INSTRUCTIONS (ITEMS 1-12): All of these items are typical single step conversions; the equivalence or the conversion factor is provided for each of the items. Write the equivalence equation or conversion factor and then solve the problem.

Convert 3.82 gal to L: \( \text{gal} = 3.785 \text{ L} \)
1. Conversion factor: 
2. Solution: 

Convert 18.2 kilogram to grams: \( \text{kg} = 10^3 \text{ g} \)
3. Conversion factor: 
4. Solution: 

Convert 16.80 fluid ounces to milliliters: \( \text{oz} = 29.57 \text{ mL} \)
3. Conversion factor: 
4. Solution: 

Convert 56 centimeters to meters: \( \frac{\text{m}}{10^2 \text{ cm}} \)
5. Equivalence equation: \( \frac{\text{m}}{10^2 \text{ cm}} \)
6. Solution: 

Convert 10.5 quarts to gallons: \( 4 \text{ qt} = \text{ gal} \)
7. Conversion factor: 
8. Solution: 

Convert 0.0765 L to milliliters: \( 10^3 \text{ mL} = \text{ L} \)
9. Conversion factor: 
10. Solution: 

Convert 72.6 kilograms to pounds: \( 2.20 \text{ lb} = \text{ kg} \)
11. Conversion factor: 
12. Solution:
INSTRUCTIONS (ITEMS 13-16): All of these items are conversions that must be carried out by more than one step; the equivalence equations to be used in each case are given. Solve the problem using the equivalence equations provided to produce the necessary conversion factors. Show all calculations.

Convert 2.00 L to ounces: $L = 10^3 \text{ mL}; \quad \text{oz} = 29.6 \text{ mL}$
13-14. Solution:

Convert 1000 cubic centimeters (cm$^3$) to cubic inches (in$^3$): $\text{in} = 2.54 \text{ cm}$
13-14. Solution:

15-16. A 100mL graduated cylinder is filled with water several times and poured into a container. When the container is completely filled, the weight of the water is 4.4 lb. How many times was the graduated cylinder emptied into the container? Hint the density of water is 0.98 g/mL ($\text{ml H}_2\text{O} = 0.980 \text{ g}$). 1 lb = 454 g.

(Items 17-21) The formula for the ideal gas law is $PV = nRT$ where $P$= pressure in atmospheres (atm), $V$= volume in liters, $n$= moles, $R$= ideal gas constant, $T$= temperature in Kelvin (K).

17. Solve for $n$
   
   $n =$

18. Solve for $P$
   
   $P =$

19. Solve for $V$
   
   $V =$

20-21. Standard temperature and pressure (STP) is 273 K and 1 atm. The volume of one mole of a gas at STP is 22.4 L. Using the ideal gas law equation and the above value for $K$, $P$, $n$ and $V$ above, calculate the value of $R$ to three significant digits. Show all steps of your solution; Place your answer in this space:

   ______________________________________________________________________

   Look up the value in the text to make sure you are correct.

   Write the correct value here: ___________________________
(Items 22-25) The number of moles (n) of a substance is determined by dividing the mass (in grams) of a substance by its formula mass (FM); thus \( n = \frac{g}{FM} \).

22. Solve this expression for FM.

\[ FM = \]

23. Calculate the formula mass of a substance if 0.500 moles of a substance has a mass of 90.20 g.

24. Substitute the value for \( n \) derived in Item 17 into the equation derived in Item 22 and solve for FM.

\[ FM = \]

25. 1.25 L of a gas at exactly 300 K and 1 atmosphere has a mass of 5.0751 g. Using the expression for formula mass derived in Item 24 and the value of \( R \) calculated in Item 20-21, calculate the formula mass of the gas.