

Let the volume of C<sub>3</sub>H<sub>8</sub> be 1 L (this is the most convenient choice, although any volume will give the same answer)

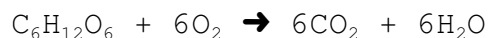
$$1 \text{ L C}_3\text{H}_8 \times \frac{1 \text{ mol C}_3\text{H}_8}{22.414 \text{ L C}_3\text{H}_8} \times \frac{5 \text{ mol O}_2}{1 \text{ mol C}_3\text{H}_8} \times \frac{22.414 \text{ L O}_2}{1 \text{ mol O}_2} \times \frac{100 \text{ L air}}{21 \text{ L O}_2} = 23.8 \text{ L air}$$

Now that you know how many L of air are required to combust 1 L of C<sub>3</sub>H<sub>8</sub> you can simply state that the propane to air ratio is:

**1 L C<sub>3</sub>H<sub>8</sub> : 23.8 L air**

This is very useful information if you had the job of propane furnace repair/design person. It requires 23.8 times as much air for optimal combustion. Less than this will result in incomplete combustion which will cause the production of CO, carbon monoxide, instead of CO<sub>2</sub>, carbon dioxide. The former is very dangerous. Carbon monoxide clings to the haemoglobin in your red blood cell 200 times more strongly than oxygen. This prevents your red blood cells from carrying oxygen to your tissues, causing death.

To make matters worse, the portion of your brain found in your brain stem that regulates breathing to make sure that you have enough oxygen does this through sensing the buildup of CO<sub>2</sub> that occurs in your blood due to the consumption of oxygen in your mitochondria:



In other words, your body does not sense low oxygen levels, instead, it senses high CO<sub>2</sub> levels. This is why it feels uncomfortable if you hold your breath for a long time. The increase in CO<sub>2</sub> concentration in your blood is picked up by the brain, giving you that urgent need to breathe. When CO plugs up the red blood cells, it does not prevent you from exhaling CO<sub>2</sub>, reason being that your blood carries CO<sub>2</sub> as dissolved equilibrium products in your blood and can easily transport them to your lungs for exhalation. Therefore your brain never picks up that there is a problem. If you encounter CO, you simply get tired and fall asleep (with a slight head ache). Tell tale sign is that your lips and nail beds will become bright red. This is because CO changes the colour of haemoglobin to a bright red colour. Hopefully you never need to know this!!!