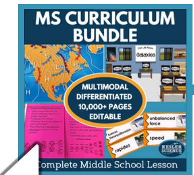
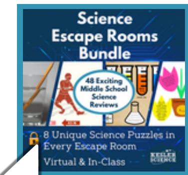
What Can Kesler Science Do for You?

4th - 8th grade science teachers love our Life, Earth, and Physical Science materials! With these easy and engaging materials, teachers can save planning time and put their focus back on the teaching that really matters.



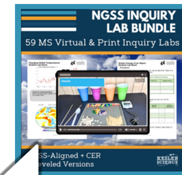
5E LESSONS

Two-week lessons with over 100 topics



ESCAPE ROOMS

Engaging activities for review

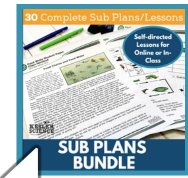


INQUIRY LABS

Three different levels to fit every student

AMAZING ANCHORS

Anchoring phenomenon to book-end your lessons

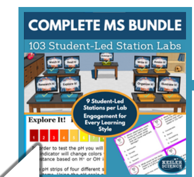


SUB PLANS

Never worry about planning for a sub again.

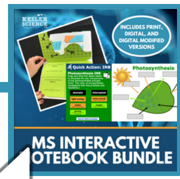
WARM-UPS

Bellringers for the entire year



STATION LABS

Student-led exploration

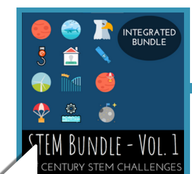


INTERACTIVE NOTEBOOKS

Bring science journals to life.

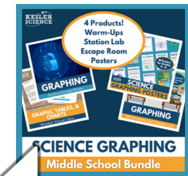
WIKI TICKETS

Quick formative assessments



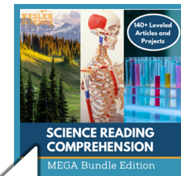
STEM CHALLENGES

Real-world STEM problem-solving



GRAPHING

Table and charts and graphs … OH MY!

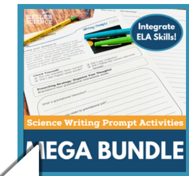


SCIENCE READING COMPREHENSION

Leveled reading passages with mini-activities

SPANGLER COLLABORATION

Exclusive Steve Spangler lessons and videos



WRITING PROMPTS

Writing activities covering 100+ topics

EXPLORIES

Story-driven units with integrated activities

The Kesler Science Professional Learning Network (PLN) group on Facebook has a huge community of engaged and supportive science teachers - come join us!

Name: ______________________

Date: ______________________

Dark Oxygen

We have discovered so many fascinating features and creatures in the depths of the ocean - hydrothermal vents, iron-plated snails, and glowing anglerfish are just a few of the oddities we've uncovered. Recently, scientists made another wild discovery—**dark oxygen**.

Most oxygen is produced when plants use sunlight to make glucose and oxygen during photosynthesis. Not dark oxygen, though! Scientists gave this name to oxygen produced without sunlight at the ocean floor. Scientists were investigating something else entirely—metal-rich lumps called ferromanganese nodules found on the seafloor—when they stumbled upon this phenomenon.

The researchers first thought their equipment was faulty; they expected to see oxygen levels drop as their devices rested on the seafloor. Instead, they found oxygen levels staying surprisingly high. Oxygen bubbles even rose up from the floor when they raised their equipment!

Where was this oxygen being generated? At first, the researchers thought microbes might be to blame, but that wasn't the case. Then they realized that the ferromanganese nodules were, in fact, little batteries.

