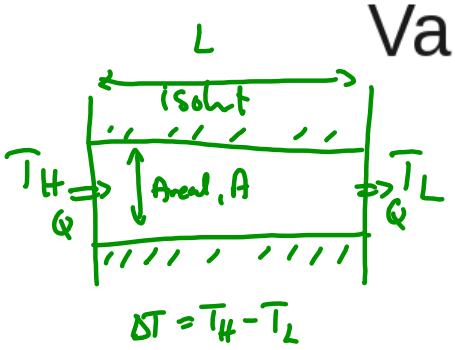
Varmetransport

- Varmeledning
- Konveksjon
- Stråling

Hvorfor har elefanten så store ører?

Feb 25-10:14 AM

Varmeledning



Varmestrøm: $H = \frac{\text{Energi}}{\text{tid}}$

$H = \lambda A \frac{\Delta T}{L}$

λ: Varmeledningsevne

feb 21-13:17

Eksempel:

Husvegg laget av enten tre ($\lambda_t \cong$ 0,12 W/mK) eller minaralull ($\lambda_m \cong$ 0,04 W/mK). Veggen er 2 m x 5 m og har tykkelsen 10 cm.

$H = \lambda A \frac{\Delta T}{L}$

$A = 2m \cdot 5m = 10m^2$

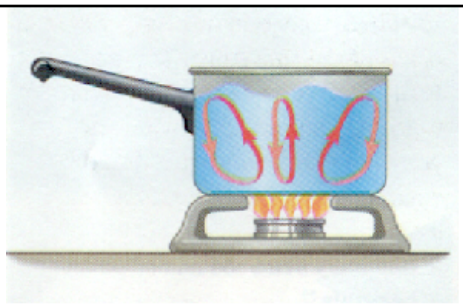
$T_H = 20°C$ $T_L = -10°C$

$L = 0{,}10m$ $\Delta T = 30\,K$

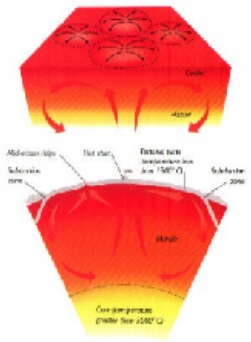
Tre: $H_t = \lambda_t A \cdot \frac{\Delta T}{L} = 0{,}36$ kW

