PHYS 202 Specific heat & Latent Heat Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

   

1. Fruit blossoms are permanently damaged when the temperature drops below about –4 °C (a “hard freeze”). Orchard owners sometimes spray a film of water over the blossoms to protect them when a hard freeze is expected. From the point of view of phase changes, give a reason for the protection.

2. At a fabrication plant, a hot metal forging has a mass of 75 kg and a specific heat capacity of 430 J/(kg·C°). To harden it, the forging is immersed in 710 kg of oil that has a temperature of 32 °C and a specific heat capacity of 2700 J/(kg·C°). The final temperature of the oil and forging at thermal equilibrium is 47 °C. Assuming that heat flows only between the forging and the oil, determine the initial temperature of the forging.

3. A woman finds the front windshield of her car covered with ice at –12.0 °C. The ice has a thickness of 4.50×10–4 m, and the windshield has an area of 1.25 m2. The density of ice is 917 kg/m3. How much heat is required to melt the ice?
(Specific heat of ice = 2000 J/(kg.K), Latent heat of fusion of ice = 33.5 x 104 J/kg)

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*3. To sterilize a 50.0-g glass baby bottle, we must raise its temperature from*  *to**. How much heat transfer is required?* Specific heat of glass = 840 J/(kg.C0). [3070 J]

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| 4. *The same heat transfer into identical masses of different substances produces different temperature changes. Calculate the final temperature when 1.00 kcal of heat transfers into 1.00 kg of the following, originally at* *: (a) water; (b) concrete; (c) steel; and (d) mercury.* Cwater = 1.00 kcal/(kg.C0), Cconcrete = 0.20 kcal/(kg.C0), Csteel = 0.108 kcal/(kg.C0), Cmercury = 0.0333 kcal/(kg.C0),Answer: a. 21.0 0C, b. 25.0 0C c. 29.30C d. 50.0 0C |
| *6. A 0.250-kg block of a pure material is heated from  to  by the addition of 4.35 kJ of energy. Calculate its specific heat and identify the substance of which it is most likely composed.* [0.0924 kcal/kg.C0, Cu] |
| *11. How much heat transfer (in kilocalories) is required to thaw a 0.450-kg package of frozen vegetables originally at*  *if their heat of fusion is the same as that of water?* [35.9 kcal] |
| *24. A 0.0500-kg ice cube at*  *is placed in 0.400 kg of*  *water in a very well-insulated container. What is the final temperature?* [20.60C] |