

Chemistry 520
Winter Quarter 2012
Take Home Quiz 1
*** Updated January 11, 2012 ***

This quiz is due in class on Monday, Jan. 16, 2012
Submit your answers on single sided paper.

1. State whether each of the following systems is closed or open and whether it is isolated or nonisolated:
 - (a) a system enclosed in rigid, impermeable, thermally conducting walls;
 - (b) a human being;
 - (c) the planet earth.
2. The heat capacity of a substance is sometimes called the *molar heat capacity* (C_m) when the basis is 1 mol of that substance. What is the relationship between molar heat capacity and the specific heat capacity?
3. The heat of combustion of $\text{H}_2(\text{g})$ to form $\text{H}_2\text{O}(\text{l})$ under constant-pressure conditions is -285.83 kJ/mol at 25°C . If the water is formed at 1.00 bar and has a density of $1.00 \times 10^3 \text{ kg/m}^3$, calculate ΔU for this reaction. 1 bar is defined as 100 kPa exactly.
4. A sample consisting of 1.00 mol of a monoatomic perfect gas, for which $C_{V,m} = 1.5R$, initially at $p_1 = 1.00 \text{ atm}$ and $T_1 = 300 \text{ K}$, is heated reversibly to 400 K at constant volume. Calculate the final pressure, ΔU , q , and w .
5. A woman slowly lifts a 30.0 kg object to a height of 2.00 m above its initial position. Find the work done on the object by the woman, and the work done by the earth.
6. Calculate the work done when 50 g of iron reacts with hydrochloric acid to produce hydrogen gas in (a) a closed vessel of fixed volume, and (b) an open beaker at 25°C .
7. When a ball of mass m is dropped through a height difference Δh , its potential energy changes by an amount $mg\Delta h$, where g is the acceleration of gravity, equal to 9.81 m/s^2 . Suppose all this energy gets dissipated into the internal energy of the ball once it has stopped bouncing. If the specific heat of the material in the ball is 0.850 J/g-K , calculate the height from which the ball must be dropped to increase the temperature of the ball by 1.00°C .