

If it was possible, how long would a person need to plug into an iPhone USB wall charger in order to gain the same amount of daily energy needed by a moderately active, 19 – 20 year old man/woman?



SOLUTION:

According to:

https://www.cnpp.usda.gov/sites/default/files/usda_food_patterns/EstimatedCalorieNeedsPerDayTable.pdf,

a moderately active man in the age range of 19 – 20 years old needs 2,800 kcal per day while a moderately active woman in the same age range needs 2,200 kcal per day. Note that in the U.S. we use the term “calorie (cal)” when, in fact, we mean “kilocalorie (kcal)”.

An iPhone USB wall charger operates at a voltage of 5 V with a current of 1000 mA

(<https://www.wired.com/2013/12/charging-devices-faq/>).

The required time to connect to the wall charger, T , is found by,

$$E = VIT, \quad (1)$$

$$T = \frac{E}{VI}, \quad (2)$$

where E is the energy needed, V is the USB voltage, I is the USB current, and T is the charging time.

Here,

$$E_{\text{male}} = 2,800 \text{ kcal} = 1.17 \times 10^7 \text{ J (male)},$$

$$E_{\text{female}} = 2,200 \text{ kcal} = 9.20 \times 10^6 \text{ J (female)},$$

$$V = 5 \text{ V},$$

$$I = 1 \text{ A},$$

$$\Rightarrow \boxed{T_{\text{male}} = 2.34 \times 10^6 \text{ s} = 651 \text{ h}},$$

$$\Rightarrow \boxed{T_{\text{female}} = 1.84 \times 10^6 \text{ s} = 511 \text{ h}}.$$

Clearly it's not possible to charge up via a wall USB charger since the required charging time is much greater than the number of hours in a day.