Key points about RE.

- There would be vast resources, the relative abundance of which it would vary from region to region
- Emphasis would be given to efficient mixing of Renewables and fossil fuel supplies.
- Biomass would be widely used should be converted to electricity efficiently.
- All electricity produced from RE should be added to Grid.

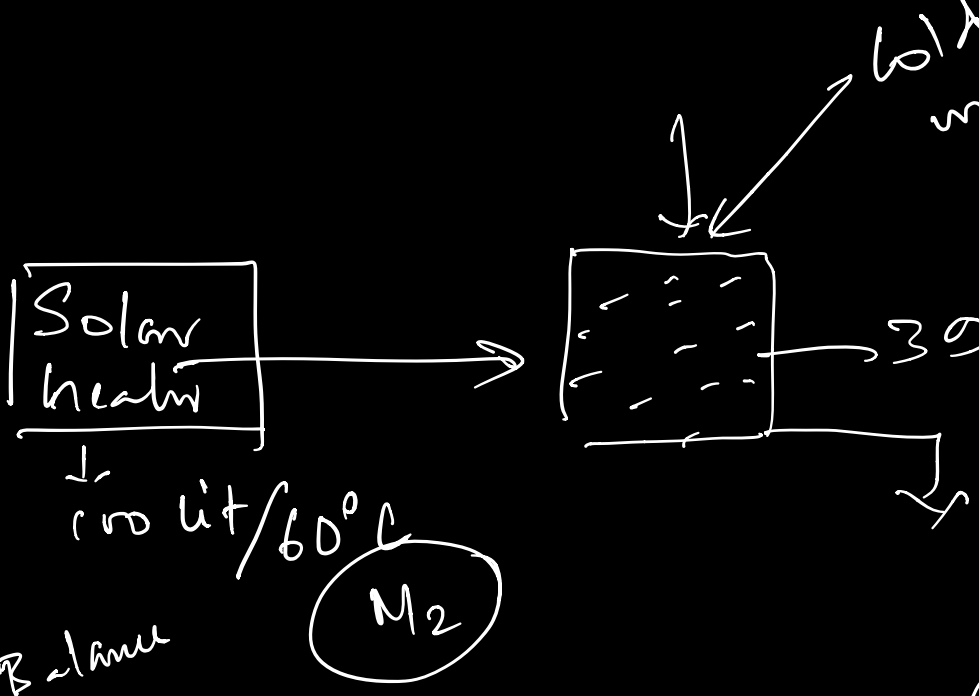
Energy Balance & Mass balance.

Input − Output = Accumulation

Problem A domestic solar water heater produces 100 litres of water at 60°C. If the optimum temp. for bathing is taken as 30°C, and if the temp of the

Cold water is 15°C. Estimate the no. of persons who can take bath. Assume 30 Lit. of water is needed for each person for bathing.

Soln.



Mass Balance

$$100 + M_1 = M_2 \quad \text{—(1)}$$

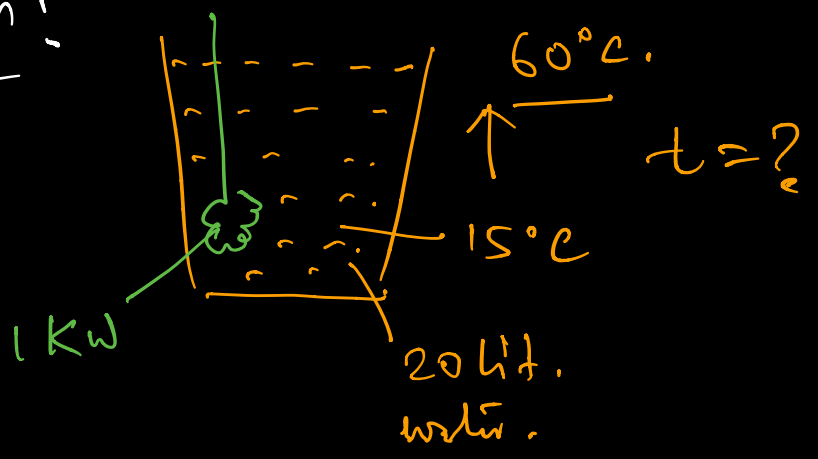
Energy balance:

