# Density, Pressure and Creatures at Depth

Lesson Plans, Student materials, Teacher notes, Supplemental materials

*Topics*

* Physical conditions under water change with depth: Density, Pressure, Light penetration
* Specific organisms can survive and thrive under these conditions using special adaptations
* Scientists must design undersea craft with these physical conditions in mind

*Resources used*

Power point: “Things are Different Under Water” By Jessica Thompson

Lab Exploration: *Under Pressure* (Adapted from PRISM)

Video BBC: *Blue Planet: The Deep*

<http://oceanservice.noaa.gov/facts/pressure.html>

<https://www.youtube.com/watch?v=-U1YVZMifMM&feature=player_detailpage> (Bill Nye: Buoyancy)

<http://oceanexplorer.noaa.gov/technology/technology.html>

<http://www.whoi.edu/main/deepseachallenger>

*Essential Questions*

* How do the laws of physics differ under water?
* Compare and contrast the physical conditions on land to those under deep water
* What adaptations do organisms living in the deep ocean have?
* How do scientists explore the deep ocean?

*Learning Objectives*

* Students will identify and describe the different ocean zones
* Students will test their theories on what will happen as you dive deeper in the ocean
* Students will be able to identify the physical factors that change as the depth increases
* Students will describe different ocean exploration technology in terms of how deep it can explore.
* Students will connect adaptations of deep sea animals to the restraints of living at depth
* Students will compare animal adaptations to engineering considerations of submersibles

*Timeline*

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| **Grades**  **9-12** | Day 1 (45-50 minute period) High School | Day 2 (45- 50 minutes) | Day 3 (90 minutes) |
| Notes/ Discussion | Power point presentation “Things are Different Under Water”. Introduce the topics by asking the students if they think it would be possible for humans to live deep under water and why or why not. (Some of them may be under the misguided impression that the only limiting factor of humans living under water is breathing air.) | Show *Blue Planet: Deep Ocean*. (50mins)  Have students take notes on each zone visited in the movie and the adaptations of the creatures described in each zone (can be done day 2, depending on time). Also, have the students pay attention to the craft used by the scientists to study the creatures at depth. |  |
| Activity | Throughout the presentation discuss the relationships between pressure, light penetration and depth. |  | Lab Exploration “Under Pressure”. |
| Materials | Power point “Things are different under water” | Netflix watch instantly or DVD of *Blue Planet* | 2 1-liter water bottles Nail or Tack  Masking Tape Scissors  Ocean Zones How Deep Can They Go? Requires web access <http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/oceanography_how_deep.html>  NOAA ocean explorer tech site |
| Assessment/HW | Class discussion | Discuss adaptations of animals and how these adaptations may be applied in the design of a sub. Complete worksheet “Ocean Zones Fill In: Organisms” | See “Under Pressure” activity write up in this unit for analysis questions |

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| **Above plan adapted for grades 6-8** | Day 1 (45-50 minutes) | Day 2 |
| Notes/ Discussion | Teacher demonstration from Under Pressure activity. Followed by discussion of oceanic zones | Show *Blue Planet: Deep Ocean*. (50mins)  Have students take notes on each zone visited in the movie and the adaptations of the creatures described in each zone (can be done day 2, depending on time). Also, have the students pay attention to the craft used by the scientists to study the creatures at depth. |
| Activity | See “Under Pressure” teacher and student documents |  |
| Materials | 2 1-liter water bottles Nail or Tack  Masking Tape Scissors  Ocean Zones How Deep Can They Go? Requires web access <http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/oceanography_how_deep.html>  NOAA ocean explorer tech site | Netflix watch instantly or DVD of *Blue Planet*  Graphic Organizer: General Characteristics of Fish in Major Ocean Zones |
| Assessment/ Hw | Students can name the ocean zones and which submersibles can reach each zone.  Students have completed Ocean Zones Fill in for Submersibles | Discuss adaptations of animals and how these adaptations may be applied in the design of a sub. Complete worksheet “Ocean Zones Fill In: Organisms”  Compare adaptations of deep sea animals to the engineering needs of submersibles |