

MEMS 0051
Spring 2020
Midterm #1
2/14/2020

Name (Print): _____

This exam contains 2 pages (including this cover page) and 2 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books or notes. Calculators are permitted on this exam.

The following rules apply:

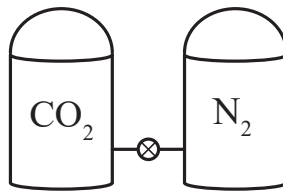
- All work must be done in the blue testing book. Any work done on the exam question sheet will not be graded.
- All work must be substantiated. A result with no methodology and mathematics will not be graded.
- Do not write in the table to the right.

Problem	Points	Score
1	50	
2	50	
Total:	100	

Bonus: This day, February 14th, 1876, marks the day Alexander Graham Bell filed a patent for what device?

Written Problem #1

1. (50 points) Two rigid tanks are connected by a ball valves, as shown below. In one tank, there exists 200 [kg] of carbon dioxide at 100 °C and 425 [kPa]. The other tank, with a volume of 25 [m³], contains nitrogen at 125 °C and 125 [kPa]. The valve is then opened, and the gases are allowed to mix. If the final equilibrium temperature is 25 °C, determine:
- The final equilibrium pressure within the system;
 - The total heat transferred during this process;
 - Ensure the gases can be treated as Ideal gases only after items a) and b) have been completed. Failure to complete items a) and b) will result in those two items being marked incorrect.



Schematic for Written Problem #1

Written Problem #2

2. (50 points) 1 [kg] of ammonia in a piston-cylinder device goes from an initial state of 49.37 °C and 3,000 [kPa] to a final state of 49.37 °C and 1,723 [kPa] in an isothermal process. Determine the amount of heat supplied to and the work done by the system. *Hint: this process is not purely isothermal.*