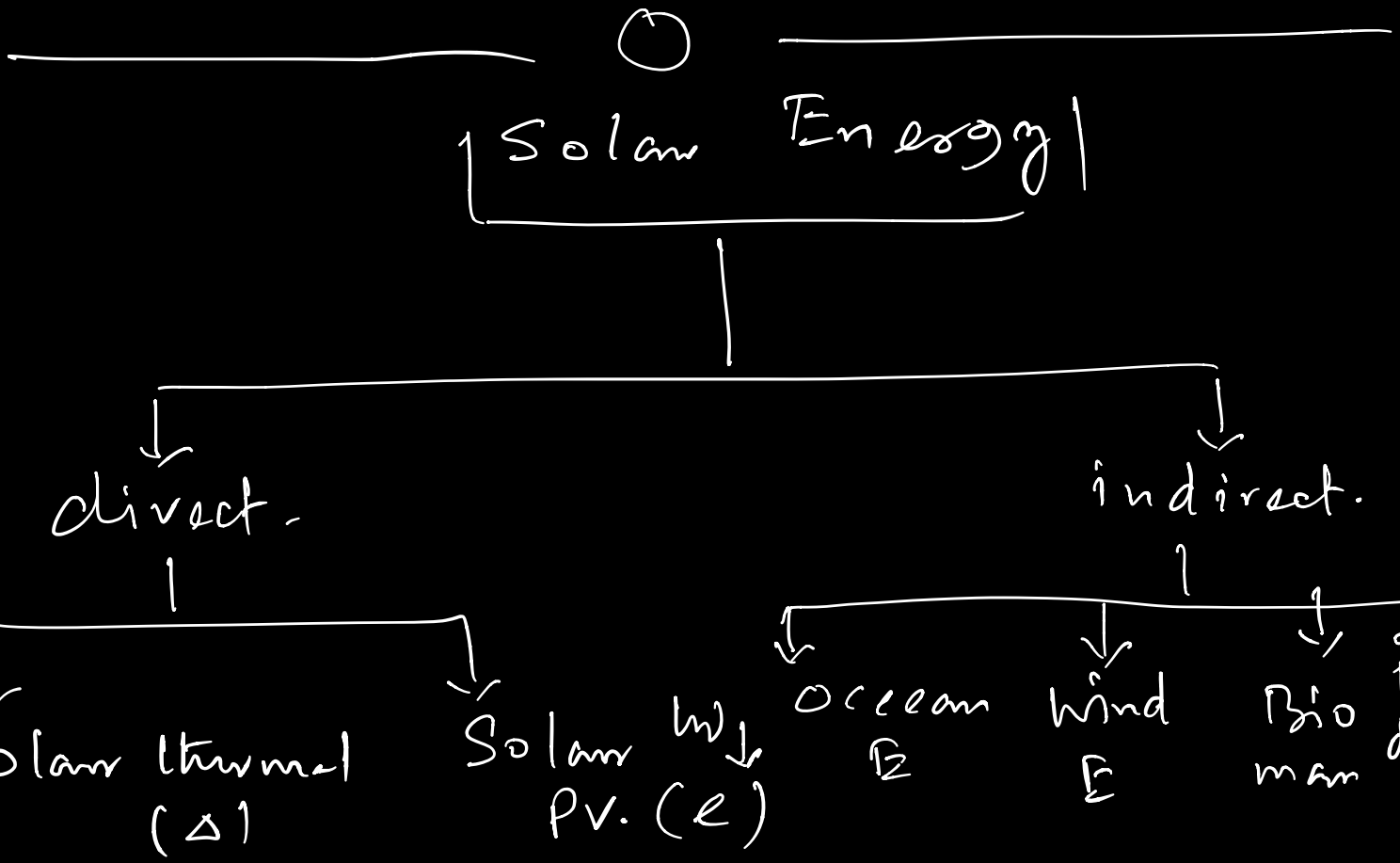
$$100 \times C_p \times 60 + M_1 \times C_p \times 15 = M_2 \times C_p \times 30 \quad \text{—(2)}$$

$$P_{nos} = M_2/30 = \text{Lit.} = \boxed{6 \text{ Persons.}}$$

Problem-2 A bucket containing 20 Lit of water is heated by an immersion rod of capacity (1 KW). The initial temp. of water is 15°C. Find out the time taken to change the water to 60°C. assuming no heat loss.

