**Deflategate**

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**Deflategate** was a National Football League (NFL) controversy involving the allegation that the New England Patriots deliberately under-inflated footballs used in their victory against the Indianapolis Colts in the American Football Conference (AFC) Championship Game of the 2014–15 NFL playoffs. The controversy resulted in Patriots quarterback Tom Brady being suspended for four games and the team being fined $1 million and losing two draft picks.

The official rules of the National Football League require footballs to be inflated to a gauge pressure between 12.5 and 13.5 pounds per square inch (psi) or 86 to 93 kPa, when measured by the referees. If the balls have a ***fixed volume and mass*** and we assume that the air inside acts as an ideal gas (*pretty safe assumption*)….

1. What would happen (qualitatively) to the pressure of a football as it’s moved from a locker room to the outdoor field? Date of game: **January 18th 2015** Location: **New England**

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| Increase/Decrease/Stay the Same ***Explain with Scientific Reasoning*** |

Thus, if a football were inflated to the minimum pressure of 12.5 psi at room temperature, the pressure would drop below the minimum as the gases inside cooled to the colder ambient temperature on the playing field. While footballs deflate naturally in colder temperatures, a deliberately under-inflated football may be easier to grip, throw, and catch, or inhibit fumbling, especially in cold, rainy conditions.

Tom Brady, New England’s QB, likes his footballs less inflated and asked the New England trainers to inflate his 12 footballs (yes each QB uses their ***OWN*** footballs) to the minimum 12.5 psi (gauge pressure). Andrew Luck, Indianapolis’ QB, likes his footballs moderately inflated and asked the Indianapolis trainers to inflate his 12 footballs to 13.0 psi. The atmospheric pressure (Po) is 14.7 psi and the 12 New England and 12 Indianapolis balls are checked before the game in the 21.7 oC locker room. All balls were found to fit into the acceptable range.

1. Calculate the pressure (in psi) of both the New England and Indianapolis balls after the have been moved outside (8.89 oC) and allowed to reach equilibrium during the first half.

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| **New England Balls** | **Indianapolis Balls** |
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1. Calculate the expected (**calculated**) pressure change in both the New England balls and the Indianapolis balls.

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At halftime of the game the balls were taken into the locker and measured again. The **New England balls** were found to have an average pressure of **11.3 psi**, while the **Indianapolis balls** were found to have an average pressure of **12.5 psi**.

1. Find the actual (**measured**) pressure change in both the New England balls and the Indianapolis balls.

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***What’s weirder that the Patriot’s 12 balls on average lost \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of pressure after being left in a colder temperature for 4 hours, or that the Colts’ 12 balls on average lost \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?***

1. Can you think of a reason for why the Indianapolis balls significantly less than New England’s?

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