

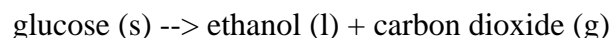
Due Wednesday, 9/29/99, in class.

Show your work. Problem sets will be spot graded. Work must be shown.

$$R = 0.08206 \text{ liter atm K}^{-1} \text{ mole}^{-1} = 8.314 \text{ J K}^{-1} \text{ mole}^{-1}$$

1. Some organisms such as yeast convert glucose to ethanol.

(a) Write a balanced equation for the process



and calculate H , q , w , and E for the reaction of 1 mole of glucose at 298K, 1 atm. Neglect the volumes of solids and liquids.

(b) Suppose the same reaction is carried out by a thermophilic organism which lives at 80°C, 1 atm. Calculate H under these conditions. Ignore the heats of solution of the products and reactants. $C_p(\text{ethanol(l)}) = 111.5 \text{ J/moleK}$, $C_p(\text{glucose(s)}) = 210 \text{ J/moleK}$, $C_p(\text{carbon dioxide(g)}) = 37.1 \text{ J/moleK}$.

(c) Suppose the same reaction is carried out at 1 atm in an insulated container so that no heat is lost to the surroundings. If the reaction occurs in 1 kg of water (again ignore heats of solution), what is the final state of the water -- temperature and phase? This time assume the total reaction solution has the same heat capacity as liquid water (4.18 kJ/kgK) and that the reaction itself occurs quickly -- it is complete at 298K, before any temperature changes can occur.

(d) Which process a, b, or c does more work? Briefly explain why.

2. T,S,&W Ch 3 Pb 6

3. T,S,&W Ch 3 Pb 15

4. T,S,&W Ch 3 Pb 17

5. T,S,&W Ch 3 Pb 24

6. T,S,&W Ch 3 Pb 26

7. T,S,&W Ch 3 Pb 27