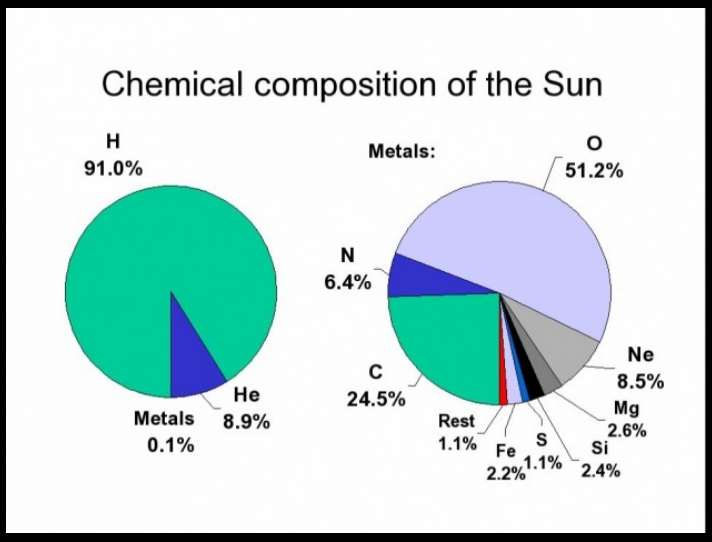
Soln:

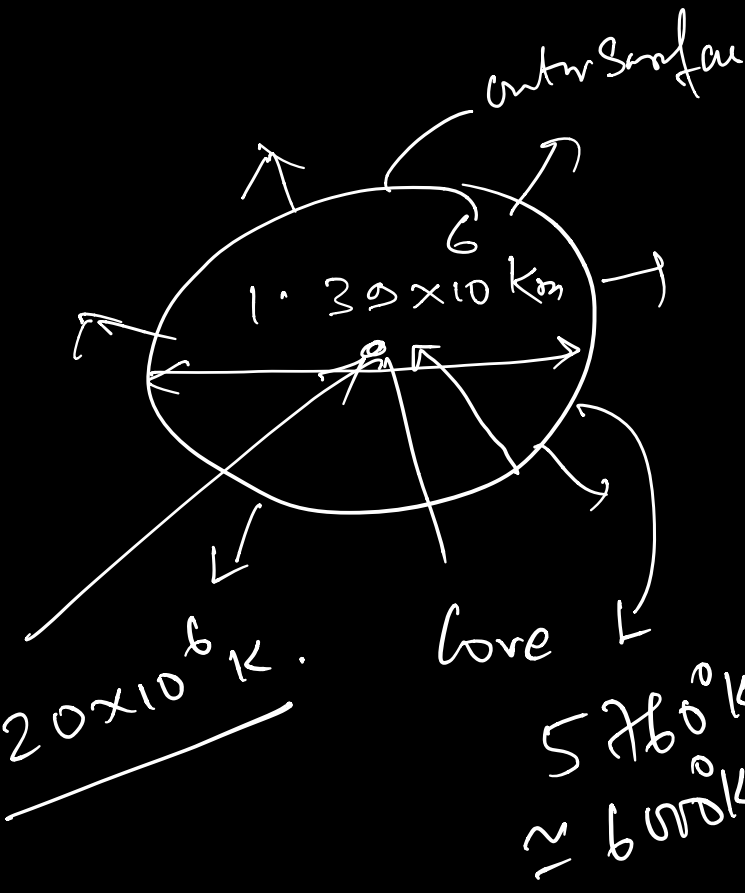

60°c.
t=?
15°c
1 KW
20 Lit.
water.

