Thermal Expansion of Solids and Liquids (SwiftStudy Printable)

For Solids

$$\Delta L = L_0 \, \alpha \Delta T$$
$$\Delta A = 2A_0 \, \alpha \Delta T$$
$$\Delta V = 3V_0 \, \alpha \Delta T$$

ΔL (ΔA, ΔV)	change in length (area, volume)	m (m^2, m^3)
L_o (A_o, V_o)	initial length (area, volume)	m (m^2, m^3)
α	coefficient of linear expansion	/°C
ΔT	change in temperature	°C

For Liquids

$$\Delta V = V_0 \, \beta \Delta T$$

ΔV	change in volume	m^3
V_o	initial volume	m^3
β	coefficient of volume expansion	/°C
ΔT	change in temperature	°C

Tips to Remember

- The coefficients of linear and volume expansion are properties of the material (aluminum, concrete, etc.). Tables of these properties can be found in many physics textbooks as well as online.
- Though the table above specifies the SI units of length and volume, the real requirement is simply to make sure that L and L_o (or V and V_o, etc.) have the same units. For example, many liquid volume expansion problems will use liters rather than cubic meters.
- You may use Kelvins instead of °C, since only the **change** in temperature matters. Just don't try it with Fahrenheit. Getting 100 °C warmer is the same as getting 100 K warmer, but it isn't the same as getting 100 °F warmer.
- Contrary to what some people expect, a hole in an object will grow rather than shrink when the object expands. If you are among those who expected that the expanding object would fill in the hole as it expands, try picturing this: A group of people stand in a circle holding hands. If they get farther apart, as the molecules in a solid do when the solid expands, does the circle get smaller or larger?