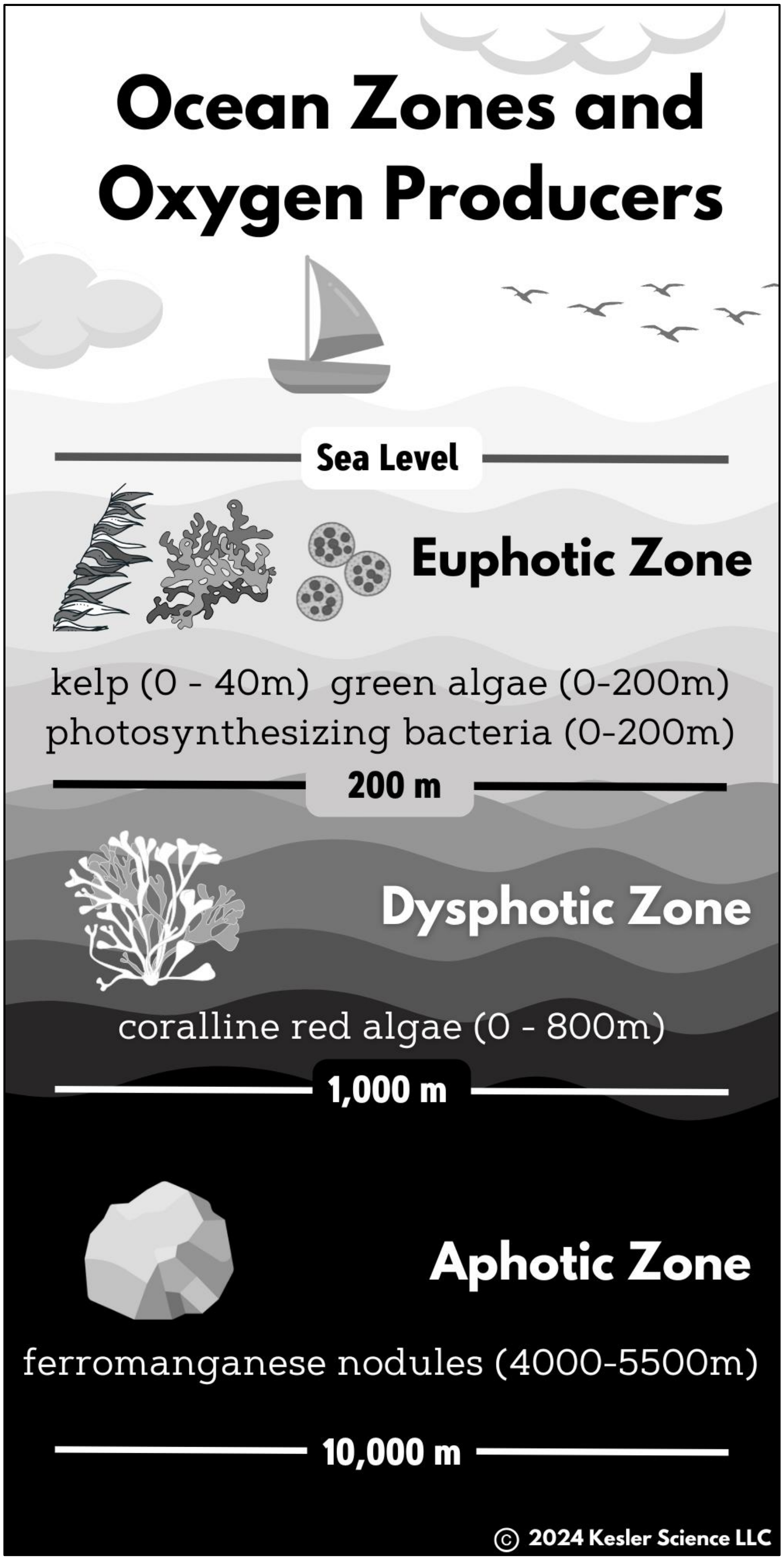
Individual nodules can produce 0.95 volts. Scientists think that when they are clustered together, they may create the 1.5 volts it takes for seawater hydrolysis.

Seawater hydrolysis happens when electricity splits seawater molecules into hydrogen and oxygen. If the nodules are generating oxygen this way, the implications could be huge. The area where the nodules exist is called the Clarion-Clipperton Zone, and it covers **4.5 million square kilometers (1.7 million square miles)** of the ocean floor. How much life in this deep-sea area is being supported by these nodules?

The question is urgent because underwater mining companies are in a race to mine these nodules for their battery-making materials. In fact, the scientists who measured the dark oxygen were originally funded by one of the mining companies. If the nodules turn out to be critical to deep ocean life, the mining companies will face a tricky situation.

The following visual shows the depth of some oxygen-producers and the ferromanganese nodules compared to the depth that sunlight can penetrate. It's a tall one!

Dark Oxygen



1. Why would it make sense that most of the oxygen-producing organisms live in the euphotic zone?

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2. Why is the depth of coralline red algae surprising?

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3. Check out this list of Greek meanings: photo = light, eu = good, dys = bad, a = not. Why do the combinations of these meanings make sense for the names of the ocean zones?

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4. There are bacteria and other organisms that live at the bottom of the Mariana Trench, which is 10,900 m deep. Some of those organisms make their own food. Why is it a safe guess that those organisms are not using photosynthesis to make their food?