Mineralull: $H_m = \lambda_m A \cdot \frac{\Delta T}{L} = 0{,}12$ kW

Feb 28-9:16 AM



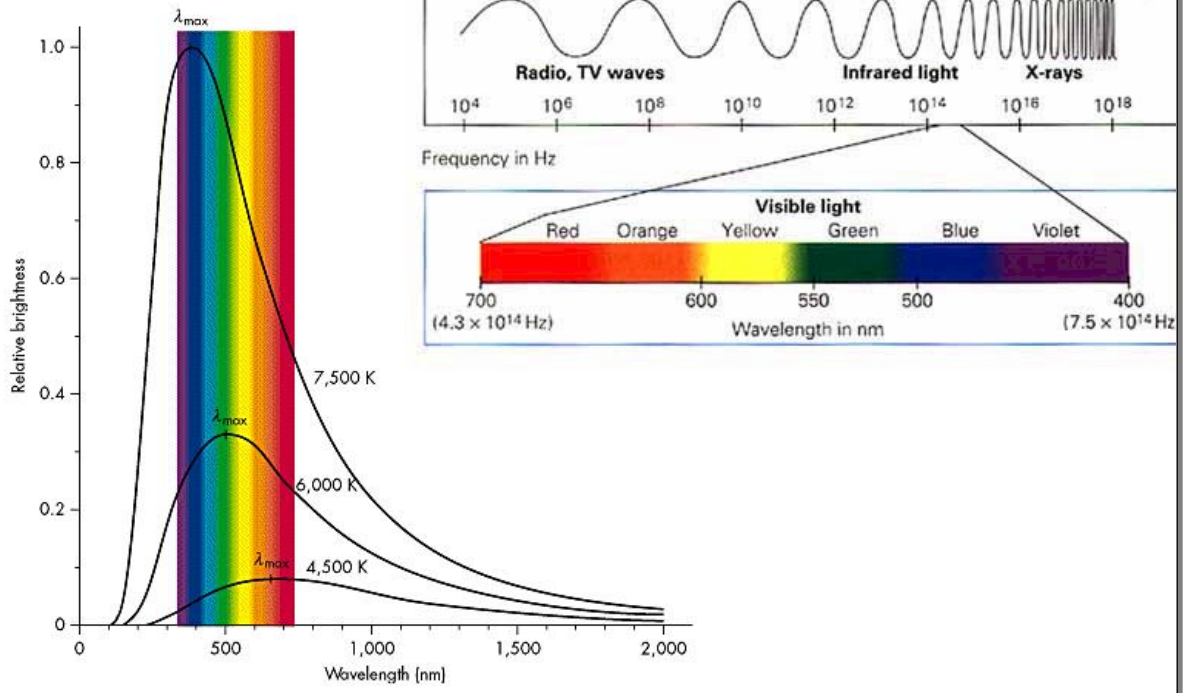
Konveksjon



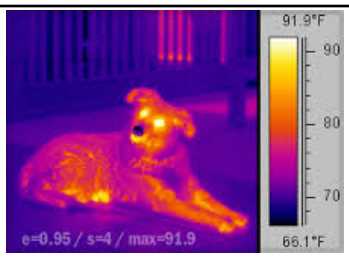
Vindstyrke i Beaufort	Vindhastighet m/s	Termometeret viser (°C)										
		15	10	5	0	-5	-10	-15	-20	-25	-30	
Vindstille	0	15	10	5	0	-5	-10	-15	-20	-25	-30	
Svak vind	1,6 - 3,3	14	9	3	-2	-7	-12	-18	-23	-28	-33	
Lett bris	3,4 - 5,4	10	4	-2	-8	-14	-20	-26	-32	-38	-44	Folt temp-eratur (°C)
Laber bris	5,5 - 7,9	8	2	-4	-11	-18	-25	-32	-38	-45	-52	
Frisk bris	8,0 - 10,7	7	0	-7	-14	-21	-29	-36	-43	-50	-57	
Liten kuling	10,8 - 13,8	5	-2	-9	-17	-24	-32	-39	-47	-54	-61	
Stiv kuling	13,9 - 17,1	5	-3	-11	-18	-26	-34	-42	-49	-57	-65	
Sterk kuling	17,2 - 20,7	4	-4	-11	-19	-27	-35	-43	-51	-59	-66	
Liten storm	20,8 - 24,4	4	-4	-12	-20	-28	-36	-44	-52	-60	-68	
Forfrysningsfare		Liten					Stor			Meget stor		

