Entropy Practice Problems – answer key

1. A) positive b) negative c) positive
2. ΔHf is defined as zero for elements in standard state. There is no absolute enthalpy value. Entropy is zero in a perfectly ordered crystal at 0K. Because 298K is above 0K, elements (or anything) in standard state cannot be zero.
3. ΔSrxn =-144.24 J/mol\*K
4. An endothermic reaction can be spontaneous if the temperature x entropy change is greater than the increase in enthalpy
5. If entropy decreases and enthalpy decreases, the overall reaction can still be spontaneous
6. A)-284.12 J/molK

b) -176.34 kJ

c) -91.7 kJ, yes it is spontaneous

d) drive for greater stability. The reaction is exothermic so products are more stable than reactants. Entropy decreases, so the drive for maximum entropy would favour reactants

e) ΔG would be positive, so reaction would be no longer spontaneous, because the TΔS term would be bigger than the ΔH term

7. a) -326.4 kJ, spontaneous b) -361.88 kJ, spontaneous

8. ΔS = 137.37 J/mol\*K ΔH = -285.34 kJ; ΔG = -322.8 kJ, temperature is different and temperature affects gibbs free energy

9. a) no b) yes, gibbs free energy change is negative

10. 4C + S8 🡪 4 CS2 ΔSf = 4(151) – [4(5.69) + 31.9] = 549.34 J/mol\*K; ΔG = 4(87.9) – 298(0.54934) = 187.89kJ/4 mol=46.97 kJ/mol