

Pressure

Lesson 27

Pressure

- How would you use the word “pressure” to describe a fast-moving championship game of tennis?
- Would you say the players are under a lot of pressure to do well?
- Would you say the ball is under pressure as well?

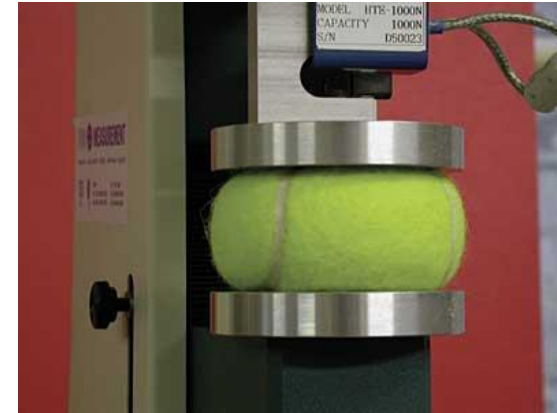
Pressure

- **Pressure** is the amount of force acting over a given area on an object
- As the pressure is applied to the ball, its shape changes
- What do you think has happened to the particles of air inside the ball?
 - The increase in pressure forces the particles closer together in a smaller volume
 - The space between the particles is compressed
- **Compression** = a decrease in volume produced by force



Gases Are Compressible

- A gas can be easily compressed because there is a large amount of space between its particles
 - Less than 1% of the volume of a gas is made up of particles
 - The rest of the volume is the space between the particles
- A container full of a gas, like a tennis ball filled with air, can briefly absorb a great deal of force because of the space between its particles



Pressure and Kinetic Activity in Gases

- Pressure can be a good indicator of the kinetic energy of a gas
 - When energy is added to a gas the kinetic energy of the particles is increased, and the particles move faster
 - This means that a warmer gas will expand in its container faster than a cooler gas will
 - Also, gas that is trapped in a container and heated will increase in pressure as the fast-moving particles bounce against the sides of its container
 - Increased pressure could cause an explosion



INSTRUCTIONS FOR USE
• SHAKE WELL BEFORE USE • Spray in short bursts into the air • For complete clearance keep doors and windows closed for ten minutes after spraying • Keep spray at least 1m away from walls and surfaces.

This product is approved under The Control of Pesticides Regulations 1986 (as amended) for use as directed. HSE No. 7460. Use only in accordance with the directions on the label. • KEEP OFF SKIN • WASH HANDS AFTER USE • KEEP IN A SAFE PLACE out of reach of children



EXTREMELY FLAMMABLE

SC JOHNSON RAID FLY & WASP KILLER
CAUTION: USE ONLY AS DIRECTED.
Pressurised container. Protect from sunlight and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Do not spray on or near a naked flame or any incandescent material. Keep away from sources of ignition - No smoking.

SC JOHNSON LTD, Frimley Green, Camberley, Surrey GU16 7AJ - Tel: 01276 852000

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Pressure and Kinetic Activity in Gases

- Pressure can cause **explosions**
- Pressure can also cause **implosions**
 - A collapse inward

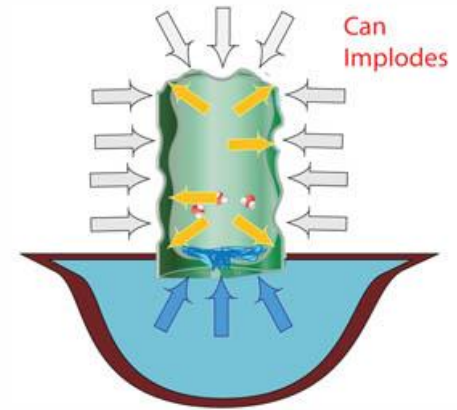
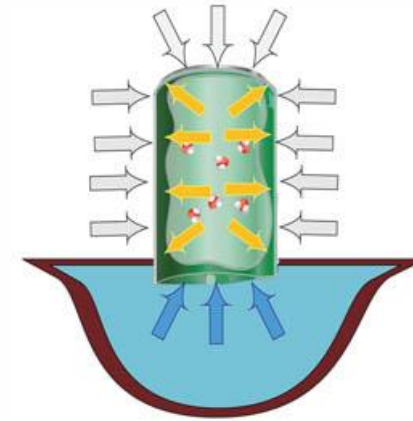


Implosion

Pressure and Kinetic Activity in Gases

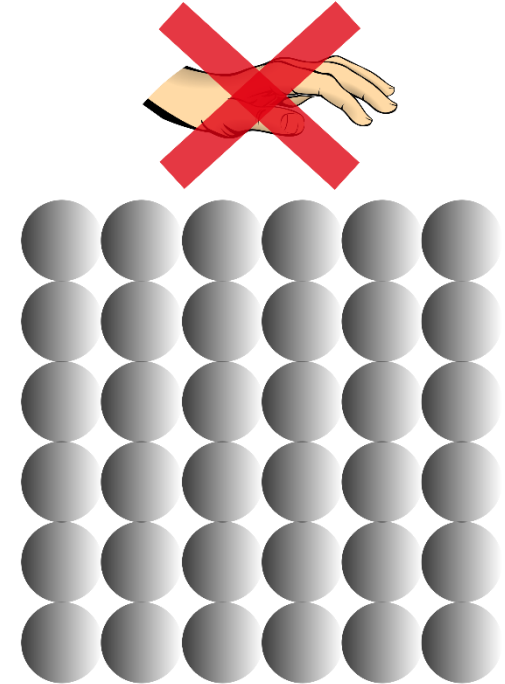
Example:

- A small amount of water is placed in a metal can
 - The can is then heated up
 - The can is then removed from heat and placed in cool water
 - As the can cooled, the particles of gas trapped inside also cooled, causing them to lose energy and contract
 - The contraction causes the pressure inside the can to become lower than air pressure outside the can
 - As a result, the air pressure on the outside pushed the walls of the can inward, crushing the can



Liquids and Solids Are Very Difficult to Compress

- The particles of liquids and solids are already so tightly packed together that squeezing them together is almost impossible
- We cannot change the volume of liquids and solids unless we actually remove some of it
- Solids and liquids are described as ***incompressible***
 - Not able to be compressed using normal means
- **Compression** is the action or state of being squished down or made smaller or more pressed together.
 - Decrease in volume produced by force



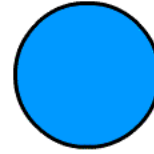
Compression and Deformation

- If you have squished a marshmallow or rolled up a foam mattress, have you compressed a solid?
 - This *appearance* of compression in a solid can be explained by the presence of air spaces within the solid



Compression and Deformation

- Solids can also appear to be compressed when they are deformed
- **Deformation** = a change of shape without being forced into a smaller volume
- E.g. a solid rubber ball may appear to momentarily compress when it hits the ground
 - If the ball contains no air, it does not compress
 - Instead, the ball's shape changes slightly as it hits the ground
 - As the ball deforms, it stores elastic energy which makes the ball bounce back upward



Compression and Deformation

- Compression and deformation can happen at the same time

Example:

- There are air spaces in the human skull, and the face is somewhat flexible
- Therefore, when the soccer ball applies a large force, the player's head both compresses and deforms
- The soccer ball also compresses and deforms because of hitting the player's head



Summary

- Pressure is the amount of force applied over a given area on an object
- When pressure is applied to matter, compression can result
- Compression is a decrease in volume produced by a force
- Gases can be easily compressed, but it is very difficult to compress liquids and solids