Extra problem

The Ice Water Diet was a thing at one time. Drink water at 0°C and use energy from burning fat to raise the temperature to 37°C before releasing it. How much ice water would one need to drink to burn 140 calories (*i.e.*, what's in a can of Coke)?

First of all, when a dietician says 100 calories, that's <u>dietary calories</u>, each of which is equivalent to 4184 joules. Then,

$$Q = mc\,\Delta T \quad \rightarrow \quad m = \frac{Q}{c\,\Delta T} = \frac{4182\frac{J}{cal} \times 140cal}{4182\frac{J}{kg\,K} \times (37 - 0)} = 3.78\text{ kg} \sim \boxed{15\text{ glasses}} \quad .$$

Then, FYI, to lose one pound of fat, you would need to drink

$$Q = mc\,\Delta T \quad \rightarrow \quad m = \frac{Q}{c\,\Delta T} = \frac{4182\frac{J}{cal} \times 3500cal}{4182\frac{J}{kg\,K} \times (37 - 0)}$$
$$= 94.6\text{ kg} \sim 378\text{ glasses or 25 gallons of ice water} \quad .$$