

Physics 317

Homework #9 – Due in class Mon Nov 21 by EOB Tues Nov 22.

1. The latent heat of fusion of ice at 1 atm and 273 K is 3.3e5 J/kg . The density of ice under these conditions is 917 kg/m^3 and the density of water is 999.8 kg/m^3 . If 1 kg of ice is melted, what will be
 - a. the work done
 - b. the change in internal energy
 - c. the change in entropy
2. 10 kg of water at 10 C is converted to ice at -20 C by being put in contact with a reservoir at -10 C. The process takes place at constant pressure. Use for the heat capacities of water and ice at constant pressure 4.18 J/g/K and 2.09 J/g/K , respectively. The latent heat of fusion for water is 3.35 e5 J/kg .
 - a. how much energy is required to
 - i. reduce water temp to 0 C
 - ii. freeze the water
 - iii. reduce ice temp to -20 C
 - b. Calculate changes in entropy, and fill in the table below:

	ΔS_{system}	$\Delta S_{\text{reservoir}}$
Cool water to 0 C		
Freeze water		
Cool ice to -20 C		

- c. What process drives the entropy change, reduction in water temp from to freezing, the freezing process or the further reduction of ice temperature?
3. Dietericci equation as found in problem 12.15 on page 305 of Baierlein.
 - a. Rewrite the Dietericci equation of state in terms of the volume per particle, $v=N/V$, P , T .
 - b. Find the critical parameters, v_c , P_c , T_c