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Thermochemistry Test #1 Review

#1

$$q = mc\Delta T$$

$$q = (10.0 \text{ kg})(4.18 \frac{\text{J}}{\text{g}^\circ\text{C}})(100.0^\circ\text{C} - 20.0^\circ\text{C})$$

$$q = (10000 \text{ g})(4.18 \frac{\text{J}}{\text{g}^\circ\text{C}})(80.0^\circ\text{C})$$

$$q = 3.34 \times 10^6 \text{ J}$$

$$q = 3.34 \times 10^3 \text{ kJ}$$

#2

$$m = \frac{q}{c\Delta T}$$

$$m = \frac{1550 \text{ J}}{(0.900 \frac{\text{J}}{\text{g}^\circ\text{C}})(266.0^\circ\text{C} - 21.0^\circ\text{C})}$$

$$m = \frac{1550 \text{ J}}{(0.90 \frac{\text{J}}{\text{g}^\circ\text{C}})(245.0^\circ\text{C})}$$

$$m = \frac{1550 \text{ J}}{220.5 \frac{\text{J}}{\text{g}}}$$

$$m = 7.03 \text{ g}$$

$$m = 7.0 \text{ g}$$

#3

$$\Delta T = \frac{q}{mc}$$

$$\Delta T = \frac{5.03 \times 10^3 \text{ J}}{(125 \text{ kg})(2.1 \frac{\text{J}}{\text{g}^\circ\text{C}})}$$

$$\Delta T = \frac{5030 \text{ J}}{262.5 \frac{\text{J}}{\text{g}^\circ\text{C}}}$$

$$\Delta T = 19.1619^\circ\text{C}$$

$$\Delta T = 19^\circ\text{C}$$

#4

energy gained = energy lost
by water by copper

$1g = 1mL = 1cm^3$

$mc\Delta T = -mc\Delta T$
 $(100cm^3)(4.18J/g\cdot c)(t_f - 14.1^\circ C) = -(2.39g)(0.385J/g\cdot c)(t_f - 100.0^\circ C)$
 $(41.8J/g\cdot c)(t_f - 14.1^\circ C) = (-0.92015J/g\cdot c)(t_f - 100.0^\circ C)$

$(41.8J/g\cdot c)t_f - 589.38J = (-0.92015J/g\cdot c)t_f + 92.015J$
 $(41.8J/g\cdot c)t_f + (0.92015J/g\cdot c)t_f = 92.015J + 589.38J$
 $(42.72015J/g\cdot c)t_f = 681.395J$

$t_f = 15.9502^\circ C$

$t_f = 16.0^\circ C$

#5

energy gained = energy lost
by water by iron

$mc\Delta T = -mc\Delta T$

$(2.00L)/4.18J/g\cdot c(t_f - 22.5^\circ C) = -(5650g)(0.444J/g\cdot c)(t_f - 312^\circ C)$

$(8360J/g\cdot c)(t_f - 22.5^\circ C) = (-2508.6J/g\cdot c)(t_f - 312^\circ C)$

$(8360J/g\cdot c)t_f - 188100J = (-2508.6J/g\cdot c)t_f + 782683.2J$
 $(8360J/g\cdot c)t_f + (2508.6J/g\cdot c)t_f = 782683.2J + 188100J$

$(10868.6J/g\cdot c)t_f = 970783.2J$

$t_f = 89.3249J$

$t_f = 89.3J$

No, he should not touch it.

#6

energy gained = energy lost
by water by aluminum

$mc\Delta T = -mc\Delta T$

$m(4.18J/g\cdot c)(25.0^\circ - 20.0^\circ C) = -(250.0g)(0.90J/g\cdot c)(25.0^\circ - 225^\circ)$

$m(4.18J/g\cdot c)(5.0^\circ C) = (-225J/g\cdot c)(-200^\circ C)$

$m(20.9J/g) = 45000J$

$m = 2153.11g$

$m = 2.2 \times 10^3g$

$m = 2.2 \times 10^3mL$

$m = 2.2L$

#7 a) $\Delta m = m_f - m_i$
 $\Delta m = 28.5g - 2.6g$
 $\Delta m = 25.9g$ of wax

b) energy gained = energy lost
 by water by wax
 $q = \Delta H_c$

$mC\Delta T = nH_c$
 $(285.4g)(4.18 \frac{J}{g^\circ C})(29.2^\circ C - 12.0^\circ C) = (25.9g)H_c$
 $(1192.97256)(17.2^\circ C) = (25.9g)H_c$
 $20519.1184J = (25.9g)H_c$
 $792.243J/g = H_c$

$H_c = 0.792KJ \times \frac{352.77g C_{25}H_{52}}{1mol C_{25}H_{52}}$

$H_c = 279 \frac{KJ}{mol}$

#8 energy gained = energy lost
 by liquid by ethanol

$q = \Delta H_c$
 $mC\Delta T = nH_c$
 $(10.0g)(1.38 \frac{KJ}{g^\circ C})(10.99^\circ C) = (2.55g \times \frac{1mol C_2H_5OH}{46.08g C_2H_5OH})H_c$
 $151.662KJ = (0.055338mol C_2H_5OH)H_c$
 $2740.62 \frac{KJ}{mol} = H_c$

$H_c = 2740 \frac{KJ}{mol}$