Quiz #9

CHEM 1411 — Spring 2019

Due Thursday, March 28 by 8:00 am

Late papers will not be accepted!

Specific Heat and Calorimetry

1. Ethylene glycol, the main ingredient in antifreeze, has a specific heat capacity of 2.42 J/g °C. How many kJ of heat would be required to raise the temperature of 1500. g of ethylene glycol from 85°C to 135°C. (10 pts)

2. Valyrian steel is a metal first produced in the ancient city of Valyria, which is lighter in weight than ordinary steel and keeps an edge without the need for honing. If 150.0 kJ of heat energy is added to a 1250 g sample of Valyrian steel initially at 25.0°C, what is the final temperature of the sample? (The specific heat of Valyrian steel is 0.155 J g^{-1} °C^{-1}.)(10 pts)

3. A 30.00 g sample of a metal was heated in a test tube to 100.00°C in boiling water and carefully added to a coffee-cup calorimeter containing 50.00 g water. The water temperature increased from 22.00°C to 25.45°C. What is the specific heat capacity of the metal? (Assume all the heat is gained by the water.) (10 pts)

The Gas Laws

4. A sample of gas has an initial volume of 35.0 L at a pressure of 1.55 atm. If the sample is
    compressed to a volume of 15.0 L, what will its pressure be?   (10 pts)

5. A sample of helium gas has a volume of 12.5 L at -25.0°C. What will be the volume of the
    gas at a temperature of 35.0°C?   (10 pts)

6. Before going on a long drive your car tires have a pressure of 5.19 atm at 22.5°C. After
    driving for several hours, the temperature of the tires rises to 45.0°C. What pressure would
    you expect the tires to have at that temperature?   (10 pts)

7. What is the pressure in atm of a sample of 64.0 g of oxygen gas in a 5.00 L container and a
    temperature of 35°C?   (10 pts)

8. How many grams of neon are in a 20.0 L steel tank at a pressure of 987 torr and a temperature of 23°C? (10 pts)

Partial Pressures

9. A mixture of 50.0 g O_2 and 150.0 g N_2 is placed in a 1.00 L container at 27ºC. Calculate the partial pressure of each gas , and the total pressure. (10 pts)
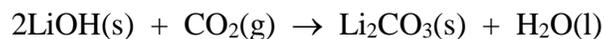
P_{O2} _____

P_{N2} _____

P_{total} _____

Gas Law Stoichiometry

10. Lithium hydroxide, LiOH, is used in spacecraft to recondition the air by absorbing the carbon dioxide exhaled by the astronauts. The reaction that occurs is:

$$2LiOH(s) + CO_2(g) \rightarrow Li_2CO_3(s) + H_2O(l)$$

How many grams of LiOH (MM 23.95 g/mol) are needed to absorb 625 L of CO_2 gas at a pressure of 258 mmHg and a temperature of 27.0ºC? (10 pts)