Topic 8 - Pressure

What's the science story?

An object immersed in a fluid experiences forces acting on its surfaces caused by the pressure of the fluid. At any given point in a fluid, pressure acts equally in all directions. Its size is equal to the force acting normal to a surface, divided by the surface area (pressure = force divided by area).

The pressure at a point in a fluid is proportional to its depth, as it is caused by the gravitational force on the fluid above that point.

The pressure of the Earth's atmosphere is called atmospheric pressure. Usually atmospheric pressure causes equal forces to act in all directions on objects, so its presence is not apparent. But if a vacuum, or partial vacuum, is created by removing air, the force due to atmospheric pressure can cause movement (e.g. liquid moving up a drinking straw) or other effects (such as rubber suckers being pressed tightly on to surfaces).

Because pressure is proportional to depth in a fluid, the force exerted by a fluid is larger on the lower surface of an immersed object than on the upper surface. This difference causes the observed upthrust. It also explains why the apparent weight of a fully or partly immersed object is less than its weight out of the fluid.

All of these ideas apply to objects immersed in a gas (such as air) though the size of the upthrust is much smaller than for a liquid.

Previous knowledge:

KS3

Year 7 -Particles

Next steps…

KS3

Forces 2

KS4

P3 Particle model

Keywords

Force	Pressure	Atmospheric pressure
Weight	Density	Sea level
Pressure	Particles	Depth
Newtons	Atmosphere	Gas
Exert		Collapse

KS3 – Year 8

Lesson No. and Title	Learning objectives	National Curriculum	Working scientifically skills	Practical equipment
1. Pressure in solids	ARE – To define and calculate pressure. AGD – To explain how the pressure of objects can be different.	• pressure measured by ratio of force over area – acting normal to any surface	WS9 Identifying variables WS16 Using a given equation	PRAC: Pressure in solids Trays of sand, spreader to flatten sand, 1N weights (lots), small support blocks (lots)
2. Pressure	ARE – To describe why pressure in solids can change. AGD – To fully compare the pressures of different parts of the body.	• pressure measured by ratio of force over area – acting normal to any surface	WS14 Drawing a graph WS16 Using a given equation	PRAC: Pressure Newton scales, squared paper
3. Pressure in liquids	ARE – To describe ***how*** liquid pressure changes with depth. AGD – To explain ***why*** liquid pressure changes with depth.	• pressure in liquids, increasing with depth;	WS9 Identifying variables	PRAC: Water pressure Bottles with holes in, washing up bowls
4. Pressure in liquids	ARE – To explain the relationship between depth and pressure. AGD – To explore the adaptations of the creatures that live at different depths.	• pressure in liquids, increasing with depth;	WS14 Drawing a graph	

KS3 – Year 8

5. Atmospheric pressure	ARE – To define atmospheric pressure. AGD – To explain how atmospheric pressure varies with height above sea level.	• atmospheric pressure, decreases with increase of height as weight of air above decreases with height	WS14 Drawing a graph	
6. Pressure in gases	ARE – To explain gas pressure using examples. AGD – To compare the effect of gas pressure in different objects.	• atmospheric pressure, decreases with increase of height as weight of air above decreases with height		DEMO: Balloon in the freezer Lots of balloons
7. Collapsing can	ARE – To explain gas pressure using examples. AGD – To compare the effect of gas pressure in different objects.	• pressure measured by ratio of force over area – acting normal to any surface		DEMO: Marshmallow in a vacuum DEMO: Collapsing can Trough, large tongs, cans x 3
Assessment 1: Gas pressure				

Assessment Criteria

Assessment No. & Title	Working Towards	Age Related Expectations	At Greater Depth
n/a	Calculate pressure using a given equation	Rearrange the pressure equation	Calculate pressure in multistep problems
n/a	Describe where pressure has increased and decreased in examples	Use ideas of pressure to describe familiar situations qualitatively	Explain why liquid pressure changes with depth
1. Gas pressure	State examples of gas pressure in everyday situations	Describe simply what gas pressure is	Explain gas pressure in different situations
	State two things that affect gas pressure	Describe the two things that affect gas pressure	Explain, using particle diagrams, what happens to gas pressure as the temperature increases