# SOLUTION SET 1
## Physics 2022

**1.** $t = 14 \times 10^9$ years x 365.25 days/year x 24 hr/day x 60 min/hr x 60 sec/min

$= 4.42 \times 10^{17}$ seconds

**2.** **a)** $D = d \tan \theta$ $d = 0.026/2$ m / tan (0.5 deg) = 1.5 m

**b)** $D = d \tan \theta$ $d = 0.026/2$ m / tan (0.5 deg / 60) = 89 m

**c)** $D = d \tan \theta$ $d = 0.026/2$ m / tan (0.5 deg / 3600) = 5360 m

**3.** **a)** $\theta = 1.4$ deg (x 60 arcmin/deg) = 84 arcmin

**b)** $\theta = 1.4$ deg (x 60 arcmin/deg x 60 arcsec/arcmin) = 5040 arcsec

**4.** It rises 4 minutes earlier each day, so in one week it rises 7 x 4 = 28 minutes sooner, which is at 8:02 pm.

**5.** **a)** Yes, if you are standing at one of the poles, all of the stars are circumpolar.

**b)** Yes, if you are standing on the equator, none of the stars are circumpolar.

**6.** Latitude = $40^o$ N Sun is at $-23.5^o$ N

Distance from the zenith is $40.0 - (-23.5) = 63.5^o$

Altitude from the horizon is $90.0 - 63.5 = 26.5^o$

**7.** At $19^o$ north latitude the Sun is on the zenith at midday twice during the year because Mumbai's latitude is less than $23.5^o$.