

Specific Heat & Heat Gain or Loss

NAME _____

Partners _____

1. The specific heat of a substance is the quantity of heat (calories) needed to raise the T° of 1g of a substance by 1°C . The specific heat of water is _____.
2. The higher the specific heat of a substance, the _____ heat is needed to raise its T° . If a substance has a high specific heat, it will heat up and cool off (quickly / slowly).
3. _____ has the highest specific heat of any natural substance, so it heats and cools _____.
4. According to p16 (the back) of the ESRT, what's the symbol for "specific heat?" _____
5. What's the unit of specific heat? _____

HEAT GAIN or LOSS with water

o Calculate heat gain or loss for a substance, we use the formula:

heat gained or lost (Q) = mass (g) x temp. change (Δt) x specific heat of the substance (C_p)

$$Q \text{ (calories)} = m \times \Delta t \times C_p$$

since the specific heat of water = $1 \text{ cal/g}^{\circ}\text{C}$, you can ignore spec. heat with water problems.

For example, how much heat must be added to 15g of water to raise its temperature 20°C ?

$$\# \text{ cals. needed (Q)} = 15\text{g} \times 20^{\circ}\text{C} = \underline{\underline{300\text{cals.}}}$$

6. How many calories of heat energy must be added to 10g of liquid water to raise its T° 15°C ?
7. How many calories does it take to raise the temperature of 100g of liquid water 25°C ?
8. How many calories of heat energy are needed to raise the temperature of 16g of water from 20°C to 30°C ?

9. How many calories of heat energy are needed to change the temperature of 25g of water by 20°C?

10. How many calories of heat are released as 32g of water are cooled from 80°C to 65°C?

HEAT GAIN or LOSS with Other Substances

When calculating heat gain or loss for substances other than water, we must take their *specific heat* into account (remember the complete formula on ESRT p.16). Example: how much heat is lost by a 10g sample of basalt as it cools from 80°C to 20°C? (see spec. heat of basalt on ESRT p.16)

$$Q = m \times \Delta t \times C_p \quad (\Delta t = 80^\circ - 20^\circ = 60^\circ)$$

$$Q = 10\text{g} \times 60^\circ\text{C} \times 0.2\text{cal/g/}^\circ\text{C} = \underline{\underline{120 \text{ calories}}}$$

11. How much heat energy is needed to change the T° of 15g of granite from 15°C to 20°C?

12. How much heat is lost from 50g of dry air as it cools from 25°C to 15°C?

13. How many calories of heat are needed to change the temp. of 25g of copper by 20°C?