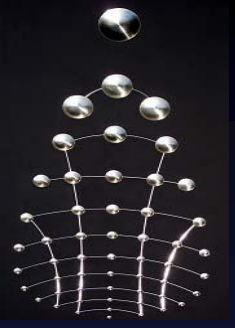

CARTESIAN DIVERS

What to do

1. **Adjust the pressure on the tank of water**
2. **Watch the divers sink at higher pressures**

The density of a substance is found by dividing the amount of space taken up by the substance by the mass of the substance. This is given by the equation:

$$P = m/v$$

Where ρ is density, m is mass and v is volume.

Air, for example, has a density of 1.2kg/m^3 under standard conditions.

The density of a substance is affected by the temperature and pressure the substance is experiencing.

Inside their squid cover, the divers contain a pipette, which is flexible, so it can change its shape. As you apply pressure to the water containing the divers, the divers will sink. Release this pressure and the divers return to the surface. The same mass of air is squeezed into a smaller volume and so the density of the air increases. This compresses the pipette, which is now heavier and loses buoyancy; sinking in the water. The pipette descends until the pressure inside and outside the pipette is equal.
Removing the pressure allows the air to return to the density of the surroundings. The pipette expands and floats back to the surface. The divers also illustrate how easy it is to compress gases, while liquids and solids are much more difficult to compress.

Buoyancy is the force which acts on floating objects to keep them afloat. The buoyancy required to lift an object is related to the amount of fluid displaced by the object. Buoyancy force is given by:

$$B = \rho_f V_f g$$

Where B is the buoyancy force, ρ_f is the density of the displaced fluid, V_f is the volume the displaced fluid and g is the force due to gravity. The force on the object is:

$$F_{net} = mg - B$$

Where m is the mass of the object.

The density, on which buoyancy is dependent, increases with depth because the pressure increases. The forces on the object balance when the mass of the object is equal to the buoyancy force. This is the equilibrium point, where the object will move to.

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