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**HOMESCHOOLING**





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# Fifth Grade Edition



## **Fifth Grade Science**

Welcome to your exciting science journey! When you complete this course you will be one of the smartest kids around. Okay, you probably already are, since homeschooled students tend to be super smart! This course is designed to help you push yourself even further by learning to think intelligently and work like a scientist.

The first sixteen units, which we call “**Mastery Badges**” and which are all found in this book, are designed for you to complete while you are in fifth grade. There are 64 mastery badges altogether. Taking four years (5th-8th grade) to complete.

You have plenty of time, so don't rush!  
Plan to spend about two weeks per mastery badge.

## **You Can Do Hard Things!**

Remember that anything important is usually challenging. However, challenging doesn't mean impossible! You can do hard things! If you find yourself stressed out or confused, know something really important. Know that everyone feels that way sometimes. Feeling overwhelmed just means that your brain is making room for all the new things you are learning.

### **Trust In Yourself**

Learn to believe in yourself and to recognize your own learning patterns. When you do feel overwhelmed remind yourself that you have felt that way before and that you got through those feelings. You didn't give up then, and because you didn't give up, you mastered the things that used to be hard for you, and you will master these new things as well.

### **Learning To Be A Scientist**

I have been teaching science for many years, and I am sometimes asked a question that sounds something like this:

“Mr. Bertoch, what is the point of science? Why do I have to learn this? How will it EVER help me in life?”

Can you hear the sarcasm? Fortunately, this question has a very easy answer. It is true that learning the job of the mitochondria (a microscopic mini-organ found inside of cells) will probably never come up on a job interview, a tax form, a driving test, or a future business meeting. It is true that unless you grow up to work in the field of medicine you will likely be just fine not knowing what this little bio-machine does. However, this misses a very important point.

When we learn about the mitochondria, we don't just memorize its function. We also learn to be curious. We learn how to do research, make observations, collect data, analyze data, look for patterns, make inferences, and how to support our views and opinions using evidence.

**THAT IS WHAT MATTERS!** That is why science is so important!

Years from now, you may forget some of the topics we study. I hope you don't. I hope you remember everything. But I harbor no unrealistic expectations. The fact is that you almost certainly will forget some of the topics we studied together during your time with me.

What you will not forget though, and what will absolutely change your life forever, are the practices that make you a more intelligent adult.

You will learn to think. To demand evidence. To use logic. To be curious. To make observations. To invent and create. To solve problems. To trust in your own intelligence and in your own abilities to be successful.

These are thing things that will lead to your success in any future job you choose to work in.

**Enjoy Your Science Journey! Science Is So Much Fun!**

## Topics Studied In The Fifth Grade

During your time in fifth grade science you will study each of the following topics. By the end of your journey through this grade, you will be an expert on each of these things.

Your goal is to hold yourself accountable to a high standard. You are after all a homeschool student, and everyone knows that homeschooled students are the most successful kind. You have a high bar, but you are up to the challenge!

### Topics of Study This Year

- The Formation of The Earth
- Minerals, Gems, Rocks
- The Rock Cycle
- Pressure & Weather
- The Coriolis Effect
- Gyres, Atmospheric & Oceanic Currents
- Sea Breezes, Land Breezes, Monsoons
- Specific Heat Capacity
- Factors Influencing Climate
- Biomes
- El Niño & La Niña
- Our Sun
- The Planets
- Atoms
- Molecules & Ions
- Mixtures - A STEM Lab

Each of these topics are broken down and explored in great depth using hands-on labs, videos, reading and writing assignments, quizzes, and many other fun and engaging activities.



Before we begin your science journey, I need to share some information with your parents or guardians about how this science curriculum works. Go ahead and hand this book over to them, and have them read the next few pages.

**It would be a good idea to review the things discussed on the next few pages together** so that both of you understand how this science class works.

## Introduction For Parents

**Welcome** to HandsomeScienceTeacher's Complete Science Curriculum! Welcome also to a fun, engaging, and hands-on science learning journey. Before we jump into the curriculum, let's first take a minute and talk about some routine housekeeping items. Important things like... why this curriculum was created, the pedagogy that it is built on, and how to utilize this resource to achieve the best possible results.

Even before we do that though, I should take a moment and introduce myself to you. Until you know who I am, and you know... why you should listen to me... there is really very little reason for you to continue using the rest of this article. When it comes to educating your child, it is important that you know who you're dealing with. Your children matter to you more than anything in this world. Which is exactly how it should be. Consider the next section my job interview with you. Where I answer your questions about why I am hopefully a worthy candidate to be entrusted with the science instruction of your precious children.

Questions like: Who is this incredibly handsome science teacher? What does he know about teaching science? What experience does he have with homeschooling? What is his personal agenda? What are his credentials? And most importantly... why does he think he is so handsome? Okay, so I won't answer the last question, since no one but me actually thinks that I truly am handsome... I'll do my best with the rest though, and then you can determine whether or not you think the curriculum I have created is worthy of use by your family.

## About Mr. Bertoch

I began my career in education way back in 1998. Though my experience with science goes back to my childhood. As a young man, I used to stay up late at night, lay in the backyard, and stare up at the stars. During my idyllic childhood growing up on a farm in Hunter, Utah I was a science addict! Kind of geeky, I know, but I adored science, and absolutely couldn't get enough of it.

In 1998, at the age of 21, I founded a company called The KidsKnowIt Network, which would eventually grow to become the most popular (by traffic) educational portal on the Internet, serving tens of millions of students all over the world every single month. In 2012 when I sold it, no other online educational company was receiving more traffic than ours.

We had the largest (by traffic) Astronomy website, Biology website, Geology website, Geography website, Dinosaur website, History website, and spelling website in the entire world. We also had the

second most popular math website. Our math website never got bigger than CoolMath.com. In that area we had to settle for second place, but that's okay, because the people at CoolMath.com were pretty... well... cool! And hey... you can't win every battle!

I loved building and working at The KidsKnowIt Network. It gave me some amazing opportunities. I got to meet and work with some impressive individuals. Including governments all over the world, in order to develop their science standards and curriculums. As well as top executives for companies like Microsoft, Lenovo, Adobe, Home Depot, and others, as we worked to create educational opportunities in the private sector. I also was given the opportunity to speak at education and technology conferences around the world as a featured presenter. During this era of my life, I was a sought-after expert in the areas of education and technology, especially as it pertains to the sciences. Incidentally, we also published educational books and produced educational videos that went out to school systems around the globe.



In 2012 I had a life-changing epiphany though. As much as I loved my job, one day as I sat in my office, I realized something very important. I remembered that ever since I had been a young boy, I had always dreamed about being a science teacher. Not a speaker, not a presenter, not a CEO, not a science consultant to governments around the world... but a science teacher, in a classroom, working with students.

I was happy, but not entirely fulfilled. This realization ate at me, and in time I set out to find investors to take over The KidsKnowIt Network so that I could move myself toward my childhood ambition. To teach! My wife was kind in supporting me in this effort. Which is good, because leaving my influential position behind led to a 95% pay cut. Teachers make WAY less money than CEO's. That's okay though because my decision to enter the classroom also led to a 1000% increase in my overall state of happiness!

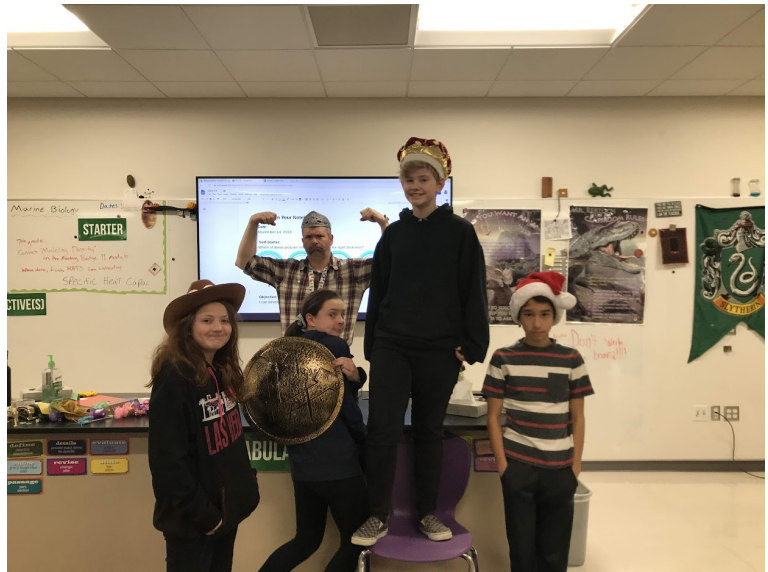
Within a year I had earned my teaching certificate, and then found myself hired to teach as a 7th-grade science teacher at West Jordan Middle School in a suburb just outside of Salt Lake City, Utah.



I continued teaching at West Jordan Middle School for the next seven years and absolutely loved it. During my time there I was awarded teacher of the year, as well as science department chair of the year (two different years). During this time, I was privileged to build a science fair program that dominated the State of Utah.

Eventually, my wife and I moved to Charleston, West Virginia where I then began teaching in a 6th-grade science class at West Side Middle School. A position that I continued working in for 3 years. Making my total time in public education 10 years. During my time at West Side Middle School, I was nominated for teacher of the year yet again. An honor that means more to me than I can express.

Following my departure from public education, I spent the next year developing the curriculum in this book and teaching it to homeschool students around the world.



During this time, I taught more than 90 students from all over the world in small classes via Zoom. These students helped me to really refine and improve these learning resources so that they could become as effective as possible for families working outside of a school system. Taking into account the need to modify labs so that they utilize, as much as possible, supplies commonly found at home, adapting lessons so that they are effective without a teacher being in the same room via video instruction, and so forth.

And that pretty much takes me through the present day. But, what about my credentials?

## My Credentials

Before you begin using HandsomeScienceTeacher.com's materials, you deserve to have the peace of mind of knowing what my credentials are. What gives me the right to put these materials together? How do you know they will be effective? How do you know that they are built on sound pedagogy? Let's start with my degrees.

**Please don't hold the fact that I have multiple degrees against me!** I built my business empire without any degrees. During that time, I found that degrees matter far less than experience. Indeed, some of the best employees I ever hired did not have a degree. When it came time to teach though, I had to have them, and so I earned several over my decade as a teacher.

### My Degrees

I am lucky enough to have had the opportunity to have earned three degrees. Two in science and one in instructional design. I have a bachelors in Earth Science which covers astronomy, geology, atmospheric science, and oceanography. I have a masters in Biology, and I have a second masters in

instructional design. Instructional design is the methodical study of, and science behind, teaching and learning. With a particular focus on creating effective courses for students.

### **My Understanding of The Various Science Standards**

Don't hold this against me either. I know the standards well, and I know that can be a handicap, if not managed correctly. Please know that I am careful in my application of the standards, and I believe I know them well enough to know when to depart from them.

During my career I have had numerous opportunities to work on the International, National, and state, district, and even school levels in the areas of developing and unpacking science standards. During my time at The KidsKnowIt Network I sat on a number of councils that helped to design and influence the current national science standards in The United States, as well as the science standards used by other countries. During that time my company was also hired by various states and organizations to consult on the creation of their standards. In these efforts, I always focused on using my influence to encourage school systems toward curricula that engendered an independent and logical mindset, where students learned to depend on their own skepticism and ability to think, rather than trusting experts.

During my time as a teacher I worked on the state and district levels to unpack science standards as well as to train other teachers in the district and state on how to teach those standards. When the State of Utah adopted the NGSS standards I sat on the State committee that went through and explored the implementation of the standards, and also spent weeks on the district level training other science teachers on how to utilize the standards.

Once again, my focus was on the important of teaching students to think for themselves, to demand evidence from the so-called experts, and to question everything. I wanted to create scientists, who don't believe me, rather than loyalists who follow what they are taught without question. Science is the process of questioning the experts, not worshipping them. My goal was always and foremost to get students to believe in their own intelligence.

Because of these experiences, I am intimately familiar with The Next Generation Science Standards, which are utilized by most states in the United States, having been part of the discussions and trainings from their creation down through their implementation, and having played at least a minor role in nudging these standards toward a student-centered approach.

### **My Understanding of Science Pedagogy**

What is Pedagogy? It is just a big word that essentially means the science of teaching. In this case, the science of teaching science... which sounds a little strange to say outloud. Science pedagogy is different than reading pedagogy, and different again from math pedagogy. Each content area touches different parts of the human mind, and so different strategies are required to reach learners.

So, what do I know about science pedagogy?

It turns out, quite a lot. Teaching science is something I am very good at. I know this sounds prideful, and I hope you will forgive me for saying as much. I don't mean to sound arrogant, but I am very good at teaching. Especially science.

At both middle schools where I taught, we worked with the most underprivileged kids in our communities. My first school, West Jordan Middle School, was the most highly impacted school in our district and one of the most highly impacted schools in the State of Utah. Our students experienced significant challenges relating to poverty.

My second school, West Side Middle School, was even more challenging. It was located in the highest crime community in the State of West Virginia, where our students lived in conditions that you cannot imagine. These students witnessed atrocities that most adults never see. They were sadly also frequently the victims of these crimes. Many of them lived in homes without utilities and were in constant survival mode.

Despite the many challenges and setbacks that our students faced, I was able to lead them on to scoring on average 20% higher on standardized tests than their peers. When I say this, I don't mean that they scored higher than their peers at the same school. Rather I mean that our poverty-stricken minority students were scoring 20% higher than students in other much more affluent schools and communities. This was an accomplishment that I am very proud of. It proved that our students were every bit as capable as those in more affluent communities.

I mentioned earlier a science fair program that I was lucky enough to get to build. During my time at West Jordan Middle School, I built this science fair dynasty which was unrivaled in the State of Utah.

At its height, we absolutely dominated the district, regional, and state science fairs. Averaging 30-40 kids every year going to the Central Utah State Science Fair, and 5-7 kids every year winning at the state science fair. I was even able to take 3 kids all the way to the national science fair where 2 of them won 3rd place in their division. **All of this from within these highly impacted schools!**



**My students learn.** They don't just memorize facts. They actually understand the content and are able to use it to do real science on their own. I know how to teach science in a way that builds scientists, rather than just making them memorize facts.

The strategies used in this curriculum are proven to be successful. I do not believe in busy work! Busy work is a waste of time. Everything we do is intentional, has a purpose, and is tied directly back to helping students become intelligent thinkers. Likewise, the order of how I present the content is intentional.

## Touching Students Brains As Many Times As Possible!



This curriculum is designed to touch students' brains. Not literally! Thank goodness. That would be gross. But rather, my curriculum is designed to repeatedly touch a child's mind in a way that forces their brains to retain what they learn. Every time we poke the brain neuropathways in their mind for that content become stronger.

Here's the deal though. We don't want to just touch one part of their brain over and over again. To be truly effective, we need to touch as many different parts of their brain as possible. This is because each time we

engage another part of their brain, we once again strengthen the pathways that store the knowledge they are learning.

Thus, we want to use the part of their brain that listens, the part of their brain that talks, the part of their brain that reads, the part of their brain that writes, the part of their brain that is creative, the part of their brain that is analytical, and above all, the part of their brain that is responsible for physical movement.

My curriculum engages their entire mind and body in the learning process. Forcing them to activate all of these parts of their brain. Which most other curriculums ignore. Most curriculums focus solely on memorization and reading. We will be engaging the entire mind, and in so doing, students will end each unit having created a very well-laid-down neuro network.

They will not just be able to recall a memorized fact. They will understand the fact, and how it relates to other facts. They will be able to utilize what they know to solve new problems. Their science education will form an integrated whole that will help them to understand the world for what it really is, and to think analytically about it.

Most importantly, they will learn to question the experts. They will learn to view themselves as every bit as smart as any expert, and as capable as anyone else of looking at data and drawing their own intelligent conclusions. Instead of being dependent on others to spoonfeed them knowledge, they will learn to seek out knowledge on their own and to determine for themselves what is true, and what isn't.

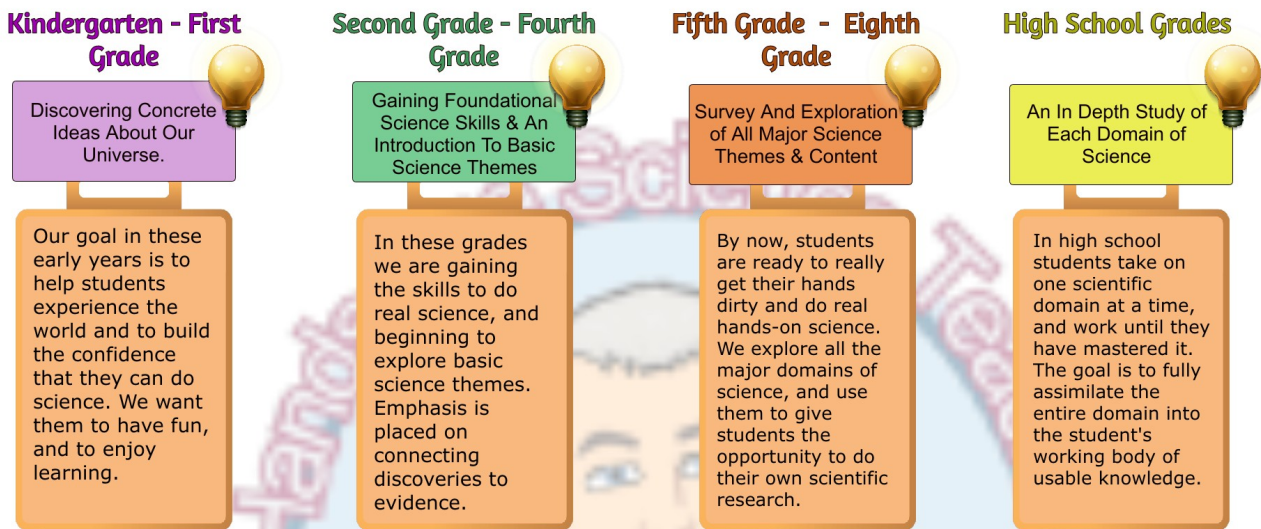
At no point in this curriculum do I tell them what they have to believe. Rather, I empower them to find truth on their own. It is not my job to impart my own agenda to them. Rather, it is my job to teach them to be skeptical of me as the teacher and to do their own research.

## How This Curriculum Is Organized

A lot of thought and experience has gone into organizing this curriculum so that it is as effective as possible. To get the most from these activities it is important that your student complete them in the order that they are presented.

## First Let's Look At The Curriculum As A Whole

The curriculum, which spans K-12 grade was created in order to achieve two very important purposes. Firstly, to develop intelligent, confident, and independent thinkers. Secondly, to impart a very deep understanding of all domains of science. To achieve this goal, the curriculum follows the framework expressed in this diagram.



As students progress through the curriculum mastery badges will become increasingly challenging. However, they all follow the pattern outlined below.

## We Always Start With Discovering Labs



Every unit, or "Mastery Badges" (more on mastery badges later) starts with what I call a Discovering Lab. Research shows that students learn and retain their knowledge best when they "discover" it for themselves, rather than when they have a teacher simply lecture to them. These discovering labs are designed to give students the opportunity to make their own discoveries.

When students begin a new Mastery Badge they won't yet know a lot of the vocabulary associated with it, and that is okay. When completing a Discovering Lab, we are not yet concerned with vocabulary. Instead, we are only working to give students experience and exposure to the concepts. These are hands-on projects that allow the students to get their feet wet with the material.



When scientists make new discoveries, they too lack the vocabulary. Because they haven't yet made up these new words. In other words, a real-world scientist makes up the vocabulary words only after they make the discoveries. Thus, in the same way, it is okay that your learner doesn't yet have the vocabulary words to describe what they are learning from a discovering lab. These words will come later on.

Students should complete the Discovering Labs carefully and do high-quality work. If they do not know what something means, they can and should research it using available resources such as books and online articles. **It will be tempting for students to look ahead to the instructional video or the article that go with the Mastery Badge.** Encourage them not to do this. They will gain more by doing their own research than by looking ahead.

How is doing research any different than looking ahead to the video or article that go with a Mastery Badge? It may seem like a subtle difference but it is important. By looking ahead to see what I teach in the video, they find answers that they will be tempted to accept as empirical. Because I am the teacher they will view what I say as the "correct" answer.

However, by doing their own research and watching outside videos, or reading outside articles, they will come across a wider array of opinions and views on a topic. They will have to read and evaluate these for themselves and decide what they believe. This is an important part of science. Scientists do research all the time. They read scientific journals and analyze articles as they try to learn what other scientists have already discovered.

It is okay for your learner to do research while completing a Discovering Lab (outside videos and articles) but resist the temptation to watch MY videos or read MY articles until after the lab is complete.

Scan the QR Code above to watch a video of me talking about Discovering Labs.

### **The Second Part of Every Mastery Badge Is Instructional Videos**

Every Mastery Badge includes one or more instructional videos, where I teach your student the material. Again, it is very important that students complete the Discovering Lab before watching these videos. It seems like a small thing, but it is actually huge. We want students to make their own discoveries prior to listening to me talk about the science behind what they have observed or researched. We want them to have formed their own opinions before I bias them with my teaching.



These science videos are easily accessed using any device via a QR code located within each Mastery Badge. They are free and included with this book. On average each video is about 10-20 minutes long, though younger grades tend to be shorter, and older grades tend to be longer.

Encourage students to really pay attention and to pause whenever they don't understand something. If they are confused they can rewind and rewatch, and even research online or in books to better understand a confusing topic. Your student's goal should be to not move beyond the video until they fully understand what is being taught.

In the older grades students are asked to write down 10 things that they learn from each video. Which helps them organize their thoughts. In younger grades they draw pictures, or do a combination of both. This engages the parts of their brain that both listen and write, and helps to create greater pathways in the brain.

### **The Third Part of Every Mastery Badge Is Literacy Assignments**



It goes without saying that reading and writing are very important. In fact, I don't think you could overstate just how important these skills are. Reading and writing cut across all content areas and for that matter, pretty much all aspects of life. In science, we read whenever we are doing research, and we write whenever we are communicating our discoveries to other people.

Each Mastery Badge includes a Literacy Assignment. In this assignment, students read an assigned article on HandsomeScienceTeacher.com (accessible by QR code) and where they will then write about what they read. They will also complete an online quiz that goes along with the article in order to check their understanding.

Take the time to really stress the importance of "Reading For Understanding" and "Writing To Communicate." Help students take ownership over their own reading and writing journeys. Younger students will need help reading and writing. Older students should be able to work on these literacy assignments more independently.



### **What does it mean to read for understanding?**

All of us can relate to reading something while not being present in our own minds. All of us have experienced having read something only to get to the end of it, and realized that we didn't retain any of what we read.

Reading For Understanding means that the student holds themselves accountable for their reading. This is an important learned skill. One strategy they can use is to stop every few sentences and intentionally ask themselves whether or not they are still paying attention. Other strategies include looking up vocabulary words they don't understand, and repeating back in their own minds what they are learning after each paragraph.

There are many strategies that can be used when working to read for understanding. Discuss these with your learner, and teach them to hold themselves accountable, so that they don't simply skim articles or race through them.

### **What does it mean to write to communicate?**

Writing To Communicate means that students write clearly, concisely, and in a way that communicates complete thoughts. I tell students that it is helpful to imagine that they are writing to someone younger than themselves. We tend to write much better when we imagine that our audience is someone younger and less experienced than ourselves, than we do when we write to a teacher or an adult. Write in a way that instructs the reader, and helps them fully understand the topic.

This means planning your writing out, and being intentional in how you present your arguments.

Note that many of the writing prompts presented in these literacy assignments call for a student to write two or more paragraphs. However, they do not specify a definition for what a paragraph is. There is nothing in this curriculum that specifies a paragraph must be a certain number of sentences long, or that it must follow a particular standard format.

This is intentional, in order to allow this curriculum to play nice with other curriculums that you may be using in your homeschool journey. When a prompt says to write a paragraph, this should be interpreted according to whatever standard you are currently holding your students accountable against. If your definition of a paragraph is five sentences long, then students should write accordingly. If it eight sentences long, then likewise, you should have your students follow that standard.

Scan the QR code above to watch a video of me talking about how to Read For Understanding and Write To Communicate.

### **Online Quizzes**

Every article includes an online quiz that checks your learning. This is an opportunity for your student to see how much they really understood from the reading assignment. A standard goal would be that students score at least 75% or higher on these quizzes before moving on. However, you are free to adapt this to your own use and alter the requirements to fit your own needs. If students don't meet your expectation for them, have them re-read the article, and retake the quiz.



### All Mastery Badges End With A Capstone Applying Labs



The capstone of every Mastery Badge is an Applying Lab. These Applying Labs should be the last thing that your student does before passing off a Mastery Badge. They are culminating activities that require your student to use everything they have learned throughout the Mastery Badge.

