Physics I

Latent Heat

Problem 1.- A 10-gram bullet made from an alloy is found to have melted on impact with an armored truck. Assuming the bullet was fired at room temperature (20° C) estimate the minimum muzzle velocity of the bullet.

Recall that kinetic energy is $KE = \dfrac{1}{2}mv^2$

Specific heat capacity of the alloy $c = 120\dfrac{J}{K \cdot kg}$

Melting point of the alloy $T = 330°C$

Latent heat of the alloy $L = \dfrac{24{,}000J}{kg}$

Problem 1a.- How fast would a silver bullet had to go to melt on impact assuming all the kinetic energy goes to the bullet?
Consider the initial temperature T=20ºC
Melting point of silver = 961 ºC
Latent heat of fusion of silver=88J/g, specific heat of silver=0.23J/gram ºC

Problem 2.- Is it possible to boil water at room temperature (27ºC)? Explain.

Problem 3.- You add a cube of ice (mass 8 grams) at T=0ºC to a 300-gram drink at T=18ºC (consider the drink to be mainly water).
Calculate the final temperature of the mixture assuming no heat is transferred to the surroundings.
Latent heat of fusion of ice 80cal/g
Specific heat of water 1cal/gram ºC

Problem 3a.- How much ice at T=0 ºC do you need to add to a 300-gram drink at T=18ºC (consider the drink to be mainly water) to cool it down to T=0 ºC?
Assume no heat is transferred to the surroundings.
Latent heat of fusion of ice 80cal/g
Specific heat of water 1cal/g ºC