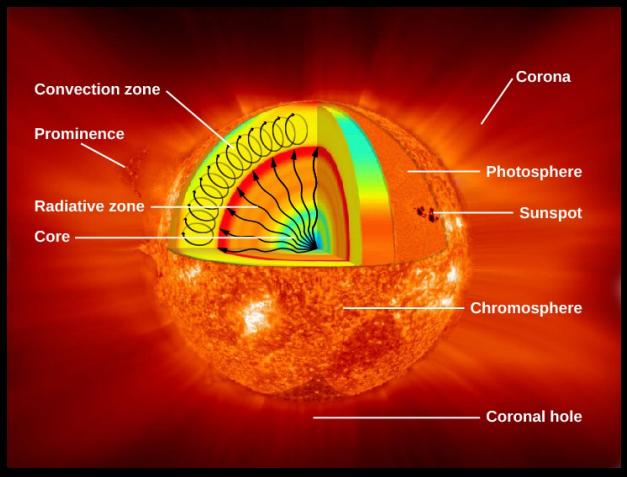

Solar Energy
direct.
indirect.
Solar thermal (Δ)
Solar PV. (ε)
ocean E
wind E
Bio mass
hy

Solar Energy

→ H → He (Thermo nuclear Rxn)





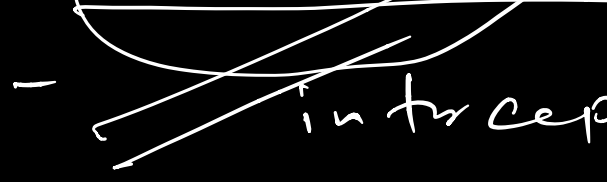


Rate of energy emission = 3.8×10^{23} KW

4.7×10^6 ton / sec

of mass needs to be converted to energy.

1.2×10^{19} KW



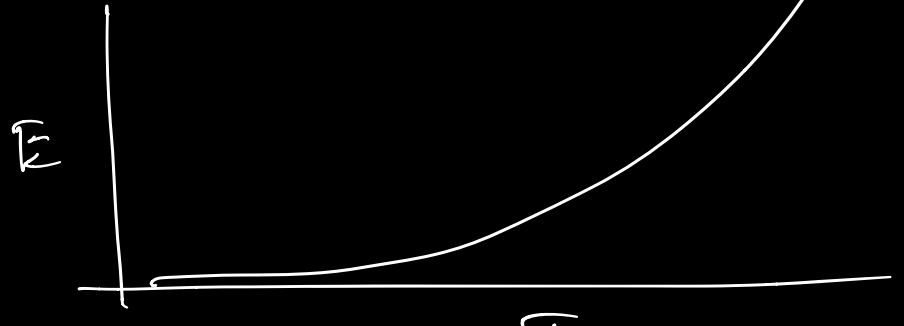
- intercepted by the earth.