In order to truly prove their competency with a Mastery Badge, and that they are indeed ready to pass it off, students should complete these Applying Labs from memory. If your student is able to complete the entire lab from memory, then that is a pretty good indication that they are ready to pass off the badge.

Note an important caveat though. When I say “complete the lab by memory” I am not referring to data or experiment results. I am referring to concepts and procedures. It is okay for students to look up data. Indeed many of the Applying Labs specifically call for them to do this in the directions and procedures.

Part of being a scientist is knowing how to look up data and how to complete experiments and simulations. What we care about isn't that they don't look up any data. Rather it is that they don't have to look up any of the procedures, or core content. **In other words, do they understand the science, and can they use it to solve problems?**



## What Are Mastery Badges

As a middle school teacher, one of the things I learned very early on was how meaningless grades are. They truly are completely and absolutely worthless. Or, at least mostly so. **The only thing a grade really shows is how well a student is able to meet the arbitrary expectations of a particular teacher.**

What they do not show though is how the grades of one teachers stack up against those of another. Johnny may earn an "A" in one class, but perhaps the same amount of work would have only earned him a "C" in another class down the hall.

More importantly neither grade tells us anything about how well Johnny actually understands the content. It is very possible to get an "A" in a class, without ever actually understanding anything that the teacher was teaching. All of us have undoubtedly BS'd (Bologna Sandwiched) our way through a class. Often, it is enough to just turn in completed assignments and be likable to the teacher. Our work may not even have correct answers! Because teachers are busy, and if the assignment looks complete they will often give you a good grade on it, without actually checking your work (yes, teachers really do this).

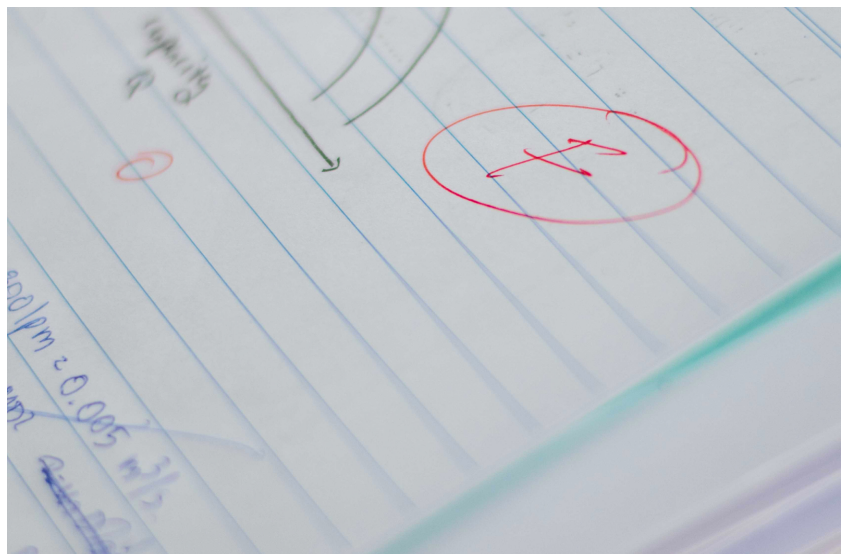
An "A" can mean a lot of things. None of which are consistent from class to class, school to school, or teacher to teacher. But, what about an "F"?

### Failure In Education Doesn't Make Any Sense To Me!

The biggest reason of all for my absolute loathing of the letter grading system has to do with the letter F! The big FAIL! What a stupid concept!

Children work really hard to try and learn something, and then when an arbitrary date on a calendar arrives the teacher decides that students are no longer allowed to continue trying.

These teachers pronounce any students who did not accomplish whatever task they were supposed to accomplish by that date to be FAILURES. Not because they can't learn. Not because they are unwilling to keep trying. But simply because the calendar says they are out of time, and its too bad for them!



I can't imagine doing that in any other aspect of childhood. Can you? Imagine if a piano teacher worked that way. A child sits down to play the piano, and the teacher tells them that they have two weeks to learn a song, and if they don't do it by then, they will be a failure. Imagine if a basketball coach worked that way! An eager little budding athlete shows up to practice each night and faithfully works to improve their free throw, only to have the coach tell them after two weeks that they are a failure.

Yet, this is exactly and precisely what we do in education. **It is almost child abuse in my opinion.** It destroys that child's sense of well-being for no valid reason whatsoever. Declaring students to be failures accomplishes no good purpose. It neither motivates nor instructs. It is simply cruel and lazy on the part of the education system. What needs to happen is, like the piano teacher or the basketball coach, constructive feedback be given so that the student can continue to progress.

### **Learning Doesn't Work The Way Public Education Insists On Teaching**

Learning doesn't happen on the same timeline for every student. Some students learn some topics more quickly, while requiring additional time to learn others.

Returning to our example of a music teacher. A student who learns to play a song on the piano in three weeks is every bit as successful as the student who learned to play it in two. A child who needs a few extra seasons to master their free throw is every bit as valuable to a professional recruiter as the athlete who mastered it in a few months.



### **It is the final result that matters, not the time it took to get there.**

Mastery Badges allow me to give each student their just reward when they complete a unit by mastering all the content associated with that unit. I created Mastery Badges during my first year as a public school teacher and I have never looked back.

Think of them as merit badges in scouting. In order to earn a Mastery Badge a student needs to complete all the assignments associated with each Mastery Badge. This includes passing off the quiz and completing the Capstone Applying Lab (from memory).

### **Student Self-Evaluation**

Throughout each Mastery Badge your student will repeatedly be asked to stop and self-evaluate or "check" their own progress. **Research shows that the single most influential factor in a student's learning success has to do with their ability to self-evaluate.** Students who stop and review their own progress do significantly better than students who don't take ownership of their learning.

As their adult guide, make sure that students are taking the time to honestly evaluate and own their progress. At the end of each Mastery Badge, before awarding the badge to them, have students honestly look back over their work and reflect on their efforts.

### **Your Role As A Mastery Badge Counselor**

Ultimately, it is up to you, the adult to determine whether or not a student has passed off a Mastery Badge. It is you who will act as their Mastery Badge Counselor, and who will be responsible for passing them off. Be honest, supportive, and kind in this role. Hold students accountable with constructive feedback. Discuss and decide together whether or not a student has achieved mastery of the content.



### **What Does Mastery Mean?**

Mastery refers to the student's ability to recall and use the knowledge and practices taught in the Mastery Badge. This includes the content as well as the Science And Engineering Practices. If students are able to easily recall the content and vocabulary, and if they are able to use this content to solve real world problems then they have "mastered" it and are ready to move on. If not, that's okay! We are not in a rush. Take the time to go back over the content and fill in the gaps.

### **Save The Mastery Badge Certificates**

The Mastery Badge Certificates in this book are meant to be saved in your homeschool files. They provide evidence to the state, should you ever be audited. Showing that your student has completed a valid and thorough science curriculum and that they mastered the concepts.

## **The Eight Science & Engineering Practices And The Crosscutting Concepts**

Over the past decade most school systems have been moving toward the Next Generation Science Standards (NGSS), which are built using what is often referred to as 3D science. These three dimensions include content, crosscutting concepts, and the eight science and engineering practices.

HandsomeScienceTeacher's Science Curriculum is built on these three dimensions of science. You will see both the crosscutting concepts and the eight science and engineering practices throughout each Mastery Badge.

Sometimes national and state standards get things very wrong. Other times they get them very right. This is a case of the latter. The eight science and engineering practices are tools that help us create intelligent thinkers. They go way beyond the scientific method that you and I were taught when we were young.

**The Eight Science & Engineering Practices Include:**

- Ask Questions.
- Develop and Use Models.
- Plan and Carry out Investigations.
- Analyze and Interpret Data.
- Use Mathematics and Computational Thinking.
- Construct Explanations.
- Engage in Argument from Evidence.
- Obtain, Evaluate, and Communicate Information.

The purpose behind these practices is to help students become scientists. It isn't enough to simply memorize Newton's Laws of Motion. We want students to be able to use these laws to do actual science and to solve problems. We want to create scientifically minded students.

The more than 400 labs that your student will complete throughout their years working in this curriculum are built on these eight science and engineering practices, as well as on the crosscutting concepts.

**The Crosscutting Concepts Include:**

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

**Your Child Is Every Bit As Smart As Any Expert**

Let's be honest. Your child is smarter than most experts. Sadly, in today's world, there are a lot of so-called experts, who really are not that intelligent. They may have degrees and lots of letters after their names, but they aren't thinkers.

They aren't the people who developed the domains they now rule over. Those great thinkers of the past came, created new knowledge, and then retired, inevitably passing on. The ideas they created were passed on to people who studied their works but never really learned to create new knowledge themselves. These experts are all too often devoted disciples of the great minds of the past, rather than self-informed thinkers in their own right.

**This curriculum teaches your child to trust their own intelligence and to demand that the experts prove the claims they are making.**



## How Much Time To Spend On Each Mastery Badge

Each Mastery Badge is designed to take approximately two weeks to complete. You may finish some more quickly while others may take longer, but as a general rule plan your pacing around two weeks per badge.

Remember that you are not in a race. Mastery is far more important than finishing quickly. If a badge takes three or four weeks don't worry about it. There is space in your schedule for some badges to run a little longer.

### **Goal: Complete 16 Badges Per School Year**

The curriculum has been designed so that you only need to complete 16 badges per school year. If you complete these badges at the suggested pace of one every two weeks then you will only need 32 school weeks to finish all 16 badges. A typical school year includes 40 weeks, which means that you have time for Christmas break, Spring break, and also for some badges to take a little more time to finish.

If you finish in April, is that really so bad? You can move on if you want and work ahead, but it is also okay (and even encouraged) to just deschool a bit and enjoy an early summer break. Go outside, go for walks, and enjoy childhood!

**These little ones only get one childhood!**

## Everything Your Student Needs To Know For Science

This curriculum covers everything your student needs to know for their entire science education. By the time they finish this curriculum if they work hard and keep themselves accountable to their own success, and if their results are like those of my other students, **they will score higher on standardized science tests than the vast majority of their peers.** Including those who have been taught in public and private schools.



Likewise, they will have a very strong footing preparing them for college and beyond. They won't just have memorized a bunch of disconnected random scientific facts in order to pass a class. Instead, they will have become functioning scientists, who think analytically and who are able to use data and evidence to solve real-world problems.

## What Is My Agenda?

Unfortunately, in today's world parents have to be concerned about the various agendas hidden beneath the curriculum that is presented to their students. It is sad that this is the case, but it is a reality. Rest assured that great effort has gone into making sure that HandsomeScienceTeacher's Curriculum is completely agenda-free. Or at least in so far as it is possible for me to hide my own biases I have done so.

It is not my job to teach your student my values. It is my job to teach them science, and I stick to that very strictly. To that end, you have access to every lesson, every video, and every article before your child accesses them.

I have opinions, but I do my utmost to keep them out of the instruction.

## Why I Created This Curriculum

I am going to be very honest here. Perhaps too honest, considering I just got done discussing how I do not allow agendas to surface in my teaching. I will permit myself this one single exception, and I hope you will forgive me for indulging in it.

I recently left the public education system. I did this because I have grown increasingly alarmed and concerned by some of the things I have seen. In my opinion, it is wrong, incredibly wrong, for school systems to teach students things without parental consent that may run counter to the values held in the student's home. Likewise, it is wrong for teachers to ask students to confide in them, and to

promise these students that the teacher will not disclose what has been confided to their parents. I have watched over the past decade as wonderful teachers have retired and as their younger replacements have come in much more willing to hide things from parents or promote their own agendas.

I have sat in meetings where teachers have openly discussed the most basic psychological needs of students while advocating against bringing parents into the loop and even suggesting that parents don't have a right to be involved.

As a person who tries to live a life of integrity, I could frankly no longer be part of a system that increasingly advocates teaching ideas, values, and concepts that parents object to. Especially when these school systems have publicly denied doing the very thing they aggressively pursue behind closed doors.

In fairness, I have had some wonderful principals and have worked under fantastic leadership. However, as the years have progressed, those stepping up into new leadership positions have become increasingly willing to suppress parent access or mislead families in what is actually being covered in classes.

People of integrity teach in the light of day. They are not afraid to let parents see behind the curtain, and they certainly do not mislead parents. If you feel a conviction within your heart to teach something then its rightness should be so self-evident that it can withstand the scrutiny of parental oversight. If you believe that the parents are wrong, this can never justify lying or misrepresenting what is being taught.

The final straw for me came when I found myself debating fellow teachers over the rights of parents. I found myself exasperated by my inability to convince a growing number of my colleagues that it was wrong to lie. Each year more and more teachers were resolutely convinced of the rightness of their efforts to promote ideas contrary to the will of parents. As these attitudes crept into leadership mandates were beginning to be written that required teachers to participate in this kind of disingenuous behavior.

People of integrity do not behave in such a manner, and again, being someone who strives, though admittedly often falls short, of such an ideal, I felt I could no longer participate in such a system, and still maintain my honor.

Fortunately, due to my earlier success in business, I didn't need the income, and though I loved working with my students, I made the decision to step into the world of homeschooling.

### **A Massive Wave of Homeschoolers**

Beginning in 2019 a massive wave of students left public education to begin homeschooling. This is nothing short of an absolute tidal wave! We are talking about millions of families who made the decision to leave the school system. My family was among them. We took our children out of public schools and into the wonderful and exciting world of homeschooling.





### **I Wanted To Be Part of The Solution**

I have a lot to offer my fellow homeschooling families. My journey in the education system has been long and thorough. My credentials are deep and extensive. I was part of the initial group of “influencers” though the word didn’t exist at that time, who built the first meaningful educational websites and portals. I have worked in the trenches designing national and state standards. I have taught in the classroom. I have all the degrees and credentials. I was teacher of the year and science chair of the year, and I understand homeschooling from the perspective of a parent.

I left public education at the end of 2021 so that I could begin to build this curriculum and **make it available completely free of charge** to you. There are other very excellent curriculums out there already. However, to my knowledge, there are very few if any others that are built on three-dimensional science or that take into account the best pedagogical strategies

### **Why Is This Curriculum Free?**

Firstly, let me explain what I mean by free. Since many who encounter this curriculum will have paid for it. If you purchased this curriculum in book form, then yes, it was certainly not free. There was a cost associated with the binding and production of the physical book. However, many of you will have come across this curriculum in digital form. Which is freely available for download and distribution without remuneration to the author.

If you have a digital copy of this curriculum please share it! Post it freely. So long as you do not alter the file, you are welcome to print it, photocopy it, and use it to your heart's content.

My purpose in creating this curriculum has never been to make money. **It is and will always be about being part of the solution.** It is about giving back and helping to fix a very broken education system.

There are millions of families who have pulled their students out of the public education system. These parents showed great courage in these actions. It is scary to take your student's education into your own hands. The trends we are seeing right now in public education put many families in a very difficult spot. Torn between a desire to protect their kids from the predations of decaying agendas, and the utter terror around the many unknowns of teaching at home.

**These families deserve the very best without having to spend a lot of money. It is to these families, that I offer this curriculum at no cost.**

A lot of effort has gone into making sure that this curriculum meets the highest standards. Free can sometimes equate to low quality, however at least in the case of these materials, free does not mean that you are getting something that is less effective.

**In my very experienced opinion, you are simply not going to find a better curriculum on the market,** than what I have produced in these books.

### **Lab Supplies Available on HandsomeScienceTeacher.com**

Having said that, I do sell lab supplies on my website [www.HandsomeScienceTeacher.com](http://www.HandsomeScienceTeacher.com). These supplies are provided at or below market cost, as a service to those families who may need them. Please do not feel pressured to buy these supplies from me. In fact, I go out of my way in the content to provide alternative supplies you can use if something is not available to you.

However, in those cases where families do desire to purchase (or rent) lab supplies they are available. If you are considering investing in lab supplies, may I recommend **The Lab Essentials Kit**, which contains the most common items used in the labs found throughout this program? These are the items that I find students usually do not have at home, including a small pocket microscope, a graduated cylinder, a precision scale, a compass, a metric ruler / magnifying glass, tweezers, specimen jars, safety glasses, and a few other odds and ends. This kit is sold significantly below retail value.

We also rent out a limited number of higher-end items including professional-grade microscopes, microscope slides, models, and various other things you might find in a school laboratory, but that you might not have access to at home.

To look through our inventory go to [www.HandsomeScienceTeacher.com](http://www.HandsomeScienceTeacher.com).

## What Can You Do To Help?

In exchange for utilizing these free resources, I ask for very little in return. All I really hope is that you will pay it forward. If you find this curriculum useful, please consider doing some of the following to help others find it.

- Consider posting a .pdf of this curriculum (available on HandsomeScienceTeacher.com) to your various homeschool groups online.
- Consider leaving a review of this book on Amazon and in other places. This helps so much more than you know, because it pushes the book up further in their searches, helping others to find it.
- Consider subscribing to my YouTube channel. Again, this helps by lending credibility to the channel, and as a result, helping the science videos climb higher in the results.
- Post our videos anywhere and everywhere. Feel free to incorporate our YouTube videos into your own projects. So long as they are not edited, and are imported via our YouTube channel. This helps us get the word out about these resources.
- Talk about this curriculum with family and friends who also homeschool.

I am deeply grateful for any and all such gestures, that help me let families know about these free resources.

## Errors In This Book

Creating these books was a monumental task that has already taken more than two years and thousands of hours to complete, and that will involve at minimum two more years of full-time work. While I am 100% confident in the scientific principles and the pedagogy, I am not 100% confident that there are not some typos or grammatical errors that I missed during editing.

A project like this usually is overseen by a vast team. Just look at the credits page of a typical textbook! I do not have a team to help me. For me, this has been a labor of love. That I have funded out of my own pocket, and that I am giving away freely once it is completed. When it is done it will include more than 15 textbooks with over 500,000 words of copy, hundreds of online articles with an additional 500,000 words of copy, and hundreds of videos and online quizzes.

A project this massively immense would take an education publishing firm 5-10 years to produce and would be overseen by a team of hundreds of people working full-time. The books would go through editors and proofreaders.

I am the writer, the editor, the proofreader, the video editor, the website programmer, and every other role associated with bringing this project to market. Each time I have gone over the text I have found errors. Again, not with the science or pedagogy, but with grammar, copy and paste errors, and so forth. It is absolutely inevitable that I missed some.

My options were to never release it or to put it out there and crowd-source the proofreading. In the end, I choose the latter.

If you find a mistake, please visit [HandsomeScienceTeacher.com](http://HandsomeScienceTeacher.com) and report it. There is a link for reporting errors at the bottom of every page. I will correct the errors you report and update the project as we move forward together.





## The Formation of The Earth

### **What I Will Be Learning In This Mastery Badge:**

In this mastery badge we will learn about how the Earth formed, including the processes that led to its formation, the makeup of the Earth, and its age.

### **What This Packet Includes:**

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### **Key Things We Will Learn In This Mastery Badge**

Some of the most important things we will learn in this mastery badge:

- The Solar System formed from a cloud of dust
- Inner Planets and Outer Planets
- The Great Bombardment
- The Formation of The Moon
- The Goldilocks Zone
- A Thousand Years of Rain

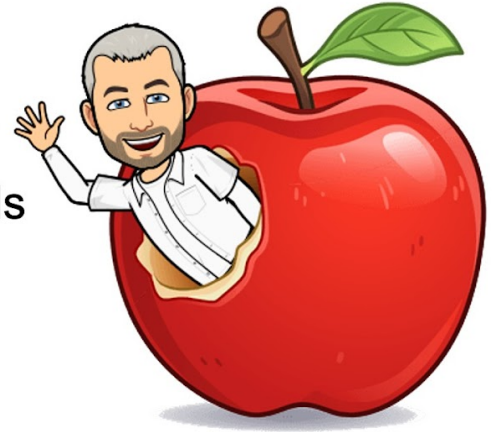
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## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Evidence For The Formation of The Earth

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the formation of the Earth

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#### Part 1: Evidence For How Solar Systems Form

##### Observe The Formation of A Minature Solar System In Your Bathtub or Sink

For this experiment, you will be creating a cloud of “dust” and “gas” in your bathtub, or sink. Replicating what existed in the gas cloud where our solar system formed. You will then trigger the formation of the solar system by adding gravity (draining your tub or sink) and observing what happens.

- **Step 1.** Review this lab with an adult, and make sure you have their permission before starting.
- **Step 2.** Fill the tub or sink with water. The water represents gas.
- **Step 3.** Add things that might represent dust to your tub or sink. Pepper, spices, and little bits of rice, are good choices. Be careful if you use anything larger than rice. We don't want to clog your drain!
- **Step 4.** Add gravity to your dust cloud by pulling the drain. Once your sink or tub starts draining, stand back, and do not interfere. **DO NOT HELP ANY PARTICLES TOWARD THE DRAIN.** Your goal is to simply observe what happens.
- **Step 5.** When your sink or tub has completely drained, record your results below.

Observe how much of the gas and dust (water and debris) ended up going down the drain. Remember that the drain represents the center of gravity, which in the case of the Solar System would be the Sun.

How much of the water (gas) went down the drain? How much was left behind, such as in the basin of the sink or tub after it stopped draining? Explain why you think you got these results.

How do you think this might compare to the formation of the actual Solar System?

Observe what was left around the basin of the sink or tub. This debris that is left represents the planets, asteroids, and comets that orbit the Sun.

Roughly how many planets formed in your experiment? The planets might be the bigger clumps of debris.

How many asteroids or comets formed? These might be the smaller debris left around your drain.

Why do you think most of the debris and water (dust and gas) go down the drain? Explain your answer in detail.

When our Solar System formed, most of the gas and dust ended up in the Sun. Only small amounts remained in outer space around the Sun. Explain why you think this might have occurred.

As your sink or tub drained, did the water and debris orbit (spin around) the drain? How might this relate to the formation of the Solar System?

## Part 2: Observing Evidence of The Great Bombardment

### Observe Evidence That A Period of Great Bombardment Occurred in The Earth's Past

It is difficult to find evidence of the Great Bombardment on the surface of the Earth because all of the old scars like craters have eroded away. However, erosion is not occurring on the Moon. Thus, we can look to the moon to find evidence of this past event.

- **Step 1.** Using a telescope or binoculars observe the Moon. If you do not have binoculars, you will have to use pictures from the Internet to complete these observations.
- **Step 2.** Record your results.

Describe what you see.

Write a detailed description of what the surface of the moon looks like.

Why do you think the moon's surface is covered by craters?

### Final Questions:

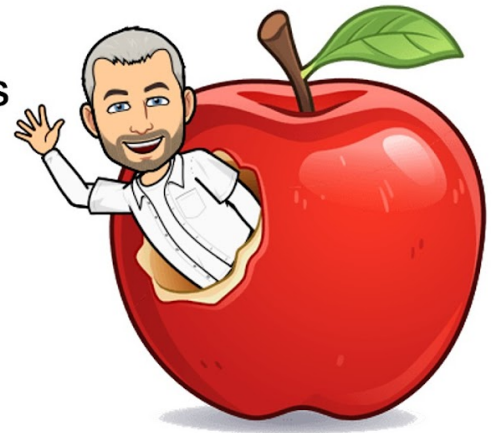
1. How are the inner planets different from the outer planets in our solar system?

