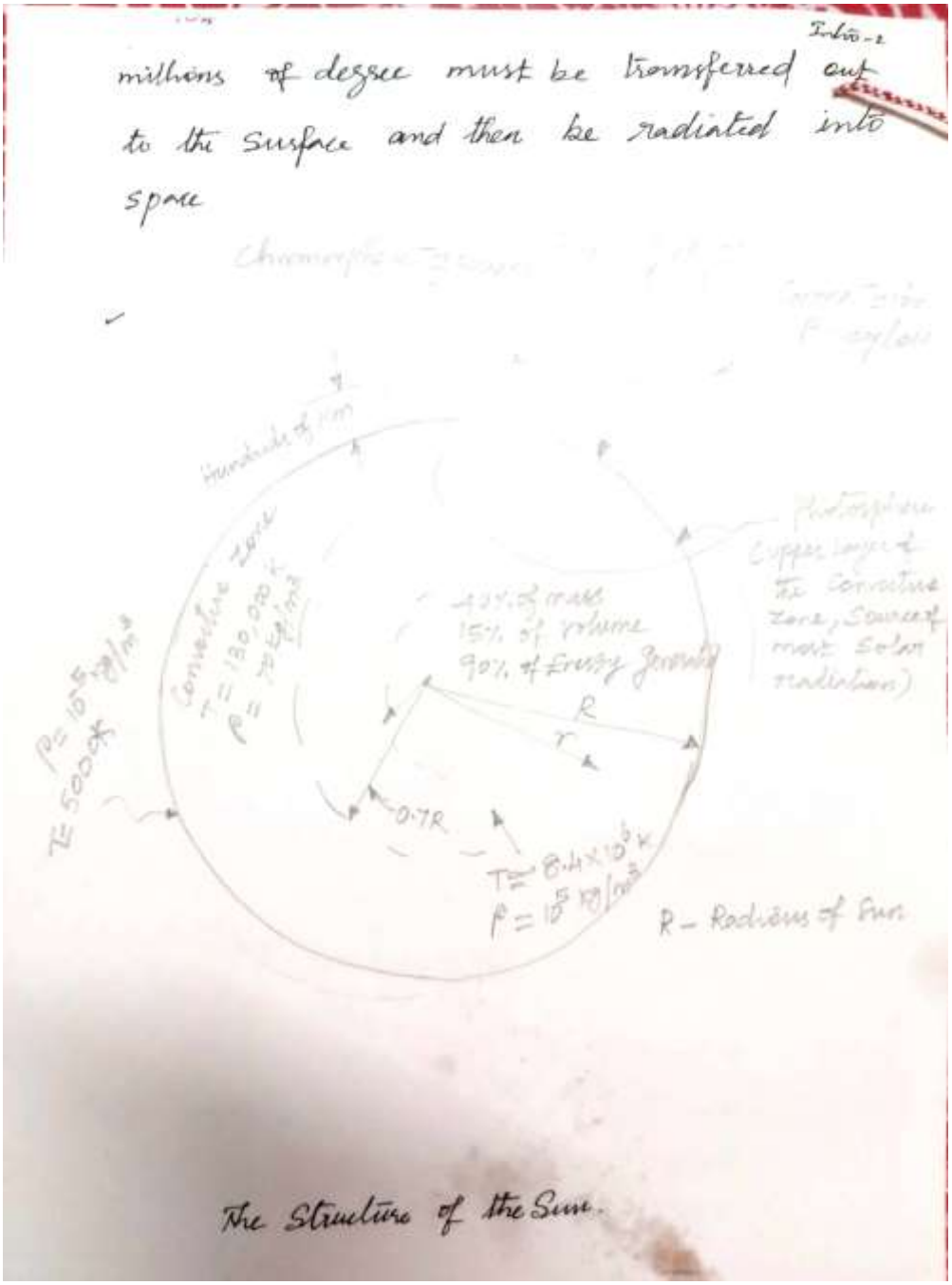
Solar Energy Utilisation.

Introduction

Introduction:

The Sun is a sphere of intensely hot gaseous matter with a diameter of 1.39×10^9 m and is, on the average, 1.5×10^{11} m from the earth.

- The Sun rotates on its axis about once every 4 weeks. However, it does not rotate as a solid body; the equator takes about 27 days and the polar region take about 30 days for each rotation.
- The Sun has an effective blackbody temperature of 5777 K.
- The temperature in the central interior regions is variously estimated at 8×10^6 to 40×10^6 K and the density is estimated to be about 100 times that of water.
- The energy produced in the interior of the solar sphere at temperatures of many


millions of degree must be transferred out to the surface and then be radiated into space
R
0.7R
R – Radius of Sun
The Structure of the Sun.

From the schematic:

- It is estimated that 90% of the energy is generated in the region of 0 to 0.23R. which contains 40% of the mass of the Sun.
- At a distance 0.7R from the center, the temperature has dropped to about 130,000K and the density has dropped to 70 kg/m³.
- Here Convection Processes begin to become important, and the zone from 0.7 to 1.0R is known as the Convection Zone.

within this (region) Zone the temperature drops to about 5000K and the density to about 10^{-5} kg/m³.

