heat units during temperature changes

CAeMis+ry: http://genest.weebly.com

Stop in for help every day at lunch and Tues, Weds., &Thurs after school!

After-hours question? Email me at home: eagenest@madison.k12.wi.us

Name KEY

Period

1. Using your algebra skills rearrange Q = (m) (C) (ΔT) to isolate the indicated variable in each case (isolate means 'get it on one side of the equals sign by itself).

Isolate C	Isolate ΔT
$Q = mc\Delta T$ rearranges to $\frac{Q}{m\Delta T} = C$	$Q = mc\Delta T$ rearranges to $\frac{Q}{mc} = \Delta T$

2. How much heat is absorbed by 20g granite boulder as energy from the sun causes its temperature to change from 10°C to 29°C? (Specific heat capacity of granite is 0.1 cal/g°C)

$q = (20g)(0.1 \frac{cal}{g°c})(19°c)$

$q = 38 \approx 40$ calories

3. How much heat is released when 30 g of water at 96°C cools to 25°C? The specific heat of water is 1 cal/g°C

$q = (30g)(1 \frac{cal}{g°c})(-71°c)$

$q =$

4. Applying the physicist's definition of the term heat, decide whether or not there is any heat occurring to the object in italics. For each object you should indicate whether the heat is negative, zero or positive.
   a) An *ice cube* is placed in a cup of hot coffee POSITIVE
   b) A pot of *hot tea* is sealed into a well-insulated thermos zero
   c) Some cold cream is poured into a cup of *hot coffee* NEGATIVE
   d) You blow *air* across a bowl of hot soup POSITIVE
   e) *You* jump into an ice cold pond NEGATIVE

5. How much heat will raise a pot of 800 g of water from 20 °C to 90 °C?

$q = (800g)(1 \frac{cal}{g°c})(+70°c)$

$q = 56000$ calories

6. What happens when you place two objects at different temperatures in contact with each other?

Heat flows from the hot object to the cold until they are equal temper

7. If a 3.1g ring is heated using 10.0 calories, its temperature rises 17.9°C. Calculate the specific heat capacity of the ring.

$q = mC\Delta T$ rearranges to $\frac{q}{m\Delta T} = C$

$\frac{(10.0\text{ cal})}{(3.1\text{g})(17.9^\circ\text{C})} = C$

ANSWER:

8. The temperature of a sample of water increases from 20°C to 46.6°C as it absorbs 5650 calories of heat. What is the mass of the sample? (Specific heat of water is 1.0 cal/g °C)

$\frac{q}{C\Delta T} = m$

$\frac{5650\text{ cal}}{(1.0\frac{\text{cal}}{\text{g}^\circ\text{C}})(26.6^\circ\text{C})} = m$

210 = grams

9. The temperature of a sample of iron with a mass of 10.0 g changed from 50.4°C to 25.0°C with the release of 47 calories of heat. What is the specific heat of iron?

$\frac{q}{m\Delta T} = C$

$\frac{47\text{ calories}}{(10.0\text{g})(-25.4^\circ\text{C})} = C$

$0.19\frac{\text{cal}}{\text{g}^\circ\text{C}}$

10. A 4.50 g coin of copper absorbed 54 calories of heat. What was the final temperature of the copper if the initial temperature was 25°C? The specific heat of copper is 0.092 cal/g°C. (1) FIND ΔT (2) THEN FIND FINAL temp

$\Delta T = \frac{q}{mC}$

$\Delta T = \frac{54\text{ cal}}{(4.50\text{g})(0.092\frac{\text{cal}}{\text{g}^\circ\text{C}})}$ $\Delta T = 130^\circ\text{C}$

$\Delta T = T_f - T_i$

$\Delta T + T_i = T_f$

$(130) + (25) = T_f$

11. A 155 g sample of an unknown substance was heated from 25°C to 40°C. In the process, the substance absorbed 569 calories of energy. What is the specific heat of the substance?

$C = \frac{Q}{m\Delta T}$

$C = \frac{569\text{cal}}{(155\text{g})(+15^\circ\text{C})}$ $C = 0.24\frac{\text{calories}}{\text{g}^\circ\text{C}}$

12. What is the specific heat of an unknown substance if a 2.50 g sample releases 12 calories as its temperature changes from 25°C to 20°C?

$C = \frac{Q}{m\Delta T}$

$C = \frac{12\text{ calories}}{(2.5\text{g})(-5^\circ)}$ $C = 0.96\frac{\text{cal}}{\text{g}^\circ\text{C}}$