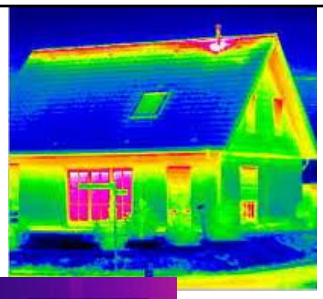
Mar 1-1:12 PM

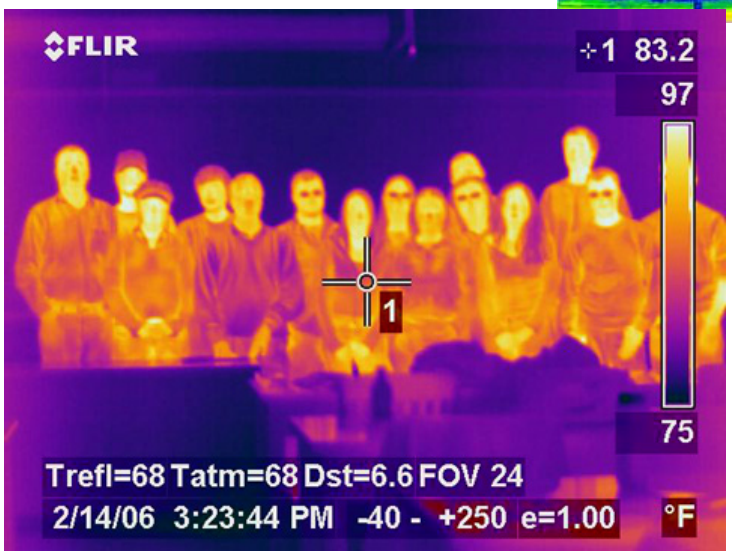
Varmestråling



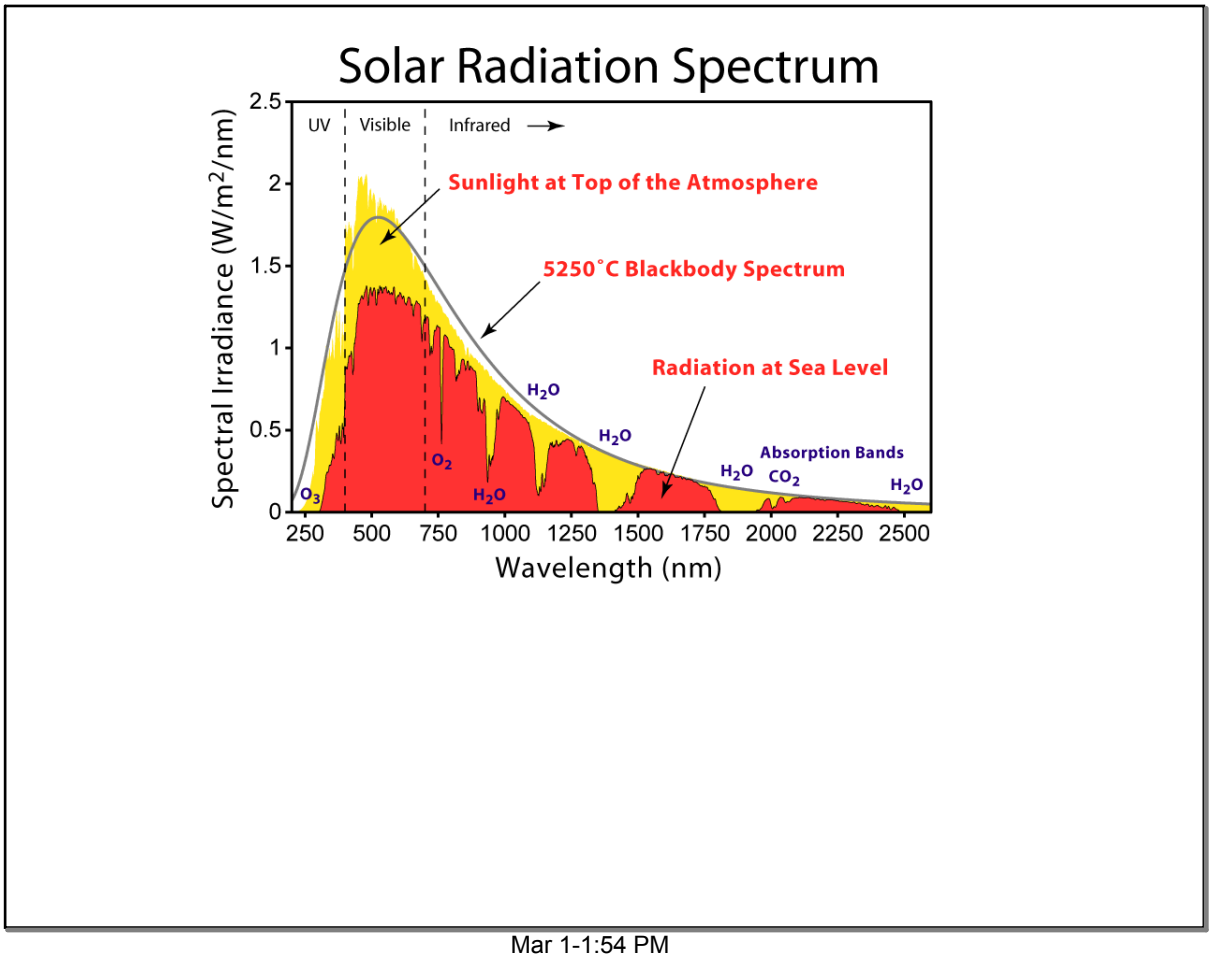
Mar 1-1:17 PM



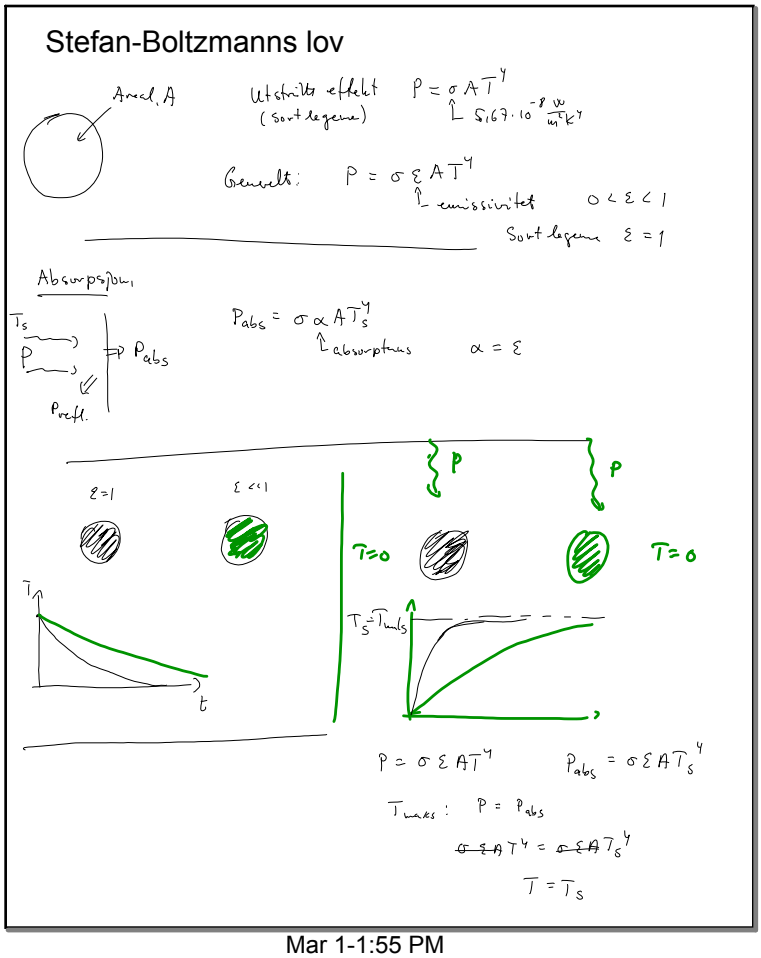




Mar 4-12:25 PM



Mar 1-1:54 PM



Mar 1-1:55 PM

Eks: $A = 2{,}0\ m^2$ $T_k = 30°C = 303\ K$ $T_0 = 22°C = 295\ K$ $\varepsilon = 0{,}97$

$P_{ut} = \sigma \varepsilon A T_k^4 = 0{,}93\ kW$

$P_{inn} = \sigma \varepsilon A T_0^4 = 0{,}8\ kW$

$P_{ut} - P_{inn} = 94\ W$

Daglig forbruk: $2000\ kcal/dag = 8400\ kJ/dag$

$$P = \frac{Q}{t} = \frac{8400\ kJ}{24 \cdot 60 \cdot 60\ s} = 97\ W$$

mai 20-09:43

NEXT-TIME QUESTION

You're a consultant for a cookware manufacturer who wishes to make a pan that will have two features:

1. absorb thermal energy from a flame as quickly as possible.
2. have a cooking surface that stays as hot as possible when heated.

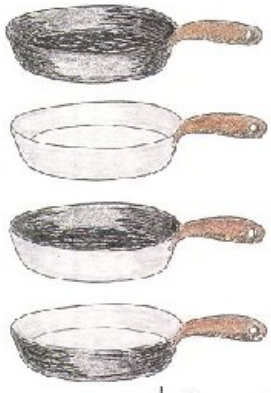
You should recommend a pan with the

a) outer and cooking surface black.

b) outer and cooking surface shiny.

c) outer surface shiny and cooking surface black.

d) outer surface black and cooking surface shiny.