2. What happened during the great bombardment?

3. How old is the Earth?

4. What is the goldilocks zone?





### **Handsome Science Teacher One Take Videos**

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### **Take Your Time, Pause And Rewind As needed**

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### **The Video For This Mastery Badge Can Be Opened Using This QR Code**

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### **Check Point**

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### **Recording Your Learning**

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have

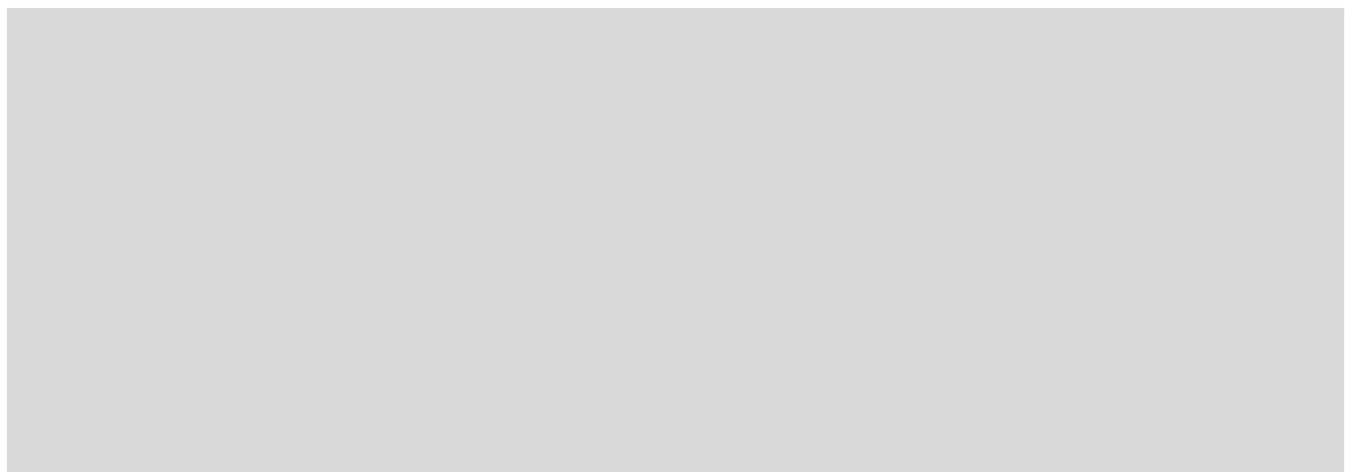
learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

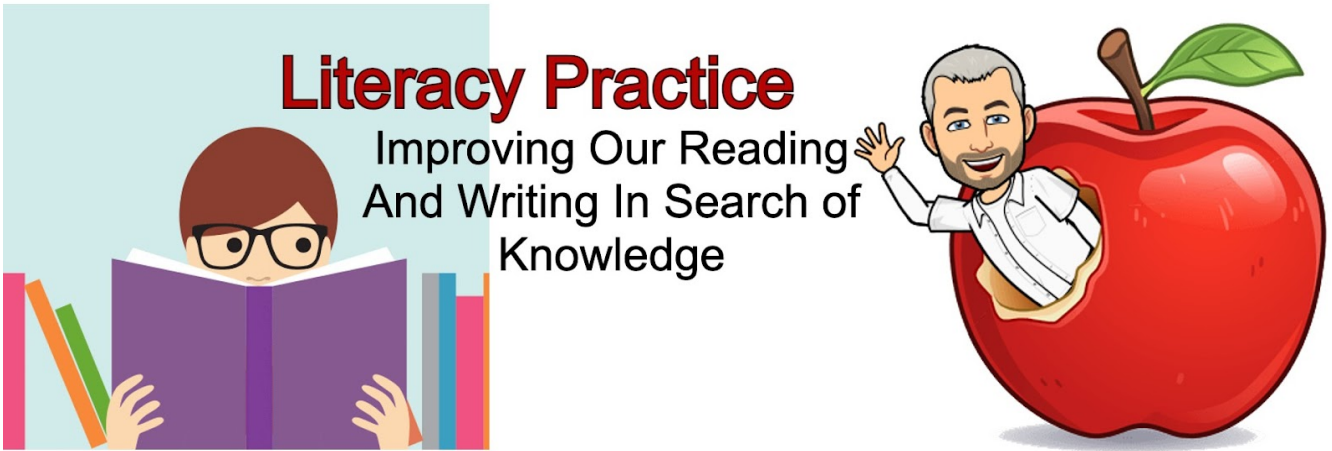
- 1.
- 2.
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- 9.
- 10.

**Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?





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## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

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## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-formation-of-the-earth/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs describing key features of the Earth and how it formed.

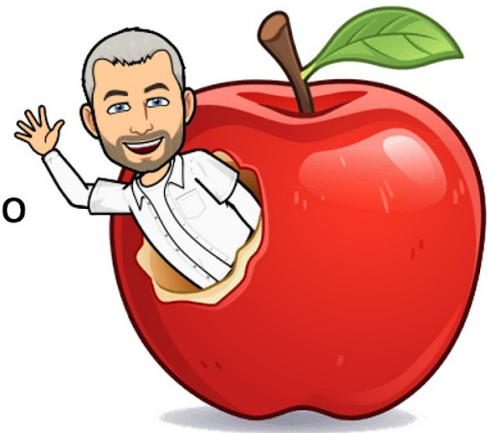
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Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Creating A Textbook Diagram

**Directions:** Follow the instructions below create a textbook diagram showing how the Earth formed.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of how the Earth formed.

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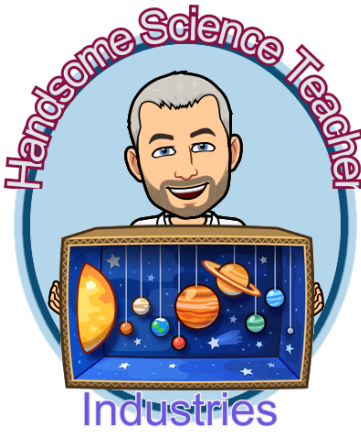
### You Have Been Hired To Work For Acme Textbooks Incorporated! Congratulations!!

Here at Acme, we pride ourselves on creating the most accurate textbooks possible. For your first assignment, our team needs you to create a diagram that will be used in a fifth-grade textbook. Your diagram must demonstrate how the Earth formed.

Please make sure to include **each** of the following in your diagram:

- A timeline showing the creation and history of the Earth.
- The Age of the Earth at different points along your timeline.
- Important events, like the creation of the Solar System, the Great Bombardment, the early rain, and so forth.
- Make sure that your diagram is in color. This can be done using crayons, colored pencils, paint, or digitally.
- Make sure all the artwork is your original work.

**Complete this assignment on a separate blank piece of paper or in a computer program.**



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.









## Minerals, Gems, & Rocks

### What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn how matter is organized on the Earth forming minerals, rocks, and gems.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge.

- What is a mineral?
- How many types of minerals are there?
- Minerals sometimes form gems.
- Minerals and gems combine to form rocks.
- Minerals, gems, and rocks are everywhere around us.

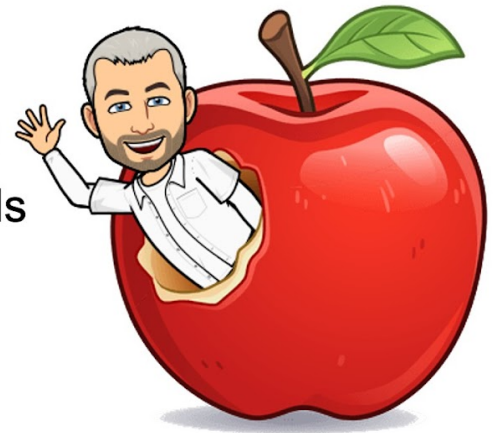
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Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Minerals, Gems, and Rocks

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about minerals, gems, and rocks.

---

#### Part 1: Creating A Mineral

**A mineral is a pure substance**

For this experiment, the mineral we will create (with an adult's help) is sugar syrup. **You must have an adult's help. As this experiment can burn you!** Under an adult's supervision, follow the directions below.

- Boil one cup of water.
- After bringing the water to a boil, slowly add 1 cup of sugar to the water, 1 tablespoon at a time.
- Continue adding sugar, until the entire mixture is thick like syrup.
- Then allow the syrup to cool for ten minutes.

#### **Congratulations! You have created a mineral!**

Not really. Sugar doesn't actually count as a mineral because it is organic. However, in all other aspects, it behaves just like a mineral. We will learn more about what makes a substance an actual mineral later on. For now, we will use it to represent minerals because it will react the same way in the rest of our experimentation.

## Part 2: Creating A Gem

A gem forms when one or more minerals crystalize in a regular repeating pattern.

For this experiment, we are going to create a gem, using the mineral you made in your last experiment.



- After allowing your sugar mineral to cool for ten minutes, pour it into a glass jar. **Please be very careful. It might still be hot.**
- Take a pencil and weight (paperclips works great for this) and tie them together with a string that is just long enough to reach the bottom of your jar.
- Drop the weight and string in so that the weight just barely touches the bottom.
- Allow it to sit for several days and observe what happens. Then answer the questions below.

**Congratulations! You have created a gem!**

1. What did your mineral look like before it formed a gem?

2. What is a mineral?

3. What does your gem look like now that it has crystalized?

4. What is a gem?

### Part 3: Creating A Rock

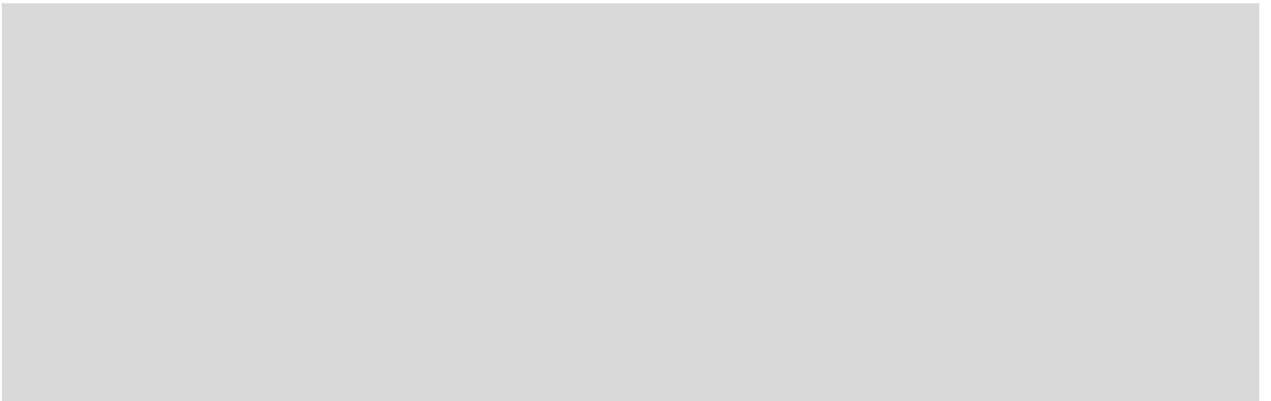
**A Rock is made of two or more minerals or gems that do not have a repeating pattern.**

For this experiment, we are going to use the gem you created in your last experiment to create a rock.

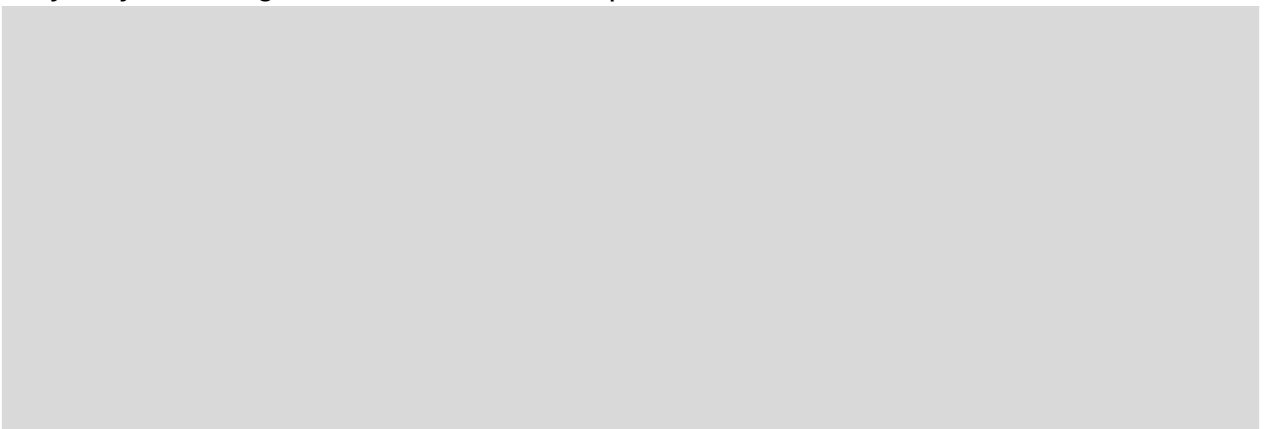
- Wait several days, until your gem has fully formed.
- Fill a bowl with chocolate chips.
- With an adult's supervision place the bowl into the microwave for 30 seconds.
- Stir and repeat until the chocolate chips are completely melted.
- Dip the gem you made in your last experiment into the chocolate, completely covering it.
- Allow the chocolate to harden.

**Congratulations! You have created a geode, which is a type of rock.**

1. How is a rock different than a gem?



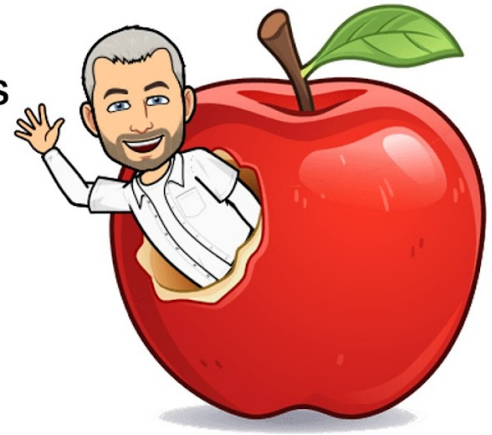
2. Why do you think gems are often so much prettier than rocks?





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully and paused to look up anything I didn't understand.

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

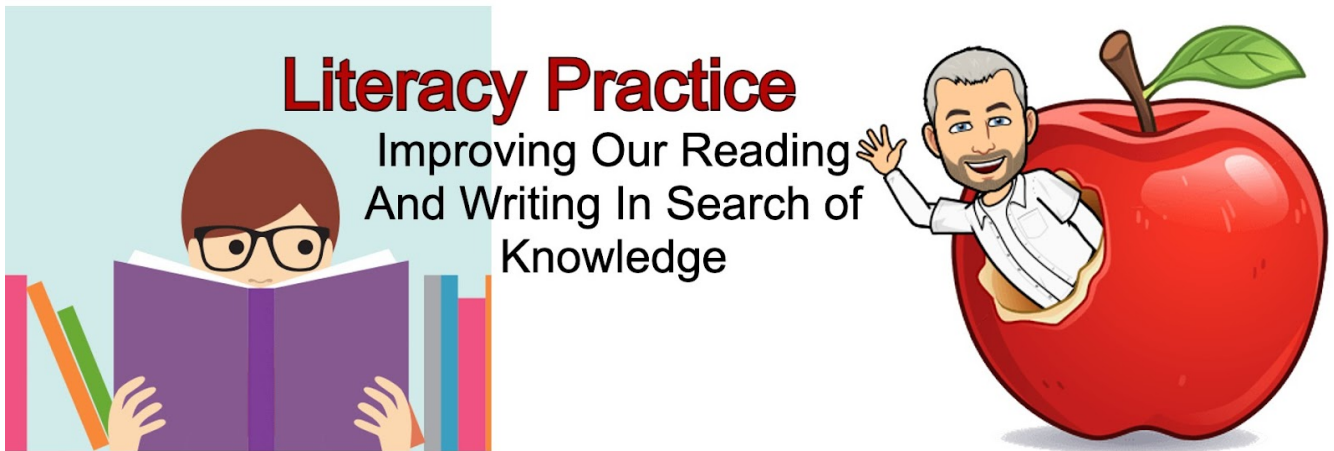
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

### Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/where-do-gems-come-from/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time

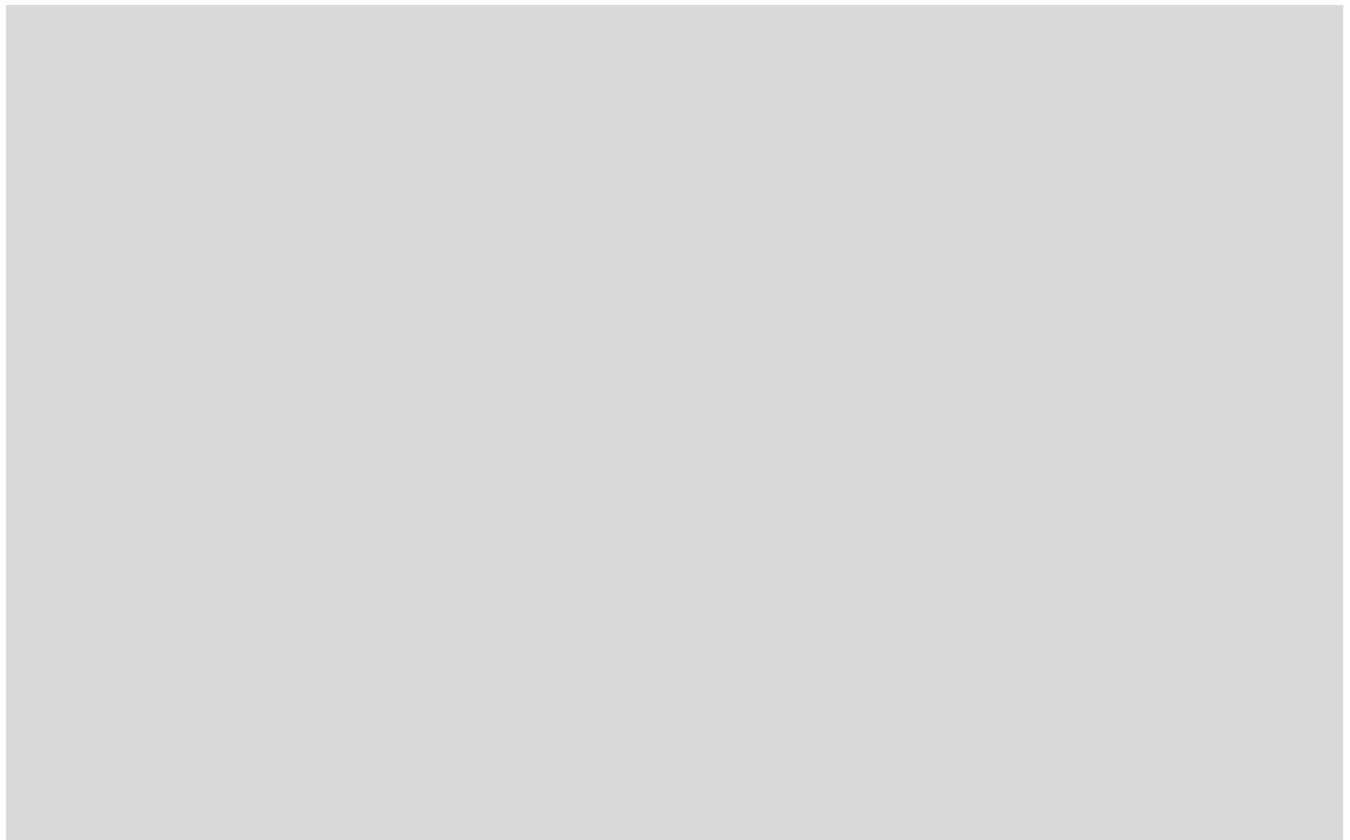
Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining how gems form.





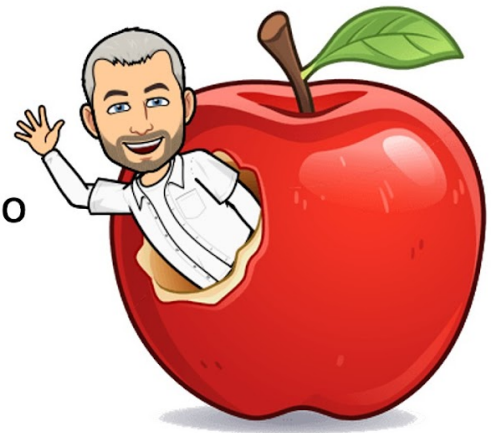
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Creating A Textbook Diagram

**Directions:** Follow the instructions below to create a textbook diagram showing how minerals combine to form gems and rocks.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of how minerals combine to form gems and rocks.

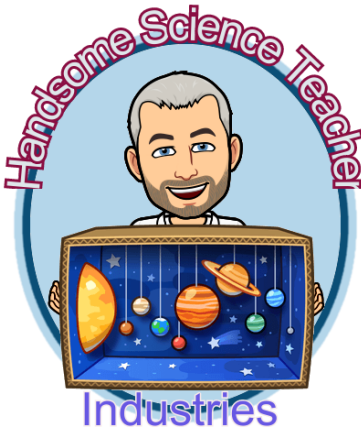
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### Create A Diagram, Showing How Minerals Combine To For Gems & Rocks.

Include each of the following.

- Picture of at least two minerals forming in magma.
- Picture of the magma cooling, and of the minerals crystalizing into gems.
- Picture of some of the minerals and gems combining to form rocks.
- Labels and descriptions, explaining what is happening.
- Make sure your diagrams are in color.
- Make sure all the artwork is your original work.

**Complete This Assignment On A Separate Blank Piece of Paper or Within Computer Software.**



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## The Rock Cycle

### What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about the rock cycle. You will discover that rocks are constantly changing from one type of rock to another and that these changes are predictable. You will become familiar with the three main types of rocks, and learn the main characteristics of each type.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- The Rock Cycle
- Igneous Rock
- Sedimentary Rock
- Metamorphic Rock
- Crystallization, Melting, Weather & Erosion
- Lake Succession
- The Law of Superposition

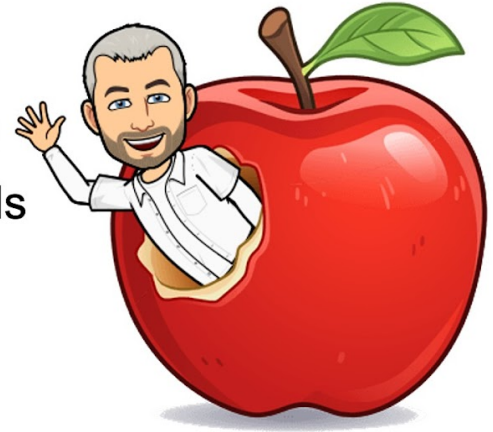
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Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering How Rocks Are Classified

**Directions:** Follow the steps below to discover how rocks are alike and how they are different.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

**Goal:** To learn as much as you can about how rocks are classified.

---

### Observing Rocks Part I: Rock Collection

**Instructions:** Go outside and gather a collection of at least 100 rocks. Try to find a wide variety of colors, textures, and shapes. If your rocks are all too similar the rest of this lab will be difficult for you to complete.

**Classify Your Rocks Into Piles** Make piles based on how your rocks are alike and how they are different. There is no wrong way to do this, but make sure you have at least three piles. More are okay.

Describe each pile of rocks. What do they have in common? How are they different?

## Observing Rocks Part II: Experimenting On My Rocks

**Instructions:** Using a sidewalk, take each rock and draw a line (like chalk). In science we call this a streak. After observing the streaks of each pile do you still think they belong together, or do you want to change your piles at all? How were the streaks alike, how were they different?



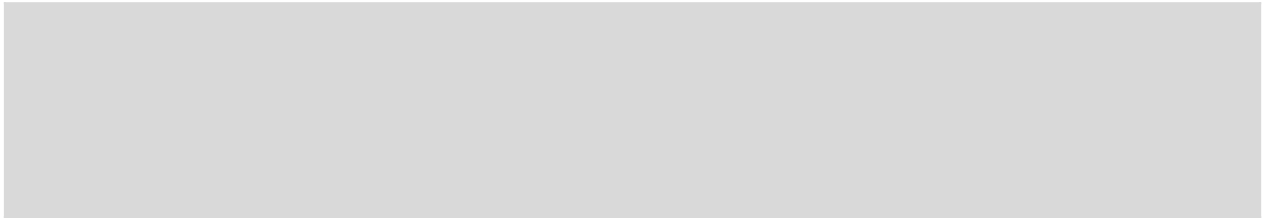
### Final Questions:

Answer each question using complete sentences.

1. What are the three main classifications of rocks that scientists use?



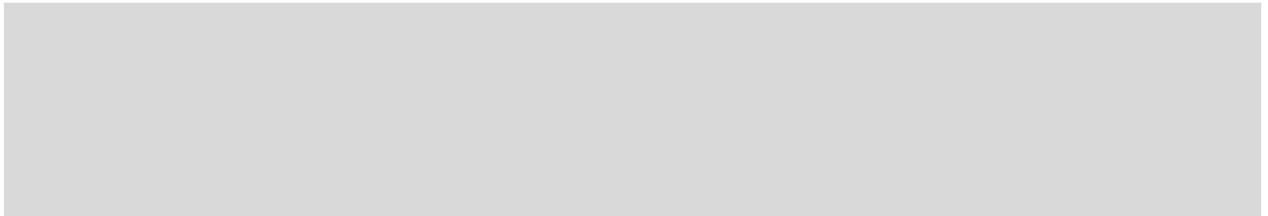
2. Explain what igneous rocks are in your own words.



3. Explain what sedimentary rocks are in your own words.



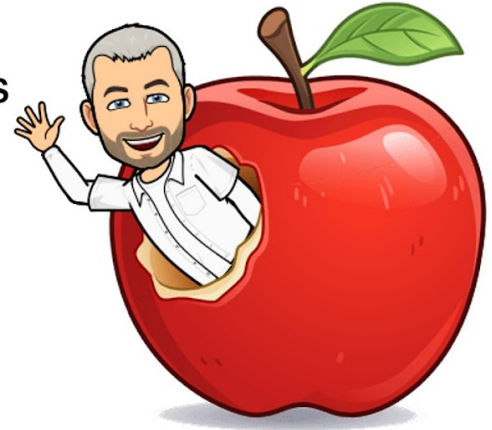
4. Explain what metamorphic rocks are in your own words.





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

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### Take Your Time, Pause And Rewind As needed

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### Check Point

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**I watched the video carefully, and paused to look up anything I didn't understand.**

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.



