

Sink or Swim



It takes about 1,400 gallons of water to produce a meal of a burger, fries and a soft drink.

Equipment/Materials

liquid dish washing soap waxed paper
scissors two bowls
water

Time Required: 15 minutes

Procedure

1. Using the pattern provided as a guide, cut out two duck shapes from waxed paper.
2. Fill both bowls with water taken from the same source.
3. Add 4 to 5 drops of soap or detergent to the water in one of the bowls.
4. Carefully place a “duck” on the surface of the water in each bowl.
5. Record your observations and speculate on the reasons for them.



Expected Result

The “duck” placed on the plain water should continue to float on the surface. The “duck” placed on the surface of the soap or detergent solution should sink.

Anticipated Conclusion

The waxed paper duck is coated with paraffin, a hydrophobic hydrocarbon. As a result, the surface tension of the water remains unbroken and the waxed paper duck is supported on the surface of the water by the surface tension. Addition of the soap or detergent reduces the surface tension and the mutual attraction of water molecules for one another, making the water “wetter.” The reduced surface tension allows the water to wet the surface of the waxed paper, causing it to sink.

Discussion

Have participants discuss the uses of soaps and detergents in other areas. Note that these products, known as surfactants, are able to decrease the surface tension of water, which causes the water to wet surfaces that would normally be hydrophobic. As a result, surfactants are useful in many situations. They can be used to remove greasy dirt and stains by attracting water molecules that wash the dirt away.

Ducks float because their body feathers are coated with an oil that makes them very hydrophobic. The oily feathers repel water, causing ducks to be supported by the surface tension of the water and displacement. If a duck were treated with a detergent or an organic solvent that removes the oil, the duck would sink. What might happen if a bottle of detergent were dumped into a duck pond? If the concentration were high enough, the ducks would sink. For this and many other reasons, it is not a good idea to wash clothes, dishes or ourselves in a lake or stream while camping.

Duck Patterns for Cut Outs

