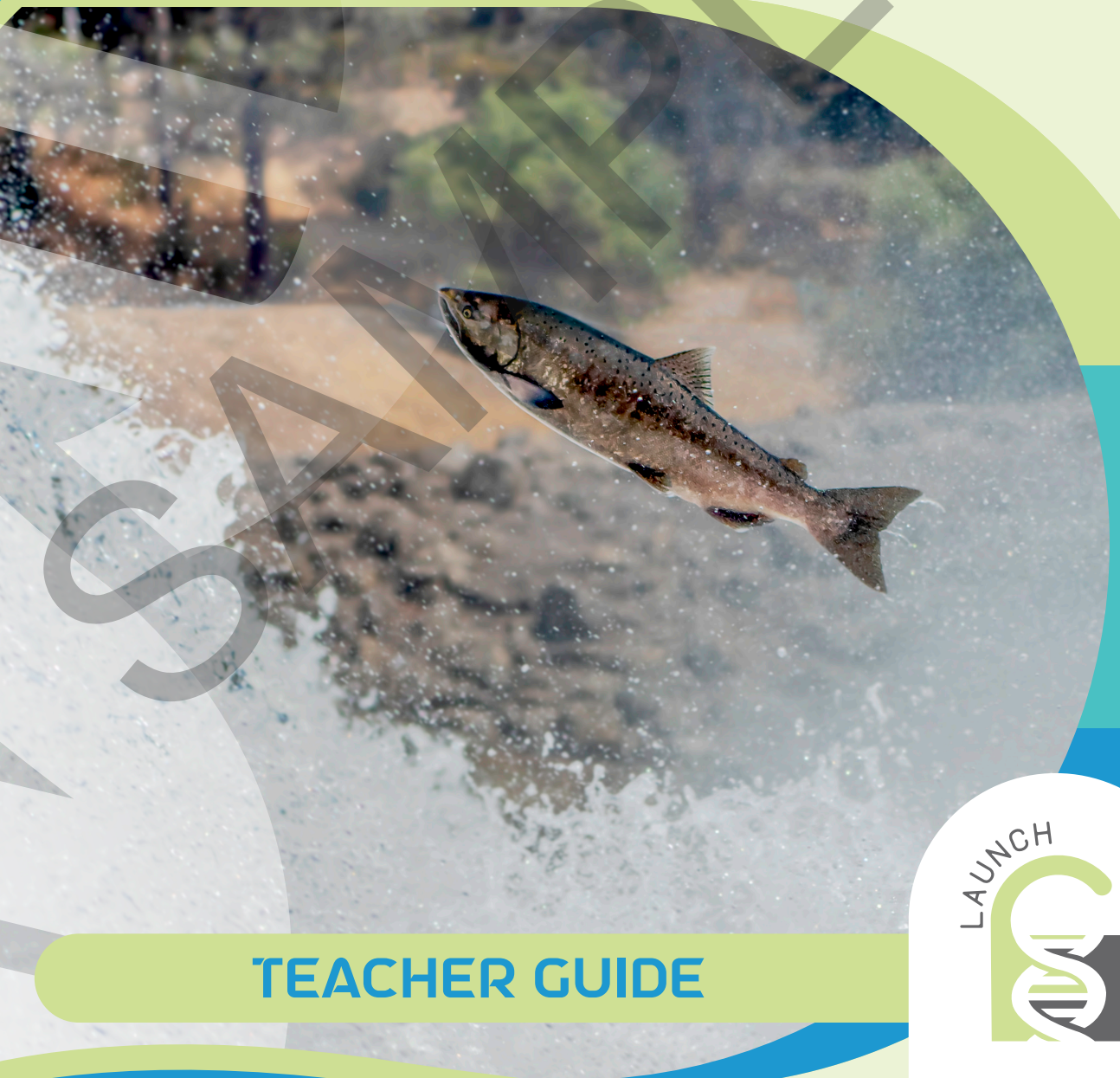


BREATHING WITHOUT AIR



TEACHER GUIDE

LAUNCH



PLANNING

Here's a suggested schedule for this kit! The activities are designed to be completed in order, but you can decide when to do them over time. Required times are estimated.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: LIVING WITHOUT OXYGEN Find out how some animals survive with little to no oxygen. Time required: 1 h	<input type="checkbox"/> No-Air Animal <input type="checkbox"/> Don't Hold Your Breath	60 minutes	Day 1
ACTIVITY 2: REMARKABLE RESPIRATION Examine the differences between body-level and cellular-level respiration. Time required: 3 h	<input type="checkbox"/> Physiological Respiration	90 minutes	Day 2
ACTIVITY 3: THE CARBOXY Follow the fl			

Full schedule
available with
purchase

1

activity

LIVING WITHOUT OXYGEN

Your student will find out how some animals survive with little to no oxygen.