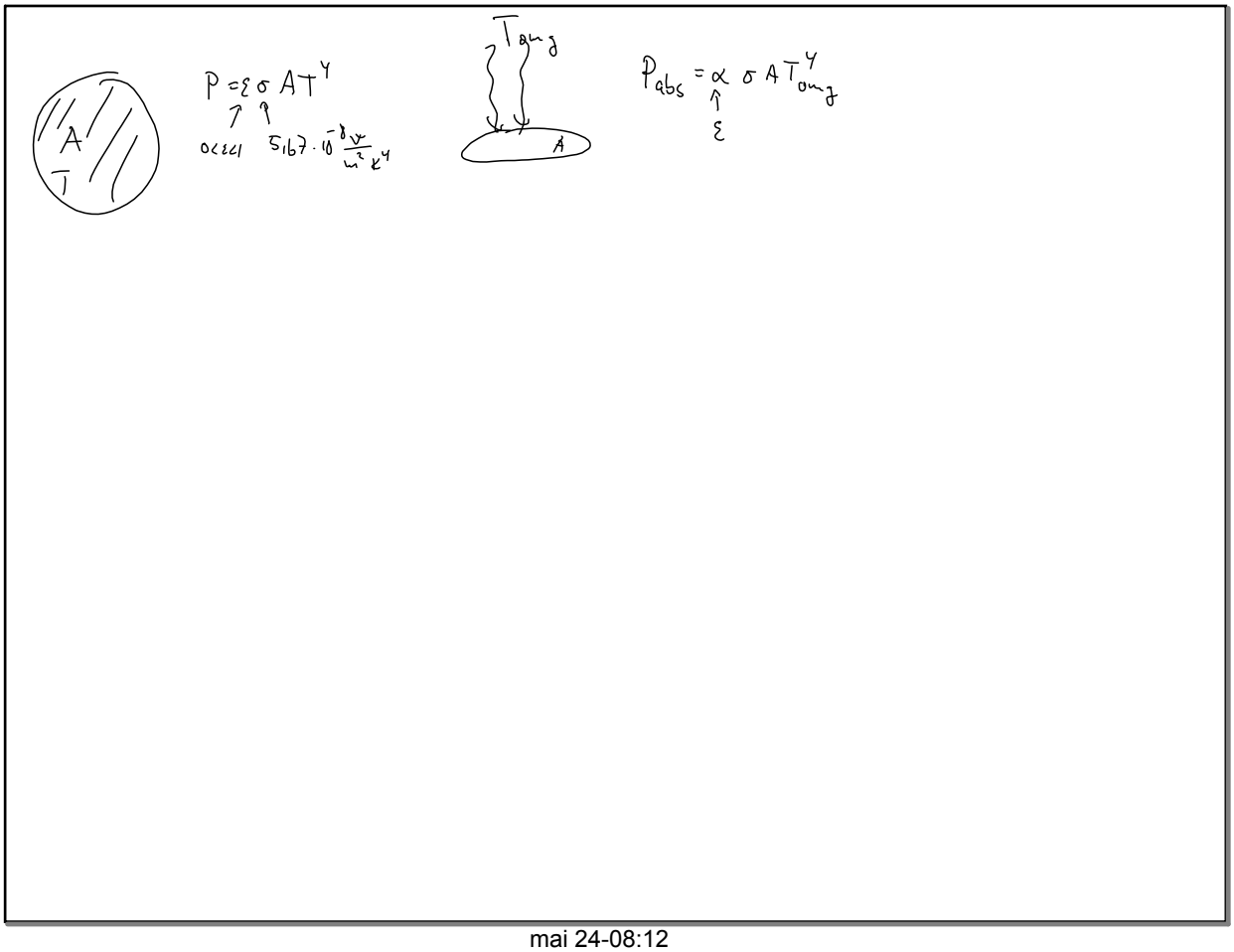


CONCEPTUAL Physics

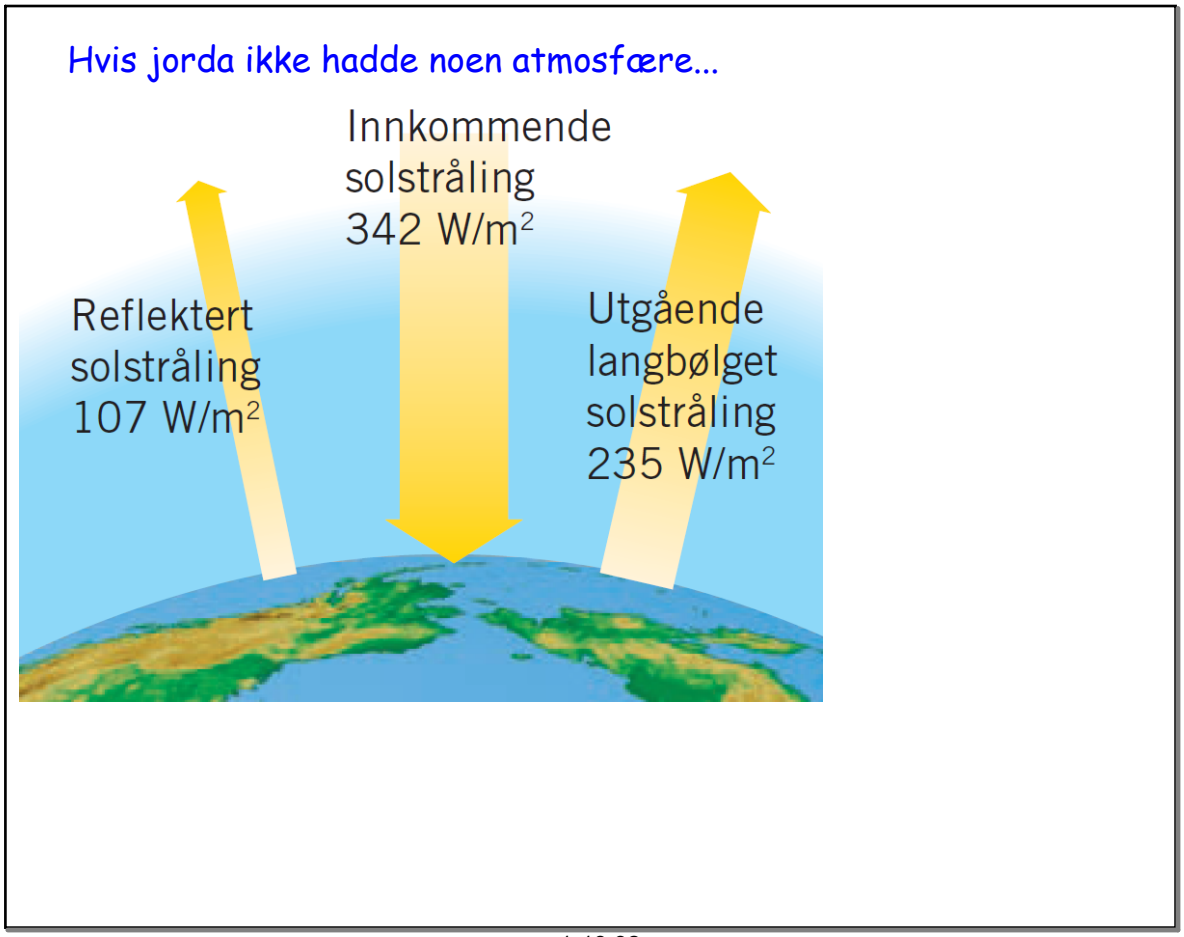
ARBOR SCIENTIFIC

thanx to Dean Baird

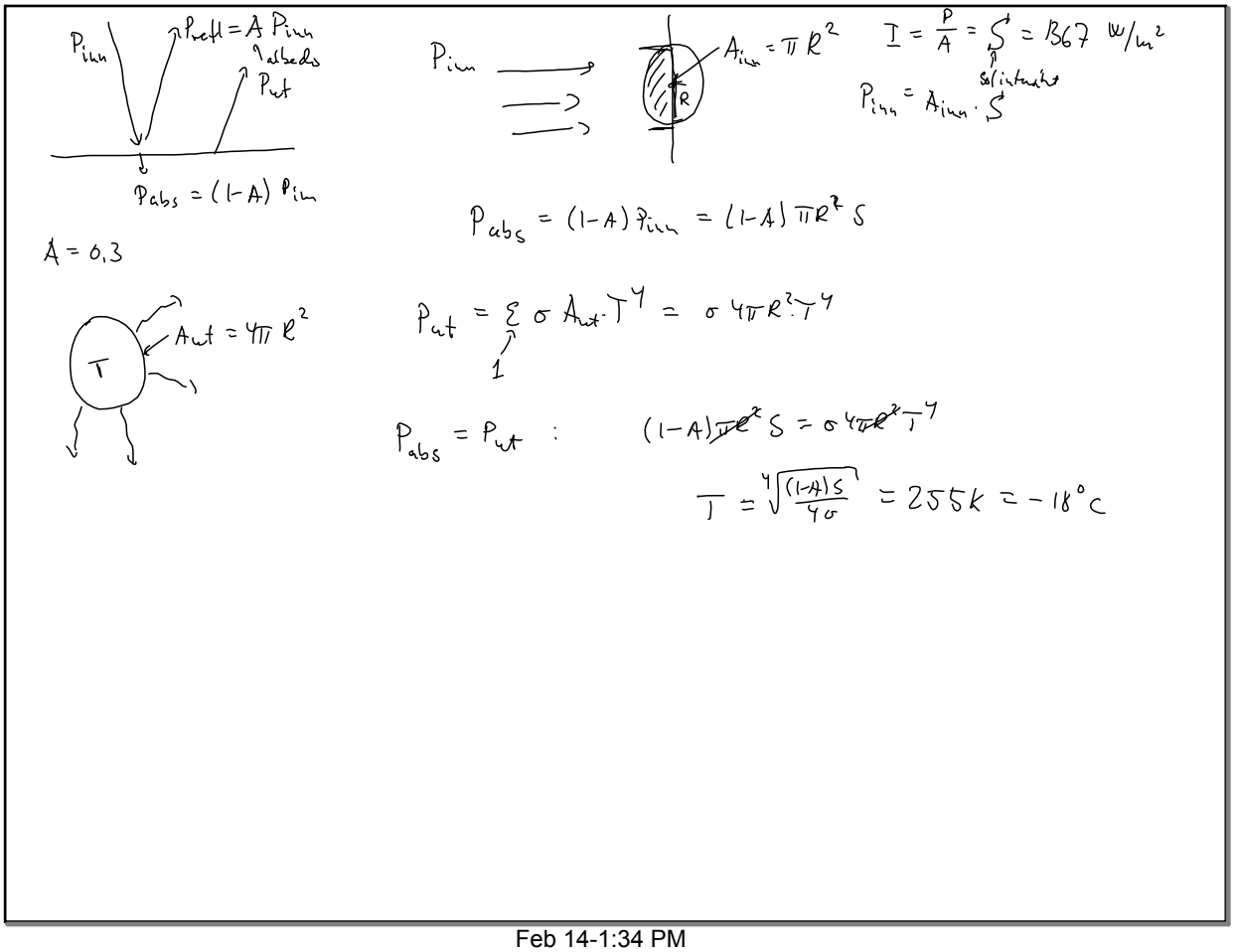
Feb 21-2:16 PM



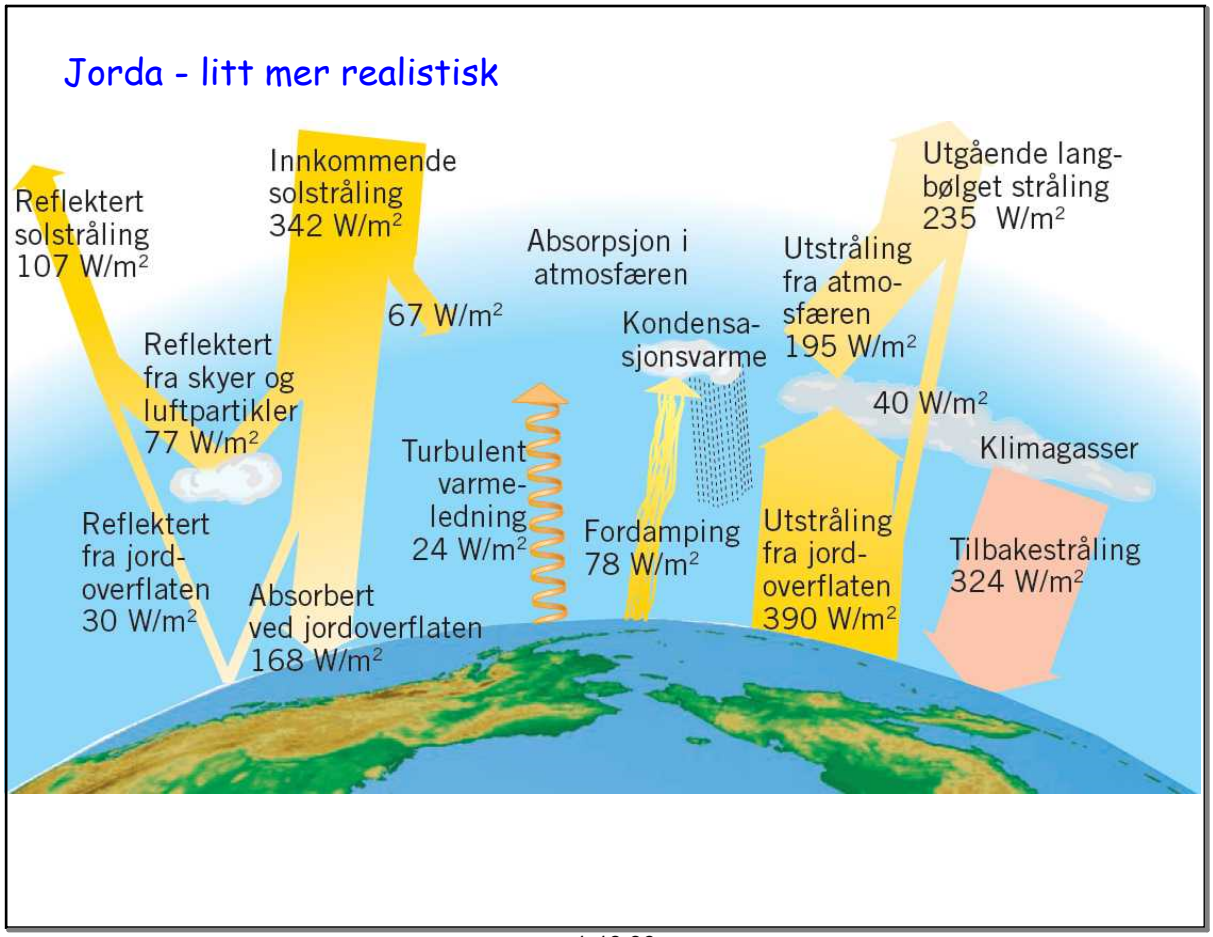
mai 24-08:12



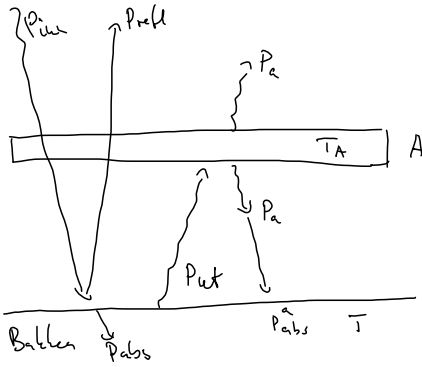
mar 1-18:32



Feb 14-1:34 PM



mar 1-18:36



Jorda $\begin{cases} P_{abs}^{T} = \pi R^2 (1-A) S + 4\pi R^2 \sigma T_A^4 \\ P_{ut} = 4\pi R^2 \sigma T^4 \end{cases}$

Atm: $\begin{cases} P_{abs} = P_{ut} = 4\pi R^2 \sigma T^4 \\ P_{ut} = 2 \cdot 4\pi R^2 \cdot \sigma T_A^4 \end{cases}$ ↑ opp + ned.

$4\pi R^2 T^4 = 8\pi R^2 T_A^4$

$T^4 = 2 T_A^4$

$T_A^4 = \frac{1}{2} T^4$

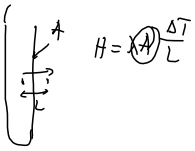
$\pi R^2 (1-A) S + 4\pi R^2 \sigma T_A^4 = 4\pi R^2 \sigma T^4$ ($T_A^4 \to \frac{1}{2} T^4$)

$(1-A) S = 4\sigma T^4 - 2\sigma T^4 = 2\sigma T^4$

$T = \sqrt[4]{\frac{(1-A)S}{2\sigma}} = 303\,K = 30^\circ C$

Feb 14-1:34 PM

Hvorfor har elefanten så store ører?