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Blog Link: https://blog.keslerscience.com/phenomenon-and-graphing/dark-oxygen
Related links: https://www.smithsonianmag.com/smart-news/scientists-discover-dark-oxygen-on-the-ocean-floor-generated-surprisingly-by-lumps-of-metal-180984778/
https://www.nature.com/articles/s41561-024-01480-8

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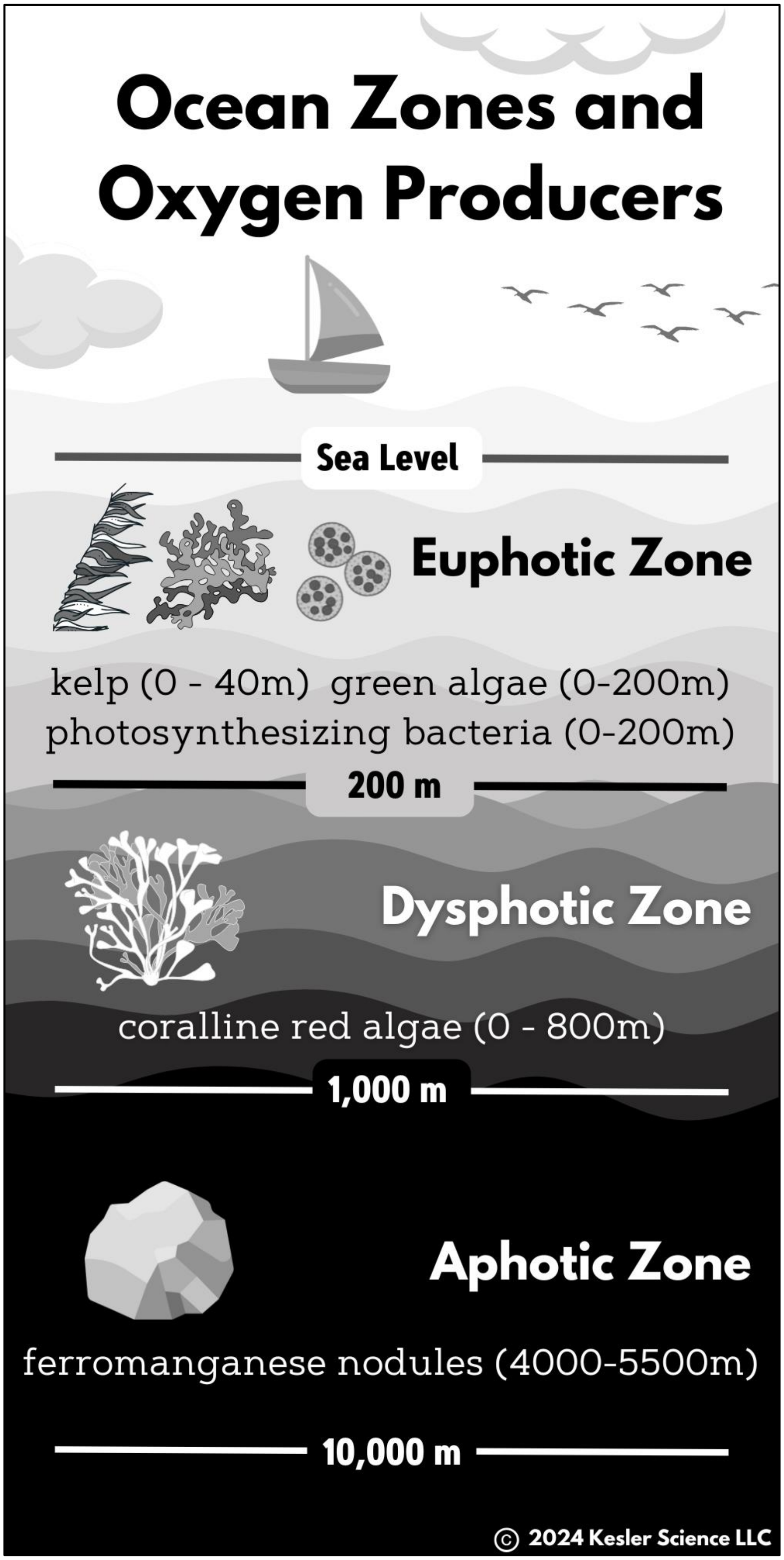
Weekly Phenomenon
Graphing Activity
Teacher Key

Dark Oxygen



1. Why would it make sense that most of the oxygen-producing organisms live in the euphotic zone?

   This is the zone where the strongest sunlight reaches, and the oxygen-producing organisms need sunlight for photosynthesis.

2. Why is the depth of coralline red algae surprising?

   Most photosynthesizers have to live where sunlight can reach easily. Wondering why this algae can live at such depths? Coralline is a strange algae whose red color allows it to absorb the blue-green light that can reach deeper into the water.

3. Check out this list of Greek meanings: photo = light, eu = good, dys = bad, a = not. Why do the combinations of these meanings make sense for the names of the ocean zones?

   Euphotic means "good light" and matches the zone with the best sunlight. Dysphotic means "bad light" and matches the zone with very weak light. Aphotic means "no light" and matches the zone where light cannot reach at all.

4. There are bacteria and other organisms that live at the bottom of the Mariana Trench, which is 10,900 m deep. Some of those organisms make their own food. Why is it a safe guess that those organisms are not using photosynthesis to make their food?

   Photosynthesis requires sunlight, which absolutely cannot reach those depths. A great topic for further research is chemosynthesis, a process that was only discovered in 1977!