NO-AIR ANIMAL

CONTENT

- In this section, your student will learn about a parasite (*Henneguya salminicola*) that is an animal but does not require oxygen; it is the only known animal to have this ability.
 - *Henneguya salminicola* has a classification that may be somewhat surprising.
 - It is in the Kingdom Animalia (it is an animal).
 - It is in the Phylum Cnidaria. Other cnidarians include sea jellies, sea anemone, and soft corals.
 - It is in Class *Myxosporea*, which only contains obligate parasites with varying needs and characteristics. Many *myxosporeans* are parasites that infect salmon.
- The vocabulary term parasite is defined.
- In this section and the next one, different types of obtaining oxygen are described. The following vocabulary may help you discuss these conditions with your student:
 - Anoxia or anoxic environment means conditions in which no oxygen is present; this usually refers to an environment that normally has no oxygen and has organisms in it that are adapted for those conditions. It can also refer to a short period of time without taking in oxygen, such as when holding one's breath.
 - Hypoxia or a hypoxic environment means levels of oxygen that are lower than normal, which can suffocate aquatic organisms and collapse ecosystems.



THINK ABOUT IT!

Question 1: What are the differences between the salmon flesh in the two photos?

Answer:

- Answers will vary, but the student should notice that the salmon flesh shown on the left looks smooth and without white blotches, while the flesh on the right looks like it has unsightly white cysts throughout.
- Check that they notice that although there are white parts in both healthy and unhealthy salmon flesh, the parasite-infected salmon has more of a blotchy appearance.

Question 2: Which of these two photos has salmon that you would rather eat (assuming you would eat salmon)?

Answer: Your student will likely state they would rather eat the one that looks "cleaner" and does not have the white spots.

How to Help: If your student does not consume salmon in their diet, they can answer on behalf of people in general, such as which would "people" rather eat?



THINK ABOUT IT!

? **Question 1:** Describe the roles of salmon and *Henneguya salminicola* in the carbon cycle.

Answer:

- Salmon contain carbon compounds in their bodies, consume organisms that contain carbon compounds, can be consumed by other organisms, perform aerobic respiration, and eventually decompose.
- *Henneguya salminicola* contain carbon compounds in their bodies, consume the carbon compounds contained in salmon, perform anerobic respiration, and decompose.

How to Help:

- *The role of an organism in the carbon cycle changes depending on its stage in life and its location.*
- *One important aspect to note as your student prepares to think about trophic levels in Activity 4 is that both organisms are consumers.*

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CARBON CHEMISTRY

✓ PREPARATION AND SUPERVISION:

SAFETY!

WARNING! Contains hazardous chemicals. Do not eat or drink. Wash your hands after use.



Calcium chloride and sodium carbonate are minor skin and eye irritants. When conducting this experiment, wear gloves and do not touch your face or eyes. Wash hands and surfaces thoroughly when finished with the experiment. Wear eye protection.

- Your student will make solutions of calcium chloride and sodium carbonate and react them to make solid calcium carbonate.
 - This will help them better understand how carbon cycles between the atmosphere, biosphere, hydrosphere, and geosphere.
- The white precipitate (insoluble solid) that forms during the reaction is calcium carbonate, commonly known as chalk.



THINK ABOUT IT!

? **Question 1:** Before the precipitation reaction, where were the carbon atoms? Explain.

Answer:

- Carbon atoms were in the carbonate part of sodium carbonate.
- The sodium carbonate ions are easily dissolved in water, so they would not be visible in the water.

How to Help: Guide your student back to the chemical equation provided in the Student Workbook and remind them that a chemical equation shows the atoms present before and after a chemical reaction.



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Kit	SU-BREATH
Instructions	IN-BREATH
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