

Objectives	Under Pressure	Extra Information
<p>L.O:</p> <p>To Understand How Depth Affects Pressure.</p>	<p>STARTING ACTIVITY – (10 minutes) GROUP DISCUSSION – Discuss with the class what they think some of the hazards of swimming in deep water may be. Acknowledge any answers to do with dangerous animals, running out of breath or the darkness, but tell the class that one of the greatest dangers is the weight, or more accurately, Pressure of the water as you go deeper.</p> <p>Tell the class that as you go deeper in water (or any substance) the weight of the water above you exerts a Force upon you. The deeper you go, the greater that Force. We call that force Pressure. Explain that Pressure can also be caused by increasing heat or reducing space, but for this lesson we will be looking at Pressure caused by Depth.</p> <p>MAIN TEACHING – Under Pressure (45 minutes) Explain to the class that Pressure in water or “Water Pressure” can be measured very simply with the following equation:</p> <p>$P = g \times h$</p> <p>Where:</p> <p>P = Pressure, given in kilopascals or kPa, which is a unit used to measure Pressure (1000 kPa is approximately equal to the pressure your body experiences at Sea Level)</p> <p>g = acceleration due to Gravity, which equals 9.81*</p> <p>h = height, or Depth, of the water, which should be measured in metres.</p> <p>GUIDANCE – Depending on the capability of your class you can choose to explain that it is in fact 9.81 m/s² meaning that for every second an object in free fall under gravity (in a vacuum) will fall 9.81m per second faster for every second etc.</p> <p>Explain that when using this equation it only works for Water Pressure and that to work out the pressure of other substances such as the air that surrounds us, you would need to include the Density of the substance when compared to water. For example if a substance is half as Dense as water, you would half the Pressure.</p>	<p>Materials Required:</p> <ul style="list-style-type: none"> ▶ 2 Litre Clear Plastic Bottle ▶ Nail (to pierce bottle) ▶ Marker Pen ▶ Ruler ▶ Water ▶ Tape ▶ Scissors ▶ Towels <p>Key Words:</p> <ul style="list-style-type: none"> ▶ Pressure ▶ Force ▶ Water Pressure ▶ KiloPascal ▶ Sea Level ▶ Gravity ▶ Depth ▶ Density/Dense <p>Success Criteria:</p> <ul style="list-style-type: none"> ▶ I can perform a simple experiment to demonstrate water pressure. ▶ I understand that pressure increases with depth. ▶ I understand the cause and relationship between increasing depth and increasing pressure.

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	<p>Explain that to get an accurate measurement for a person swimming underwater you would also need to add the Pressure of the air at Sea Level (or approximately 1000 kPa) as there isn't just the weight of the water above them but also a column of air, adding to the Pressure.</p> <p>Tell the class that they will be doing a simple experiment to prove that Pressure increases with Depth.</p> <ol style="list-style-type: none">1 Prepare your 2 litre clear plastic bottle by piercing holes up one side of it at regular intervals (e.g. 3cm apart). (this step may have to be done before class)2 Tape up each of your holes individually, making sure that they are secure and that each piece of tape can be removed without disturbing the others.3 Fill your bottle up with water (make sure that no water is leaking from the tape).4 Use the marker pen to mark the bottle with the current water line5 Remove one piece of tape and measure how far the water pours.6 Reset the experiment by replacing the tape and refilling the bottle to the mark made previously.7 Remove another piece of tape and measure how far the water pours.8 Repeat the last two steps for each of your holes and compare your results.9 (optional) Don't fill up your bottle to the same level and repeat the whole experiment, and then compare your results again. <p>GROUP DISCUSSION – Discuss with the class their findings. They should have noted that the lower the hole when compared to the water level the further the water poured. Explain that the fact that the water poured further is proof that a greater force was acting upon it, and that force is the Water Pressure caused by the depth of the water.</p>	

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	<p>PLENARY – (5 minutes) Tell the class that the approximate pressure inside a can of cola is 380 kPa. Ask the class to work out at what Depth, to the nearest Metre, would the Water Pressure be greater than the Pressure inside the cola can.</p> <p>GUIDANCE – Solution:</p> <p>If: $P = g \times h$</p> <p>$380 = 9.81 \times h$ $380/9.81 = h$ $h = 38.74$ $h = 39\text{m}$ (to nearest Metre)</p> <p>GROUP DISCUSSION – Discuss with the class what they think would happen if they opened a cola can at a depth greater than 39m. Explain that instead of air rushing out of the can causing bubbles, the water would rush in.</p>	