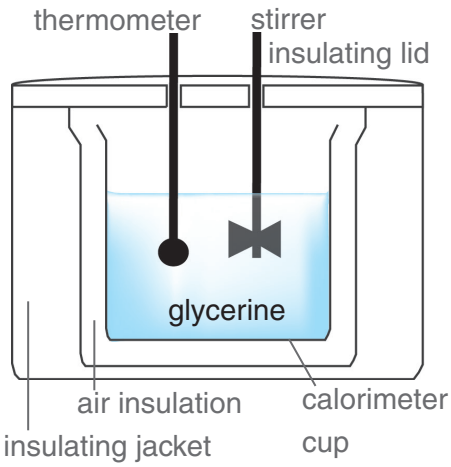
Exercise 18 Date:

1. Write down the law of conservation of heat.

2. The formula for the calculation of heat is: $Q = mc\Delta T$
Write down the meaning and unit of each symbol.

3 Glycerine, with mass 45 g, is placed in a calorimeter as shown in the diagram. The glycerine is at a temperature of 18°C.
The liquid is stirred for a time until the temperature of the liquid and calorimeter rises to 22°C. The heat capacity of glycerine is 105,84 $J \cdot K^{-1}$.



3.1 Calculate the specific heat capacity of glycerine.

3.2 Calculate how much heat is transferred to the glycerine during the stirring process.

4. Calculate the amount of heat required to raise the temperature of 1,7 ℓ water in a kettle from 18°C to 98°C. For water, c = 4 200 $J \cdot kg^{-1} \cdot K^{-1}$. Assume 1 ℓ water = 1 kg.

5 A bullet with a mass of 25 g is moving at 95 $m \cdot s^{-1}$ when it hits a target. The temperature of the bullet rises from 15°C to 38°C.

5.1 Calculate the kinetic energy of the bullet just before it hits the target. Use the formula $E_K = {}^1/_2 mv^2$.

5.2 How much heat energy is transferred to the bullet during the impact with the target?

5.3 Calculate the heat capacity of the bullet.

5.4 Calculate the specific heat capacity of the bullet.

6 Mercury, with a mass of 300 g is in a sealed glass tube. The tube is now turned over 25 times so the mercury falls a height of 1,25 m each time. The temperature of the mercury rises from 21,8°C before the first fall to 24°C after the 25th fall.

6.1 Use the formula $E_P = mgh$ and calculate the potential energy of the mercury relative to the bottom of the tube at the moment that the tube is turned over.

6.2 How much heat energy is transferred to the mercury each time that the mercury falls 1,25 m? Assume that no energy is converted into any other forms.

6.3 Calculate the total amount of heat energy transferred to the mercury after it has fallen 25 times.

6.4 Calculate the heat capacity of the mercury.

6.5 Calculate the specific heat capacity of the mercury.

Notes