Extension Activity – Water

Title of Activity - Flinkers 2.0

Concepts/Principles Covered –

According to Archimedes' Principle, an object partially or fully submerged in a fluid will experience a resultant vertical force pushing up on it equal to the weight of the volume of fluid displaced (Δ) by the object. This vertical force is called the Force of Buoyancy (F_B).

The Buoyant Force on an object is equal to the weight of the volume of the water displaced by the object. When the weight of the object submerged is equal to the upward buoyant force exerted by the water, the object is neutrally buoyant so it neither sinks or floats; instead it "flinks". According to legend, Archimedes shouted, "Eureka" when he deduced his famous principle.

Mathematically, Archimedes' Principle is:
$F_B = \Delta = \rho g V$.
F_B is the buoyant force
Δ is the displacement of water in lbs
ρ is the density of water in lb-s^2/ft^4
(ρ = 1.94 lb-s^2/ft^4 for freshwater)
g is the acceleration due to gravity in ft/s^2 (g=32 ft/s^2)
∇ is the submerged volume of the object in ft^3

The formula may be rewritten as $\nabla = \Delta/(\rho g)$

Short Description –

Demonstrate water's buoyant force using similar materials. Represent the phenomena with a mathematical formula that shows the parametric relationship between volume and displacement of water.

Standards Covered -

5-PS1-3: Make observations and measurements to identify materials based on their properties.

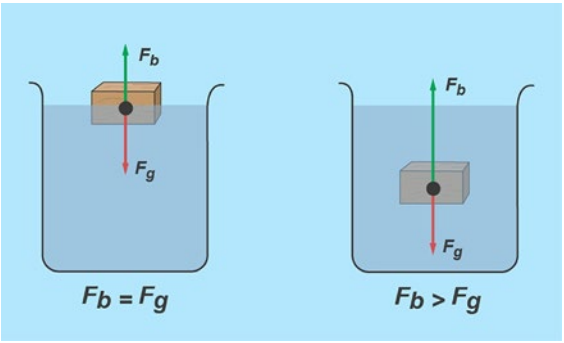
HS-ESS2-: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Length - 45 minutes

Age Group – Grades 6-10

Materials and Supplies -

- Clear container with water
- Foam packing peanuts or small cubes of sponge or cork
- Paperclips
- Small washers



Step-by-step Instructions -

- Fill a clear container with water.
- Place a foam peanut or piece of sponge in the water. What happens?
- Attach paper clips and small washers to your peanut/sponge. Can you make it flink?
- Experiment by changing your shape and weight distribution until it flinks for 10 seconds. Try a different material, such as a cork.
- What is the relationship between ∇ and Δ?
- What is the maximum displacement (Δ_{max}) you can achieve without sinking your design?