Law of Conservation of Mass:

"In any kind of physical or chemical process, mass is neither created nor destroyed - the mass before the process equals the mass after the process." - the total mass of the system does not change, the total mass of the products of a chemical reaction is always the same as the total mass of the original materials.

"Physics for scientists and engineers," 4th edition, Vol.1, Raymond A. Serway, Saunders College Publishing, 1996.

Ex.

1) When wood burns, mass seems to disappear because some of the products of reaction are gases; if the mass of the original wood is added to the mass of the oxygen that combined with it and if the mass of the resulting ash is added to the mass o the gaseous products, the two sums will turn out exactly equal.

2) Iron increases in weight on rusting because it combines with gases from the air, and the increase in weight is exactly equal to the weight of gas consumed. Out of thousands of reactions that have been tested with accurate chemical balances, no deviation from the law has ever been found.

Law of Conversation of Energy:

The total energy of a closed system is constant.
Matter is neither created nor destroyed – total mass of reactants equals total mass of products

You can calculate the change of temp by simply understanding that energy **and** the mass is conserved - it means that we added the two heat quantities together we can calculate the change of temperature by using the law or measure change of temp and show the conservation of energy

E1 + E2 = E3 -> E(universe) = E(System) + E(Surroundings)
M1 + M2 = M3

Is T1 + T2 = unknown

(No, no law of conservation of temperature, so we have to use the concept of conservation of energy)

Total amount of thermal energy in beaker of water in absolute terms as opposed to differential terms (reference point is 0 degrees Kelvin)

Knowns: M1, M2, T1, T2 (Kelvin)

When add the two together, want to know what T3 and M3 are going to be.
Can't add the two temp together, so need to introduce the concept of conservation of energy.