

Re: Increase in Room Temperature by One Human

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- *From:* "OG" <owen@xxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Mon, 12 Jan 2009 11:17:07 -0000
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"W. eWatson" <notvalid2@xxxxxxxxxxxxxx> wrote in message
[news:FZxal.11147\\$as4.10969@xxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:FZxal.11147$as4.10969@xxxxxxxxxxxxxxxxxxxxxxxxxx)

OG wrote:

"W. eWatson" <notvalid2@xxxxxxxxxxxxxx> wrote in message
[news:9aual.13470\\$YU2.2640@xxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:news:9aual.13470$YU2.2640@xxxxxxxxxxxxxxxxxxxxxxxxxx)

It's been a very long time since I had a physics course that might address this.

Suppose I have a 10x10x10' room that has one human in it. The room is fully insulated. A human produces 100 watts, but 1/2 of that is in heat. What I would like to know is if the room was initially at 60F, what temperature would it be at say 6 hours later? I would think this somehow involves knowing the specific heat of a human body and air. Roughly or exactly, how does one make the calculation? I have no idea what the specific heat is for either item.

If the human produces 100W, but only half of that is heat, what's the other 50W ?

Do you need to know the Specific heat of the human? As a species we regulate our temperature to be more or less constant, so unless the temperature of the room increases to a similar temperature, the only thermal mass that will be warming up will be the air in the room.

I'm sure you can google the density and specific heat capacity of air at room temperature, and use it to roughly calculate the temperature after 6

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x 3600 seconds @ 100 Watts.

Why do you want to use degrees F and the room size in feet ? Celsius and metres would be easier

I have no idea what the other 1/2 is. I read that it is true. Use whatever thermometer scale is convenient for temp, or a typical room size measure. If someone can tell me the specific heat of both bodies, that would be good. Google didn't give very satisfactory answers. Assume the room is R and the human is H, for specific heats. Name your units. SI or whatever. How does one calculate the rise in temp given H and R, and the volume of air in the room?

"I read that it is true" The 100W has to go somewhere, so where else can it go? Worry about understanding the principles first before you worry about the calculations

but back to the calculations

http://en.wikipedia.org/wiki/Specific_heat_capacity

Heat capacity Air 1010 J/K/kg at typical room conditions

Heat capacity of flesh is 3500 J/K/kg

Assume room is 3.1 metres on each side(within 2% of your original 10ft side)

hence volume of room is 30 m^3

density of air = 1.2 kg/m^3

Calculate the mass of the air in the room.

Each second the human gives off 100 Joules of energy. Calculate the energy in joules added to the air over 6 hours.

Calculate the increase in temperature of the air.

Assume the body temperature remains constant up to 37 C at which point the body temperature increases with the room temperature.

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