

Warm-up:

Loosen Up! I

When heat energy is added to most objects, they expand. For equal changes in temperature, the amount of expansion depends in part on the dimensions of the object as well as the material it is made of. Two rods of different metals but of equal length would expand different amounts due to the difference in the material. Two rods made of the same material but of different lengths would expand different amounts due to the difference in their lengths.

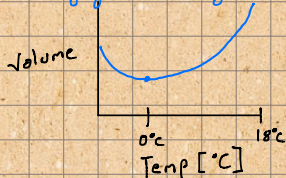
A common way to loosen a metal lid that is screwed tightly to a glass jar is to run hot water over the lid and jar top. Explain why this loosens the lid.

• Thermal Expansion: as temp increases, KE ↑ causing molecules to spread out

↳ Almost all compounds expand when heated and contract when cooled

↳ Water expands when freezing

↳ Very good at hydrogen bonding



★ If this was not true, all water micro organisms would not survive

• Specific Heat Capacity: amount of energy transferred in order to raise 1 gram of compound by 1°C

$$C_p = \frac{J}{g \cdot ^\circ C}$$

heat energy ↑ mass ↑ specific heat ↑ change in Temp

$$Q = m \cdot C_p \cdot \Delta T$$

Ex: How much thermal energy is needed to heat

2,000g of Copper from 21°C to 35°C? $C_p = 0.3845 \frac{J}{g \cdot ^\circ C}$

$$Q = 2,000g \cdot 0.3845 \frac{J}{g \cdot ^\circ C} \cdot [35^\circ C - 21^\circ C]$$

$$= 10,766J = 10,770J$$

• Newton's Law of Cooling: rate at which an object cools depends on the temp difference between object & environment

↳ i.e. Rate of cooling is proportional to temp change

Think about it:

1. What will cool faster, a hot cup of tea or a lukewarm cup of tea?

↳ Rate of hot tea will be greater due to temp difference

2. You have coffee served about 5 minutes before you're ready

for it. For it to be as hot as possible, should you pour

the cream in right away or when you are ready to drink it?

↳ Right away to lower temp difference

