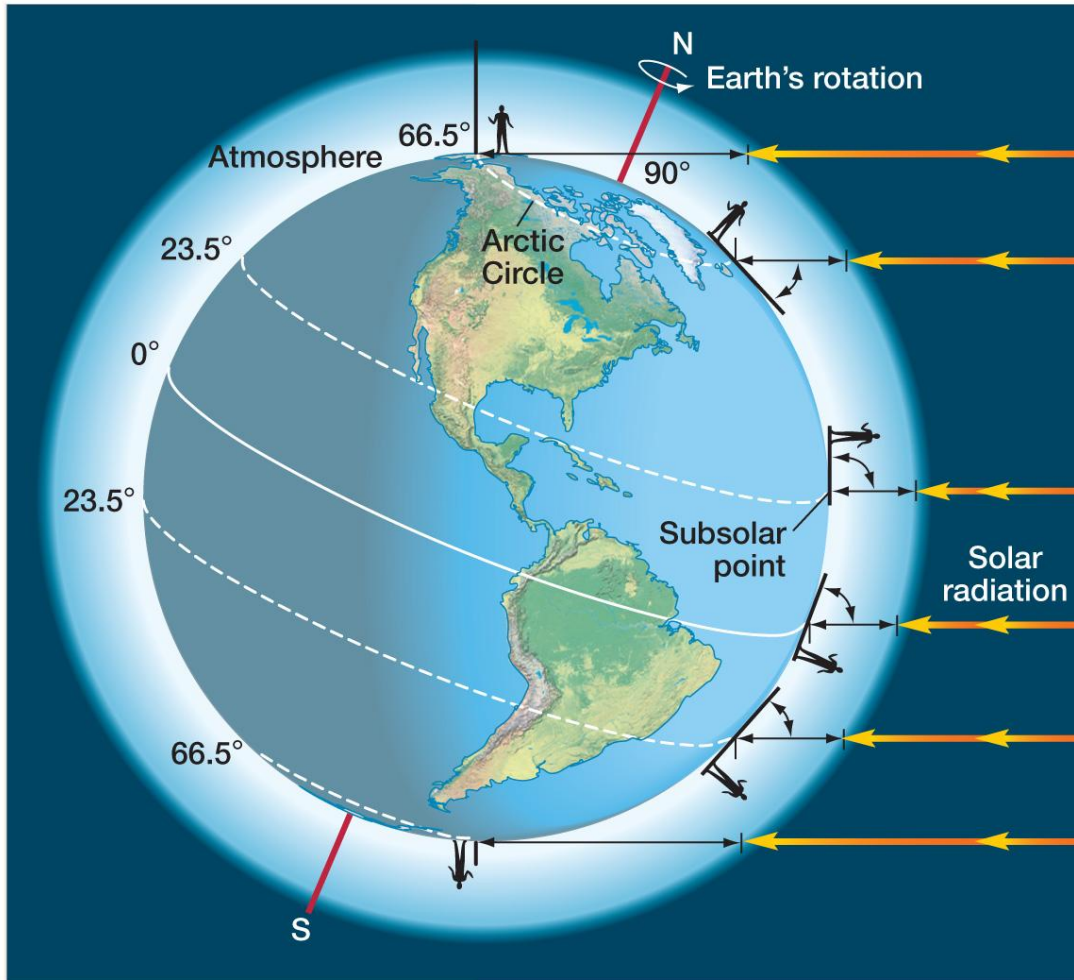
(b)

