

Why does Ice Float on Water?



It is a matter of common experience that ice floats on water. Howsoever large the size of ice may be, it will not sink. Even icebergs which are huge masses of ice keep on floating in the sea. Do you know why ice floats on water?

The law of floatation of bodies was given by the Greek scientist Archimedes. According to this law, whenever a body is placed in water, it is acted upon by two forces—the weight of the body acting downwards and the buoyant force of water acting upwards. If the weight of the body is equal to or less than the up-thrust of water, the body floats on water. In other words, if the weight of the body is equal to or less than the weight of the water displaced by it, it will float on water. On the other hand, if the weight of the body is more than the weight of the water displaced, the body will sink in water. Hence a body floats when its weight is equal to the weight of the water displaced. A piece of wood floats on water, because its weight is less than the weight of the water displaced by it. Since the weight of wood is nearly half of the weight of an equal volume of water, half of wood is under water, while the other half is above it. Similarly, the weight of cork is nearly one-fifth of the weight of the water displaced by it, so approximately one-fifth of cork is under water while the rest remains above water. You can understand the floatation of ice also on the basis of this law.

Why does Ice Float on Water?

In general, when a liquid changes to solid, it contracts because its molecules come closer to each other. As a result of this, the volume of the substance decreases or its density increases. Hence a substance becomes heavier in 'solid state than in the liquid, state.

But water is a peculiar liquid. When it becomes ice, instead of contracting, it expands. The volume of ice becomes more than that of the water. The effect of the increase in the volume of ice is that its density becomes nine-tenth of water, that is, ice becomes lighter than water. So we get about 10 liters of ice made out of 9 liters of water. And as you know, 'liter' is a measure of volume. That is why nearly nine-tenth of ice is submerged in water, while only one-tenth is above water. The ice under water (9/10 of the whole) displaces water whose weight equals that of the whole ice. This law of floatation is derived from Archimedes principle. This also explains how the maximum portion of the giant icebergs remains sub-merged in water while only a tip (1/10 part) is above water.

Bursting of water pipes in cold regions is due to the volume of ice being greater than that of water. As soon as water freezes, the volume is increased which produces strong force due to which pipes burst. In Finland, this property is utilized in breaking rocks. Water is filled in empty spaces available between rocks. When water freezes, it expands and, generates enough pressure to cause cracks in the rocks.