Specific Heat Worksheet

1. A beaker contains 610.0 g of water at 15.0°C. After being heated for 22 minutes the water's temperature rose to 48.0°C. Calculate the heat energy absorbed.

$Q = mc\Delta T$ $610.0 \times 4.19 \times (48.0 - 15.0)$

$843000\,J$ or $8.43 \times 10^5\,J$

2. A beaker contains 270 g of water at 15°C. The water absorbs 24 000 J of energy. What is the water's final temperature?

$FT = IT + \Delta T$

$15 + 21$

36°C

$\Delta T = \frac{Q}{mc}$ $\frac{24000}{270 \times 4.18} = 21°C$

3. Oil has a specific heat capacity of 2.0 J/g.°C. If 200 g of oil absorbs 5 005 J of heat energy to reach a final temperature of 40.0°C, what was its initial temperature?

$IT = FT - \Delta T$

$40.0 - 10$

30°C

$\Delta T = \frac{Q}{mc}$ $\frac{5005}{200 \times 2.0} = 10°C$

4. A beaker contains 405 g of water at 19°C. After being heated for 42 minutes the water's temperature reaches 55°C. Calculate the heat energy absorbed.

$Q = mc\Delta T$ $405 \times 4.19 \times (55 - 19)$

$61000\,J$ or $6.1 \times 10^4\,J$

5. You pour 250 ml of water into a glass just out of the freezer. After a while, you notice that the temperature of the water has fallen from 18°C to 12°C.
   a- Is this an energy transfer or transformation?

   TRANSFER

   b- Calculate the heat energy transfer.

$Q = mc\Delta T$ $250 \times 4.18 \times (12 - 18) = -6300\,J$

   c- Explain if the water gives off or absorbs energy.

Water gives off heat to colder cup

   d- Explain of the glass gave off or absorbed energy.

Cold glass absorbs heat

7. Syrup has a specific heat capacity of 1.3 J/g.°C. If 200 g of syrup absorbs 5 000 J of heat energy to reach a final temperature of 55°C, what was its initial temperature?

$IT = FT - \Delta T$ $\quad 55 - 20$ $\quad = 40°C$

$\Delta T = \frac{Q}{mc}$ $\quad \frac{5000}{200 \times 1.3} = 20°C$

8. What is the mass of water if it absorbs 65 000 J of heat energy to go from a temperature of 75°C to 94°C?

$m = \frac{Q}{\Delta T C}$ $\quad \frac{65000}{(94-75) \times 4.19} = 820g$

9. What is honey's specific heat if 90.0 g are heated for 18.0 minutes and experience a temperature change of 40.0°C absorbing 7 500.0 J of heat?

$C = \frac{Q}{m \Delta T}$ $\quad \frac{7500.0}{90.0 \times 40.0} = 2.08 \text{ J/g.°C}$

10. Water's specific heat is 4.19 J/g.°C. Olive oil's specific heat is 1.9 J/g.°C.
    a- Which one would get hotter faster? Olive oil
    b- Which one would keep its heat for longer? Water
    c- Why would we put water in a car's cooling system over olive oil?

Water has a high SH. so it would take long to get hot. Olive oil will cause car to overheat too quickly because gets hot quickly.

11. When preparing tea, Naomi pours 205 g of boiling water into a porcelain cup. The cup also weighs 205 g. Naomi wants to find the specific heat of the porcelain cup. She obtained the following results:
    - Before pouring the water into the tea cup:
        - temperature of cup = 25°C
        - Initial temperature of water = 105°C
    - After pouring the water into the cup and stirring gently:
        - Final temperature of water = 88°C

Calculate the specific heat capacity of the cup.

$Q = mc\Delta T$
$205 \times 4.19 \times (88 - 105)$
$= -1.5 \times 10^4 J$
Water's energy loss

cup gained

$C = \frac{Q}{m \Delta T}$ $\quad \frac{1.5 \times 10^4}{205 \times (88-25)}$
$= 1.2 \text{ J/g.°C}$