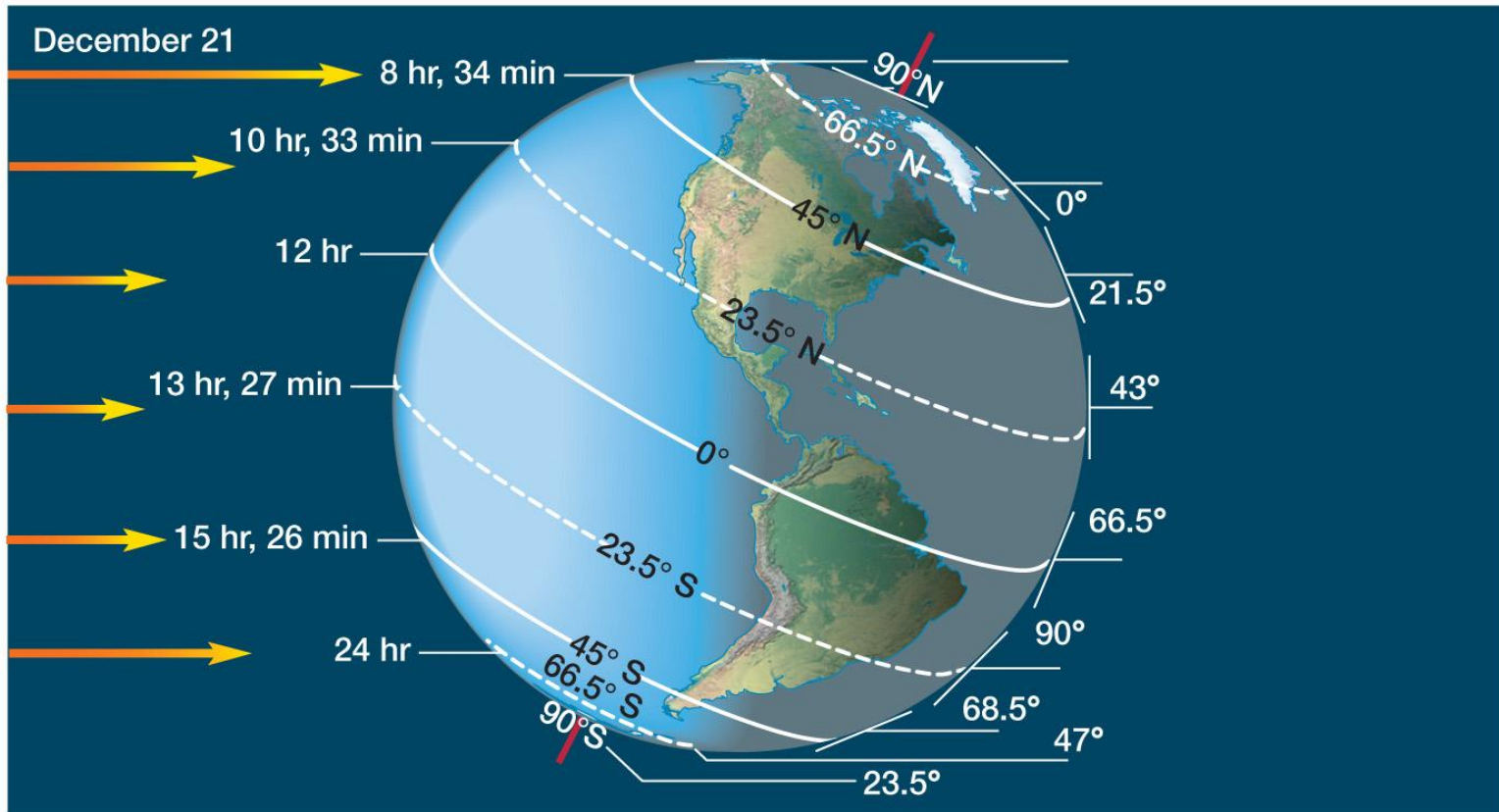


(a)

