Pg. 78 #13

a. Positive
b. Negative
c. Negative
d. Positive
e. Negative

Pg. 78 #15

How many joules of energy are required to raise the temperature of 75 g of water from 20.0°C to 70.0°C?

Pg. 78 #15

$$q = mC_p \Delta T$$

$$q = (75)(4.184)(70.0 - 20.0)$$

$$q = 15690\ J$$

Pg. 78 #16

How many joules of energy are required to raise the temperature of 65 g of iron from 25°C to 95°C?

Pg. 78 #16

$$q = mC_p\Delta T$$

$$q = (65)(0.449)(95 - 25)$$

$$q = 2043\ J$$

Pg. 78 #17

How many joules of heat are required to heat 25.0 g of ethyl alcohol from the prevailing room temperature, 22.5°C, to its boiling point, 78.5°C?

Pg. 78 #17

$$q = mC_p \Delta T$$

$$q = (25.0)(2.44)(78.5 - 22.5)$$

$$q = 3416\ J$$

Pg. 78 #18

How many joules of heat are required to heat 35.0 g of isopropyl alcohol from the prevailing room temperature, 21.2°C, to its boiling point, 82.4°C?

Pg. 78 #18

$$q = mC_p \Delta T$$

$$q = (35.0)(2.61)(82.4 - 21.2)$$

$$q = 5590\ J$$

Pg. 78 #19

A 250.0 g metal bar requires 5.866 kJ to change its temperature from 22°C to 100.0°C. What is the specific heat of the metal?

Pg. 78 #19

$$q = mC_p\Delta T$$

$$5866 = (250.0)(C_p)(100.0 - 22)$$

$$C_p = 0.301\ \frac{J}{g^\circ C}$$

Pg. 78 #20

A 250.0 g metal bar requires 5.866 kJ to change its temperature from 22°C to 100.0°C. What is the specific heat of the metal?

Pg. 78 #20

$$q = mC_p \Delta T$$

$$30700 = (1000)(C_p)(630.0 - 20.0)$$

$$C_p = 0.0503 \ \frac{J}{g^\circ C}$$

Pg. 79 #21

$$mC_p\Delta T = -mC_p\Delta T$$

$$(200.0)(4.184)(T_f - 22.0) = -(325.0)(0.131)(T_f - 427)$$

$$836.8(T_f - 22.0) = -42.575(T_f - 427)$$

$$836.8T_f - 18409.6 = -42.575T_f + 18179.5$$

$$879.375T_f = 36589.1$$

$$T_f = 41.6°C$$

Pg. 79 #22

$$mC_p\Delta T = -mC_p\Delta T$$

$$(2000.0)(4.184)(T_f - 24.0) = -(500.0)(0.449)(T_f - 212)$$

$$8368(T_f - 24.0) = -224.5(T_f - 212)$$

$$8368T_f - 200832 = -224.5T_f + 47594$$

$$8592.5T_f = 248426$$

$$T_f = 28.9°C$$

$$\Delta T = 4.9°C$$

Pg. 79 #23

$$-q_{lost} = q_{gained}$$

$$-mC_p\Delta T = mC_p\Delta T$$

$$-(110.0)(C_p)(24.2 - 92.0) = (75.0)(4.184)(24.2 - 21.0)$$

$$C_p = 0.135 \frac{J}{g^\circ C}$$

It could be lead based on the similar specific heat values.

Pg. 79 #24

$$-q_{lost} = q_{gained}$$

$$-mC_p\Delta T = mC_p\Delta T$$

$$-(40.0)(C_p)(21.0-62.0) = (85.0)(4.184)(21.0-19.2)$$

$$C_p = 0.390\,\tfrac{J}{g^\circ C}$$

It could not be gold because the specific heat values are not similar.

Pg. 79 #25

The mass of the ashes do not add up to 20 kg because many of the products of a combustion reaction are gases. These gases were not trapped and escaped to the atmosphere, giving the illusion that mass was lost.

Pg. 79 #29

If 40.0 kJ of energy are absorbed by 500.0g of water at 10.0°C, what is the final temperature of the water?

Pg. 79 #29

$$q_{gained} = mC_p\Delta T$$

$$4\bar{0}000 = mC_p\Delta T$$

$$4\bar{0}000 = (500.0)(4.184)(T_f - 10.0)$$

$$T_f = 29.1°C$$

Pg. 79 #30

$$q = mC_p \Delta T$$

$$q = (500.0)(1)(90.0 - 20.0)$$

$$q = 35\bar{0}00\ cal$$

$$35\bar{0}00\ cal \times \frac{1\ \text{g}}{5500\ cal} = 6.4\ \text{g}$$

Pg. 79 #34

$$-q_{lost} = q_{gained}$$

$$-mC_p\Delta T = mC_p\Delta T$$

$$-(20.0)(C_p)(29.0 - 203.0) = (100.0)(4.184)(29.0 - 25.0)$$

$$C_p = 0.481\frac{J}{g^\circ C}$$

Pg. 79 #35

$$mC_p\Delta T = -mC_p\Delta T$$

$$(50.0)(4.184)(T_f - 10.0) = -(10.0)(4.184)(T_f - 50.0)$$

$$50.0(T_f - 10.0) = -10.0(T_f - 50.0)$$

$$50.0T_f - 500 = -10.0T_f + 500$$

$$60.0T_f = 1000$$

$$T_f = 16.7°C$$

Pg. 79 #36

- Ideally, if we assume that all metals transfer heat directly to the egg, the metal with the lowest specific heat should fry the egg the fastest. Under this assumption, you can reasonably assume the best frying pan is the copper one.

Pg. 79 #37

$$q_{water} = mC_p\Delta T$$

$$q = (800.0)(4.184)(100 - 25)$$

$$q = 251040\ J$$

$$q_{copper} = mC_p\Delta T$$

$$q = (300.0)(0.385)(100 - 25)$$

$$q = 8662.5\ J$$

$$q_{total} = 8662.5\ J + 251040\ J = 345180\ J$$

$$259702.5\ J \times \frac{1\ \mathrm{s}}{628\ J} = 413.5\ s = 6:06:53.5$$

Pg. 79 #38

- Gas particles are sparse in the air. The more contact air particles make with the hot substance, the more heat it will take away upon contact. For this reason, blowing across the surface of the cup cools the drink faster.

Pg. 79 #39

- If both pots are truly boiling, then the potatoes are sitting in water at 100 degrees Celsius in both instances. However, a case can be made that with a vigorous boil more particle collisions are taking place and the interior will be warmed faster.