### **Ten Things I Learned From This Video**

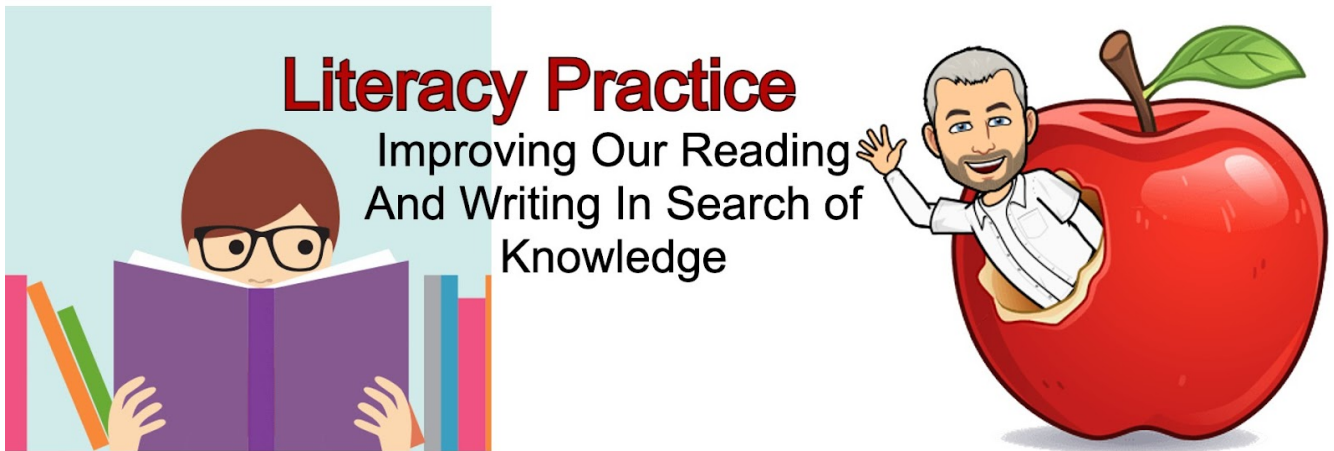
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- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-rock-cycle/>

**Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge**

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs in your own words describing the rock cycle. Share examples.

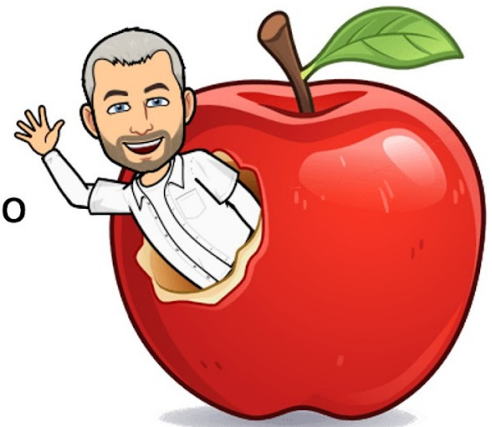
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Date: \_\_\_\_\_



# Applying Lab

## Proving That We Can Do It Ourselves



### Activity: Exploring The Rock Cycle

**Directions:** In the discovering lab you went outside and found 100 rocks. You then classified them into your own groups. Since then, we have learned that scientists use three groups to classify all rocks. Which they call igneous, sedimentary, and metamorphic. In this lab, instead of finding rocks outside, you are going to find them online and enter information about each one in the data sheet provided on the next page.

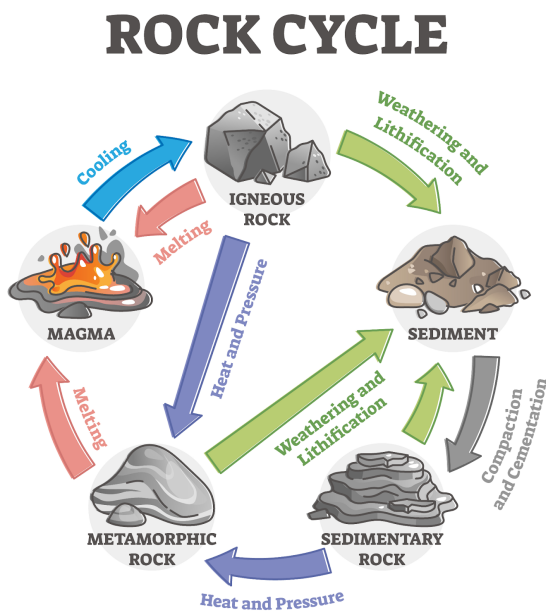


Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To learn as much as you can about the rock cycle

### Part I: Defining The Rock Cycle



1. Write a definition in your own words for igneous rock. Be detailed.

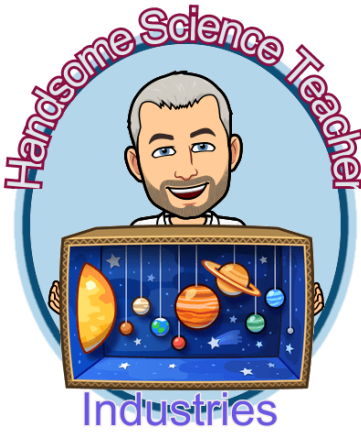
2. Write a definition in your own words for sedimentary rock. Be detailed.

3. Write a definition in your own words for Metamorphic rock. Be detailed.

**Part II: Finding Rocks That Fit Into Each Group**

Start by listing seven different kinds of rock in the table below. If you cannot think of any types of rocks it is okay to go online or look in books for the names of different rock types. Once you have listed seven kinds of rocks, research to find information about each rock type and then complete the rest of the chart.

<b>Rock Type</b>	<b>Share <u>two</u> facts about this rock!</b>	<b>Igneous, Metamorphic, or Sedimentary?</b>
1. _____		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.









## Pressure & Weather

### What I Will Be Learning In This Mastery Badge:

In this Mastery Badge we are going to learn about atmospheric pressure and how it influences the weather.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is pressure?
- High Pressure
- Low Pressure
- Air Parcels
- How Parcels of Differing Pressures Interact.
- Fronts

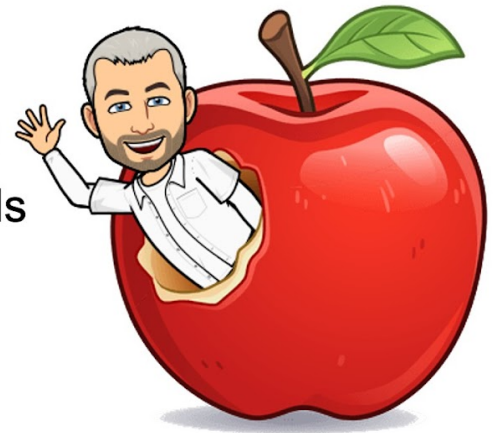
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Minerals, Gems, and Rocks

Directions: Watch the news for the next ten days, and record both the pressure and the weather that are reported.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how pressure affects the weather.

---

#### Part I: Recording The Pressure And Weather Conditions

Congratulations! You have been hired to audit (check) the effectiveness of local meteorologists. Your job is very important. For the next ten days, you will be watching a local newscast and recording certain things that are reported by the meteorologist using the chart below.

##### A Note About "Barometric Pressure"

One of the data points you will be collecting is called "pressure" or sometimes "barometric pressure." If your local meteorologist does not report this you will have to look up the pressure online. There are many websites you can use to do this. Search "my local barometric pressure" to find a good website.

##### A Note About "High-Pressure / Low-Pressure"

This is not asking for a number but for the description offered by your local meteorologist. What did they say about high-pressures? What did they say about low-pressures? Briefly summarize their descriptions of high and low pressures in and around your community.

##### A Note About "Weather Conditions"

In this box, you should record the actual weather conditions for that day. Was it sunny? Was it raining? What it cloudy? Be detailed and specific.

Fill out this chart carefully and completely.

Observation Date	Barometric Pressure	High-Pressure / Low-Pressure	Weather Conditions

**Part II: Interpreting Data**

Scientists use data to understand the world around them. Using data is a very important skill. Look over your data and draw your own conclusions to answer the questions below. There are no wrong answers. What matters is only that your conclusions are supported by your data.

1. Do you see any patterns in your data?

2. Is there any relationship that you can see between pressure and weather? Explain.

3. What does atmospheric pressure refer to exactly?



## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

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### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

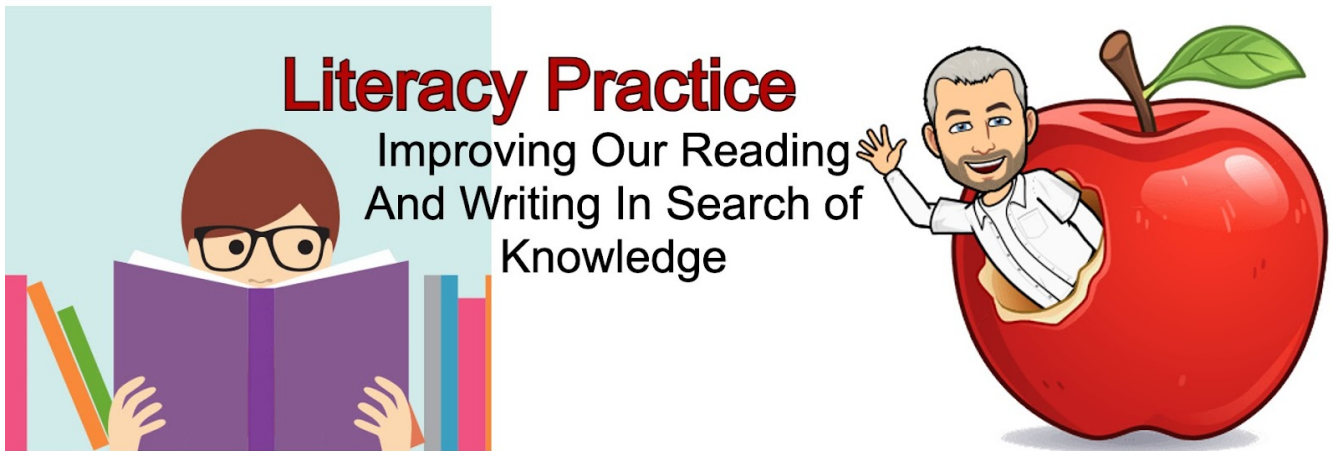
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

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- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



---

## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/atmospheric-pressure-2/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining what pressure is and why the atmosphere has pressure.

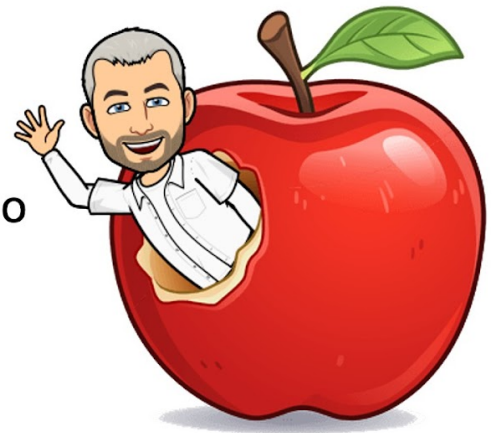
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Applying Lab

### Proving That We Can Do It Ourselves



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### Activity: Using Pressure To Predict The Weather

**Directions:** In the discovering lab you observed the predictions of others and looked for patterns. Now you are going to apply what you have learned to make your own weather predictions.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of how pressure and weather are related.

---

Each night for the next six days you will record the atmospheric pressure, and then make predictions about the weather. Do not cheat by looking at the weather report. You want these predictions to be your own.

#### **A Note About Making Weather Predictions:**

In the early days of meteorology (the study of the weather) Meteorologists had very few tools they could use. One of the first of these was barometric pressure. As time has gone on, scientists have developed many more tools including satellite imagery and doppler radar. You will be using only barometric pressure, so do not feel bad if your predictions are not as accurate as the local meteorologist on television. Remember that they have more advanced tools than you have access to. In this lab, we are just trying our best to make as accurate of predictions as we can, based on the data we have access to.

#### **A Note To The Mastery Badge Counselor:**

When grading this mastery badge, do not grade it based on whether or not the student's predictions are correct. Even meteorologists, with all their advanced equipment, get the weather wrong. What you are looking for is whether or not the predictions made by the student match the data they collected. Ie, did they accurately forecast the weather based on the data, not based on the actual weather. For example, if the student's data shows a low-pressure, did they forecast bad weather?



**Collect Data And Predict The Weather**

Observation Date	Barometric Pressure	My Weather Prediction

**Final Questions:**

Remember to answer each final question using complete sentences.

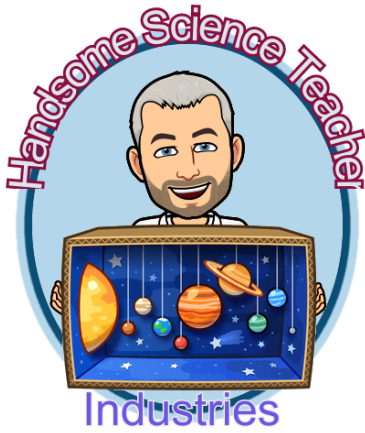
1. What is pressure?

2. How does a high-pressure system affect the weather?

3. How does a low-pressure system affect the weather?

4. When a high-pressure and a low-pressure system are side-by-side, where does the wind blow?

5. How do meteorologists use pressure to predict the weather?



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## The Coriolis Effect

### What I Will Be Learning In This Mastery Badge:

In this Mastery Badge we are going to learn about the Coriolis Effect. Including what causes it, and how it impacts atmospheric and oceanic currents.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is the Coriolis Effect?
- What causes the Coriolis Effect?
- How the Coriolis Effect affects atmospheric currents.
- How the Coriolis Effect affects oceanic currents.

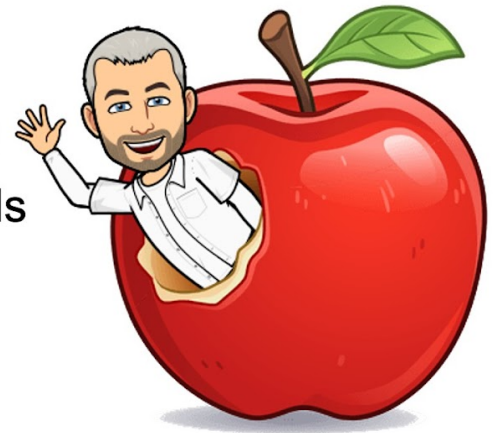
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering The Coriolis Effect

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To learn as much as you can about the Coriolis Effect

---

For this lab you are going to need a globe. If you do not have a globe, they are usually available at home decor or craft stores such as Hobby Lobby. We also sometimes make a limited number of globes available at HandsomeScienceTeacher.com. If a globe cannot be obtained, you can use a ball, though this will be more challenging.

#### Part I: Drawing Lines on A Non-Rotating Globe

For this lab you will be drawing on a globe. Please be careful to make sure you use something that will come off of the globe later, such as dry erase marker.

##### Step 1.

Have someone hold the globe perfectly still. For this part of the experiment, you do not want the globe to rotate. Place your marker at the North Pole.

##### Step 2.

While the globe remains perfectly still, draw a line going straight down the globe.

**Step 3.**

Observe and record the results. Were you able to draw a straight line? Explain.



**Step 4.**

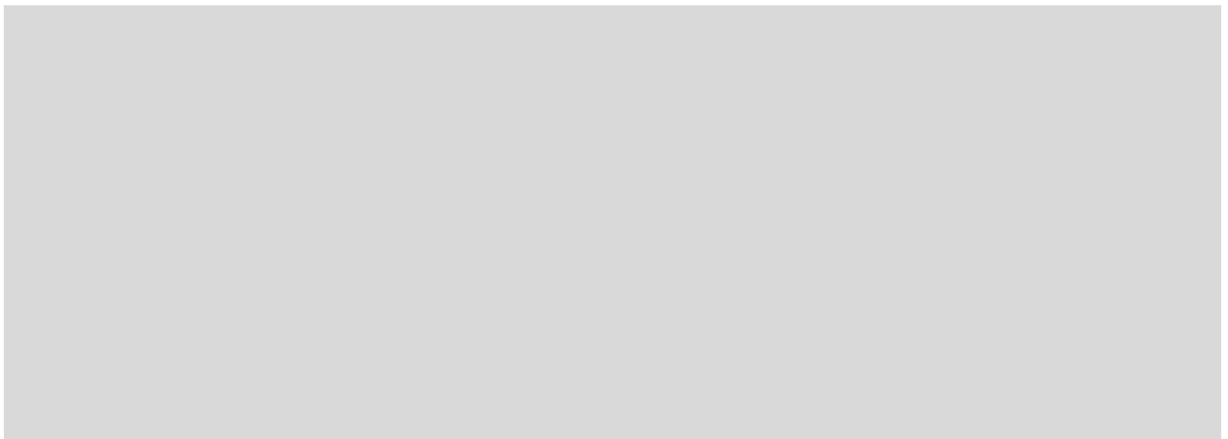
Now we are going to draw a second line. This time while the globe is rotating. Have someone slowly rotate the globe. You do not want it to rotate very quickly. Just a few inches at a time is plenty.

**Step 5.**

As the globe rotates, once again bring your hand down in a straight line. Do not worry about what the line you are drawing looks like. Your goal is that your hand and marker move downward in a straight line, NOT that the line you draw is straight.

**Step 6.**

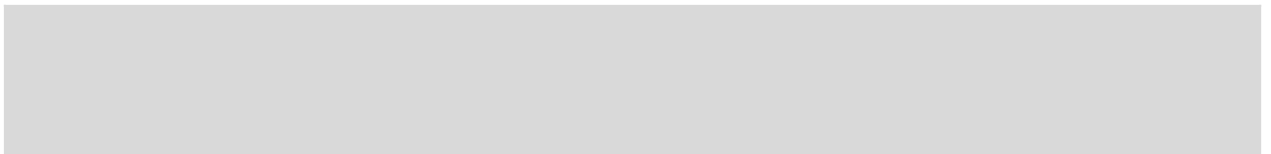
Compare this line to the first that you drew. How are they alike? How are they different? Explain why you think the two lines were different from one another. Be detailed.



**Final Questions**

Remember to answer each question using complete sentences.

1. How does the rotation of the Earth affect things that are moving above it like wind, birds, and airplanes? In other words, as something moves in the air above the Earth (like an airplane) what is happening to the Earth below?



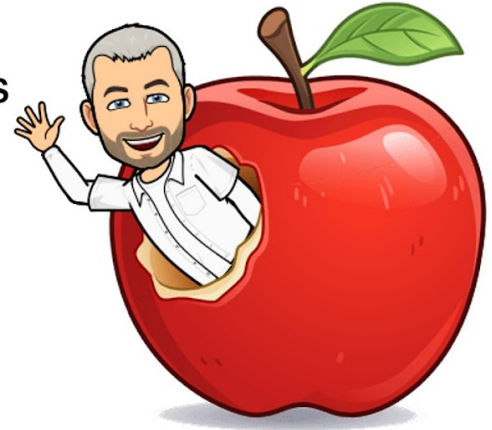
2. Do you think airplane pilots account for the rotation of the Earth when they fly their planes? Why or why not?





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.



### **Ten Things I Learned From This Video**

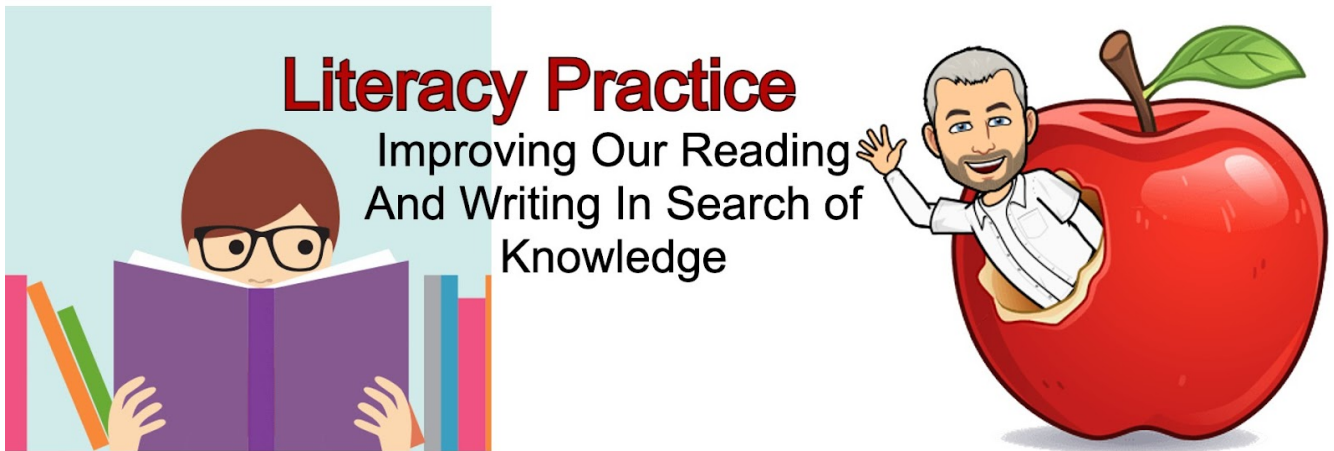
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



---

## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

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Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-coriolis-effect/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining what the Coriolis Effect is and what causes it.

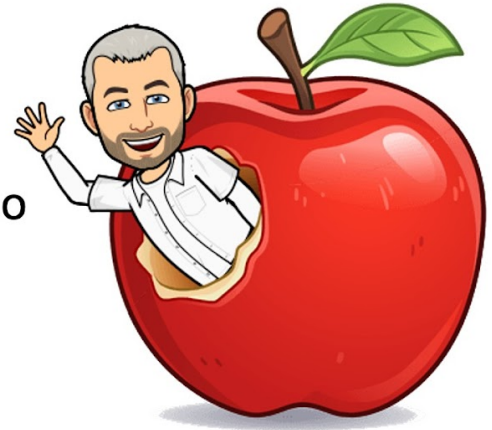
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Applying The Coriolis Effect

**Directions:** Follow the instructions below to create a script for airline pilots to read at the beginning of flights.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

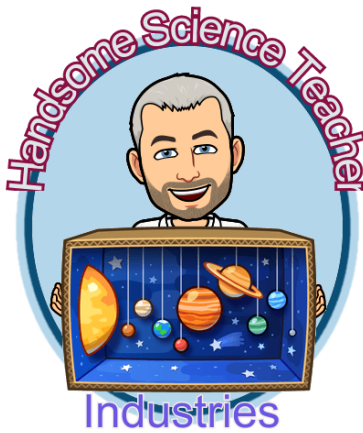
**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

**Goal: To demonstrate your understanding of how the Coriolis Effect impacts the Earth.**

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**Welcome to Uchtdorf Airlines, where we pride ourselves on excellence.**

You have been hired as a communications specialist. Your job will be to write scripts for all of our pilots to read over the intercom before each flight. In the space below, write a detailed script for our pilots to read just before takeoff. In this script make sure to mention the Coriolis Effect... because our passengers deserve to know the truth about the rotation of the Earth! Have the pilot explain what the Coriolis Effect is, how it affects the Earth, and how the pilot will skillfully adjust the flight pattern to account for it.



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





## Gyres, Atmospheric Currents & Oceanic Currents

### What I Will Be Learning In This Mastery Badge:

In this Mastery Badge we are going to learn about subtropical highs and how these create gyres in the oceans and prevailing winds in the atmosphere.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is a subtropical high?
- Subtropical highs create gyres in the ocean basins.
- Gyres lead to ocean currents.
- Oceanic currents affect climate.
- Subtropical highs create bands of prevailing winds in the atmosphere.
- Winds are named based on where they come from.
- The names of each of the atmospheric currents.

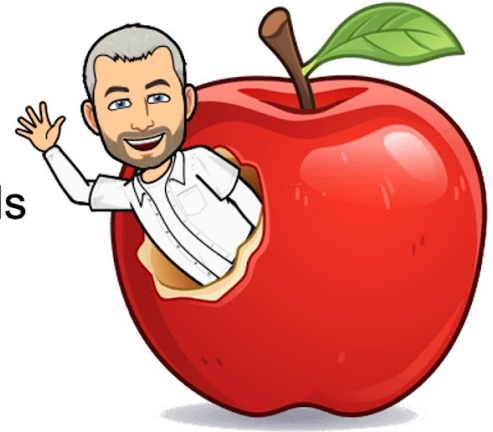
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Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Ocean Currents

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about oceanic currents

---

#### Creating My Own Oceanic Currents

For this lab you will need a paper or plastic disposable cup, a large glass cake pan, cold water, hot water, a thumbtack, and food coloring.

##### Step 1.

With an adult's supervision, carefully fill a disposable cup with hot water. The hotter the better, but be careful not to get burned.

##### Step 2.

Add red food coloring to the hot water and mix it in. Be careful not to get the water too dark. You want it red, but not black. You will get better results if you can still see through it.