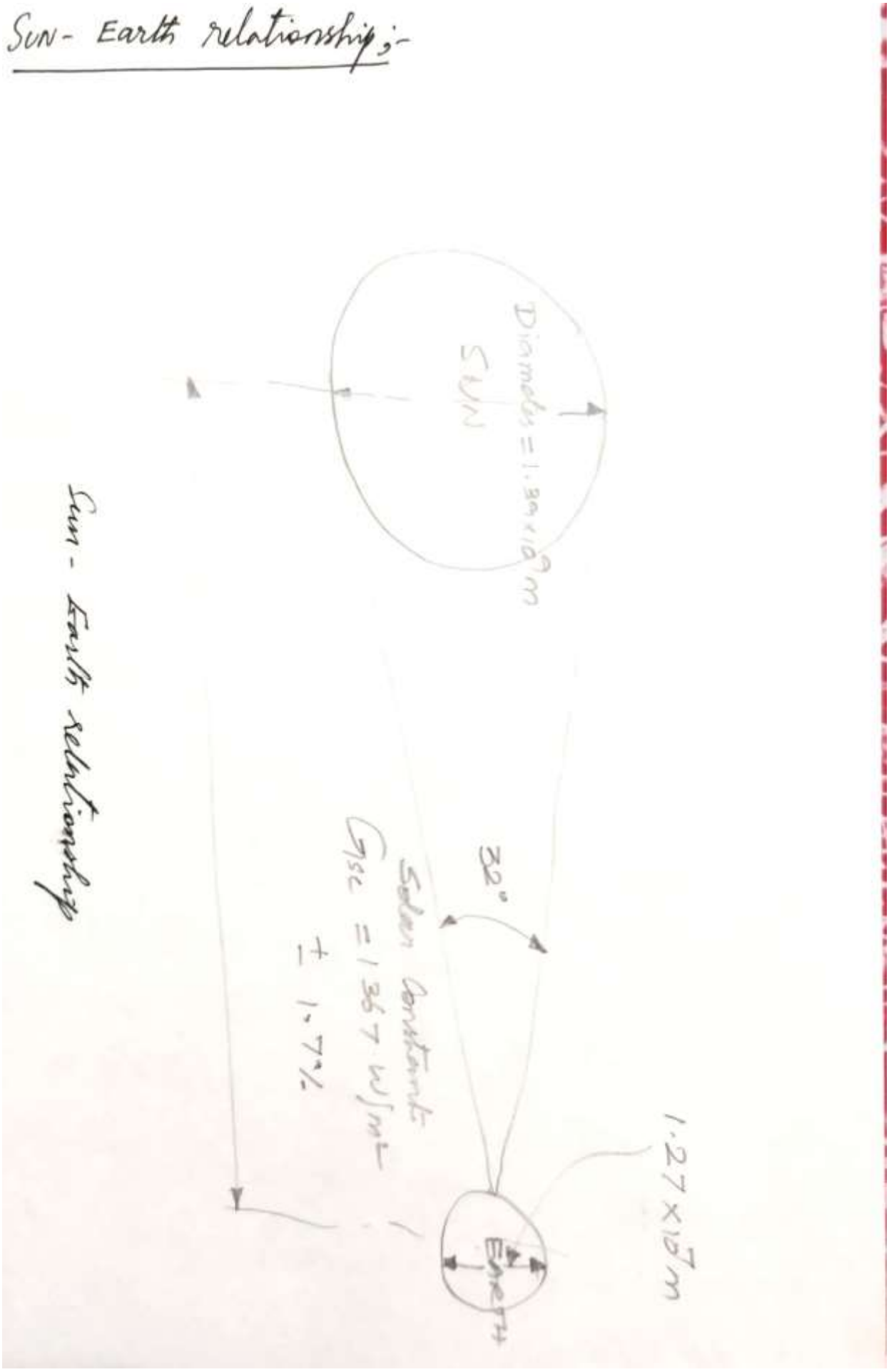
- The Sun's Surface appears to be Composed of granules (irregular Convection cells), within dimensions from 1000 to 3000 Km and with cell lifetime of a minutes.

Further out is a Corona a region of very low density and of very high (10^6 K) temperature.

Intro-4.

- Features of the Solar Surface are Small dark areas - called poses, which are of the same order of magnitude as the convective cells, and Large dark areas called Sunspots
- The outer layer of the convective Zone is called the photosphere.
- outside of the photosphere is a more or less transparent Solar atmosphere, observable during total Solar eclipse or by instruments that occult the Solar disk.
- Above the photosphere is a layer of a layer of cooler gases several hundred kilometers deep called the reversing layer.
- Outside of that is a layer referred to as the chromo-sphere, with a depth of about 10,000 km.
- This is a gaseous layer with temperature some what higher than that of the photosphere but with lower density.

Sun- Earth relationship;-



- Schematic shows the geometry of the Sun-earth relationship.
- The eccentricity of the earth's orbit is such that the distance between the Sun and the earth varies by 1.7%.
- At a distance of one astronomical unit, 1.495×10^{11} m, the mean earth-Sun distance, the Sun subtends an angle of 32°.
- The radiation emitted by the Sun and its spatial relationship to the earth result in a nearly fixed intensity of solar radiation outside of the earth's atmosphere.
- The Solar Constant, G_{sc} is the energy from the Sun, per unit time, received on a unit area of surface perpendicular to the direction of propagation of the radiation, at mean earth-Sun distance, outside of the atmosphere.