Black body Radiation

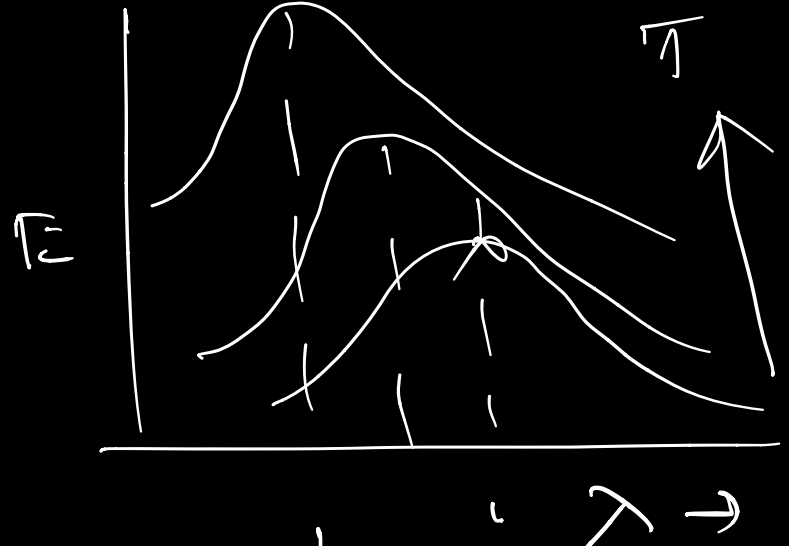
Stephan Boltzman

$$E \propto \frac{\text{const}}{T^4}$$

$$\text{const} = 5.67 \times 10^{-8} \ W/m^2 K^4$$



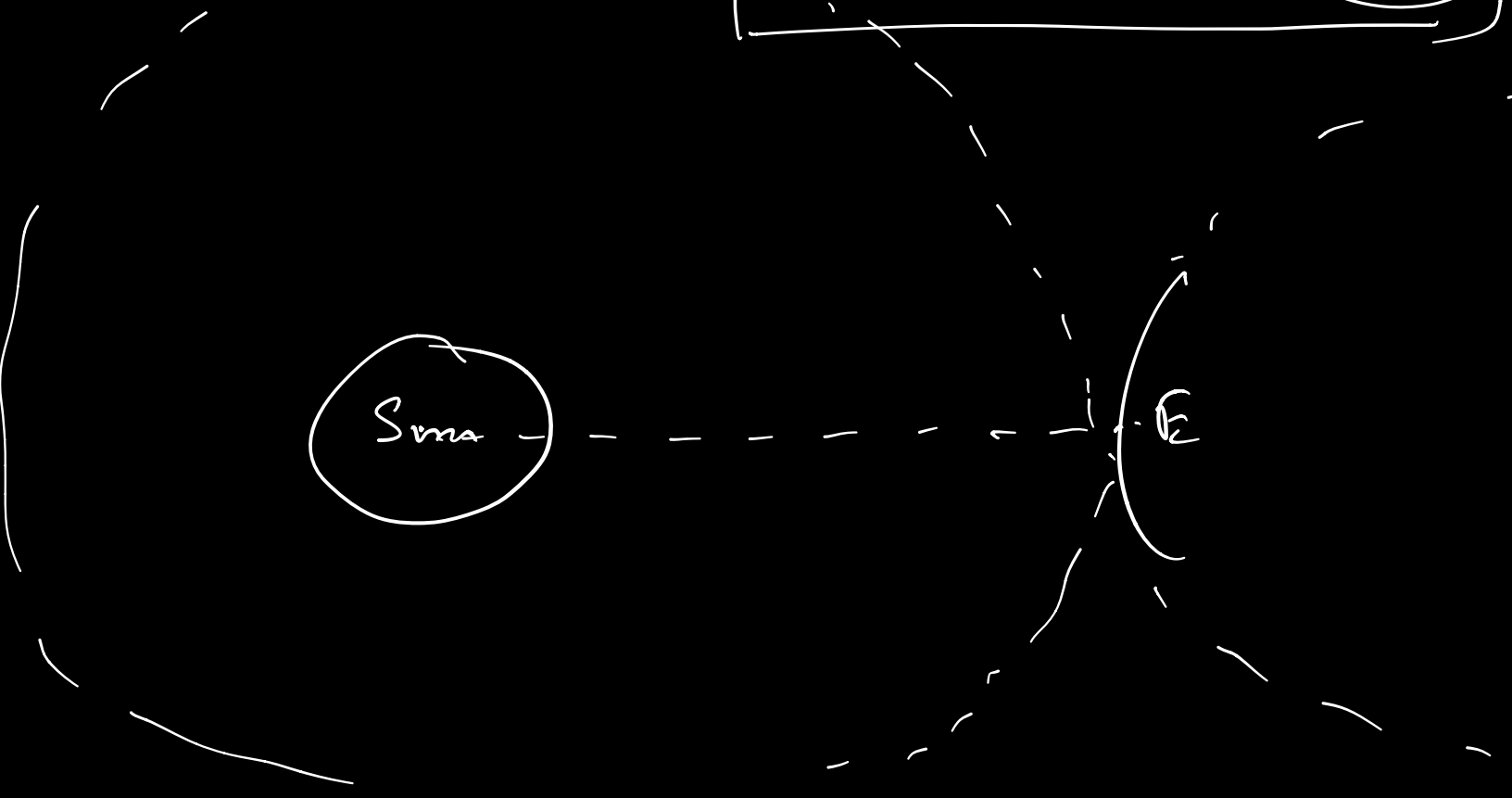
Wein's law



$$\lambda_{max} \propto \frac{1}{T}$$

$$\lambda_{max} = \frac{\text{const}}{T}$$

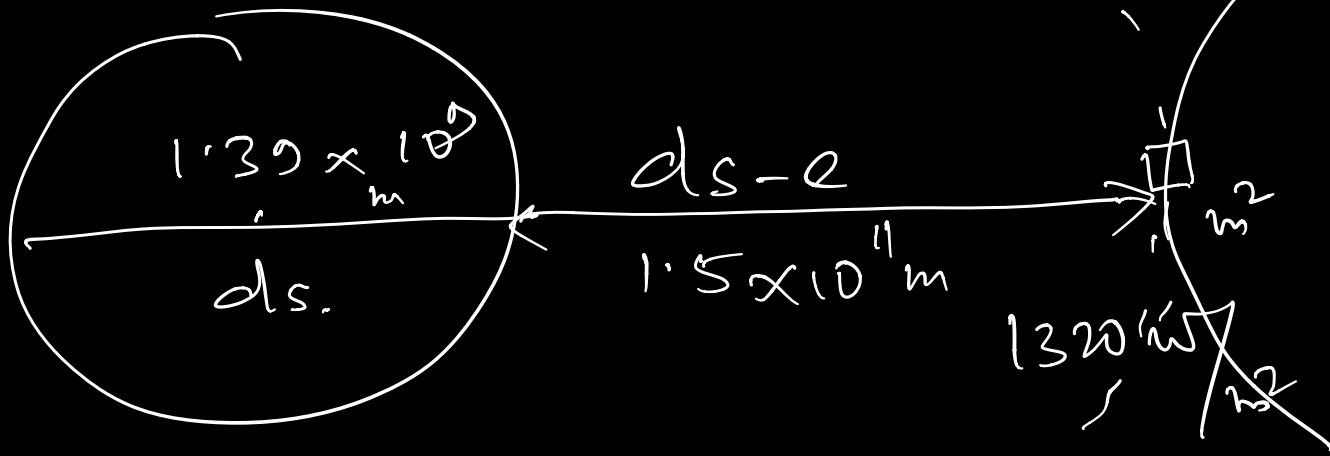
$$\text{const} = 2.897 \times 10^{-3} \ (m \cdot K)$$



Problem-③ Determine the temp of the Sun in the months of June? $I_{ext.} = 1320\ W/m^2$, $d_{S-e} = 1.5 \times 10^{11}\ m$
diameter of Sun $= 1.39 \times 10^{9}\ m$; $\sigma =$

$\sigma = 5.67 \times 10^{-8}\ W/m^2.K^4$.

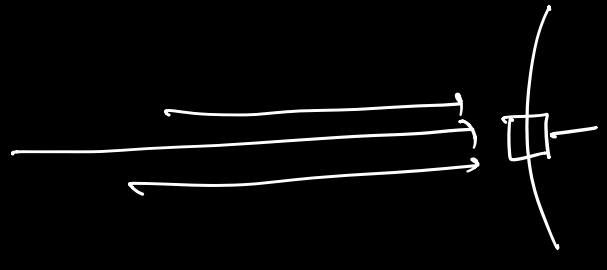
(I) Extraterrestrial Radiation



$$\sigma T_s^4 (4\pi R_s^2) = I_{extra} \times (4\pi R_s^2)$$

$$\boxed{T_s = 5738\ K.}$$

Q-1 Estimate the Global temp. of our planet in terms of temp. of Sun T_{sun}, its radius R_{sun} and distance between Earth and Sun is 'D'.



Q.5 Calculate the average earth's temp. in the absence of atmosphere. $I_{sc} = 1367\ W/m^2$, diameter of earth 12.75×10^6 m.