##### Step 3.

Fill a large glass cake pan with cold water. The colder the better. You can use ice to get the water cold, but remove the ice before finishing the experiment.

##### Step 4.

Add blue food coloring to the cold water. Again, be careful not to get the water too dark.

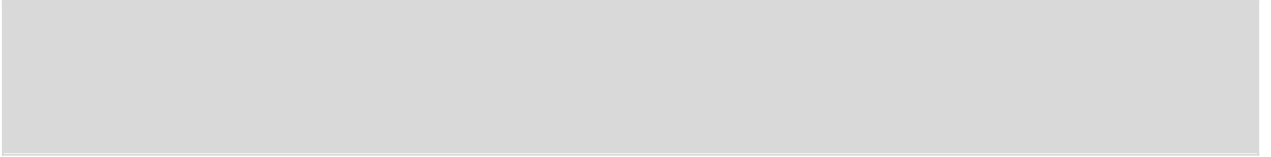
##### Step 5.

Being careful not to get burned, take a thumbtack, and stick it through the disposable cup, near the

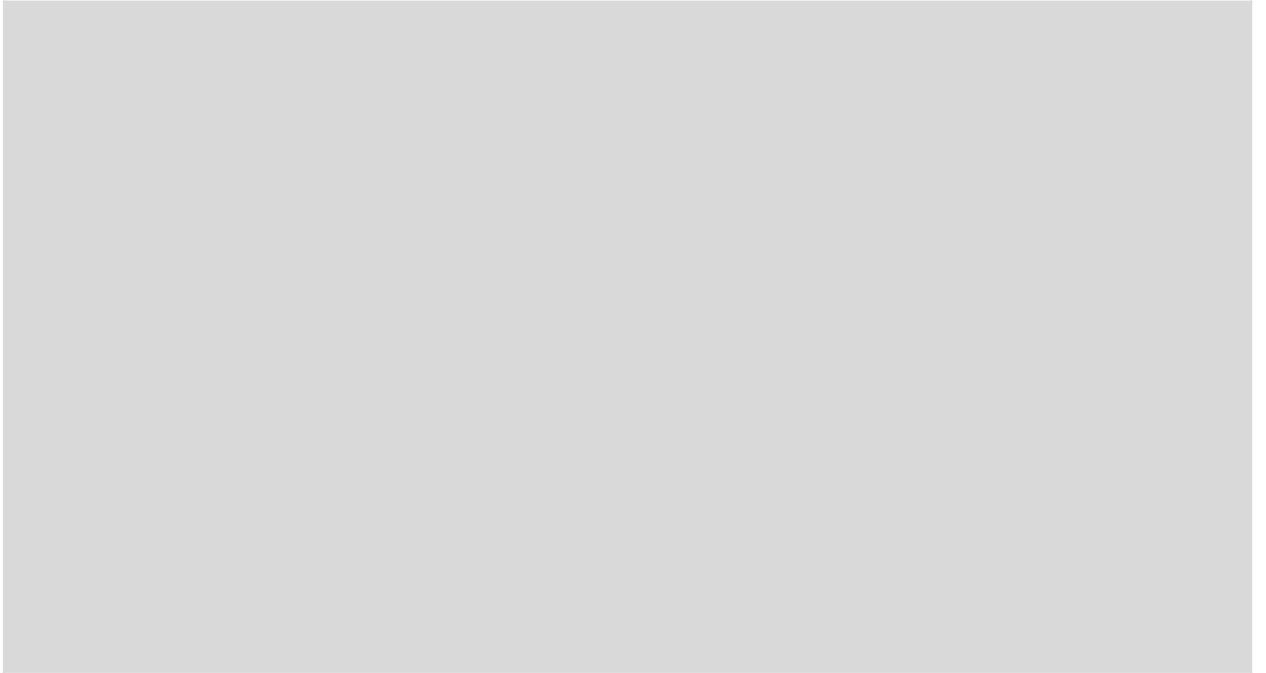


bottom. Then, leaving the pin in the cup, set the cup in the glass pan. Once the cup is in place, remove the thumbtack and observe what happens.

What did you observe? What happened as the hot water leaked out of the cup into the pan of cold water?



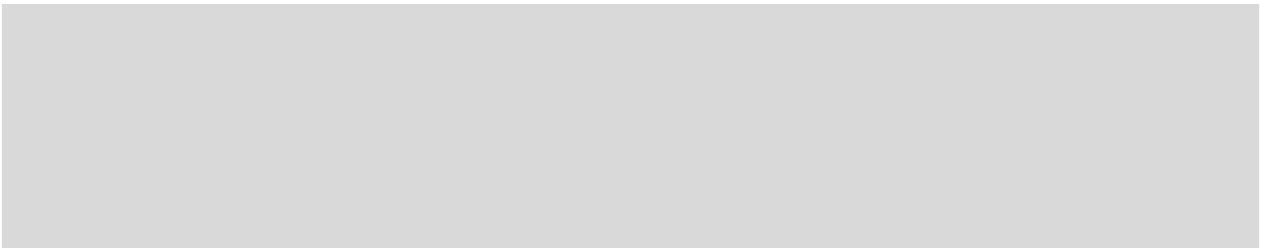
Draw a picture of what it looked like as the hot and cold water mixed.



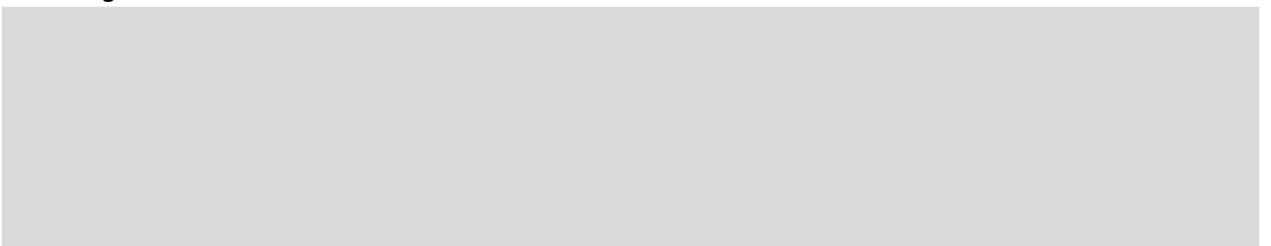
### Final Questions

Remember to answer each question using complete sentences.

1. What happens when cold and hot water mix?



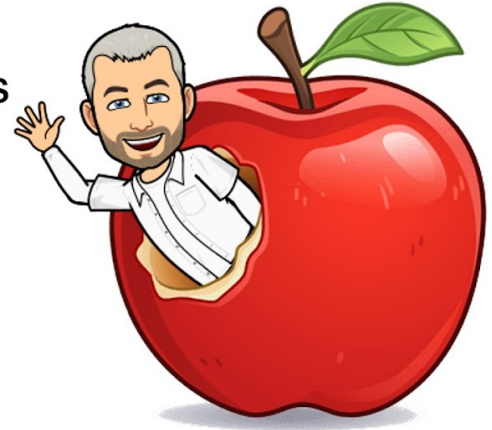
2. How might this relate to the Earth's oceans?





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

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### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully and paused to look up anything I didn't understand.**

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

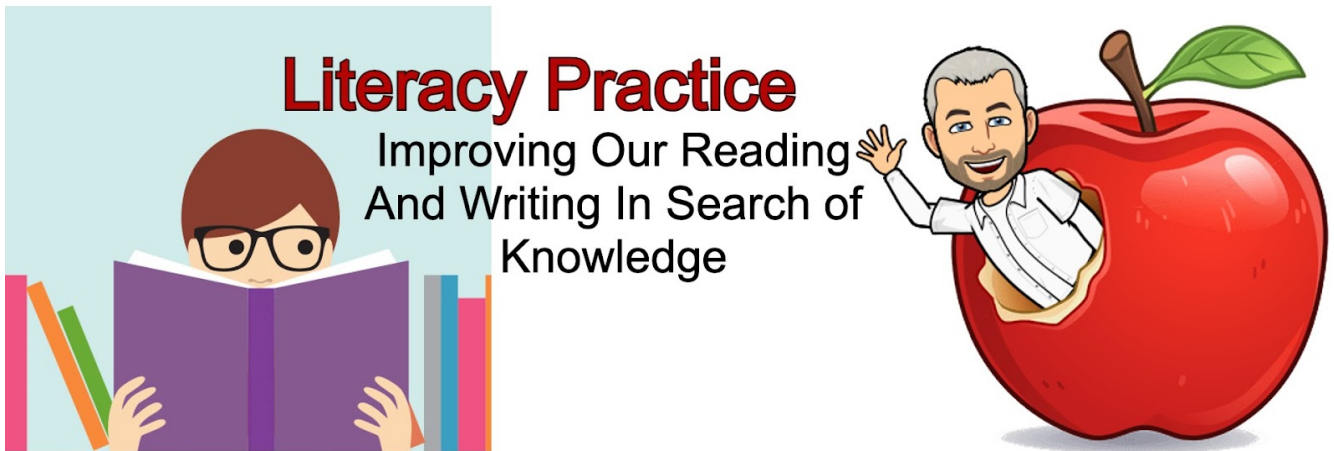
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
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### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



---

## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/circulation-of-the-atmosphere-atmospheric-currents/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining what causes atmospheric currents.

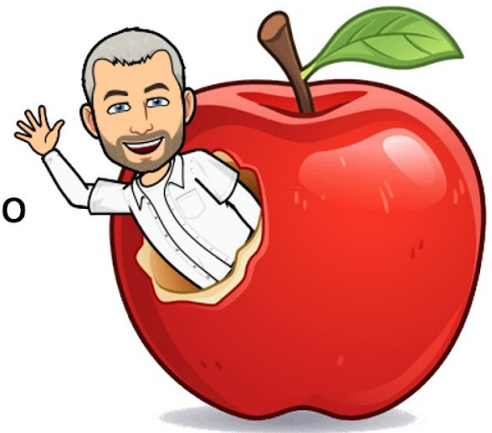
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Applying Atmospheric And Oceanic Currents

**Directions:** Follow the instructions below to create a map of the atmospheric and oceanic currents.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of the currents that move through the atmosphere and oceans.

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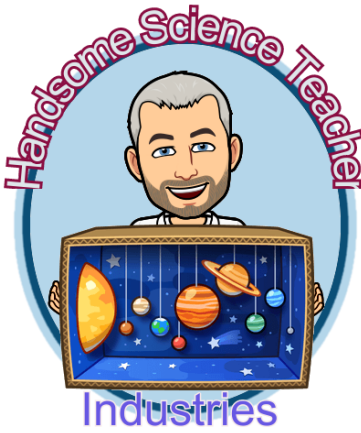
The year is 1493, and Kristof Kolumbu has hired you to help him on his expedition across the ocean. Kristof isn't as famous as that other explorer with a similar name, The one with all the cities, countries, and holidays named after him. Kristof is sad, and wants cities and holidays named after him as well. Your job is to create a map of the Earth that he can use on his expedition.

Include major oceanic and atmospheric currents on your map. He will need both of these to power his sailing vessels across the ocean.

**Make sure your map includes all of the following:**

- All of the gyres and currents found around each major ocean basin.
- All of the prevailing winds (atmospheric currents).
- Labels of each current, gyre, and subtropical high.
- Make sure your map is in color.

**Complete your map on a separate piece of paper.**



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

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**Keep this on file as evidence of your successful completion of this topic.**

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## Sea Breezes, Land Breezes, Monsoons

### **What I Will Be Learning In This Mastery Badge:**

In this Mastery Badge we are going to learn about sea breezes, land breezes, and monsoons.

### **What This Packet Includes:**

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### **I. Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### **II. Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### **III. Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### **IV. Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### **Key Things We Will Learn In This Mastery Badge**

Some of the most important things we will learn in this mastery badge:

- What is a sea breeze?
- What is a land breeze?
- What causes sea breezes and land breezes?
- What is a monsoon?
- What causes the wet and dry cycles of a monsoon?

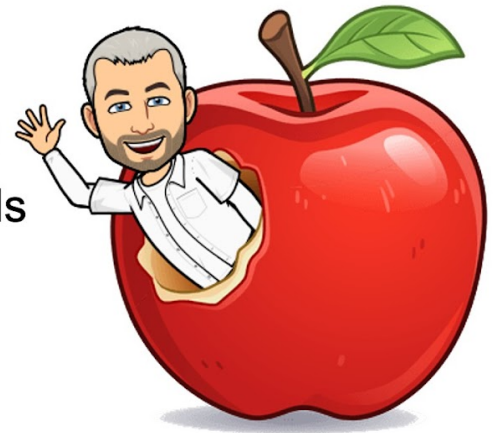
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## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Sea Breezes

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about sea breezes

---

#### Creating My Own Sea Breeze

For this lab you will need two cake pans, ice water, sand, and an incense stick.

##### Step 1.

With an adult's help, place your sand into a pan and heat it up on the stove. You want to get it nice and hot. Stir it repeatedly so that the temperature is even throughout the sand.

##### Step 2.

With an adult's help pour the hot sand into a cake pan. And flatten it out, so that it feels up the entire pan.

##### Step 3.

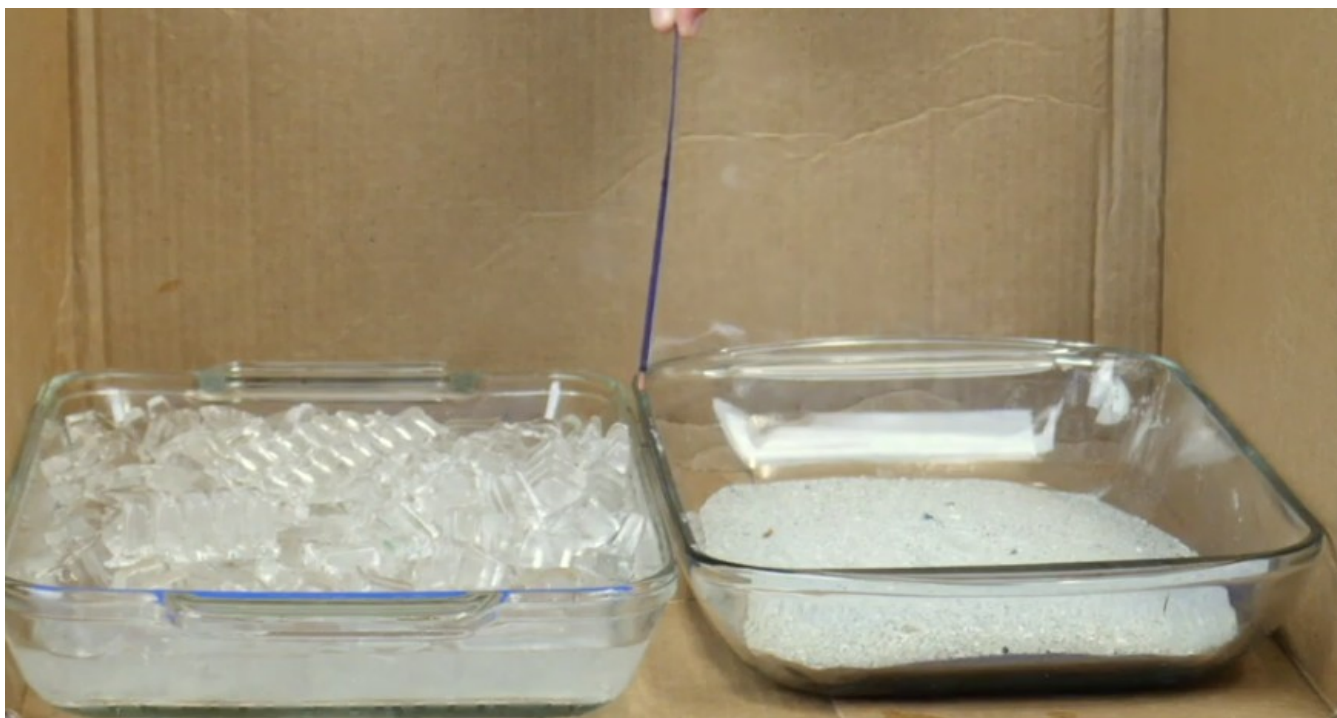
Fill a second cake pan with freezing cold ice water. It is okay to leave the ice in the water. We want to make it as cold as possible.

##### Step 4.

Place both pans as close together as you can inside of a cardboard box.

##### Step 5.

Hold a burning incense between the two pans, and observe what happens.



What did you notice about the smoke? Which direction did it move?

A large, empty rectangular gray box provided for the student to write their observations.

Draw a picture of showing how the smoke moved in your experiment.

A large, empty rectangular gray box provided for the student to draw a picture of the smoke movement.


**Final Questions**

Remember to answer each question using complete sentences.

1. Why do you think the smoke moved the way it did?



2. In our experiment we saw that when hot sand and cold water sit side-by-side it creates wind. How do you think this might relate to the ocean?



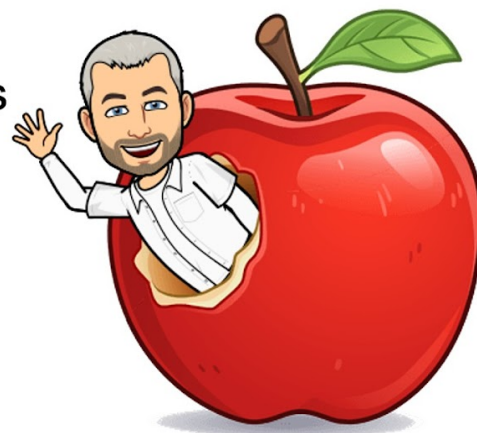
3. What do you think might have happened if the sand was cold and the water was hot?





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully and paused to look up anything I didn't understand.**

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

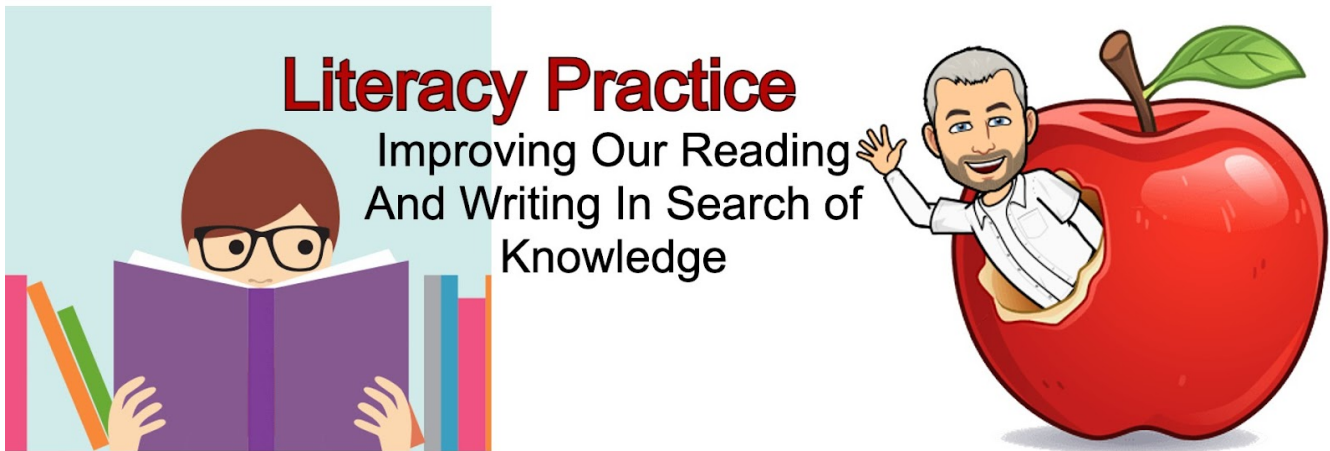
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

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## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/sea-and-land-breezes/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining how sea breezes and land breezes form.



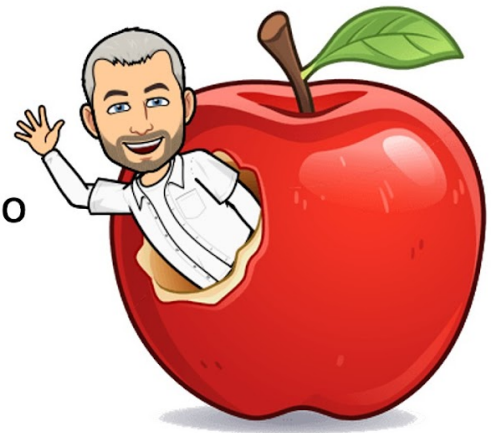
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## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Applying Sea Breezes, Land Breezes, And Monsoons

**Directions:** Follow the instructions below to create a map of the atmospheric and oceanic currents.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

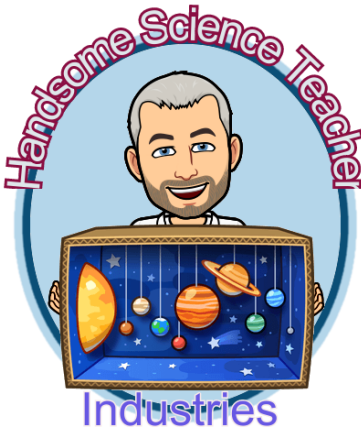
**Goal:** To demonstrate your understanding of sea breezes, land breezes, and monsoons

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You have been elected to serve on the city council for the city of Ocean Bluff. One of your first assignments is to help create signs informing tourists of the best times of day to fly kites on the beach. Create a large sign, that can be posted on the beach.

**Make sure your sign includes all of the following:**

- An explanation of sea breezes and land breezes.
- A diagram of sea breezes and land breezes.
- Information for tourists on how these breezes will change depending on the time of day, and how this will affect their kite-flying activities.



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

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[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

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Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
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## Specific Heat Capacity

### What I Will Be Learning In This Mastery Badge:

In this Mastery Badge we are going to learn about specific heat capacity, including how the temperatures of substances increase at varying rates depending on their specific heat capacity.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What does capacity refer to?
- What is heat capacity?
- How does the specific heat capacity of different objects influence their temperatures?
- Which substances have a high specific heat capacity?
- Which substances have a low specific heat capacity?

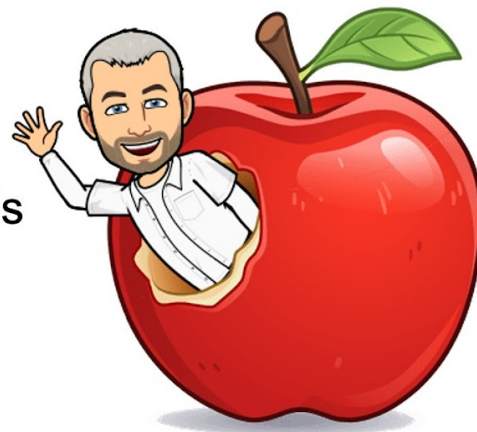
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# Discovering Lab

Learning Through Hands  
On Activities



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## Activity: Discovering Specific Heat Capacity

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To learn as much as you can about the capacity for different substances to absorb and store heat.

---

### Measuring The Specific Heat Capacity of Different Substances

For this lab you will need sand, water, three disposable cups, and a thermometer. If you do not have a thermometer one can be purchased on HandsomeScienceTeacher.com. Alternatively, you can use a thermometer from a pharmacy.

#### Step 1.

Fill one disposable cup with sand, a second with water, and a third with any substance of your choice. You can use rice, flour, oil, or any other substance you want to include in this experiment. Try to get all three substances to the same temperature. A good way to do this is to place them in a refrigerator for a few hours.

#### Step 2.

Place all three cups in a window that gets a lot of sunlight. Do this before the sun shines through the window. Take and record the temperature of each cup below.

Sand Temperature	Water Temperature	Other Substance Temperature

**Step 3.**

Leave the cups in the window for seven hours. Make sure that they get lots of direct sunlight. Measure and record the temperature of each substance once per hour.

Time	Sand Temperature	Water Temperature	Other Substance Temperature
After 1 Hour			
After 2 Hours			
After 3 Hours			
After 4 Hours			
After 5 Hours			
After 6 Hours			
After 7 Hours			

**Create a line graph showing how the temperature of each substance changed over time. You can do this by drawing or by using a program such as a spreadsheet or a word processor.**

**Analyze Your Data**

Scientists support their conclusions with evidence and data. What conclusions can you draw about how heat affects different substances? For example, do all substances heat up at the same rate?





