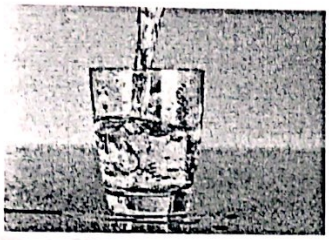
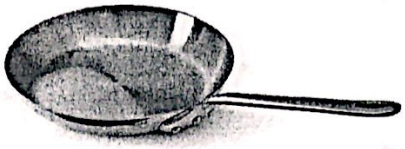
Name: _____ Date: _____

Introduction to Calorimetry **Regents Chemistry**

1) a. If 50.0 g of water and 50.0 g of copper each absorb 2500. joules of energy, which substance will have the greater increase in temperature?



Specific heat capacity= 4.18 J/g°C



Specific heat capacity= 0.386 J/g°C

b. Which substance had the greater increase in temperature? Explain using ***specific heat capacity.***

2) If 45.75 g of water changes temperature from 36.0°C to 79.0°C, how much energy did this require?

3) Determine the quantity of aluminum that *loses* 13450. joules to decrease its temperature by from 97.8 °C to 59.8 °C? The specific heat capacity of aluminum is 0.900 J/g°C

4) If 26.7 grams of water at 87.0 °C *releases* 1585 J of energy, what is the final temperature?

5) Determine the initial temperature of a 16.0 g sample of water at 35.8 °C that *absorbed* 5675 J of energy?

Name: _____ **Date:** _____

Regents Chemistry

Introduction to Calorimetry

6) If 16.7 grams of ethanol cools from 100. °C to 82 °C by releasing 739 J of energy, determine the specific heat capacity of the ethanol.

7) How many joules of heat are released when 5.00 g of water cools from 75.0 °C to 25.0 °C?

8) When 20 grams of water is cooled from 20°C to 10°C, determine the number of joules of heat released.

9) What is the total number of joules of heat that must be absorbed to change the temperature of 100. grams of H_2O from 25.0 °C to 30.0 °C?

10) How many joules of heat are needed to raise the temperature of a 4.52 gram sample of water by 8.5 °C?

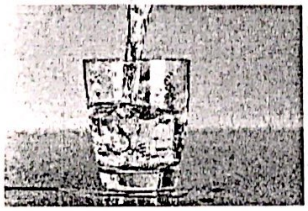
Name: Key

Date:

Introduction to Calorimetry — **Regents Chemistry**

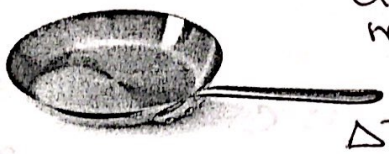
1) a. If 50.0 g of water and 50.0 g of copper each absorb 2500. joules of energy, which substance will have the greater increase in temperature?

$Q = 2500.\ J$
$m = 50.0\ g$
$c = 0.386\ J/g°C$
$\Delta T = ?$



Specific heat capacity= 4.18 J/g°C

$Q = mc\Delta T$
$(2500.) = (50.0)(4.18)(\Delta T)$
$\frac{2500.}{209} = \frac{209\ \Delta T}{209}$
$\Delta T = 11.96°C = \boxed{12.0°C}$



$Q = 2500.\ J$
$m = 50.0\ g$
$c = 0.386\ J/g°C$
$\Delta T = ?$

Specific heat capacity= 0.386 J/g°C

$Q = mc\Delta T$
$(2500.) = 50.0)(0.386)(\Delta T)$
$\frac{2500.}{19.3} = \frac{19.3\ \Delta T}{19.3}$
$\Delta T = 129.5°C = \boxed{130.°C}$

b. Which substance had the greater increase in temperature? Explain using ***specific heat capacity.***

The copper. Copper has a lower specific heat than water therefore it takes more energy to heat up 1g of water than 1 g of copper.

2) If 45.75 g of water changes temperature from 36.0°C to 79.0°C, how much energy did this require?

