

Metrology

Measurement in Sport



Pressure

To ensure fairness in the Olympics, it is important to check the pressures of inflatable sports balls like footballs and volleyballs: the pressure inside a ball affects its bounce, so standardising the pressure ensures balls behave as the players expect.

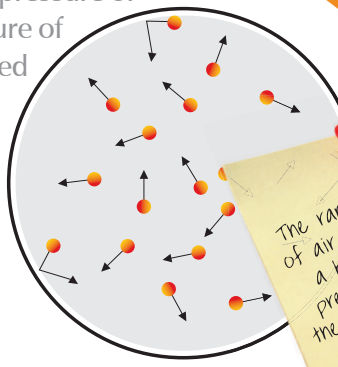
The pressure of the air in a sports ball is measured by a pressure gauge, and pressure gauges are checked against pressure balances

Pressure is defined as force per unit area, and the SI unit of pressure is the pascal, which is one newton per square metre – and a newton is about the force with which an apple presses onto the hand. The normal atmospheric pressure at sea level is about 100 thousand pascals, and the pressure inside an Olympic football is 180 thousand pascals.

Did you know? The Olympics held at the highest elevation were those at Mexico City, 1968, held at 2300 metres above sea level. At that altitude, atmospheric pressure is about 25% less than at sea-level, and athletes from lower-lying countries suffered from the lack of oxygen.

In practice, quite a wide margin is permitted on the pressures of balls used in the Olympics. The reason for this is that the pressure of air depends on its temperature, and the temperature of a ball changes throughout a game: when it is dropped from warm hands into cold mud, for instance.

Pressure is the force of impact of air molecules – so the more molecules are squeezed into a football, the higher the pressure inside it. Heating the ball makes the molecules move faster and hit harder, so that also increases the pressure.



The random movement of air molecules inside a ball creates the pressure that keeps the ball firmly inflated



Pressure gauge instrument used to measure ball pressure

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No games without Measurement



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