

20 The Sun is a main sequence star.

(a) State what is meant by a main sequence star.

(1)

(b) The Sun will eventually leave the main sequence and become a red giant star.

luminosity of Sun = $3.83 \times 10^{26} \text{ W}$

(i) Show that the current radius of the Sun is about $7.0 \times 10^8 \text{ m}$.

surface temperature of Sun = 5780 K

(2)

(ii) As a red giant star, the radius of the Sun will be about 150 times its current radius. Its luminosity will be about 1600 times its current luminosity.

λ_{max} is the wavelength at which peak power radiation occurs.

Show that when the Sun is in its red giant stage, λ_{max} is about $1 \times 10^{-6} \text{ m}$.

current radius of Sun = $7.0 \times 10^8 \text{ m}$

(3)



- (iii) At this stage of its evolution the Sun will be classified as a red giant star.
The wavelength of red light is between $6.2 \times 10^{-7} \text{ m}$ and $7.8 \times 10^{-7} \text{ m}$.

Comment on the value for λ_{max} and this classification of the Sun.

(3)

- (c) As the Sun continues its evolution, its mass will decrease. It is estimated that at its largest radius, the mass of the Sun will have decreased significantly.

Explain how the orbital period of a planet would change as the mass of the Sun decreases.

Assume that the radius of the planet's orbit about the Sun does not change.

(3)