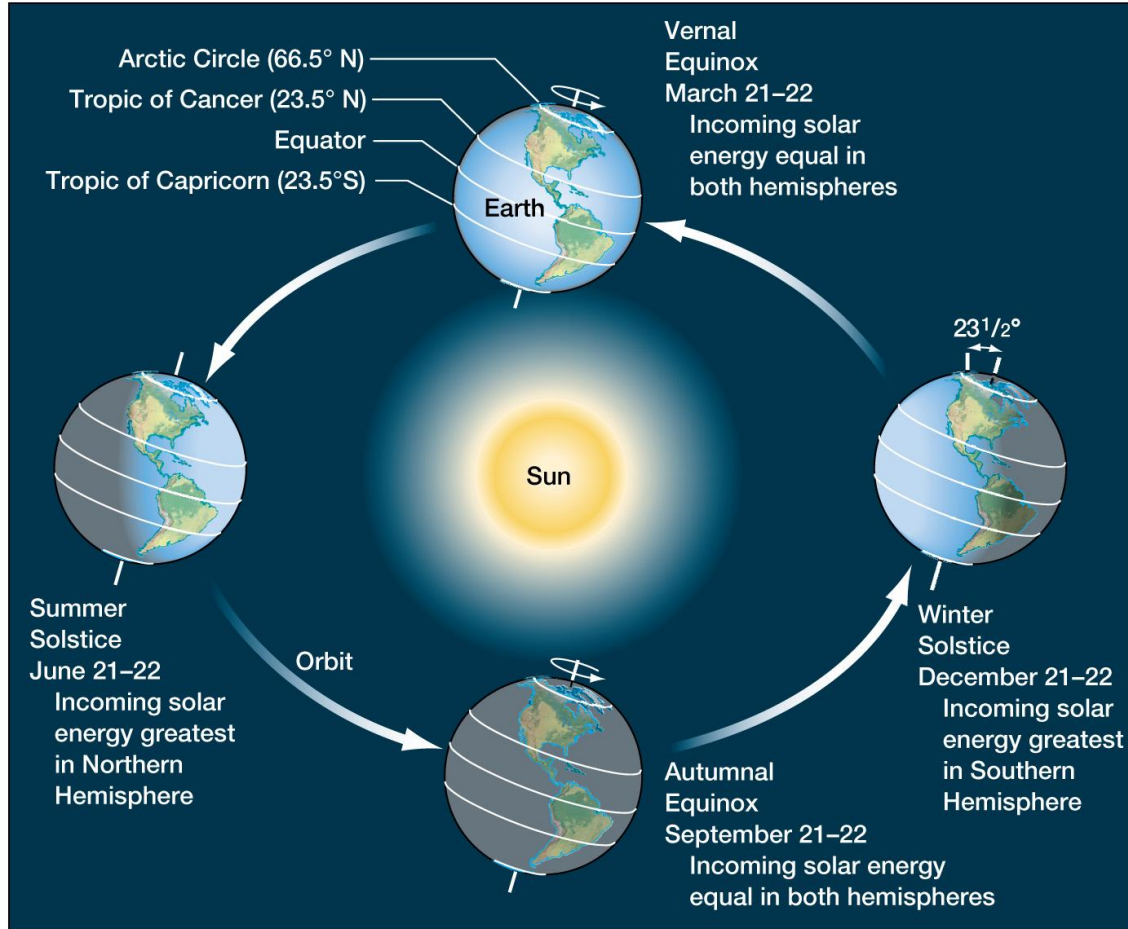


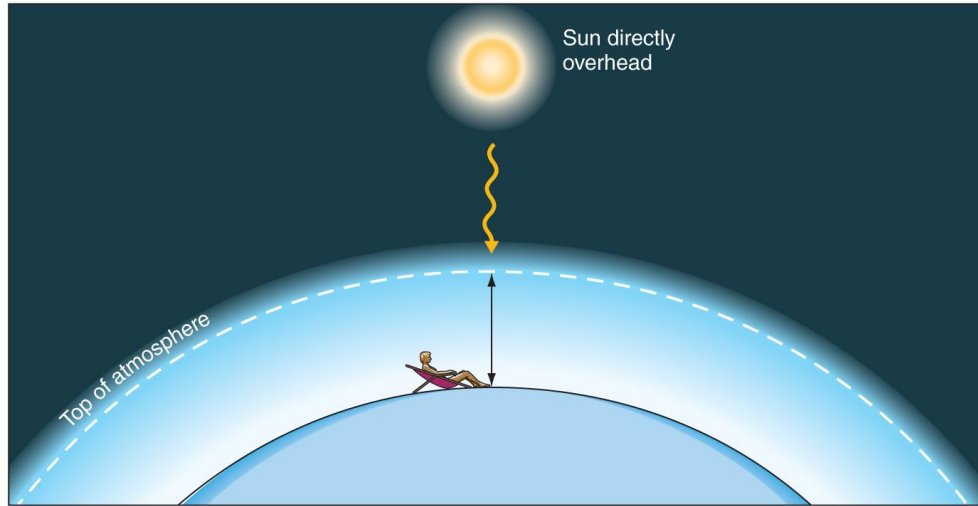
(b)



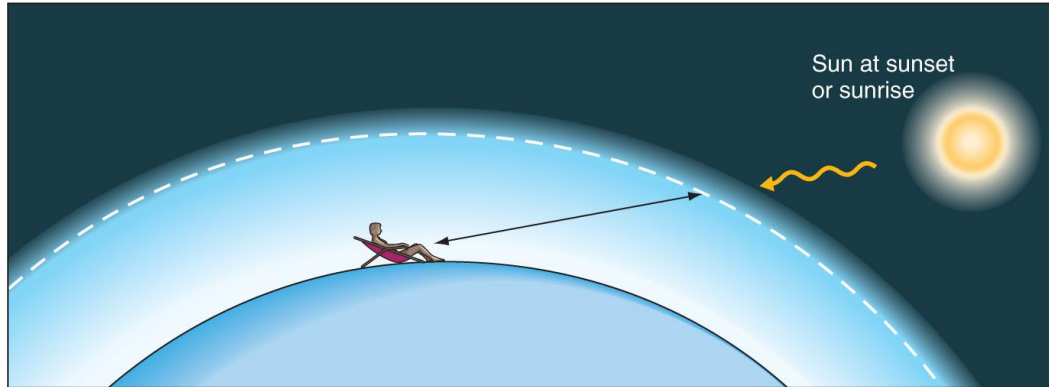


(c)





(a)



(b)