Peanut Calorimetry

OFFICE

||||||| = calc. errors

Pre-Lab

a) There are 4.184 J in 1 cal. Thus, there are

$$170\times10^3 \text{ cal} \times \frac{4.184\text{ J}}{1\text{ cal}} = 711.28\times10^3 = 7.1128\times10^5\text{ J} = 711.28\text{ kJ}$$

in 28 g of dry peanuts.

b) If dry peanuts are made of only carbohydrates, protein, and fat, then

$$5\text{ g carbohydrates} \times \frac{4\text{ kcal}}{1\text{ g carb}} = 20\text{ kcal carbs in 28 g peanuts}$$

$$8\text{ g protein} \times \frac{4\text{ kcal}}{1\text{ g protein}} = 32\text{ kcal protein in 28 g peanuts}$$

$170\text{ kcal} - (20+32) = 118\text{ kcal fat in 28 g peanuts}$

$$\frac{118\text{ kcal fat}}{(28-(5+8))\text{ g fat}} = \text{[illegible]}\ 7.87\text{ kcal/g fat}$$

$$7.87\ \frac{\text{[illegible]}\times10^3\text{ cal fat}}{1\text{ g fat}} \times \frac{4.184\text{ J}}{1\text{ cal}} = \text{[illegible]}\times10^3\text{ J} = \text{[illegible]}\ \text{kJ/g fat}$$

(32.93 kJ/g fat)

c) Since only the fat burns, the amount of energy released in burning 28 g of dry peanuts is

$$28\text{ g peanuts} \times \frac{14\text{ g fat}}{28\text{ g peanuts}} \times \frac{32.93\text{ kJ}}{1\text{ g fat}} = 461.02\text{ kJ released}$$

d) Since all of the energy released by the nut is transferred to the water,

$$q_{\text{released from nut}} = q_{\text{absorbed by water}} = m_{\text{water}}\, s_{\text{water}}\, \Delta T_{\text{water}}$$

$$T_f - T_i = q/(m_{H_2O}\, s_{H_2O})$$

$$T_f = T_i + q/(m_{H_2O}\, s_{H_2O}) = 21^\circ\text{C} + 493.78\times10^3/(10\times4.184)$$

T_f = way too high

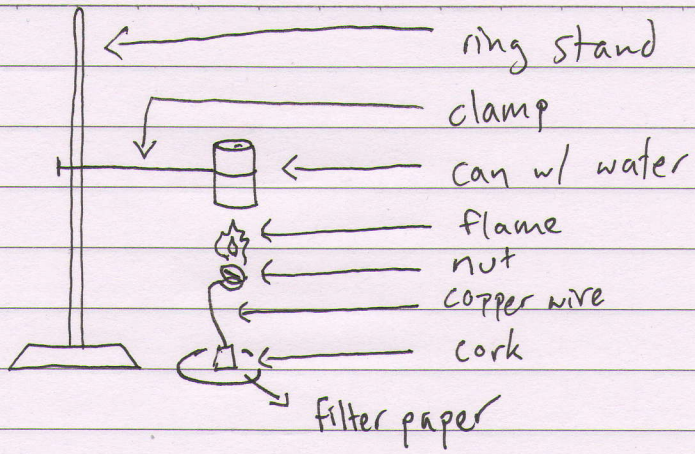
* Revised problem *

$$q_{\text{released from nut}} = \frac{461.02\text{ kJ}}{28\text{ g peanuts}} \times 3\text{ g peanuts} = 49.40\text{ kJ}$$

$$T_f = 21^\circ\text{C} + 49.40\times10^3/(200\text{ g}\times4.184) = 70.19^\circ\text{C}$$

Note: the actual change in temperature could be much less if the heat is not transferred efficiently

e)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clamp
can w/ water
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