47.76 An expansion tank consists of an air bladder which is filled to a pressure of $10psig$ which sits atop a column of water $4ft$ high. The tank has a single opening at the bottom of the tank. What is the pressure at the opening?

A. $12psia$

B. $26psia$

C. $29psia$

D. $34psia$

Consider the static pressure due to the air bladder and the height of the water column which exerts additional hydrostatic pressure on the point of interest. Neglect velocity pressure.

$$P = P_s + \gamma z$$

Since the answer choices are in *absolute* pressure, convert the bladder pressure from *psig* to *psia*.

$$P_s = 10psig + 14.7psi = 24.7psia$$

For the water column, divide by the coversion factor rule of thumb for water, $2.31\frac{ft}{psi}$.

$$\frac{4ft}{2.31\frac{ft}{psi}} = 1.73psi$$

Solve for the total pressure.

$$P = 24.7psia + 1.73psi = 26.43psia$$

Answer B

47.77 How much air is required to burn $25lb$ of methane with 30% excess air?

A. $260lb$

B. $340lb$

C. $430lb$

D. $560lb$

Use the Combustion Reactions of Common Fuel Constituents table and consider the reaction and Stoichiometric Oxygen and Air Requirements for methane. Optionally, re-write the reaction including nitrogen on both sides to validate the stoichiometric air requirements provided in the table. Calculate the air-to-fuel ratio on a molar/volume basis as well as on a mass basis. Use the Periodic Table for atomic weights as needed. Alternatively, use the values provided directly in the table.