More Heat Practice Problems – Answers

1. $C = 3930\ J/kg°C$ $\quad m_A = 312g = 0.312kg$ $\quad m_B = 189g = 0.189kg$

$T_2 = ?$ $\quad T_{1A} = 21.8°C$ $\quad T_{1B} = 95.2°C$

$$Q_A = -Q_B$$
$$m_A \cancel{c}(T_2 - T_{1A}) = -m_B \cancel{c}(T_2 - T_{1B})$$

$$(0.312kg)(T_2 - 21.8°C) = -0.189kg(T_2 - 95.2°C)$$
$$0.312T_2 - 6.8016 = -0.189T_2 + 17.9928$$
$$0.501T_2 = 24.7944$$
$$T_2 = 49.5°C$$

2. $m_A = 94.8g = 0.0948kg$ $\quad m_B = 152g = 0.152kg$ $\quad C = 1700\ J/kg°C$

$T_{1A} = 15.1°C$ $\quad T_{1B} = 27.2°C$

$$Q_A = -Q_B$$
$$m_A \cancel{c}(T_2 - T_{1A}) = -m_B \cancel{c}(T_2 - T_{1B})$$

$$(0.0948)(T_2 - 15.1) = -0.152(T_2 - 27.2)$$

$$0.0948T_2 - 1.43148 = -0.152T_2 + 4.1344$$
$$0.2468T_2 = 5.56588$$
$$T_2 = 22.5°C$$

MORE HEAT PRACTICE PROBLEMS - ANSWERS.

3. Porcelain:

$C_p = 107 J/kg°C$

$m_p = 164g$

$= 0.164kg$

$T_{1p} = 21.2°C$

Water:

$C_w = 4.18 \times 10^3 J/kg°C$

$m_w = 197g$

$= 0.197kg$

$T_{1w} = 95.3°C$

$$Q_p = -Q_w$$

$$m_p C_p (T_2 - T_{1p}) = -m_w C_w (T_2 - T_{1w})$$

$$(0.164kg)(107J/kg°C)(T_2 - 21.2°C) = -0.197kg(4.18 \times 10^3 J/kg°C)(T_2 - 95.3°C)$$

$$17.548 \cdot T_2 - 372.0176 = -823.46 T_2 + 78475.738$$

$$841.008 T_2 = 78847.7556$$

$$T_2 = 93.8°C$$

p.217 2. Crushed Glass

$m_c = 1.35kg$

$C_c = 500 J/kg°C$

$T_{c1} = 23.3°C$

$T_2 = 119°C$

Sand

$m_s = 2.15kg$

$C_s = ?$

$T_{s1} = 156°C$

$T_2 = 119°C$

$$Q_c = -Q_s$$

$$m_c C_c (T_2 - T_{c1}) = -m_s C_s (T_2 - T_{s1})$$

$$\frac{m_c C_c (T_2 - T_{c1})}{-m_s (T_2 - T_{s1})} = C_s$$

$$C_s = \frac{(1.35kg)(500J/kg°C)(119°C - 23.3°C)}{-(2.15kg)(119°C - 156°C)}$$

$$C_s = 812 J/kg°C$$

More Heat Practice Problems - Answers

2. Water:

$m_w = 435g$
$= 0.435\ kg$
$T_{iw} = 95.2°C$
$C_w = 4.18 \times 10^3\ J/kg°C$
$T_2 = 65.2°C$

Other:

$m_o = 435g$
$= 0.435\ kg$
$T_{io} = 14.8°C$
$T_2 = 65.2°C$
$C_o = ?$

$$-Q_w = Q_o$$

$$-\cancel{m_w} C_w (T_2 - T_{iw}) = \cancel{m_o} C_o (T_2 - T_{io})$$

$$C_o = \frac{-C_w (T_2 - T_{iw})}{(T_2 - T_{io})}$$

$$C_o = \frac{-(4.18 \times 10^3\ J/kg°C)(65.2°C - 95.2°C)}{65.2°C - 14.8°C}$$

$$C_o = 2.49\ J/kg°C$$

3. Granite:

$m_g = 2.65\ kg$
$T_{ig} = 85.3°C$
$T_2 = 26.7°C$
$C_g = ?$

$$-Q_g = Q_w$$

$$-m_g C_g (T_2 - T_{ig}) = m_w C_w (T_2 - T_{iw})$$

$$C_g = \frac{m_w C_w (T_2 - T_{iw})}{-m_g (T_2 - T_{ig})}$$

Water:

$m_w = 2.65\ kg$
$T_{iw} = 15.6°C$
$T_2 = 26.7°C$
$C_w = 4.18 \times 10^3\ J/kg°C$

$$C_g = \frac{(2.65\ kg)(4.18 \times 10^3\ J/kg°C)(26.7°C - 15.6°C)}{-(2.65\ kg)(26.7°C - 85.3°C)}$$

$$C_g = 791\ J/kg°C$$