## Video Instruction

Reviewing The Teacher's  
Instruction At My Own  
Pace



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

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### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

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### **Ten Things I Learned From This Video**

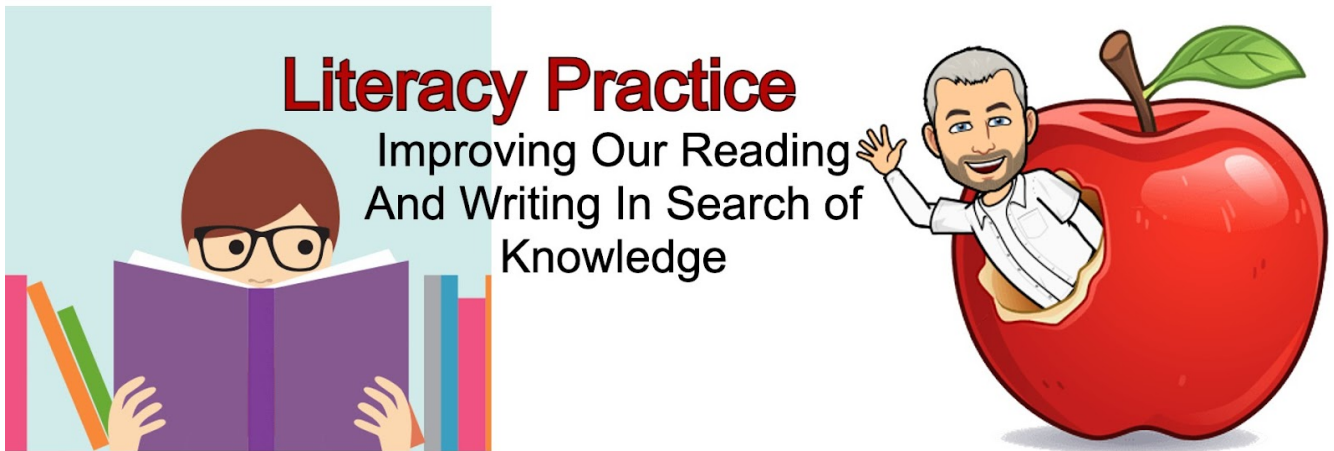
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Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About The Formation of The Earth

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



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## Article:



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<https://handsomescienceteacher.com/Online-science-classes-kids/specific-heat-capacity/>

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**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs explaining what specific heat capacity is, and how it affects climate.

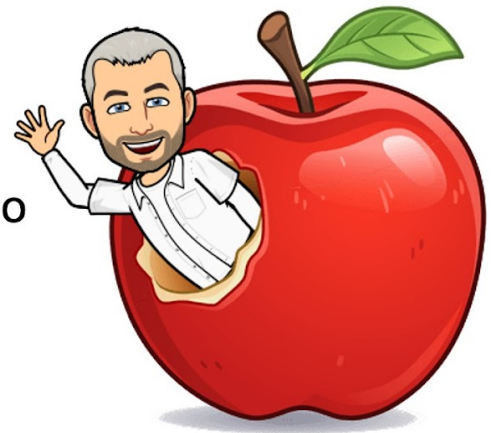
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## Applying Lab

Proving That We Can Do  
It Ourselves



---

### Activity: Applying Specific Heat Capacity

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**Goal:** To demonstrate your understanding of sea breezes, land breezes, and monsoons

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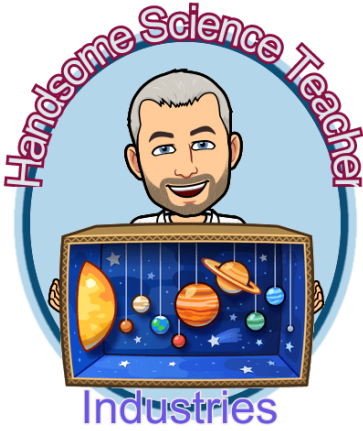
As a valued employee of Acme Toothpaste, we need your opinion. Our company is growing and will be opening a new plant. In order to ensure the highest quality toothpaste it is very important that our new plant be located in a place where there are no extreme temperature shifts between daytime and nighttime temperatures.

We are counting on you to find a city for us, where the temperature will be moderated by the presence of water. Once you locate a city, we need you to then create a presentation (PowerPoint, Google Slides, Etc) illustrating why you selected the location that you did, and how the presence of water will help to moderate the shift between day and night temperatures.

If you do a really good job, I will take all the credit with the board of directors. If you do a bad job, you will be fired. Because here at Acme Toothpaste, we value you... well, we value you helping me!

**Make sure your presentation includes all of the following:**

- It must be at least ten slides long.
- Must recommend a city for Acme Toothpaste.
- Must discuss how the presence of water helps moderate temperatures between day and night.
- Must give a definition and explanation of specific heat capacity.



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

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**Mastery Badge Counselor Evaluation:**

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\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
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Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
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### Certificate For Your Homeschool Records

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## El Niño & La Niña

### **What I Will Be Learning In This Mastery Badge:**

In this mastery badge we will learn about El Niño & La Niña. Including their causes, and how they impact climate, weather, and living things.

### **What This Packet Includes:**

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands-on demonstration that you have mastered the skills and content of this badge.

### **Key Things We Will Learn In This Mastery Badge**

Some of the most important things we will learn in this mastery badge:

- What is El Niño?
- What is La Niña?
- What causes these phenomena to occur?
- What impact do they have on the climate and weather?
- What impact do they have on living things, such as fish?

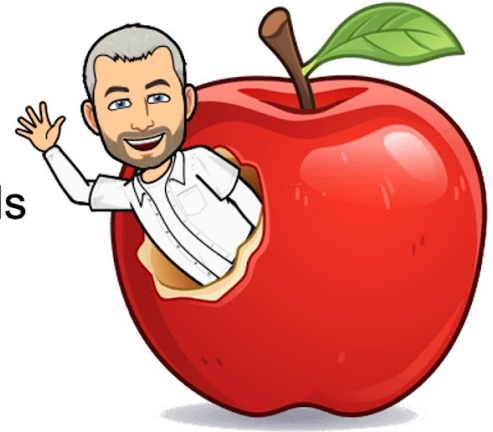
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## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering El Niño & La Niña

**Directions:** Follow the steps below to learn as much as you can about how El Niño & La Niña occur. By the end of this lab, you will not understand what El Niño & La Niña are. However, you will have a groundwork that will help you better understand what is taught in the video.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To learn as much as you can about El Niño & La Niña

---

#### Building Your Own El Niño & La Niña

For this lab, you will need a large waterproof tub (like a fishtank or rubber storage tub) water, food coloring, a fan, and oil.

#### Step 1.

Fill a tub with water. A fish tank works really well, but don't use one that has fish in it. You can also use a plastic storage bin, however it will be more difficult to see the effect of this experiment if the sides are not clear. Leave a couple of inches at the top.

#### Step 2.

Add food coloring to the water. It doesn't matter which color. This will just help us to keep track of what the water is doing.



**Step 3.**

Carefully pour a small amount of vegetable oil on top of the water. Try to add enough so that there is about a half-inch layer of oil on top of the water. You may need to wait between pours to allow the oil and water to separate and settle.

**Step 4.**

Place a fan next to the fish tank and angle it so that it blows across the top. Observe what happens.

How does the layer of oil change when the fan blows across it?

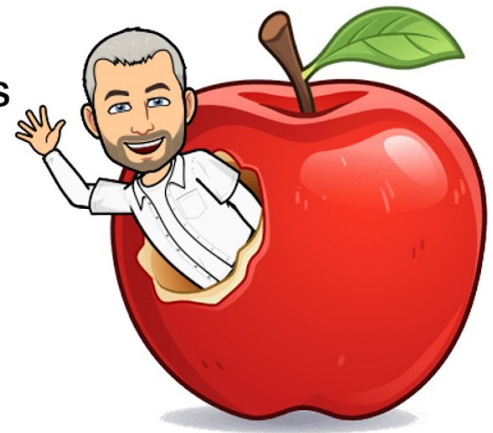
Where is the oil the deepest?

What happens when you turn the fan off?

Relate this to the oceans. What do you think might happen if winds blew part of the ocean towards land?

What might happen if these winds stopped blowing?

Draw a diagram showing what your tub of water and oil looked like while the fan was turned on.



### **Handsome Science Teacher One Take Videos**

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### **Take Your Time, Pause And Rewind As needed**

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### **The Videos For This Mastery Badge Can Be Opened Using These QR Codes**

This Mastery Badge includes two videos:



Watch The Assigned Science Videos

Scan This QR Codes To Open And Watch The Assigned Videos For This Mastery Badge

### **Check Point**

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### **Recording Your Learning**

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

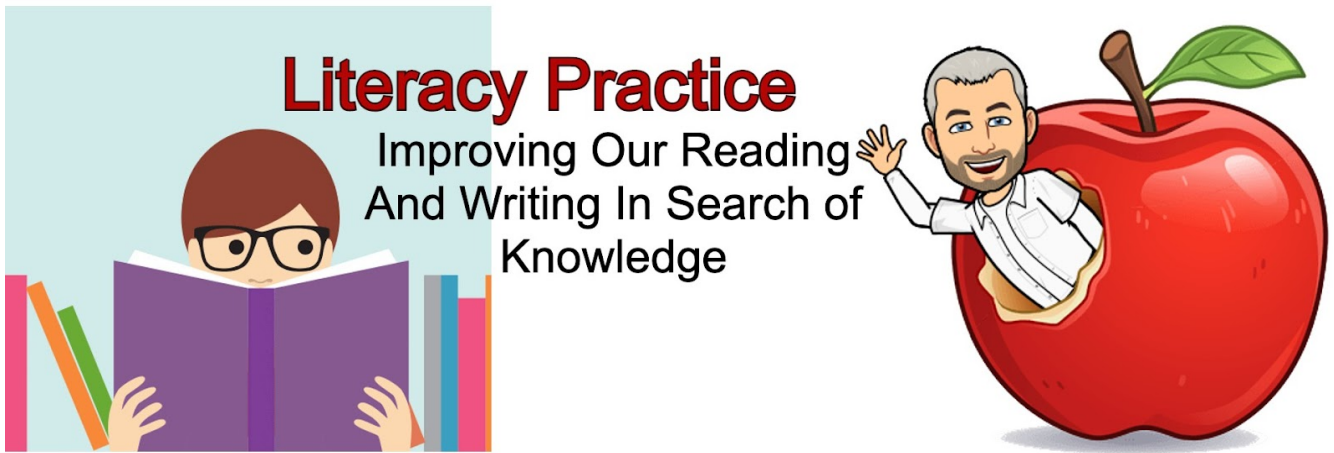
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About Biomes

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/el-nino-la-nina/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time


Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs in your own words explaining what El Niño is and why it occurs.



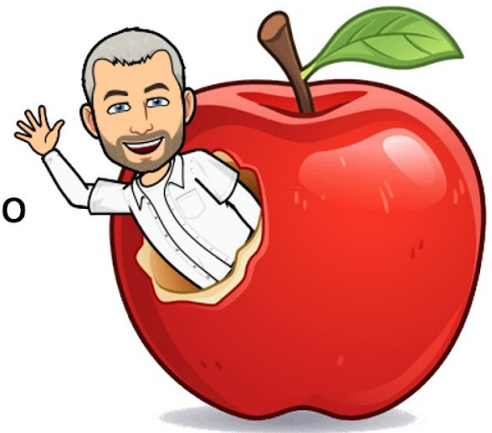
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Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Applying El Niño & La Niña

**Directions:** In this activity you will be writing a short article for a fictional scientific journal.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of El Niño & La Niña

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**Congratulations!** You have been selected as “Scientist of The Month” here at Acme Science Labs. It is a tremendous honor. You won’t get a plaque, a trophy, or any extra money. We aren’t even going to put your picture on the wall. But what we are going to do is assign you extra work! You’re Welcome! And again, congratulations for being selected as ~~victim~~, err, I mean employee of the month!

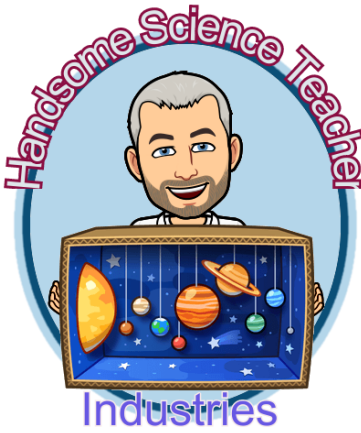
#### Your Employee of The Month Assignment:

While the rest of us relax in the breakroom, you are going to write an article for The National Oceanography Science Journal.

#### Make Sure Your Article Includes All of The Following:

- Your article should be at least five paragraphs long.
- It should include at least two references, properly cited, from other resources, such as online articles or books.
- Your article should thoroughly explain what El Niño & La Niña are, what causes them, and how they affect the Earth.

You have already done some of this work in the literacy assignment. It is okay to use that work and build on it / expand what you wrote there.



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

**Certificate For Your Homeschool Records**

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## The Sun

### What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about the Sun and its characteristics. This includes its size, temperature, age, stellar classification, location in the galaxy, how it formed, and how it will eventually die.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

#### I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

#### II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

#### III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

#### IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are stars?
- How do stars form?
- How old is the Sun?
- How will the Sun die?
- Sun size/distance from Earth.
- What kind of star is the Sun?
- Where is the sun located in the galaxy?
- The properties of sunlight.

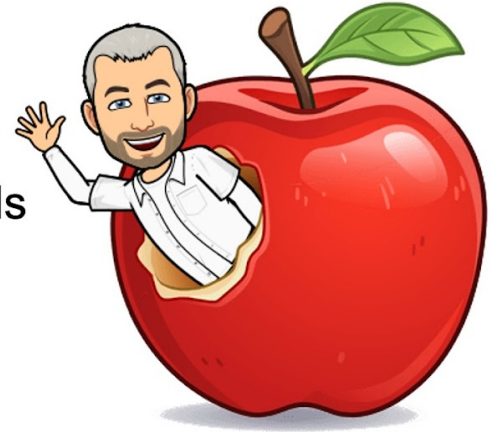
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering The Properties of Sunlight

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

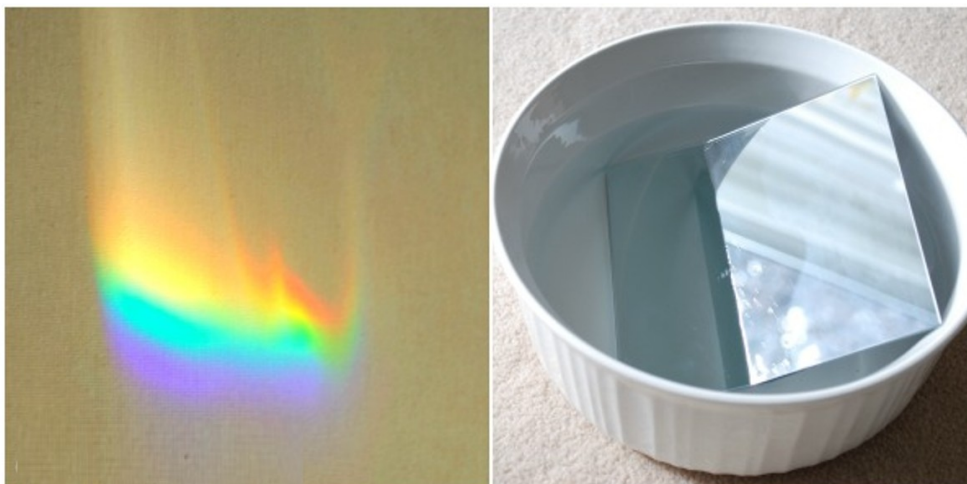
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the properties of sunlight

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### Experiment: Dividing The Sunlight

**Instructions:** For this lab you will need a bowl of water, and a small mirror. Place the bowl of water in a sunny place near a wall. Put the mirror inside the bowl so that it is at least partially submerged. It is important that your mirror be held at an angle (slanted) under the water. Catch the rays of the sun, and aim them at the wall.



**What do you observe?** Be detailed and write using complete sentences.



**Final Questions:**

Remember to answer questions using complete sentences.

1. What color is sunlight? Is it more than one color? How do you know?



2. Do you think there might be colors in sunlight that the human eye can't see? Explain your answer.



3. What type of star is the Sun? How do you think this might affect the type of light it produces?



4. How old is the Sun?



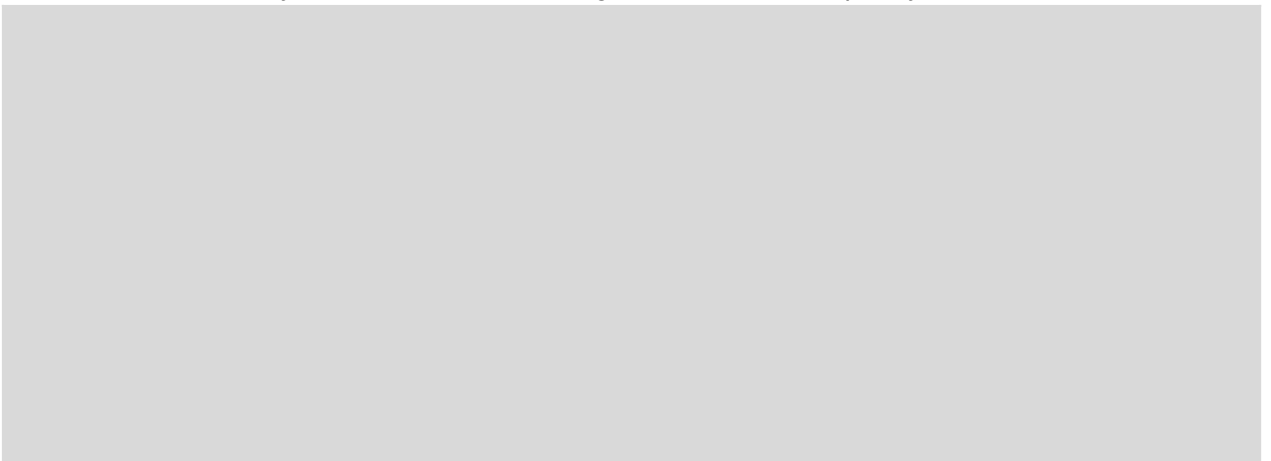
5. How long do scientists think the Sun will live?

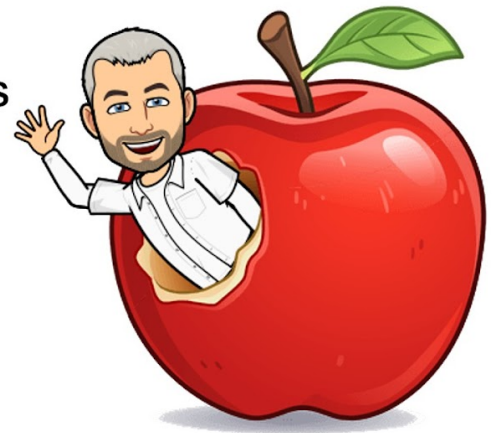


6. Explain what will happen at the end of the Sun's life.



7. Think of at least two ways that the Sun affects things here on Earth. Explain your answer.





### **Handsome Science Teacher One Take Videos**

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### **Take Your Time, Pause And Rewind As needed**

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This Mastery Badge includes one video:



Watch The Assigned Science Video

**Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge**

### **Check Point**

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### **Recording Your Learning**

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

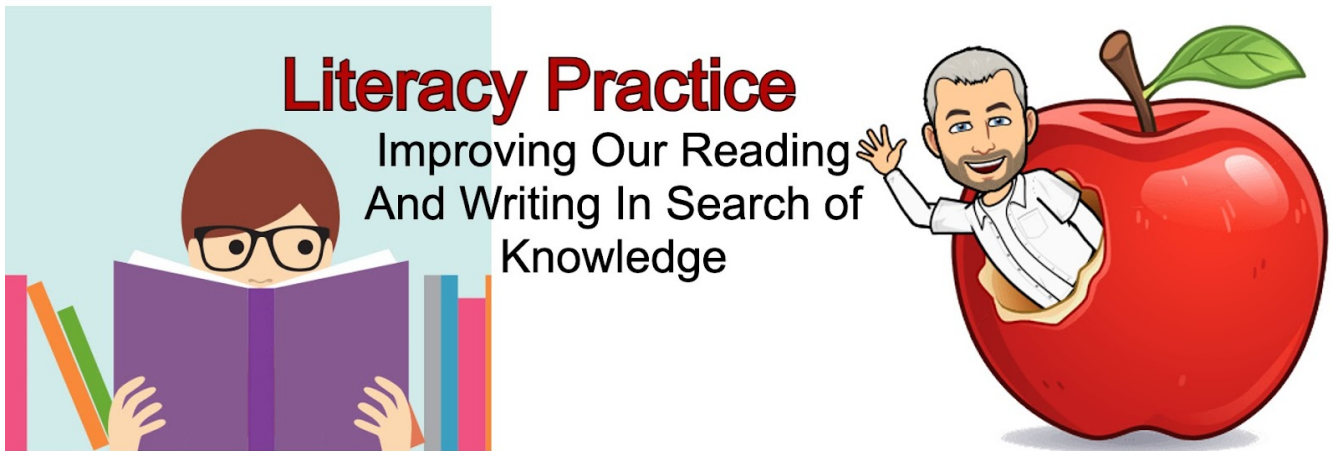
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

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### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



---

## Activity: Reading And Writing About Biomes

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



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### 1. Practice Reading For Understanding

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---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-sun/>

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### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Scientists have learned a lot about stars by studying our sun. According to this article what are some of the characteristics of the Sun? Write two paragraphs.

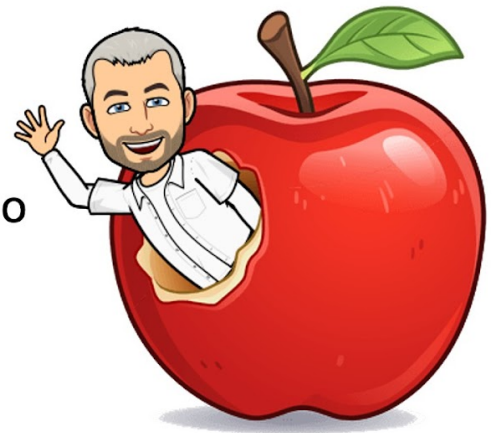
Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Applying Lab

### Proving That We Can Do It Ourselves



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### Activity: Sun Diagram

**Directions:** Follow the instructions below to make a diagram of the Sun.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To create a diagram of the Sun.

---

**Step 1:** Imagine that you have been hired to create a diagram of the Sun for a textbook company. They need a detailed picture showing each of the following things:

- How the Sun formed.
- Where the Sun is located in the Milky Way Galaxy.
- How the Sun will eventually die.
- The properties of sunlight.

The company has asked that your diagram be completed in color, but they have not given you any other directions beyond that. You can use crayon, colored pencils, or complete your drawing digitally. You can complete one drawing, or show each of the above criteria in four separate drawings. Make sure you label each diagram.

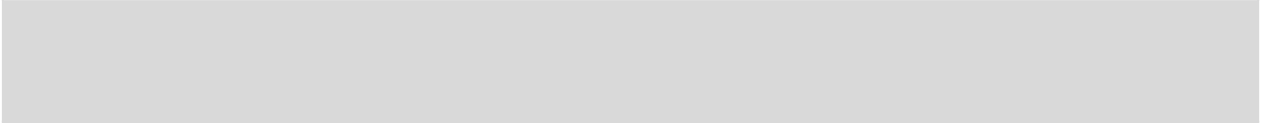
### Final Questions:

Remember to answer each question using complete sentences.

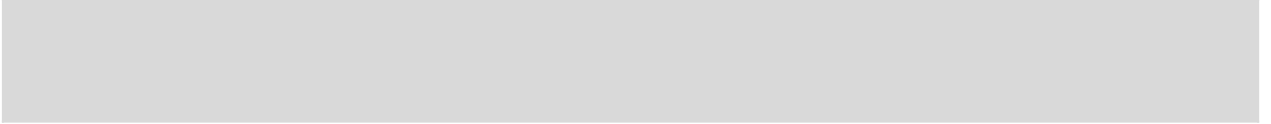
1. How much bigger is the Sun than the Earth?



2. How far is the Sun from the Earth?



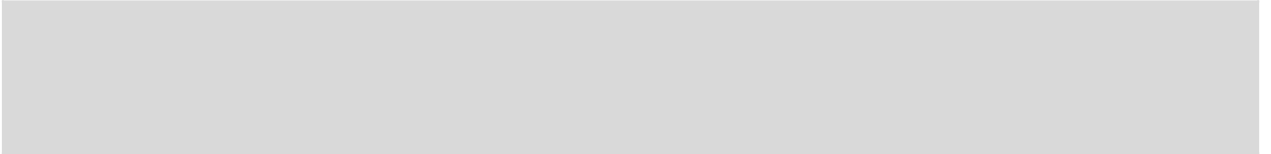
3. How big is the Sun compared to other stars?



