PROPELLANT WORD PROBLEMS

A SPHERICAL VESSEL IS FILLED WITH A GAS. THE EXPERIMENTAL MEASUREMENTS ARE AS FOLLOWS:
- Circumference: 12.0 feet
- Open Empty Weight: 3.00 lb
- Full of gas: 2.65 lb
- Temperature (gas + ambient): 70°F
- Gas Pressure (inside vessel): 2.0 psig
- Air Pressure - standard atmosphere
- M (air): 29 g/mol

a. What is the weight of the gas in the vessel? ____________________________
b. What is the molecular weight of the gas? ____________________________
c. What is the density of the gas in the vessel? ____________________________

A VESSEL HAS A VOLUME OF 2.0 FT³. IT CONTAINS A GAS AT 3000 PSI AND TEMPERATURE OF 5100°F.
If the gas cools to 600°F, what will be the gage pressure in the vessel? ____________________________

A PROPELLANT PRODUCES A GAS WITH AN AVERAGE MOLECULAR WEIGHT OF 26.
The gas contains 13% water by weight. What weight of propellant is required to fill a vessel of 350 in³ with gas at 400 psig at 80°F? ____________________________

A PROPELLANT CHARGE IS REQUIRED TO PRODUCE 2.0 LB OF GAS IN A PERIOD OF 8.0 SECONDS. IT IS TO BE AN END-BURNING CHARGE OF CONSTANT BURNING SURFACE. THE BURNING RATE OF THE PROPELLANT IS 0.40 INCHES/SECOND. THE DENSITY OF THE PROPELLANT IS 0.055 LB/IN³. NO SOLIDS OR CONDENSATES ARE PRODUCED BY THE PROPELLANT.

a. What length of charge is required? ____________________________
b. What diameter of charge is required? ____________________________

THE PROPELLANT CHARGE IN PROBLEM #4 IS TO BE OPERATED IN A COMBUSTION CHAMBER AT 910 PSIG.
The discharge coefficient of the propellant is 7.21 X 10⁻³ LBM/LBF·SEC#

a. What will be the required nozzle throat area? ____________________________
b. What will be the required nozzle throat diameter? ____________________________


What is the pressure of the gas in the cylinder at the end of the stroke? ____________________________