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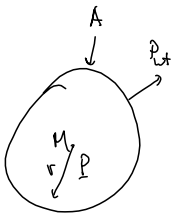
$\approx A(\ )$

$P = \sigma A T^4$

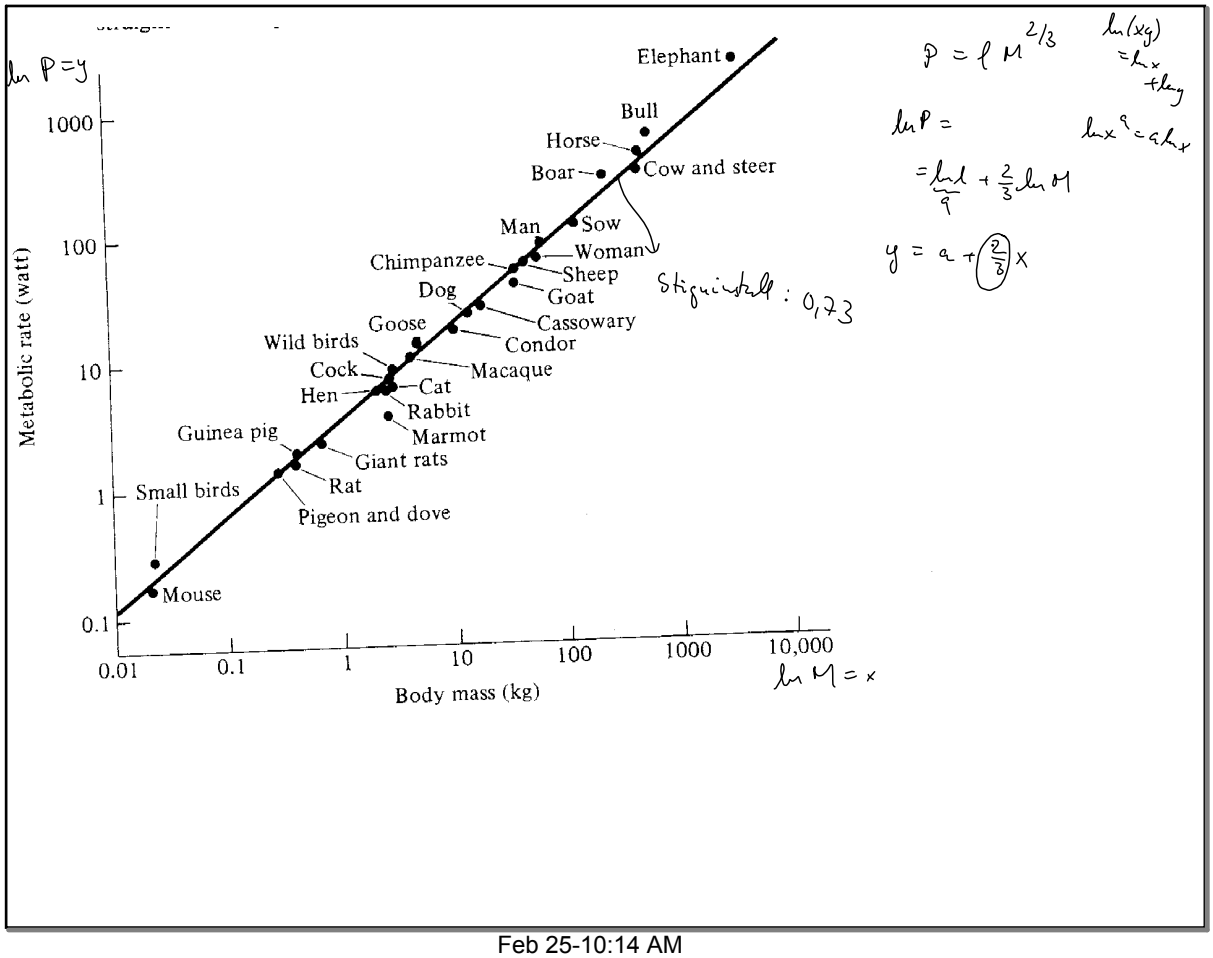


$P_{ut} = P = kA = k M^{2/3}$

$M = c \cdot r^3 = f \cdot A^{3/2} \Rightarrow A = g M^{2/3}$

$A = d r^2 \to r = e\sqrt{A} = e A^{1/2}$

Feb 25-10:14 AM



Feb 25-10:14 AM

Feb 28-11:03 AM

image-9

image-10