4. How much of the Solar System's total mass is found in the Sun?

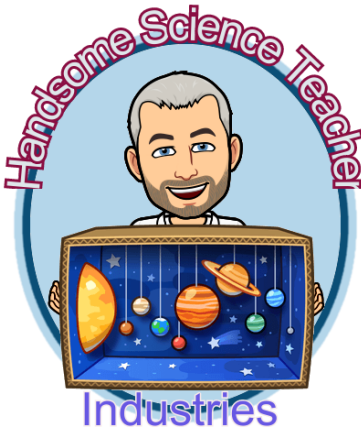


5. What is the temperature of the surface of the Sun?



6. What would happen to life on the Earth without the Sun?





**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## The Planets

### What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about the planets of our Solar System as well as several of their moons. You will learn to make predictions about planets based on where they are located in the Solar System and will begin to recognize patterns that these planets all share in common.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Introduction to each of the eight planets
- Characteristics of The Inner Planets
- Characteristics of The Outer Planets
- Rings
- Why isn't Pluto a planet?
- The Asteroid Belt

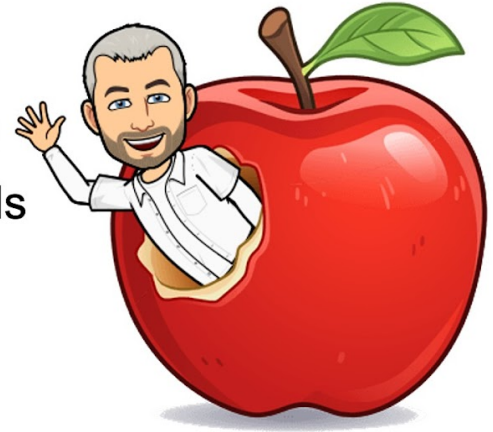
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Date: \_\_\_\_\_



## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Commonalities Among Various Planets

**Directions:** Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

**Goal:** To learn as much as you can about how the planets are alike, and how they are different.

---

#### Collecting Data On Our Solar System

Collecting data is a really important task that scientists often must engage in. As a scientist it is important that you collect accurate data. This means taking your time and checking your numbers carefully. In this assignment, you will collecting data on each of the eight planets in our solar system. You will then examine your data looking for patterns.

#### Collecting Data About The Planets

One very important thing that scientists do is research. This research leads to them collecting data that they can then use to make educated conclusions about how the Universe works. In this lab, you will be researching online to collect data about each of the eight planets in our Solar System.

#### Where Can You Find This Data?

You will have to utilize your resources in order to find the data to complete the table on the next page. You might look in books that you have at home, or use a search engine to find a website that has this information.

**Fill In The Entire Data Sheet Carefully**

Planet Name	Length of Year	Distance From Sun	Rocky Surface or Gas?
Mercury			
Venus			
Earth			
Mars			
Jupiter			
Saturn			
Neptune			
Pluto			

**Analyze Your Data - What Patterns Do You See?**

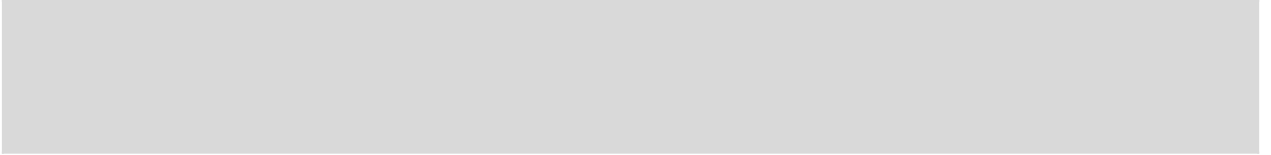
After collecting data, scientists analyze it. When you are analyzing data, there are no wrong answers. Just make sure that your answers are supported by the data that you collected. As you examine your data, what do you notice? Are there any patterns? What stands out? How are the planets alike, and how are they different? Look carefully at how the first four are alike and different versus the final four.



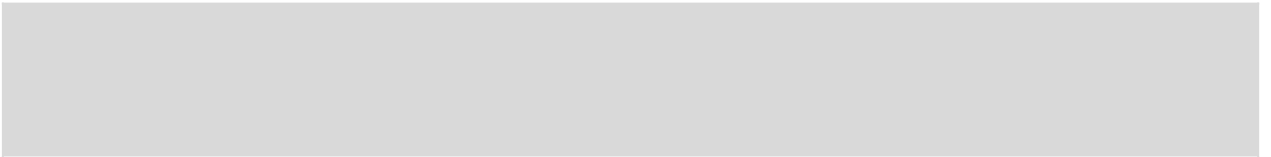
**Final Questions:**

Make sure to answer these questions using complete sentences.

1. Which planet has the longest year?



2. Which planet has the shortest year?



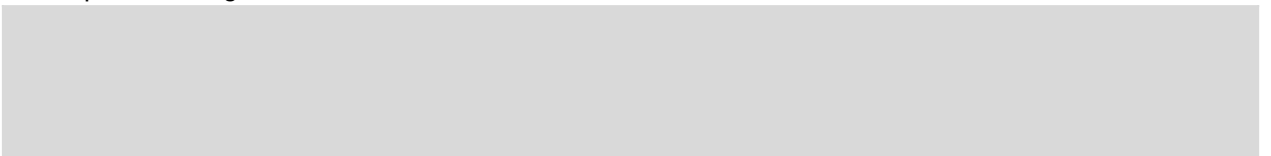
3. Do you see any patterns in how short or long the years are for planets?



4. Which planets are rocky?



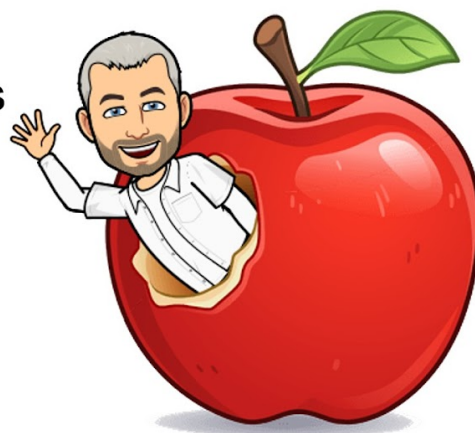
5. Which planets are gaseous?



6. Do you see any patterns in how the gaseous and rocky planets are organized?







### **Handsome Science Teacher One Take Videos**

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**I watched the video carefully, and paused to look up anything I didn't understand.**

### **Recording Your Learning**

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

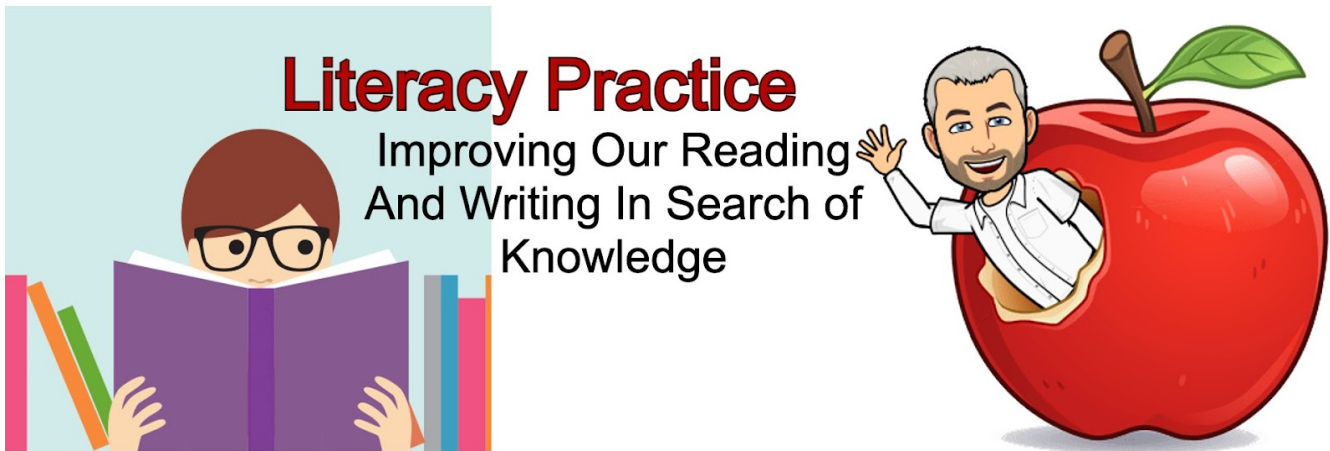
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### **Now, Let's Connect These New Concepts To Things You Already Knew**

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## Activity: Reading And Writing About Biomes

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## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/the-eight-planets/>

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**Check Point**

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

**Quiz Time**

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

**Now Let's Write To Communicate**

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs comparing and contrasting the eight planets of our Solar System.

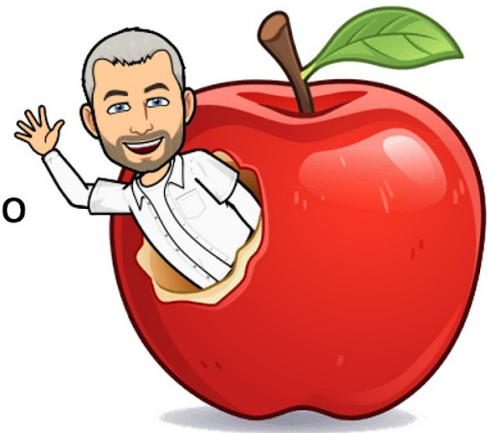
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Date: \_\_\_\_\_



## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Making My Own Planet

**Directions:** Follow the instructions below to make your own planet



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

**Goal:** To create a planet that follows the patterns that I have learned about in this mastery badge.

---

#### Discovering A New Planet

Pretend that you are an astronomer and that you have just discovered a new planet in our Solar System. Scientists always communicate their discoveries to other scientists so that humankind can all benefit. In order to help other scientists fully understand the awesomeness of your new discovery, you will need to explain some facts about the planet that you have discovered.

#### My Planet's Name

Go ahead and give your planet a name. This can be anything you want:

#### Where my planet is located

What part of the Solar System is your planet located in? Is it inside the Asteroid Belt (an inner planet) or outside the Asteroid Belt (an outer planet)? There are no wrong answers, it is entirely up to you. However, remember that the location of your planet will affect its features.

#### Describe Your Planet's Features

What does the planet you discovered look like? Is it a small rocky planet, or a gas giant? Does it have moons?

Does it have rings? Remember to follow the patterns that we learned about earlier. If it is an inner planet, it should have the characteristics of an inner planet. If it is an outer planet, it should have the characteristics of an outer planet.

**Draw a picture of your planet**

Using colored pencils, crayons, or computer software draw a picture of your planet. Make sure that the drawing matches the description you provided.

**This drawing should be completed on a separate piece of paper.**

**Final Questions:**

Answer each of the following final questions using complete sentences.

1. Which planet in our Solar System is the biggest?

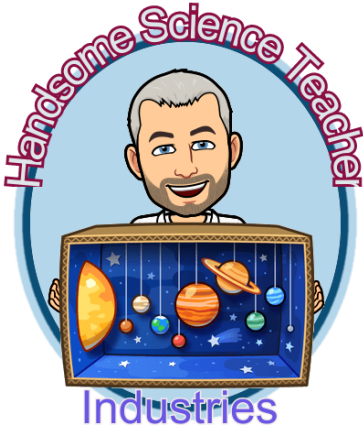
2. Which is the smallest?

3. Where are the rocky planets located?

4. Where are the gas giants located?

5. Why isn't Pluto considered a planet?

6. Which planets have moons?



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

**Certificate For Your Homeschool Records**

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## Atoms

### What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about matter. Starting with protons, neutrons, and electrons. By the end of this mastery badge, you will be able to describe how these sub-atomic particles combine to form atoms.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Atoms, The Smallest Piece of Matter
- Protons, Neutrons, Electrons
- Opposites Attract, Likes Repeal
- Reading A Periodic Table

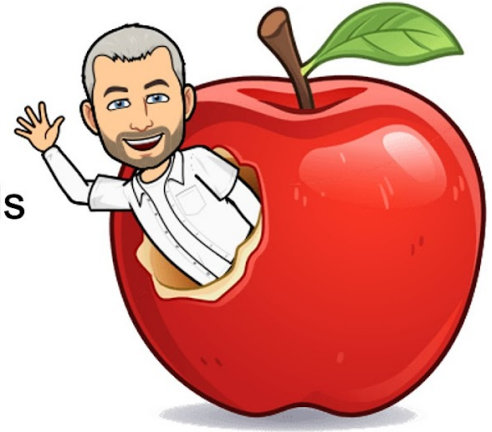
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# Discovering Lab

Learning Through Hands  
On Activities



## Activity: Discovering Atoms

Directions: Follow the directions below.

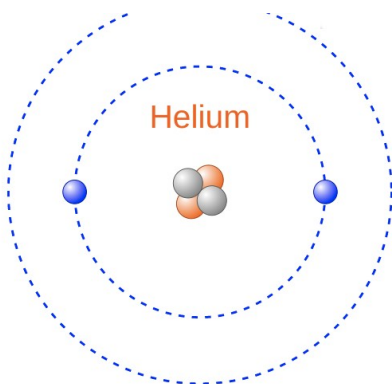


Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about atoms.

### First Atom:



This is a helium atom. Take a minute and examine it. You will notice blue circles which are called electrons, gray circles called neutrons, and orange circles called protons.

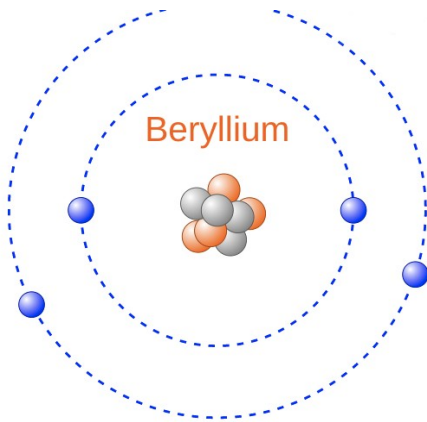
How many electrons are there?

How many protons are there?

Where are the electrons located?

Where are the protons and neutrons?

**Second Atom:**



This is a beryllium atom. Take a minute to examine it. Remember that the blue circles are electrons, the gray circles are neutrons, and the orange circles are protons.

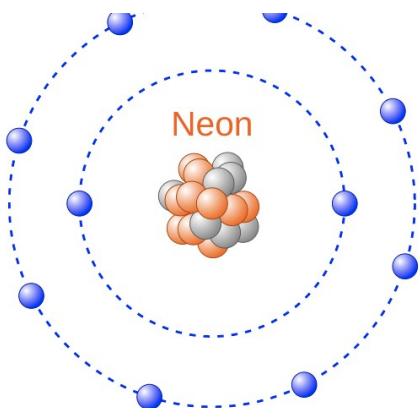
How is this atom different from an atom of helium?

How many protons and electrons are there?

The center of all atoms is called the nucleus. Why do you think scientists might call it that? There are no wrong answers, but be thoughtful.

The outer layers of an atom are called either shells or orbitals. Why do you think scientists call them that? Again, there are no wrong answers, but be thoughtful.

**Third Atom:**



This is a neon atom. Neon atoms are important because **they completely fill the first two orbitals**. Take a minute to examine it.

How many electrons are in the first orbital?

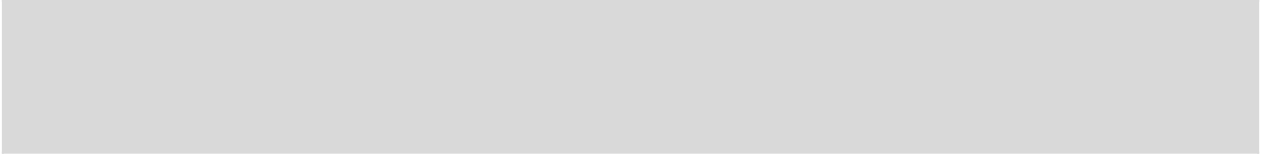
How many atoms are in the second orbital?

How many protons and electrons are there? Do you notice any patterns with protons and electrons? Explain your answer.

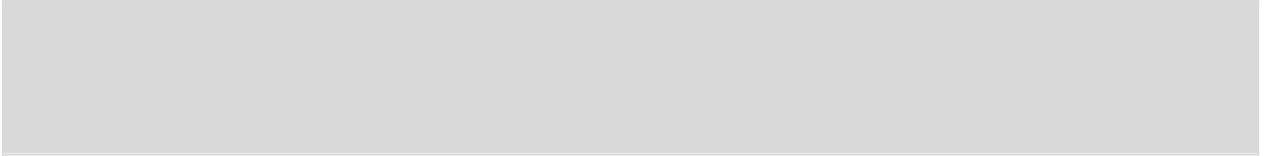
**Final Questions:**

Remember to use complete sentences.

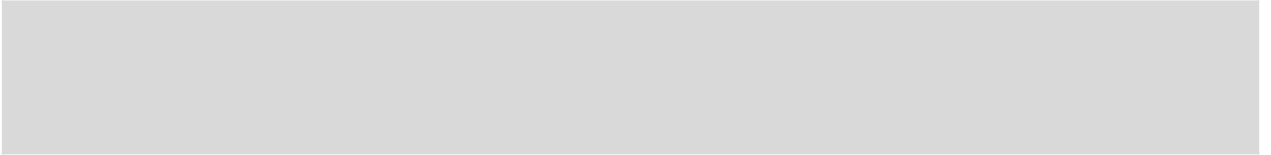
1. What is an atom?



2. What are the three sub-atomic particles that make up atoms called?



3. What charge do protons have? You might have to research this question using books and websites.



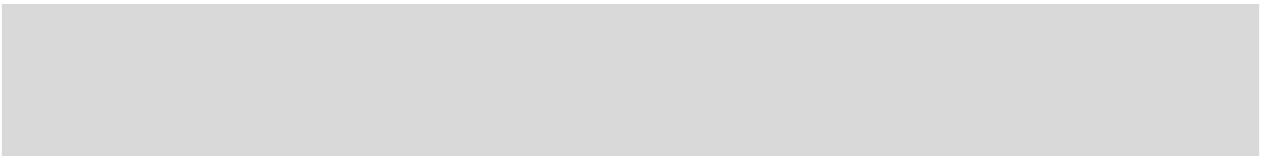
4. What charge do electrons have?



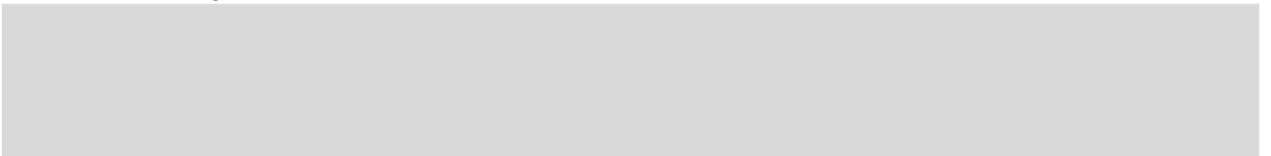
5. What charge do neutrons have?

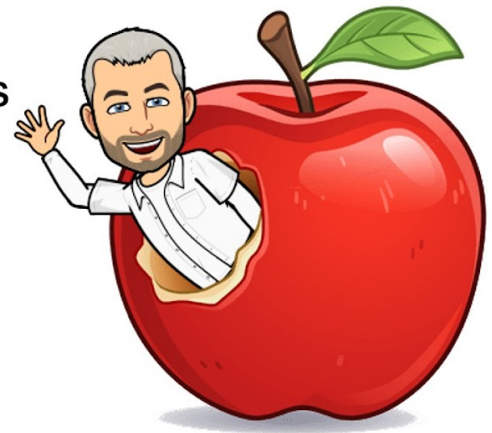


6. With positive and negative charges, what do opposites do?



7. What do like charges do?





### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### The Videos For This Mastery Badge Can Be Opened Using These QR Codes

This Mastery Badge includes Two videos:



Watch The Assigned Science Videos

Scan These QR Codes To Open And Watch The Assigned Videos For This Mastery Badge

### Check Point

Let's make sure that you really did take your time to watch this video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

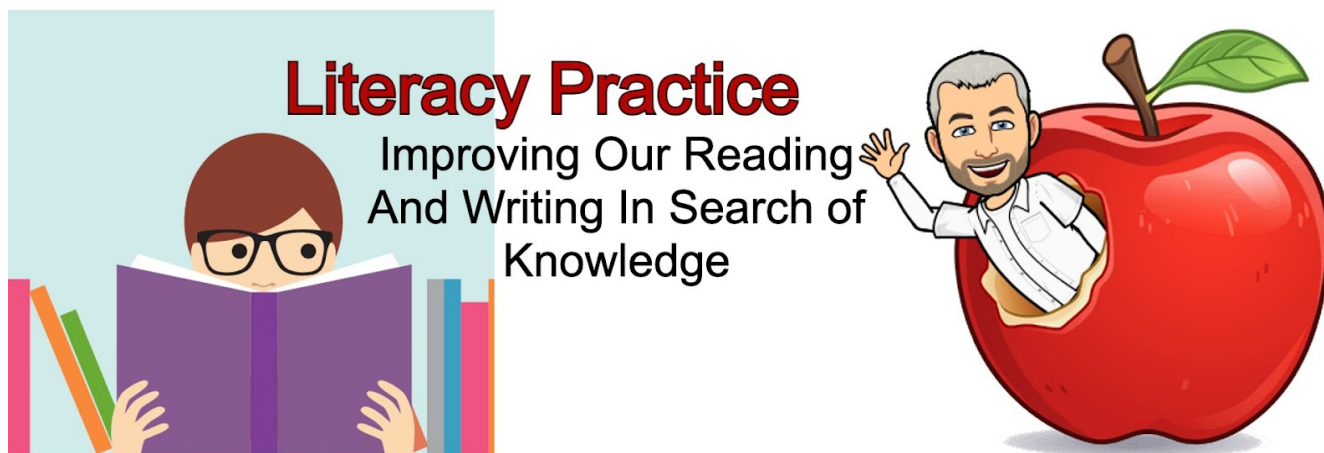
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About Atoms

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/atoms/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Pick two topics that you learned about from these articles. Write a two-paragraph summary explaining what atoms are and what they are made of.



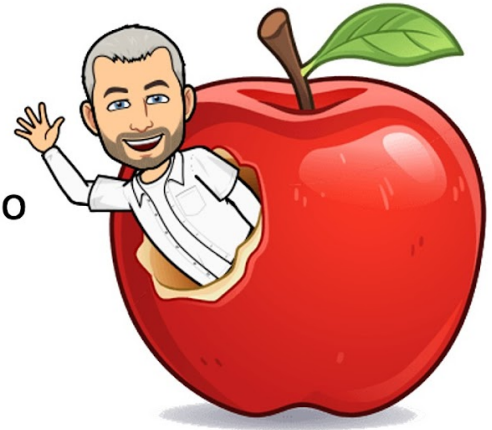
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# Applying Lab

Proving That We Can Do  
It Ourselves



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## Activity: Making My Own Atoms

**Directions:** Follow the instructions below to make your own planet



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To demonstrate your understanding of how atoms form and how they are structured.

---

### Creating Atoms

In this lab, you Are Going To Create An Atom. Actually, You Are Going To Create Several. To do this, you will need to gather some supplies to represent each part of the atom. You will need something to represent protons, something to represent neutrons, and something to represent electrons. Beads, marshmallows, candy, coins, are all things that would work really well.

**What I am using to represent protons:**

**What I am using to represent neutrons:**

**What I am using to represent electrons:**

### Using The Periodic Table To Create Atoms

For each atom, you will need to use this periodic table to look up the number of protons (atomic number). Place the correct number of protons in the middle of the atom. Then place an equal number of electrons in orbit around the protons. Make sure that you do not exceed the maximum number of electrons per orbital. The nucleus of your atom will also need neutrons, in order to hold the protons together.

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo
Lanthanoids		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
Actinoids		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

#### Create An Oxygen Atom (The Symbol For Oxygen is O)

Remember: First look at the atomic number to find out how many protons you need in your nucleus. Then balance your atom by adding the same number of electrons in orbit around the protons. Finally, add some neutrons to the nucleus to act as glue.

When you are done making your atom, take a picture of it then continue to the next atom.

#### Create An Aluminium Atom (The Symbol For Aluminium is AL)

When you are done making your atom, take a picture of it then continue to the next atom.

#### Create An Calcium Atom (The Symbol For Calcium is CA)

When you are done making your atom, take a picture of it then continue to the next atom.

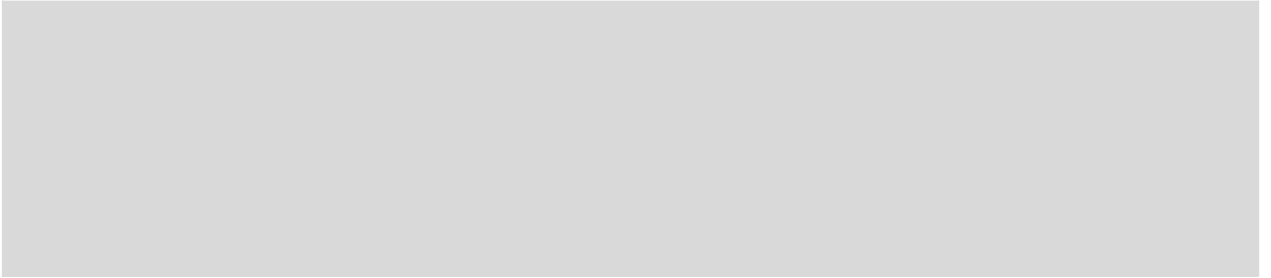
#### Create An Silver Atom (The Symbol For Silver is AG)

When you are done making your atom, take a picture of it then continue to the next atom.

