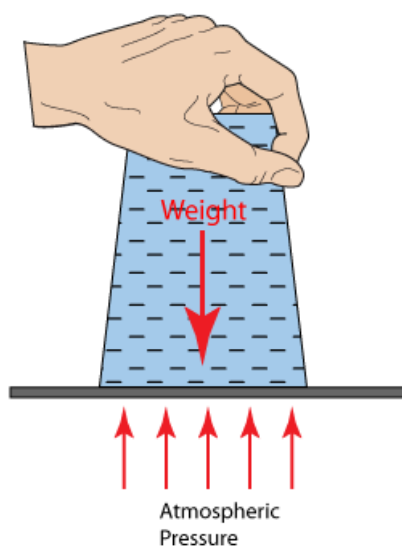


SCIENCE FORM 2

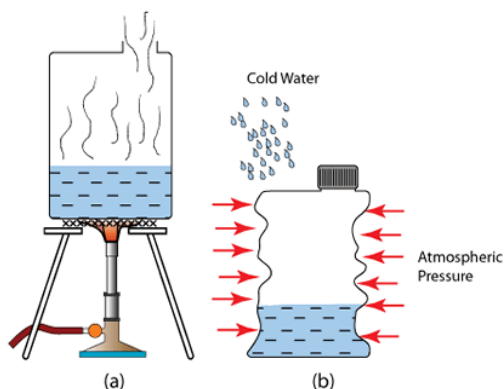
CHAPTER 6 AIR PRESSURE

Kinetic Theory of gases

- Atmosphere: thick layer of air surrounded by the Earth
- Air pressure : the air in the atmosphere presses on the surfaces of all objects
- air is made up of very tiny particles called molecules , which move freely in all directions and collide elastically with each other and with the wall of a container
- when the particles continuously hit the wall of the container and bounce back, a force is exerted by the particles on the wall of the container, this force produces a pressure on the wall of the container
- Examples

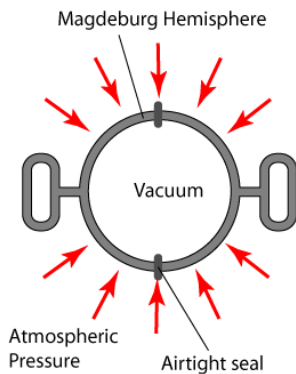


-
- The cardboard does not fall and the water remains in the glass even though it's not supported by anything.
- The force caused by the atmospheric pressure acts on the surface of the cardboard is greater than the weight of the water in the glass.



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- When a can filled with hot water is closed and is cooled down rapidly by pouring cold water on it, it will crash instantly.

- When the air inside the can is cooled, its pressure decreases. The high atmospheric pressure outside exerts a great force on the can and causes it to crash.



- Figure above shows a Magdeburg Hemisphere. When the air inside the hemisphere is pumped out so that it becomes a vacuum, the hemisphere cannot be separated even by a very great force.
- The atmospheric pressure exerts a strong force on the outer surface of the hemisphere, holding the hemisphere tightly together.

Factors affecting pressure

I. Volume

- Air pressure increases with decreasing volume of the container and produces a larger force
- As the volume decreases, the air particles move in a smaller space. Therefore, more particles hit the wall of the container, higher pressure acts on the wall of the container

II. Temperature

- Air pressure increases as temperature of the gas increases
- As the temperature increases, the air particles have more kinetic energy, more particles hit the wall of the container with greater force, therefore, pressure increase

Application of Air pressure

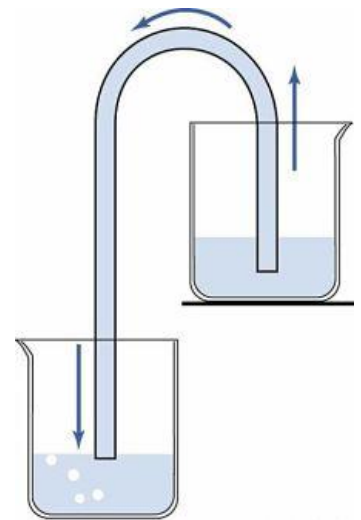
(a) Syringe : Used to suck up liquids

- The piston is pulled up
- A low pressure area is formed
- The higher atmospheric pressure outside the syringe pushes the water into the syringe



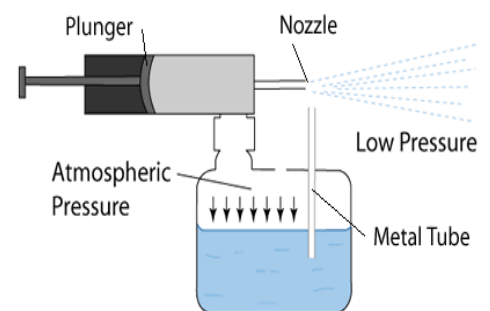
(b) Siphon: Used to transfer liquids from a higher level to a lower level

