Consider a spacecraft of mass $M$ and specific heat $c$ traveling at an altitude of 500 km above Earth’s surface. The vehicle is completely covered by a multi-layer thermal shield, except for the surface exposed towards the Earth (the radiator). Assume the shield acts as an adiabatic enclosure, so no heat is emitted or absorbed by it.

**Write down a heat power equation** that would describe the temperature evolution in time of the spacecraft. Assume electronic components inside the spacecraft create a heat dissipation load $P_D = 100$ W. Assume the Earth’s albedo (fraction of solar radiation reflected by the Earth) is $a = 0.3$. Take the Earth’s surface temperature at 300°C.

After a long time, the temperature of the spacecraft will stop changing. A steady state equilibrium situation will be reached. **Calculate the equilibrium temperature.**

For the radiator assume:
- Emissivity: $\varepsilon = 0.1$ (for instance, oxidized aluminum)
- Absorption: $\alpha = \varepsilon = 0.1$ (Kirchoff’s law)
- Area: $A_r = 1$ m$^2$

Surface temperature of the Sun: 5800°C
Radius of the Sun: 695,000 km
Earth-Sun distance: 149,597,892 km
Radius of the Earth: 6379 km