Gravitation - Lesson 18
Experiments on Buoyancy

1. Floating Bottle

(i) Take an empty plastic bottle. Close the mouth of the bottle with an airtight stopper. Put it in a bucket filled with water. You see that the bottle floats.

(ii) Push the bottle into the water. You feel an upward push. Try to push it further down. You will find it challenging to push deeper and deeper. This indicates that water exerts a force on the bottle in the upward direction. The water's upward force increases as the bottle are pushed deeper till it is completely immersed.

(iii) Now, release the bottle. It bounces back to the surface.

(iv) Does the force due to the gravitational attraction of the earth act on this bottle? If so, why doesn't the bottle stay immersed in water after it is released? How can you immerse the bottle in water?

Yes, gravitational force does work on the bottle, but the upward force on the bottle by the water is much more than the tiny 'mg' of the bottle. To immerse it, just increase the mass of the bottle, but putting some sones in it or filling it with water.

2. **Nail and Cork in Water**

(i) Take a beaker filled with water.

(ii) Take an iron nail and place it on the surface of the water.

(iii) Observe what happens:

The nail sinks. The force due to the gravitational attraction of the earth on the iron nail pulls it downwards. There is an upthrust of water on the nail, which pushes it upwards. But the downward force acting on the nail is greater than the upthrust of water on the nail. So it sinks (Figure)

3. **Archimedis' Principle**

(i) Take a piece of stone and tie it to one end of a rubber string or a spring balance.

(ii) Suspend the stone by holding the balance or the string, as shown in Figure I.

(iii) Note the elongation of the string or the reading on the spring balance due to the weight of the stone.

(iv) Now, slowly dip the stone in the water in a container, as shown in Figure II.

(v) Observe what happens to the elongation of the string or the reading on the balance.

You will find that the elongation of the string or the reading of the balance decreases as the stone is gradually lowered in the water.

Note to Teacher

The goal of the experiments/activities is to introduce the idea of buoyancy. The lesson takes few real-world examples and attempts to illuminate the buoyant property of fluids.