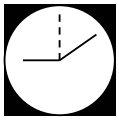
[50 minute lesson]

Czech Republic Public Release Lesson 5 Lesson Graph [8th grade]



10 minutes

Whole-Class Practical Work: Class observes buoyancy

The teacher greets the class good morning and introduces the goal for today's lesson, which is to determine variables affecting buoyant force. She demonstrates buoyant force with the use of a rock attached to a spring scale and submerged inside a beaker of water. The class makes observations guided by the teacher. The teacher then submerges the rock into a different beaker of liquid, which the students identify later as salt water. The teacher writes on the chalkboard that buoyancy is related to the volume of an object; it is also related to the density of the liquid. She conducts another demonstration using a beaker full of water, which overflows when an object is submerged. Students make observations and conclude that the buoyant force is the same as the gravitational force of the water that was displaced.

5 minutes

Whole-Class Seatwork: Class discusses Archimedes' principle

After the various demonstrations, the teacher tells the class they had been describing Archimedes' principle in words. Now they will attempt to talk about it as a formula. They derive the formula as: F = volume $_{\text{(of object)}}$ × density $_{\text{(of object)}}$ × gravity. They then talk about swimming as it relates to buoyancy.

2 minutes

Whole-Class Practical Work: Class establishes relationship between gravitational force and buoyant force

The teacher engages the class in a series of demonstrations and questions. She drops a ball of clay in a beaker of water and it sinks. The class talks about the reasons for this. She writes on the chalkboard that the gravitational force was larger than the buoyant force. She guides them in figuring what is necessary for the clay to float (i.e., gravitational force = buoyant force). The teacher announces that their goal is to "teach their clay to float."

2 minutes

Independent Practical Work: Students float clay in water

Students have materials at their desks. They manipulate their clay so it can float in water.

5 minutes

Whole-Class Practical Work: Teacher experiments with a clay boat

The teacher puts a clay boat into a beaker of water. She draws three scenarios on the chalkboard: (1) surface of water with no clay, (2) surface of water with clay ball, and (3) surface of water with clay boat. They observe the water level is greatest in the third drawing and conclude that buoyancy is increased because "the clay takes up a greater volume of water" when the clay is spread, thus allowing it to float.

3 minutes

Independent Seatwork: Students copy drawings into notebooks

Students copy the three drawings from the chalkboard into their individual notebooks.

2 minutes

Whole-Class Practical Work: Class observes oil and water

The teacher holds a small beaker of oil and water to show the class. They talk about the densities and engage in a brief discussion about heterogeneous mixtures and separation techniques.

$5\frac{1}{2}$ minutes

Whole-Class Seatwork: Class discusses real-life issues related to density of liquids

The class talks about the densities of water and ice, including the implications in nature. They also talk about societal issues related to oil spills in the ocean.

$8\frac{1}{2}$ minutes

Whole-Class Practical Work: Teacher demonstrates different gas and liquid densities

The teacher demonstrates the densities of air and propane. She sprays lighter fluid into a beaker, which comes out in gaseous form. She places a match in the beaker and it ignites into a large flame. They engage in a series of questioning that leads to the teacher pouring gas from one beaker into another beaker. The class concludes that the (propane) gas needs to be of greater density than air in order to be poured. Students consult with their physics table to confirm the values. When talking about densities of different liquids, the teacher uses a beaker of honey, water, and oil. She questions the students about the three liquids in terms of their densities, verbally and through a demonstration with a Lego piece. She then gives instructions for the next activity.

$1\frac{1}{2}$ minutes

Independent Seatwork: Students work on density activity

Students copy the density values given by the teacher onto their respective colored strips of paper. They look up the values in their physics table and identify the different substances. Meanwhile, the teacher is arranging the answers on a magnetic board in front of the classroom.

5 minutes

Whole-Class Seatwork: Class goes over answers to density activity

Students compare their answers to the teacher's. They organize the substances according to the density values and then talk about a real-life scenario with a gas leak in the basement. The teacher concludes the lesson by assigning homework for next week.