

HEAT FLOW

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ICE WATER IN VEINS. AN EVENT TO MATCH



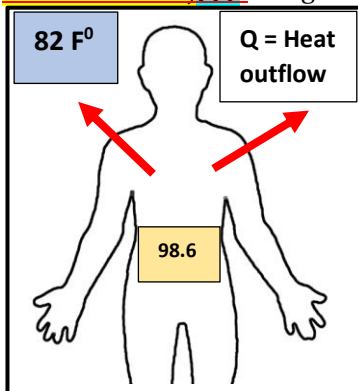
INTRODUCTION: Goal of this application is to determine amount of heat needed to be extracted from a typical 180 lb. (98.6 F degree) human to become hypothermic at 82 degrees F.

QUESTIONS: (a) Convert 98.6 & 82 F degrees to Celsius degrees?, (b) Convert 180 lb. to kg.?, (c) Find Δt in Celsius degrees?,(d) Find amount of heat extracted to drop body 98.6 to 82 F° ?

BURGHAUSEN, Germany — Burghausen Castle, perched on a hill high above this scenic Bavarian town, was still bathed in a white morning fog when the first swimmers of the day approached the Wöhrsee, a sickle-shaped lake that curls along the medieval fortification's western flank. It was 29 degrees outside, and as the seven women descended a set of ladders to touch the water, their clipped exhalations — “Whew, whew, whew!” — sliced through the quiet on the jetty. Moments later, there was an electronic beep, then a collective splash, and with a spurt of cheers from a few dozen spectators, the first meet of the International Ice Swimming Association's new season was underway. Out here, on the first Saturday of December, cold became a remarkably variable concept. Onlookers wore heavy coats and knit caps pulled low and clasped their palms around steaming drinks. Around them strolled the 50 or so swimmers, ages 12 to 65, wearing swimsuits and flip-flops. **They would be plunging into water**

measured at 39 degrees. To an uninitiated observer, ice swimming, as it is called, can seem deeply peculiar. From afar, in the absence of snow or ice, it resembles normal swimming in any lake. But lakeside, stooped and shivering in a parka, flexing your toes inside multiple layers of socks and witnessing groups of half-naked people splashing into the frigid water of their own accord, your mind naturally struggles to comprehend why. Julia Wittig preparing for the one-kilometer race. Ms. Wittig, a 37-year-old schoolteacher, went on to set a world record in the event. **In the first event, the women's**

1,000-meter freestyle race, Julia Wittig, a 37-year-old schoolteacher, was positioned in the center lane in a black swimsuit and cap, earplugs and goggles — the only equipment allowed in competition. **Ice swimming has deep roots in Europe, particularly in Eastern European** and Nordic countries, where many believe it provides restorative health benefits. The risk to the body is real. Sudden contact with cold water can cause hyperventilation and sudden increase in blood pressure. **((Prolonged exposure can lead to hypothermia. Death can occur when the core body temperature drops below 82 degrees Fahrenheit,)))** though fatalities in cold water typically occur from heart attacks upon entering the cold water.



HINTS: $C = 5/9(F - 32)$, specific heat of human flesh = $c = 3500 \text{ J/kg. } ^\circ\text{C}^0$
 2.202 lb./kg. , $Q = c m \Delta t$, Be sure to show calculations in your presentations.

ANSWERS: (a) $98.6 \text{ F}^\circ = 37^\circ\text{C}^0$, $82 \text{ F}^\circ = 27.78 \text{ C}^\circ$, (b) $m = 81.65 \text{ kg.}$, (c) $\Delta t = 9.22 \text{ C}^\circ$
(d) $Q = \sim 2,634,846 \text{ J}$