- A siphon needs to be filled with water before it can operate
- When the water flows out, a lower pressure vacuum area is formed in the tube
- The higher air pressure presses down on the surface of the water and pushes the water into the siphon



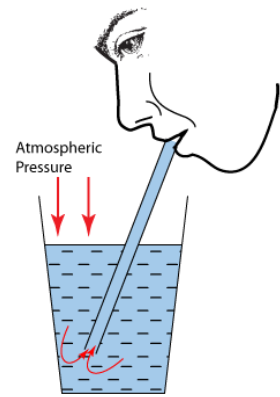
(c) Insecticide spray: Used to spray insecticide over a large area

- The syringe is pushed in to force the air out at high speed
- A low pressure area is formed
- The higher air pressure inside the tin forces the liquid out through the metal tube



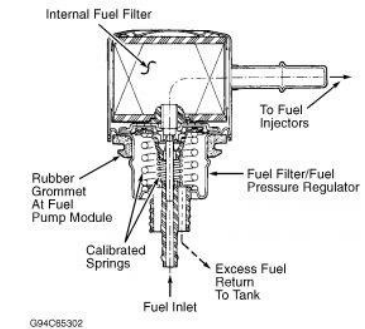
(d) Drinking straw: Used to suck drinks from containers

- When sucked, air inside the straw is removed, leaving a low pressure area
- The higher air pressure pushes the water into the straw



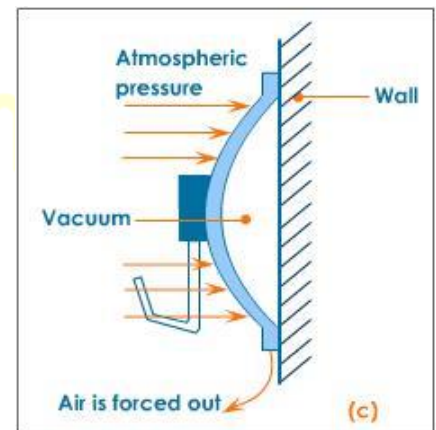
(e) Filter pump: Used to suck air out of a container

- Water flows fast from a pipe
- A low-pressured area is formed around the channel
- Air from the container is sucked into the filter pump



(f) sucker hook: Used to hang light objects from a wall

- When the sucker hook is pressed the air inside it is forced out leaving a low pressure area
- The higher air pressure outside presses down on the hook and makes it stick firmly to the wall



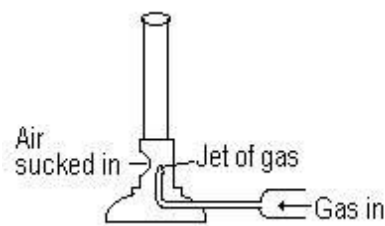
(g) Dropper: Used to suck up liquids

- When the nipple is pressed, the air inside is forced out, leaving a low -pressure area
- The higher air pressure outside presses down on the surface of the liquid and pushes the liquid into the dropper



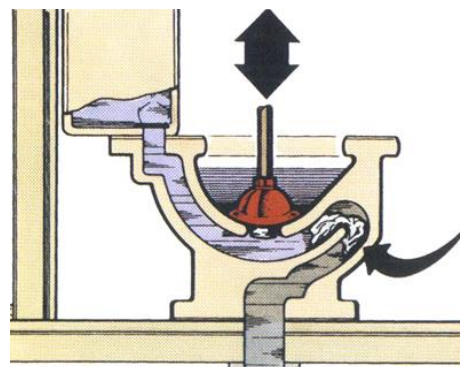
(h) Bunsen burner

- The fast flow of gas produces a low pressure area around the jet
- The higher pressure forces air into the bunsen burner



(i) Suction pump

- When the suction pump is pushed down, the air inside it is pushed out, leaving a low pressure area
- The higher air pressure outside presses on the rubber cup and makes it stick to the surface of the sink
- When the suction pump is pulled upwards, the higher pressure inside the pipe pushes out the dirt that clog it.



(j) Pouring liquid from a container: A tin of condensed milk usually needs two holes punched into it before you can pour out the milk

- The air pressure that pushes air into one hole forces the milk out of the other hole



Gas under high pressure

- gas are usually stored in liquid form in strong metal cylinders (aerosol cans or liquefied)
 - Hydrogen : used for welding and rocket fuel
 - oxygen: hospitals, diving, welding and rocket fuel
 - Carbon dioxide: fire extinguishers and manufacturing of dry ice
 - Nitrogen: store fish at low temperature and cooling systems
 - Liquefied petroleum gas (LPG) : homes and vehicles
- An aerosol contains vapour under high pressure, this pressurised vapour acts as a propelling agent in driving the liquid contents out of the can as spray

- air under high pressure can be used to drive a wrench in loosening tight screws or nuts
- a jet of air released at high speed is used to blow away dust or water from engine parts

Precautions using gas under high pressure

1. do not place a gas cylinder near a heat source
2. a gas cylinder should always be placed upright and not lying down
3. do not dispose of gas cylinder in a fire



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