$Q = ?$
$m = 45.75g$
$c = 4.18\ J/g°C$
$\Delta T = T_f - T_i = 79.0 - 36.0 = 43.0°C$

$Q = mc\Delta T$
$Q = (45.75)(4.18)(43.0)$
$Q = \boxed{8223\ J}$

3) Determine the quantity of aluminum that *loses* 13450. joules to decrease its temperature by from 97.8 °C to 59.8 °C? The specific heat capacity of aluminum is 0.900 J/g°C

$Q = 13450J$
$m = ?$
$C = 0.900\ J/g°C$
$\Delta T = 97.8 - 59.8 = 38.0°C$

$Q = mc\Delta T$
$13450 = m(0.900)(38.0)$
$\frac{13450}{34.2} = \frac{m34.2}{34.2}$
$m = \boxed{393.3g}$

4) If 26.7 grams of water at 87.0 °C *releases* 1585 J of energy, what is the final temperature?

$Q = 1585\ J$
$m = 26.7g$
$c = 4.18\ J/g°C$
$\Delta T = ?$

$Q = mc\Delta T$
$1585 = (26.7)(4.18)\Delta T$
$\frac{1585}{111.606} = \frac{111.606\ \Delta T}{111.606}$
$\Delta T = 14.2°C$

Energy is released to final temp. will be lower than 87.0°C

$87.0 - 14.2 = \boxed{72.8°C}$

5) Determine the initial temperature of a 16.0 g sample of water at 35.8 °C that *absorbed* 5675 J of energy?

$Q = 5675\ J$
$m = 16.0g$
$C = 4.18\ J/g°C$
$\Delta T = ?$

$Q = mc\Delta T$
$5675 = (16.0)(4.18)\Delta T$
$5675 = 66.88\ \Delta T$
$\Delta T = 5675/66.88 = 84.9°C$

Heat was absorbed so the initial temp was raised to 35.8°C.

$35.8 - 84.9 = \boxed{-49.1°C}$

Name: _____ Date: _____

Introduction to Calorimetry **Regents Chemistry**

6) If 16.7 grams of ethanol cools from 100. °C to 82 °C by releasing 739 J of energy, determine the specific heat capacity of the ethanol.

$q = 739\ J$
$m = 16.7\ g$
$c = ?$
$\Delta T = 100 - 82 = 18°C$

$q = mc\Delta T$
$739 = (16.7)(c)(18)$
$\frac{739}{300.6} = \frac{300.6\,c}{300.6}$
$c = 2.46\ J/g°C = \boxed{2.5\ J/g°C}$

7) How many joules of heat are released when 5.00 g of water cools from 75.0 °C to 25.0 °C?

$q = ?$
$m = 5.00g$
$c = 4.18\ J/g°C$
$\Delta T = 50.0°C$
$(75.0 - 25.0)$

$q = mc\Delta T$
$q = (5.00g)(4.18\ J/g°C)(50.0°C)$
$q = \boxed{1045\ J}$

8) When 20 grams of water is cooled from 20°C to 10°C, determine the number of joules of heat released.

$q = ?$
$m = 20g$
$c = 4.18\ J/g°C$
$\Delta T = 10°C$
$20 - 10 = 10$

$q = mc\Delta T$
$q = (20)(4.18)(10)$
$q = \boxed{836\ J} = 800\ J$

9) What is the total number of joules of heat that must be absorbed to change the temperature of 100. grams of H_2O from 25.0 °C to 30.0 °C?

$q = ?$
$m = 100.$
$c = 4.18\ J/g°C$
$\Delta T = 5.0°C$
$(30.0 - 25.0)$

$q = mc\Delta T$
$q = (100.)(4.18)(5.0)$
$q = \boxed{2090\ J}$

10) How many joules of heat are needed to raise the temperature of a 4.52 gram sample of water by 8.5 °C?

$q = ?$
$m = 4.52g$
$c = 4.18\ J/g°C$
$\Delta T = 8.5°C$

$q = mc\Delta T$
$q = (4.52g)(4.18\ J/g°C)(8.5°C)$
$q = 160.5956$
$q = \boxed{160\ J}$