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

The air pressure in a ball is measured by a pressure gauge, which is checked against a pressure balance.

Pressure is defined as force per unit area, and the SI unit of pressure is the pascal, which is one newton per square metre. A newton is about the force an apple presses onto a hand. Atmospheric pressure at sea level is about 100,000 pascals, and the pressure inside a football is 180,000 pascals.

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

The random movement of air molecules inside a ball creates a force of impact that keeps the ball firmly inflated.

Squeezing more molecules into a football raises the pressure inside it. Heating the ball makes molecules move faster and hit harder, increasing pressure.

No games without measurement

Did you know?

The Olympics held at the highest elevation were those at Mexico City, 1968, which is 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.