

Rationale:

The students will explore how living things have adaptations enabling them to survive in their environments. They will simulate buoyancy in the chambered shells of ammonites (extinct relatives of octopuses) by measuring the depths of floating bottles filled with different amounts of liquid and gas. They will learn that ammonites filled their shells with water to sink downwards and air to float upwards, while also observing the properties and behaviours of gases and liquids.

Students will record and organise data within tables and graphs to identify patterns. They will refer to patterns within their data to suggest explanations for their findings.

The students will be engaged by activities suited for various learning preferences, with new information processed with the use of visual sources (watching clips on ammonites) and kinaesthetic-based investigations (simulating the characteristics of ammonite shells in water). Social learning will be achieved through the sharing of results. The students will also enjoy drawing ammonites and graphs.

Learning Outcomes:

Cognitive:

Students will:-

1. Understand that living things have structural features and adaptations to help them survive in their environments.
2. Learn that the chambered shells of ammonites held either water or gas to control water buoyancy.
3. Comprehend that gas and liquid have mass and take up space (e.g. within a bottle or an ammonite shell).
4. Learn that gas and liquids have different observable properties and that air (a gas) is lighter than water (a liquid).

Affective:

Students will:-

5. Enjoy watching videos of ammonites.
6. Appreciate carrying out a practical investigation.
7. Enjoy collaborating with fellow students.
8. Be excited to express their creativity through drawing ammonites.

Procedural/Skill:

Students will:-

9. Develop their use of equipment to measure data.
10. Expand their communication skills through discussions with the teacher and fellow students.
11. Improve their math skills in determining averages.
12. Refine their drawing skills through sketching graphs and ammonite anatomy.

Resources:

Computer, projector, plastic tubs, bottles, measuring jugs, water, sponges/paper towel and Activity Sheets.

Suggested YouTube clips:

1. 'Dinosaur Animation 3: Under the Sea'
<https://www.youtube.com/watch?v=PDwrxYOy0AY> - (animation of ammonite predation).
2. 'Alexander Lukeneder, Natural History Museum Vienna'
<https://www.youtube.com/watch?v=7c6V1hFFJDQ> - (animation of unusually-shaped ammonite).
3. '3.7" AMMONITE Fossil Sawn & Polished Inside Natural Outside Madagascar for sale'
https://www.youtube.com/watch?v=2HZ_uTuDyWQ - (internal chambers of fossilised ammonite shells).

For related teachers' notes and activity sheets, please go to www.kronosauruskorner.com.

Procedure:

Engagement:

The students will be encouraged to describe their favourite extinct creature and which adaptations it used for survival (e.g. what did they use to move?). Animated clips of ammonites will be played (YouTube clips 1 and 2), with the teacher asking what adaptations were used by ammonites to move up and down underwater. The teacher will show YouTube clip 3 and explain that ammonites were extinct cephalopods (related to octopuses) and had shells containing chambers. Ammonites could fill these chambers with matter to float up and down. The students will be asked to describe three different states of matter (answer: solid, liquid and gas) and which states could fill an ammonite's shell.

Lesson steps:

1. A student will be selected to examine two bottles in front of the class (the bottles must be capped). One bottle will be filled with water and the other filled with air. The teacher will ask the class which bottle is heavier, with the student confirming that the bottled water is heavier. The teacher will ask the student to crush the other bottle, first with the cap on and then off. The teacher will ask why it was difficult to crush with the cap on (answer: it wasn't empty – it was filled with air that couldn't escape). They will ask what shape air (gas) and water (liquid) takes when put inside a bottle (the same shape as the bottle). The students will be asked why air bubbles float to the surface when bottled water is turned upside-down (teacher demonstrates).
2. The students will collect empty bottles (e.g. 400 ml size) which represent ammonite shells. They will be instructed to measure the depth of the bottles inside a tub of water. This can be done by placing rulers at the bottom of the tub. They will record the depth of the bottles filled with 0 ml, 100 ml, 200 ml and 400 ml of water (water can be poured using measuring jugs). The students will be asked to consider any safety risks when using water (e.g. slippery floors from spills) and clean up any mess.
3. The students will complete Task 1 in Activity Sheet 1 by recording depths within a table. They will ask two other students to share their results. With three sets of data, they will work out the average depths of the bottles when filled with different amounts of water.
4. The students will complete Task 2 by constructing a line graph plotting average depths of the bottles when filled with different amounts of water.
5. The students will complete Tasks 3-5 in Activity Sheet 1.

Conclusion:

6. The students will hand in their work (or finish it for homework if it is not completed). The students will be asked for an interesting fact they have learnt about ammonites and differences in the properties of air and water.
7. The teacher will recap the major points from today's lesson, including how adaptations help living things survive and the properties of gas and liquid.

Homework:

The students will complete Activity Sheet 2, where they will draw the external and internal features of ammonites. They will also answer questions regarding adaptations used by ammonites to survive in their surroundings.

Name: _____

Task 1. Record the depths of bottles filled with different amounts of water.

