Quiz 1

CHEM 2011: Introduction to Thermodynamics

January 25, 2023

First name (please write as legibly as possible within the boxes)

Last name

Student ID

Question:	1	2	3	Total
Points:	2	3	5	10
Score:				

Instructions:

1. Answer all questions. Write your answers on the space provided. No other paper is allowed.
2. All work must be clearly shown.
3. No credit will be given to any answer without adequate justification.
4. All solutions should be articulate and complete.
5. Do not ask any questions during the test.
6. The definitions and notations in the textbook are used.
7. Use your own judgement to decide when you can quote a result to support your reasoning.
8. No aids of any kind are permitted.

GOOD LUCK!!!

1. (2 points) Complete the sentences below using the following choice of words: OPEN, CLOSED, ISOLATED, ADIABATIC, and DIATHERMAL.

   (a) (1) A plastic container is used to store warm leftover food. The container becomes warm to touch as a result. This indicates that the walls of the container are: _____.

   (b) (1) The container seals tightly and no matter can leave the container. The container is a _____ system.

2. (3 points) Sodium metal reacts with chlorine gas to produce sodium chloride according to the following unbalanced equation:

$$Na_{(s)} + Cl_{2(g)} \rightarrow NaCl_{(s)}$$

   Determine the *limiting regent* and calculate *how many grams* of NaCl are formed, when 275 mL of chlorine gas at a temperature of 475°C and 5.6 atm are mixed with 0.15 g of sodium metal?

	Na	Cl
Molar Mass (g/mol)	22.99	35.45

3. (5 points) Two connected vessels are separated by a value. The first vessel has a volume of 350 cm^3 and contains nitrogen N_2 at 28°C and a pressure of 2 bar. The second vessel has a volume of 750 cm^3 and contains helium He at 21°C and a pressure of 1200 mm Hg.

	N	He
Molar Mass (g/mol)	14.01	4.00

(a) (1) Consider the conditions under which the two different gas samples are held. Circle the correct answer.

i. (0.5) Which molecules/atoms have the higher average kinetic energy?

N_2 He

ii. (0.5) which molecules/atoms have the higher root mean square speed?

N_2 He

(b) (4) The valve between the two containers is then opened and both are heated to 35°C. Determine the final total pressure, P_{total}, and the partial pressures of nitrogen and helium P_{N_2} and P_{He}, in the vessels. Report pressures in *bar*.