8.2.1: Practice Problems- The Basics of Energy

PROBLEM 8.2.1.1

A burning match and a bonfire may have the same temperature, yet you would not sit around a burning match on a fall evening to stay warm. Why not?

Answer

The temperature of 1 gram of burning wood is approximately the same for both a match and a bonfire. This is an intensive property and depends on the material (wood). However, the overall amount of produced heat depends on the amount of material; this is an extensive property. The amount of wood in a bonfire is much greater than that in a match; the total amount of produced heat is also much greater, which is why we can sit around a bonfire to stay warm, but a match would not provide enough heat to keep us from getting cold.

PROBLEM 8.2.1.2

Explain the difference between heat capacity and specific heat of a substance.

Answer

Heat capacity refers to the heat required to raise the temperature of the mass of the substance 1 degree; specific heat refers to the heat required to raise the temperature of 1 gram of the substance 1 degree. Thus, heat capacity is an extensive property, and specific heat is an intensive one.

PROBLEM 8.2.1.3

How much heat, in joules and in calories, must be added to a 75.0–g iron block with a specific heat of 0.449 J/g °C to increase its temperature from 25 °C to its melting temperature of 1535 °C?

Answer

50,800 J

12,200 cal

Click here to see a video of the solution

PROBLEM 8.2.1.4

How much heat, in joules and in calories, is required to heat a 28.4-g (1-oz) ice cube from −23.0 °C to −1.0 °C?

Answer

1310 J

313 cal

PROBLEM 8.2.1.5

How much would the temperature of 275 g of water increase if 36.5 kJ of heat were added?

Answer

31.7° C

Click here to see a video of the solution

PROBLEM 8.2.1.6

If 14.5 kJ of heat were added to 485 g of liquid water, how much would its temperature increase?

Answer

7.15 °C

PROBLEM 8.2.1.7

A piece of unknown substance weighs 44.7 g and requires 2110 J to increase its temperature from 23.2 °C to 89.6 °C.

a. What is the specific heat of the substance?
b. If it is one of the substances found in Table 8.1.1, what is its likely identity?

Answer a

$$C = \frac{0.711\ J}{g\ ^\circ C}$$

Answer b

Silicon

Click here to see a video of the solution

PROBLEM 8.2.1.8

A piece of unknown solid substance weighs 437.2 g, and requires 8460 J to increase its temperature from 19.3 °C to 68.9 °C.

a. What is the specific heat of the substance?
b. If it is one of the substances found in Table 8.1.1, what is its likely identity?

Answer a

$$C = \frac{0.390\ J}{g\ ^\circ C}$$

Answer b

Copper

PROBLEM 8.2.1.9

An aluminum kettle weighs 1.05 kg.

a. What is the heat capacity of the kettle (Table 8.1.1)?
b. How much heat is required to increase the temperature of this kettle from 23.0 °C to 99.0 °C?
c. How much heat (in kJ) is required to heat this kettle from 23.0 °C to 99.0 °C if it contains 1.25 L of water (density of 0.997 g/mL and a specific heat of 4.184 J/g °C)?

Answer a

$$C = \frac{0.897\ J}{g\ ^\circ C}$$

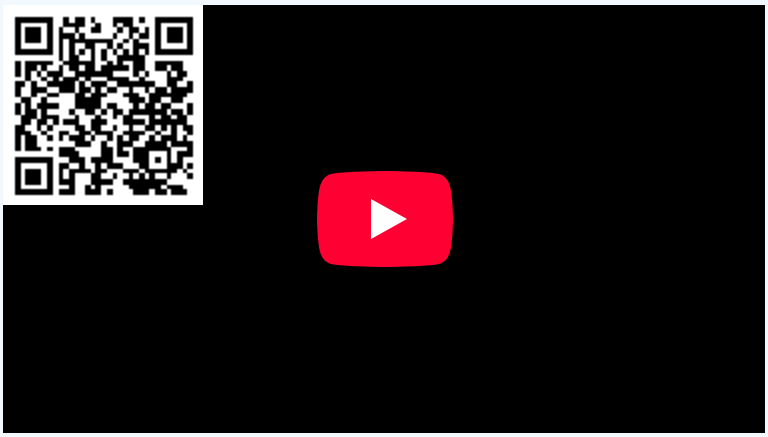
Answer b

71580 J

Answer c

467.86 kJ

Click here to see a video of the solution



Contributors

- Template:ContribOpenStax
- Adelaide Clark, Oregon Institute of Technology