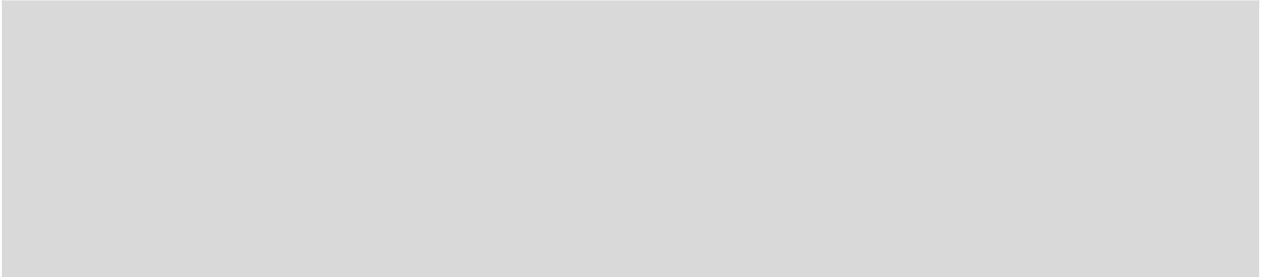
**Final Questions:**

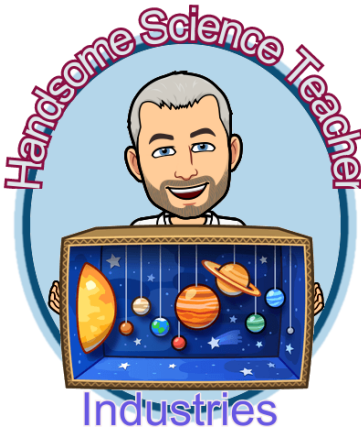
Answer each question using complete sentences.

1. Oxygen and silver are physically very different from each other. Yet structurally they are both made up of the same three ingredients. Oxygen has 8 **protons**, while silver has 47. How many **electrons** does an oxygen atom have? How many **electrons** does a silver atom have? Why do you think adding more protons and electrons makes the two elements behave so differently from one another?



2. What is an ion? How are they different from other atoms?





**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## Molecules & Compounds

### What I Will Be Learning In This Mastery Badge:

In this mastery badge you will learn about how atoms combine to form molecules and how a molecule with two different elements forms a compound. We will also learn the difference between covalent and ionic bonds.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Review Atoms
- Review Ions
- What are valence electrons?
- How valence electrons cause elements to be attracted to each other.
- Two ways that elements can combine. Covalent / Ionic
- What is a compound?

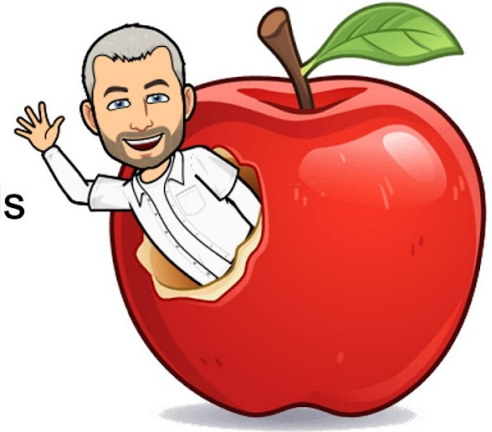
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# Discovering Lab

Learning Through Hands  
On Activities



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## Activity: Discovering Molecules

Directions: Follow the directions below.

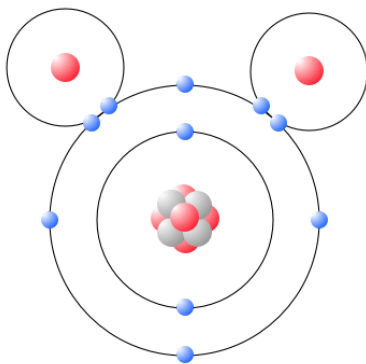


Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about molecules

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### Molecule

In the last mastery badge we learned that atoms are made up of protons, neutrons, and electrons. We also learned to identify atoms based on the number of protons. In this model, the protons are red, the electrons are blue, and the neutrons are gray.

How many protons are in each of the top atoms?

Use a periodic table to identify which atoms they are.

Some of the protons are hidden in the large lower atom so I will tell you that there are 8. Which atom has 8 protons?



This is a water molecule. Look closely at it. Notice that the hydrogen atoms are “stuck” to the oxygen atom. What do you think might cause these atoms to stick together? There are no wrong answers here. Scientists don't always know the right answers. This is your opportunity to be thoughtful and to think about possible reasons for why two hydrogen atoms would stick to one oxygen atom. Later we will discover why this occurs. For now, just do your best to guess.

### Online Simulations

There are some really great molecule simulations online. It is impossible to post a link to these because the links change and this packet would quickly become outdated. Using a search engine, find an online simulation that allows you to create molecules. Use the simulation for 30 minutes, and then record what you learned from it below. Just as before, there are no wrong answers here. Just be thoughtful.

What observations did you make? What did you learn from the simulation?

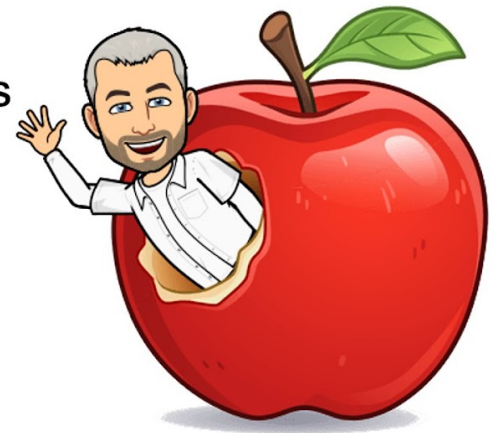
### Final Questions:

Remember to answer each final question using complete sentences.

1. What is a molecule?

2. Why do you think molecules form?

3.



### Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

### Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

### Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

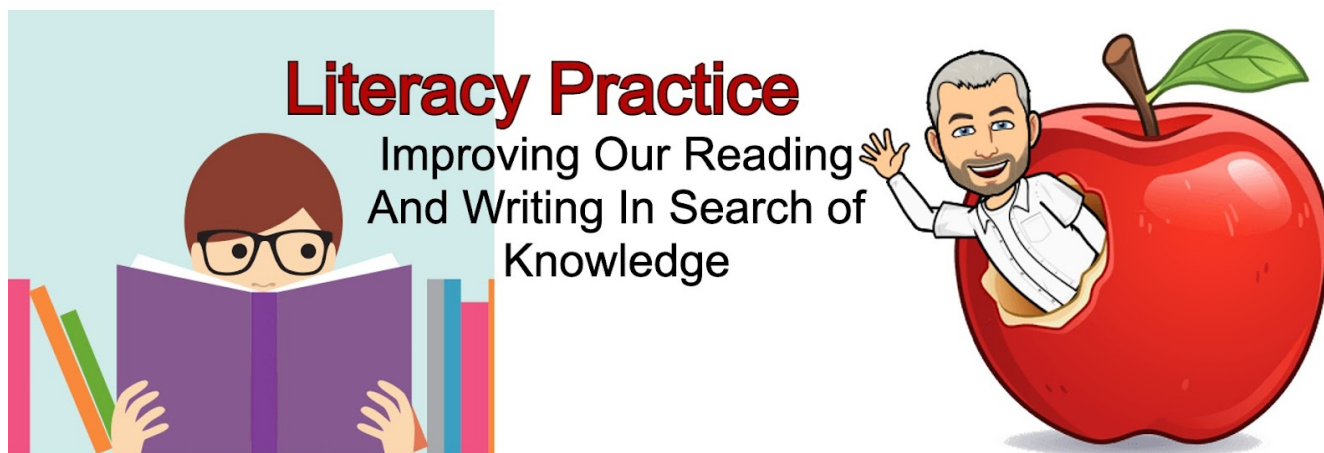
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



---

## Activity: Reading And Writing About Atoms

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

---

## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/molecules/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs describing how atoms combine to form molecules.

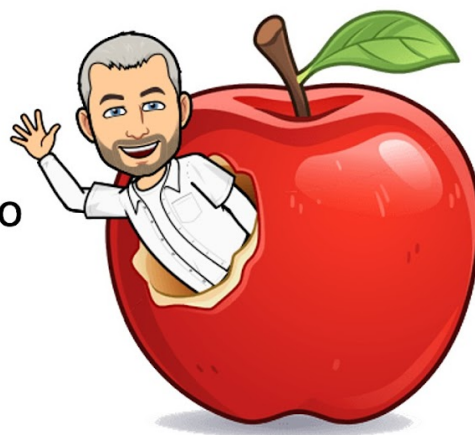
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## Applying Lab

Proving That We Can Do  
It Ourselves



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### Activity: Diagramming A Covalent And Ionic Bond

**Directions:** Follow the instructions below to diagram your own bonds.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To create an ionic bond and covalent bond.

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### You Are Going To Create A Detailed Diagram of A Covalent And An Ionic Bond

To do this, you will need paper and colored pencils, or crayons.

#### Part I: Covalent Bond

Select any molecule that has a covalent bond. To find one, you will need to use a search engine. You can search for something like "Examples of covalent bonds." Your molecule does not need to be super complex but should have at least three atoms.

Which molecule are you going to draw?

List all of the types of atoms in the molecule you selected.

### Covalent Diagram # 1

Draw each atom separately. Showing where the valence electrons are. Label each atom including their names, and draw an arrow pointing to the valence electrons. Remember, valence electrons are the furthest out electrons in the orbit of an atom.

### Covalent Diagram # 2

Now draw the same atoms again, but this time as a combined molecule. Show how the electrons have become stuck together. Label each atom, as well as the molecule that they formed.

## Part 2: Ionic Bond

Select any ion that has an ionic bond. To find one, you will need to use a search engine You can search for something like "Examples of ionic bonds." Your ion does not need to be super complex but should have at least two atoms.

Which ion are you going to draw?

List all of the types of atoms in the ion you selected.

### Ionic Diagram # 1

Draw each atom separately. Showing where the valence electrons are. Label the atoms with the names, and draw an arrow pointing to the valence electrons. Remember, valence electrons are the furthest out electrons in the orbit of an atom.

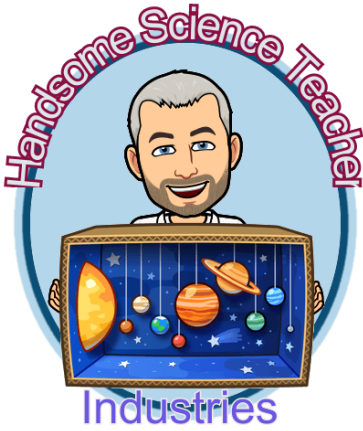
### Ionic Diagram # 2

Now draw the same atoms again, but this time as a combined ion. Show how one atom donated an electron to the other. Label each atom, as well as the ion that they formed.

### Final Questions:

1. What is the difference between an ionic bond and a covalent bond?

2. What is a valence electron?



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

[Large gray rectangular area for student self-evaluation]

**Mastery Badge Counselor Evaluation:**

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date



**Certificate For Your Homeschool Records**

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

**Keep this on file as evidence of your successful completion of this topic.**

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.







## Mixtures A STEM Lab

### What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about how different types of compounds are mixed together to create mixtures. We will learn to identify various mixtures and to distinguish between elements, compounds, and mixtures.

### What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

- I. **Discovering Lab**  
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.
- II. **Video Instruction**  
You will watch a video presented by Mr. Bertoch, and answer questions about it.
- III. **Literacy Practice**  
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.
- IV. **Applying Lab**  
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

### Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Review Elements
- Review Compounds
- What Is a Mixture?
- Types of Mixtures
- Examples of Mixtures

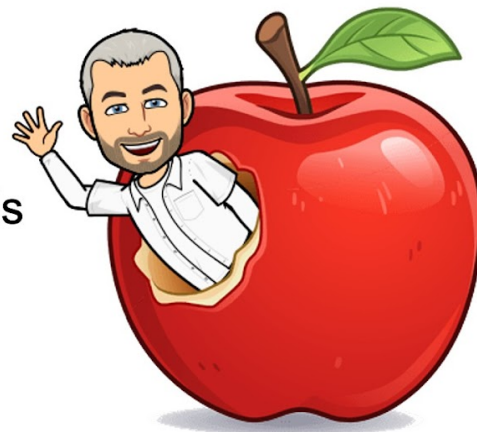
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## Discovering Lab

Learning Through Hands  
On Activities



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### Activity: Discovering Mixtures

Directions: Follow the directions below.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about mixtures

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#### Create A Mixture

Using cereal, candy, legos, or anything else, create a mixture. To do this, simply put different types, colors, and shapes into the same container. When we mix different things together we call the substance that forms a mixture.

#### Draw A Picture

Create a picture of your mixture showing what it looks like.

#### Observe Your Mixture

Write a few sentences describing what your mixture looks like. Be detailed.

Atoms combine to form new compounds which are made up of molecules. However, molecules can be mixed in the same container without combining. Notice: Did the objects you mixed together combine to form any new substances, or did they remain as separate pieces of cereal, legos, skittles, etc.

**Try To Explain What You Observed:**

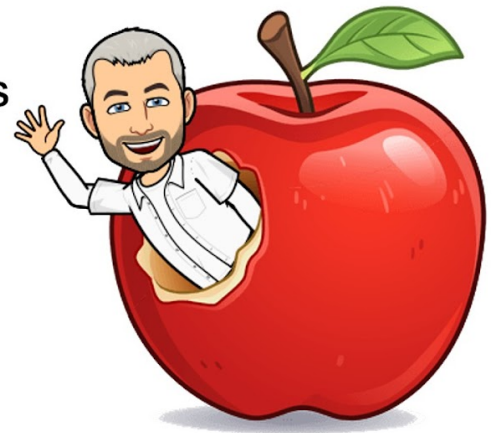
Scientists sometimes have to explain difficult things to others. See if you can explain what you have discovered about mixtures. How are they like compounds? How are they different? It is okay if you need to refer to online articles, or books to help you clarify your thoughts. Research is very important in science.

**Final Questions:**

1. In your own words explain what an element is.

2. Explain how elements combine to form compounds.

3. Explain how compounds combine to form mixtures.



### **Handsome Science Teacher One Take Videos**

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

### **Take Your Time, Pause And Rewind As needed**

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

### **The Video For This Mastery Badge Can Be Opened Using This QR Code**

This Mastery Badge includes one video:



Watch The Assigned Science Video

**Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge**

### **Check Point**

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I watched the video carefully, and paused to look up anything I didn't understand.**

### **Recording Your Learning**

On the next page, you will record your learning and connect it to things you already know.

### **Ten Things I Learned From This Video**

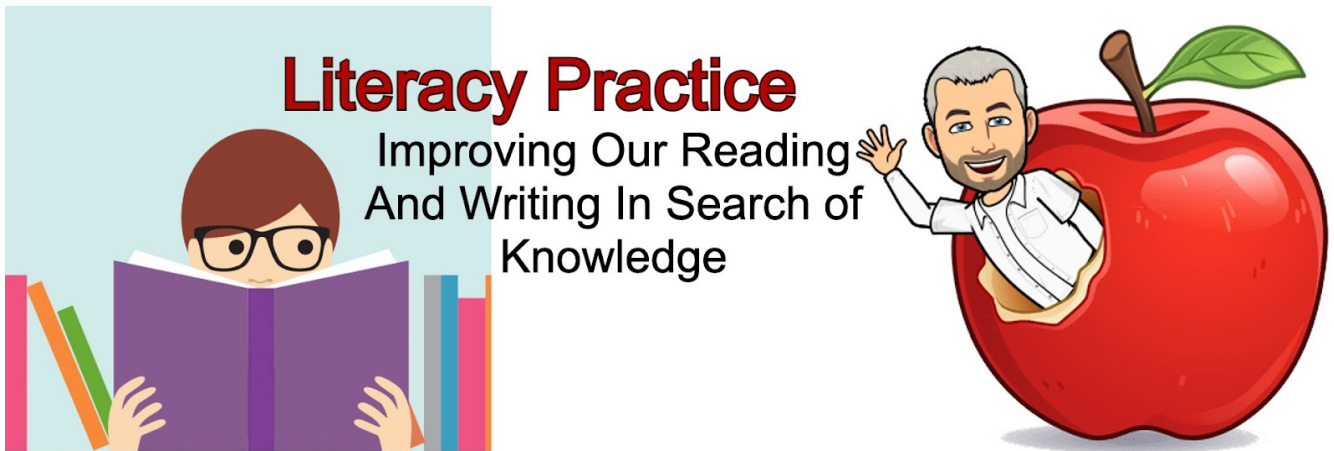
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

### **Now, Let's Connect These New Concepts To Things You Already Knew**

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



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## Activity: Reading And Writing About Atoms

**Directions:** Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

**Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment**

### 1. Practice Reading For Understanding

Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

### 2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

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## Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/mixtures/>

**Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge**



### Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

**I Read For Understanding. I did not skim the article. I understood the material that the article discussed.**

### Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

### Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

**Writing Prompt:** Write two paragraphs describing what a mixture is. Share a few examples of different kinds of mixtures from the article.

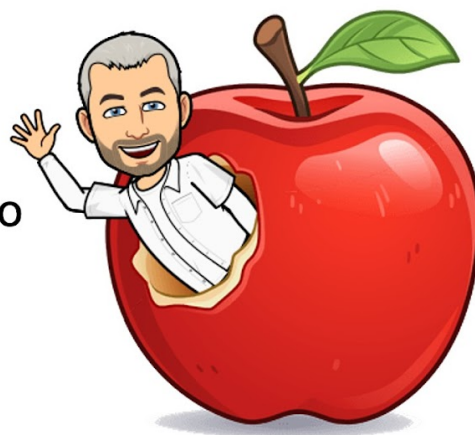
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Date: \_\_\_\_\_



## Applying Lab

### Proving That We Can Do It Ourselves



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### Activity: Creating And Separating Mixtures

**Directions:** Follow the instructions below to create and separate mixtures.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

**Goal:** To create and separate mixtures.

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### Creating And Separating Three Mixtures

In this lab you are going to create three mixtures. To do this you will need water, sand, salt, and sugar.

Step 1. Pour water into three cups.

Step 2. Add a generous amount of salt to one of these cups, and label it with the word 'Salt.'

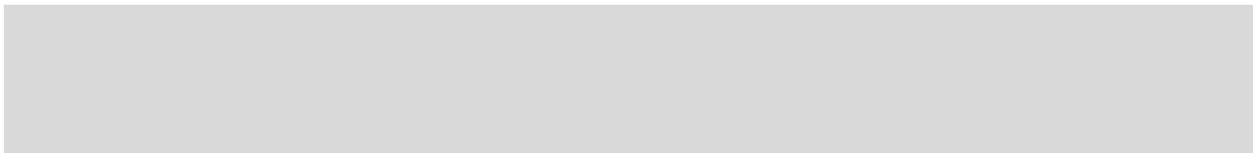
Step 3. Add a generous amount of sugar to a second cup and label it 'Sugar'.

Step 4. Add a generous amount of sand to a third cup, and label it 'Sand'.

### Problem:

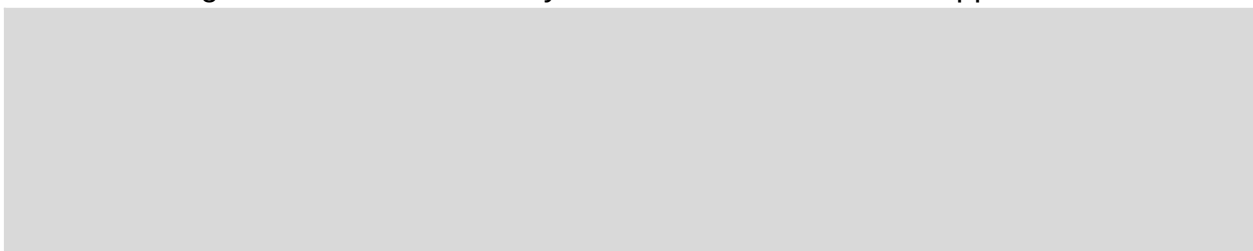
In the video, we learned that mixtures can be separated physically, without having to do any chemical reactions to them. We just created three mixtures. Sugar water, saltwater, and sand water. What could you do to separate your mixtures back to their original ingredients?

How can you remove sand from water? How can you remove the salt? How can you remove the sugar? There are no wrong answers here. Scientists don't always have someone to tell them how to do an experiment. This is your opportunity to come up with your own ideas.

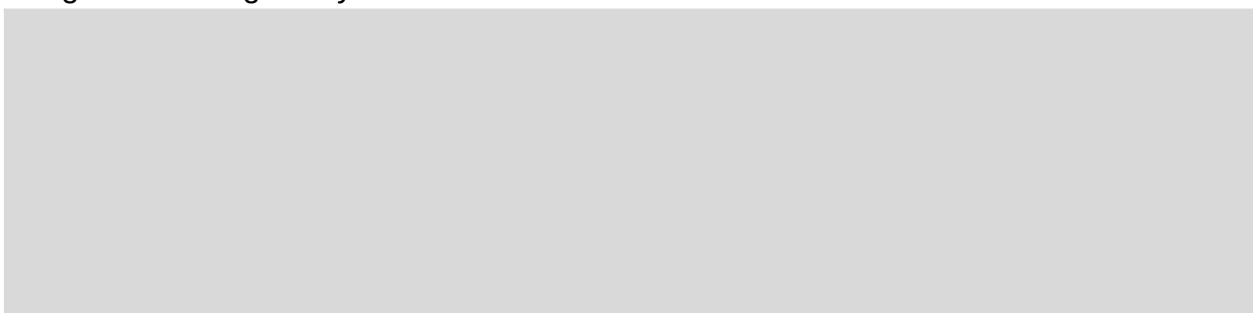


**Try Your Best:**

Try to remove the sugar, salt, and sand from your water. Describe what happened below.



Draw a diagram showing how you removed each of the substances from the water.



**Hints:**

Sometimes it is helpful to reverse the problem and think about it from another angle. Instead of trying to figure out how to remove the salt or sand from the water, consider how you might remove the water from the salt or the sugar.

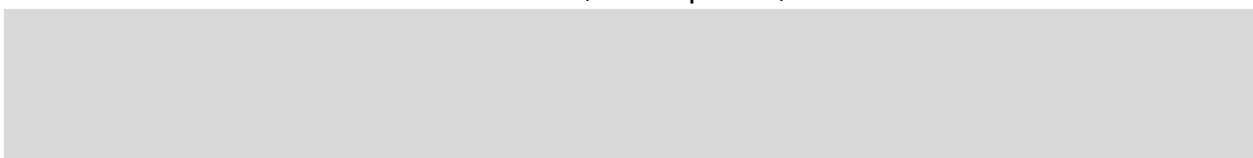
**Final Questions:**

Answer each of the following final questions using complete sentences.

1. Why are some mixtures harder to separate than others?



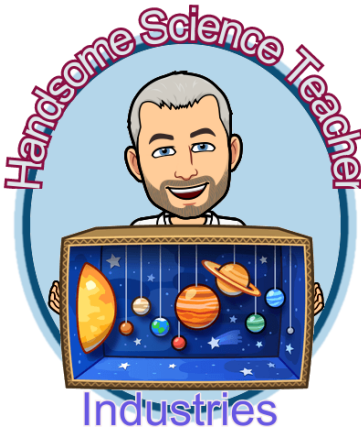
2. What is the difference between a mixture, a compound, and an element?



3. What are the different kinds of mixtures? Which are homogeneous? Which are heterogeneous?



- 4.



**Congratulations! You Have Completed The Entire Mastery Badge**

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

**Time To Evaluate Your Work**

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

**My Self-Evaluation:**

Based on the criteria listed above, I believe I have passed off this Mastery Badge because... (Be detailed and specific)

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[Large gray rectangular area for counselor evaluation]

\_\_\_\_\_  
Student's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Mastery  
Badge Counselor

\_\_\_\_\_  
Date

### Certificate For Your Homeschool Records

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# Sixth Grade Is Up Next



## **Congratulations On Finishing Fifth Grade!**

Next Stop! Sixth Grade!! In sixth grade we will learn more about the environment, we will study physics, and we will learn more about astronomy and the world around us.

Visit [HandsomeScienceTeacher.com](https://HandsomeScienceTeacher.com) to download a digital copy of the sixth grade textbook for free. If you would like a physical copy, they can also be purchased on [HandsomeScienceTeacher.com](https://HandsomeScienceTeacher.com).

HOMESCHOOLING