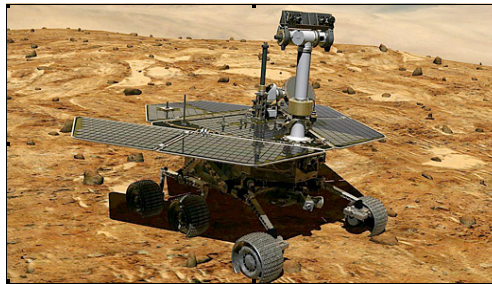


AST 250 Spring 2010

HOMEWORK #2

Due Wednesday Feb 03

- (1) (a) What is the energy (in eV) of a photon of yellow visible light ?
(b) Calculate the wavelength of the famous spin-flip transition of atomic hydrogen ($\nu = 1420$ MHz).
- (2) Calculate (a) the number of square degrees in 1 steradian and (b) the number of steradians in a region with an angular diameter of 1 arcsecond.
- (3) The solar flux density measured above the Earth's atmosphere is 1370 Watts per square meter.
(a) What is the average Solar flux density measured at Mars?
(b) If the approximate efficiency of the solar panels (area = 1.3 m^2) on the Martian rover, Spirit, is 20%, then how many Watts could the fully illuminated panels generate?



- (4) If you were standing on a hypothetical planet orbiting around our nearest star, Proxima Centauri ($D = 4.2$ ly), what would be the apparent magnitude (m_V) of the Sun? Would the Sun be a bright star in the planet's night sky?
- (5) The first exoplanet to be discovered was a half-Jupiter mass planet orbiting the star 51 Pegasi ($m_V = +5.49$ mag, $D = 15.61$ pc).
 - (a) What is the absolute visual magnitude of 51 Peg?
 - (b) Ignoring bolometric corrections, how does 51 Peg's luminosity compare to the Sun?
 - (c) If the effective temperature of 51 Peg is $T_{\text{eff}} = 5570$ K, how big is 51 Peg compared to the Sun?
 - (d) If the planet 51 Peg b orbits the star at a radius of 0.053 AU, how many times larger is the incident flux density on the planet's atmosphere than the solar flux density for the Earth?