Example 1

Calculate the specific heat capacity of concrete if 3570 J of heat causes the temperature of a 275 gram sample to change from 11.35 °C to 27.45 °C ?

Solution

Q = 3570 J; m = 275 gram;

Temperature change = 27.45 – 11.35 = 16.1 °C

$Q = mc\Theta$

$3570 = (275) \times c \times (16.1)$

$3570 = 4427.5 \times c$

$c = \frac{3570}{4427.5} = 0.806 \text{ J/g°C}$

Example 2

How much heat is required to raise the temperature of 250.0 g of mercury by 52°C? (specific heat capacity mercury = 140 J / kg° C)

Solution

$m =$ g

$=$ kg

$\Delta\theta =$ °C

$c_{mer} =$ $J\,kg^{-1}\,°C^{-1}$

$Q = mc\Delta\theta$

$= (\quad)(\quad)(\quad)$

$=$ J *

Example 3

216 J of energy is required to raise the temperature of aluminum from 15° to 35°C. Calculate the mass of aluminum. Specific Heat Capacity of aluminum is 0.90 $J°C^{-1}g^{-1}$.

Solution

$Q =$ J

$\Delta\theta =$ °C − °C

$=$ °C

$m = ?$

$c =$ $J°C^{-1}g^{-1}$ ← Note that this unit is in $J°C^{-1}g^{-1}$. So the calculation will obtain the mass value in grams

So $Q = mc\theta$

$= m(\quad)(\quad)$

$\therefore m = \dfrac{\quad}{(\quad)}$

$=$ grams #

Example 4

3.5 kg of liquid X at 95°C is allowed to cool. If the specific heat capacity of liquid is 600J/kg°C and 9550 J of heat energy is released, calculate the final temperature of the liquid.

Note that $\Delta\theta$ is the change of temperature. Just take any higher (hotter) value minus the smaller (colder) value.

m = kg

$\theta_{initial}$ = °C

c = $Jkg^{-1}°C^{-1}$

Q = J

θ_{final} = ?

So, $Q = mc\Delta\theta$

$= mc(\theta_i - \theta_f)$

$= (\quad)(\quad)(\quad - \theta_f)$

$= \quad - \theta_f$

$(\quad)(\quad)$

θ_f = −

= °C ✱

Example 5

The initial temperature of 150g of ethanol was 22°C. What will be the final temperature of the ethanol if 3240 J was needed to raise the temperature of the ethanol? Specific heat capacity of ethanol is 2400 $J°C^{-1}kg^{-1}$.

Solution

$m =$ g

$=$ kg

$\theta_i =$ °C

$\theta_f = ?$

$Q =$ J

$c =$ $J°C^{-1}kg^{-1}$

So $Q = mc\Delta\theta$

$= (\quad)(\quad)(\theta_f - \quad)$

$= \theta_f -$

$\therefore \theta_f =$ +

$=$ °C

Example 6

A bicycle and have a combine mass of 133 kg. How many energy of heat are generated in the brakes when the temperature change from 77°F to 42°C. The specific heat capacity of iron is 450 J/kg°C.

$m =$ kg

$\theta_i = 77^\circ F \rightarrow ^\circ C$

$= -x(\quad -\quad)$

$=$ °C

So $\Delta\theta =$ -

$=$ °C

$c =$ $Jkg^{-1}{}^\circ C^{-1}$

$Q = m\ c\ \Delta\theta$

$= (\quad)(\quad)(\quad)$

$=$ J

@

kJ