Gravitation - Lesson 12
Experiments on Freefall

1. **Freefalling Stone**

   (i) Take a stone.

   (ii) Throw it upwards.

   (iii) It reaches a certain height, and then it starts falling.

2. **Falling Paper And Stone**

   (i) Take a sheet of paper and a stone. Drop them simultaneously from the first floor of a building. Observe whether both of them reach the ground simultaneously.

   (ii) We see that paper reaches the ground a little later than the stone. This happens because of air resistance. The air offers resistance due to friction to the motion of the falling objects. The resistance offered by air to the paper is more than the resistance offered to the stone. If we do the experiment in a glass jar from which air has been sucked out, the paper and the stone would fall at the same rate.

3. **Freefalling Coins**

(i) Take a square bell jar and evacuate it.

(ii) Hold two iron coins (or any iron metal) of different weight and size with an electro-magnet.

(iii) As you switch off the magnet, let them fall on two switches, lighting two bulbs of different colours.

(iv) They should glow at the same instant.

(v) Do the experiment with air, and they should fall at different rates due to air drag.

4. Forceless Water Bottle

(i) Take a water bottle and punch a few holes in it at the bottom.

(ii) Fill it with water and let it out the holes.

(iii) Leave the bottle from a height and see the water does not come out during free fall. Gravity doesn't work under freefall, which means while freefalling, you'll feel the same weightlessness as you'd fell in outer space in the absence of gravity. This consequence led to Einstein's formulation of general relativity.

Note to Teacher

The goal of the experiments is to introduce the concept of freefall. This does not explain freefall, but lays out its consequences. Most of these can be done at home or can be demonstrated to get more clarity.