Amount of water	Depths of bottle (your measurements)	Depths of bottle (partner 1 measurements)	Depths of bottle (partner 2 measurements)	Average bottle depths
0 ml				
100 ml				
200 ml				
400 ml				

Task 2. Draw a line graph plotting the average depths of the bottles filled with different amounts of water.



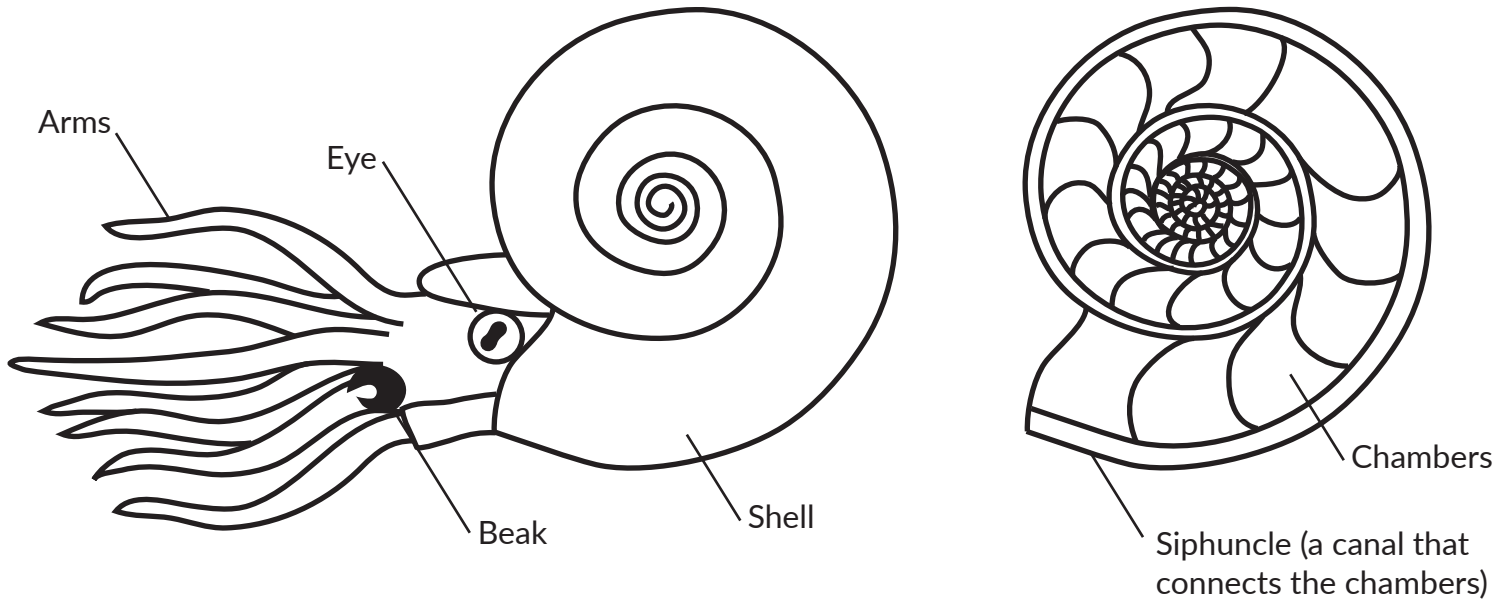
Task 3. What changes occurred when bottles were filled with increasing amounts of water? Why did this happen?

Task 4. What adaptation would an ammonite use to float upwards underwater?

Task 5. Predict what would happen if a plesiosaur swallowed stones while underwater?

Name: _____

Observe a reconstruction of a living ammonite (left) and a cross section of an ammonite shell (right).



Task 6. List the functions of the following features:

Arms: _____

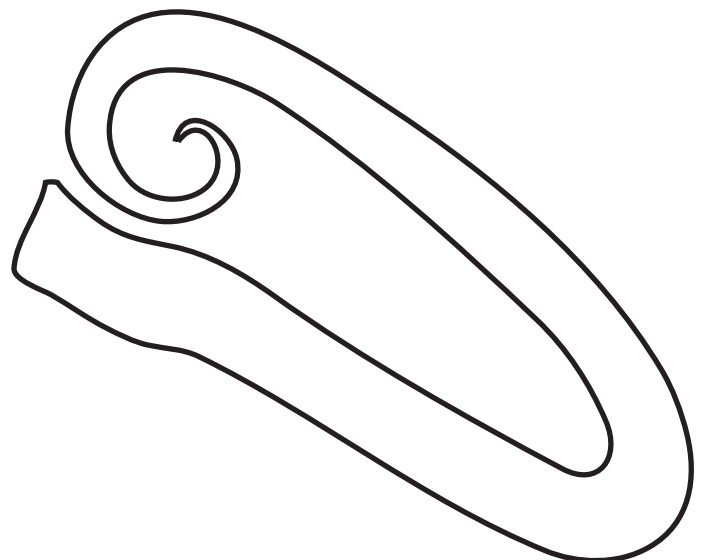
Eye: _____

Beak: _____

Shell: _____

Chambers: _____

Siphuncle: _____



Task 7. Draw and label the external (outside) features of these two ammonites.