

QUESTION 2 A PLANET & ITS SURFACE TEMPERATURE (10 points)

A fast rotating planet of radius R with surface albedo a is orbiting a star of luminosity L . The orbital radius is D . It is assumed here that, at equilibrium, all of the energy absorbed by the planet is re-emitted as a blackbody **radiation**.

- a.) What is the radiation flux from the star at the planet's surface? (1.5 points)
- b.) What is the total rate of energy absorbed by the planet? (1.5 points)
- c.) What is the reflected luminosity of the planet? (2 points)
- d.) What is the average blackbody temperature of the planet's surface? (2 points)
- e.) If we were to assume that one side of the planet is always facing the star, what would be the average surface temperature of that side? (2 points)
- f.) For the planet in problem d:
 $a = 0.25$,
 $D = 1.523 \text{ A.U.}$,
 calculate its surface temperature in kelvins for the value of $L = 3.826 \cdot 10^{26} \text{ W}$.

(1 point)