Experiment 5

Aim

To show that gases are readily compressible and liquids are not.

Theory

The density of gases varies considerably with pressure but not for liquids. That is, gases are readily compressible while liquids are not. In this experiment we shall use a plastic syringe to demonstrate it.

Materials Required

A plastic syringe of maximum available size (such as 25 mL or 50 mL) without needle, water, some other liquids such as mustard oil, kerosene, and fruit juice etc.

Procedure

1. Hold the cylinder of a plastic syringe of maximum available size in one of your hand.
2. Insert the piston into the syringe cylinder and bring it to a certain level inside the syringe cylinder. In this situation air (gas) is inside the syringe. Note and record the reading of the piston in the syringe. This is your initial reading.
3. Close (or plug) the outlet nozzle of the syringe strongly by one of the finger of the same hand holding the syringe cylinder.

4. Apply a little force on the piston to push it in the syringe cylinder (that is to compress the air). Are you able to push it (Fig. 5.1)?
5. Keep on applying the force on the piston to push it further inside the syringe cylinder. Do you find that after some attempts, the piston stops pushing in further? Are you able to further compress the air inside the syringe? Note and record the reading of the piston in the syringe cylinder. This is the final piston reading.
6. Take out the piston from the syringe and unplug the nozzle.

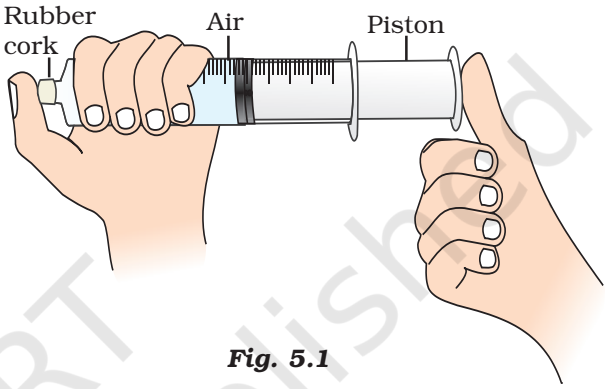

Fig. 5.1

7. Fill the syringe cylinder with water. Insert the piston into the syringe cylinder. Slowly push it inside the cylinder to allow the air pass through the nozzle of the syringe. Ensure that there is no air bubble inside the cylinder. Note the reading of the piston in the syringe. This is your initial reading for water inside the syringe.
8. Again close (or plug) the nozzle of the syringe strongly.
9. Apply force on the piston to push it in (or to compress the water inside). What do you observe? Does the water compress? Note and record the final reading.
10. Repeat the experiment with other liquids. Record observations.

OBSERVATIONS

Sl. No.	Material	Initial reading of piston in syringe	Final reading of piston in syringe
1.	Air		
2.	Water		
3.	Oil		
4.			

RESULTS AND DISCUSSION

Infer from your observations that the gases are readily compressible while liquids are not. This shows that gases have more vacant space between the constituent particles.

Precautions and Sources of Error

- Use a cloth to safely and tightly close or plug the nozzle of the syringe cylinder.
- The motion of piston inside the syringe cylinder must be tight otherwise air (or liquid) may leak from the gas-piston boundary (or liquid-piston boundary).
- The needle of the syringe must not be used as it may hurt.

Questions

- What do you conclude about the inter-particle space in case of liquids and gases?
- Was it easy to compress gas (air)? What happened when you released pressure on the piston?
- What do you think which is present between the particles of air?
- Where do you come across the phenomenon of compressibility of gases and liquids in daily life?