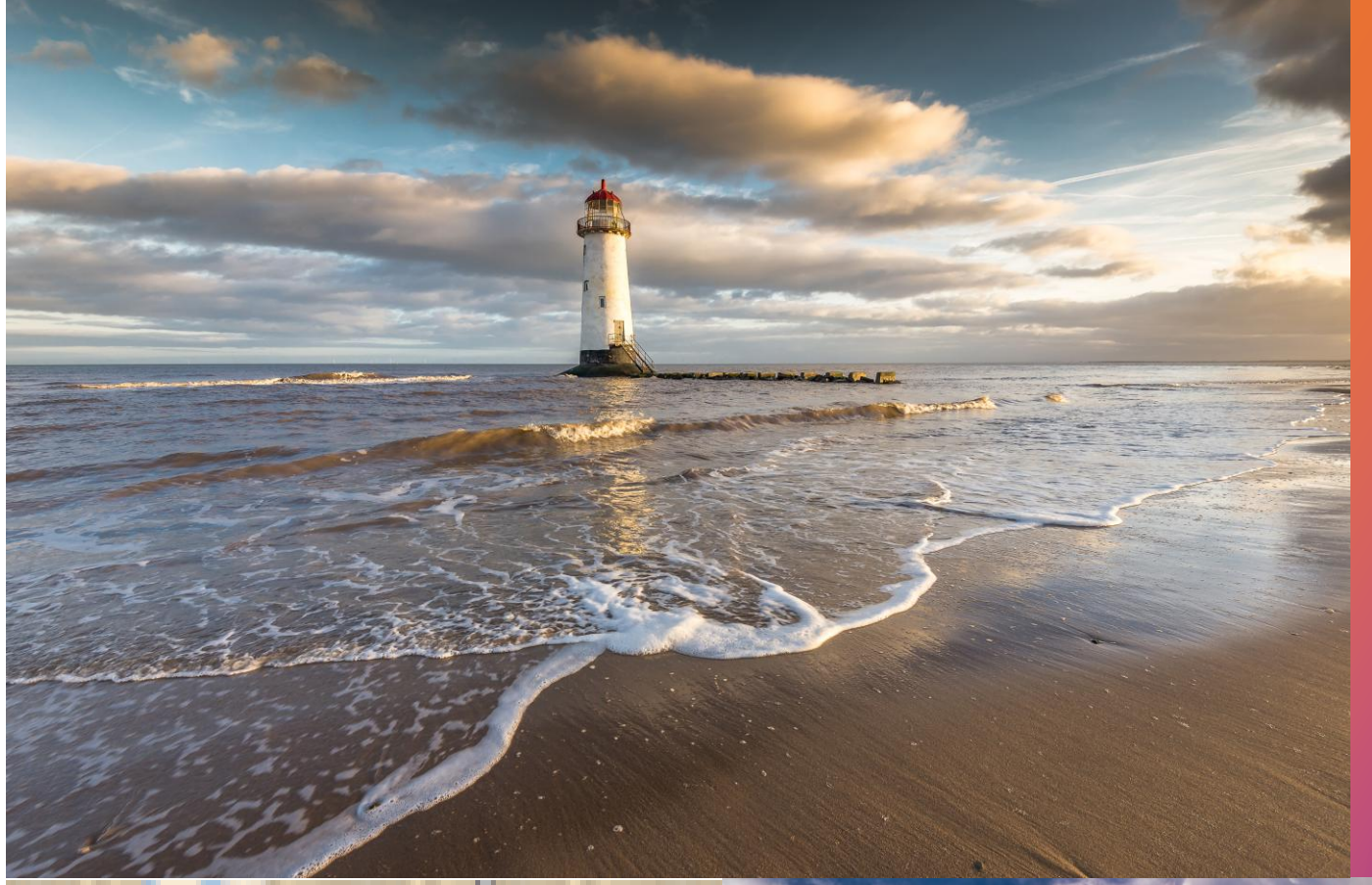


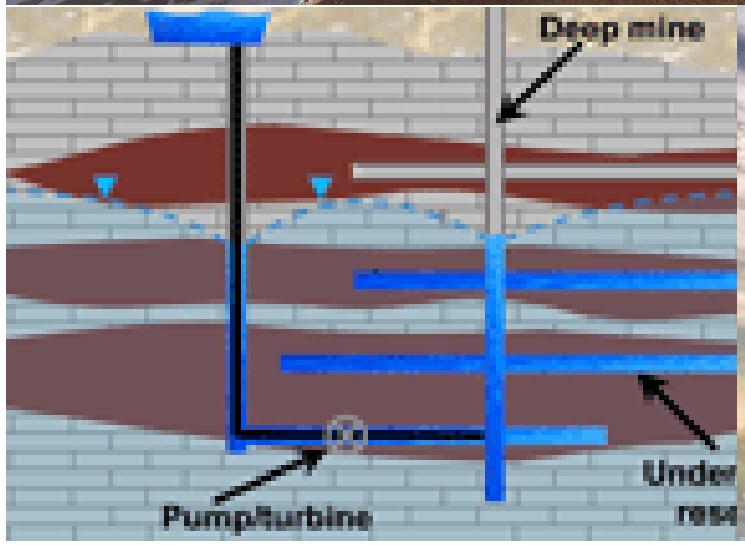
Amazing Water

Vol 1 Chemistry

Water's Above, On, and In or Under the Ground!

- It's necessary (life)
- It's moveable (water cycle)
- It's powerful (heat capacity)
- It's navigable (ships)
- It's climate controlling
- It's valuable, but readily available
- It's fun!
- It's EVERYWHERE…







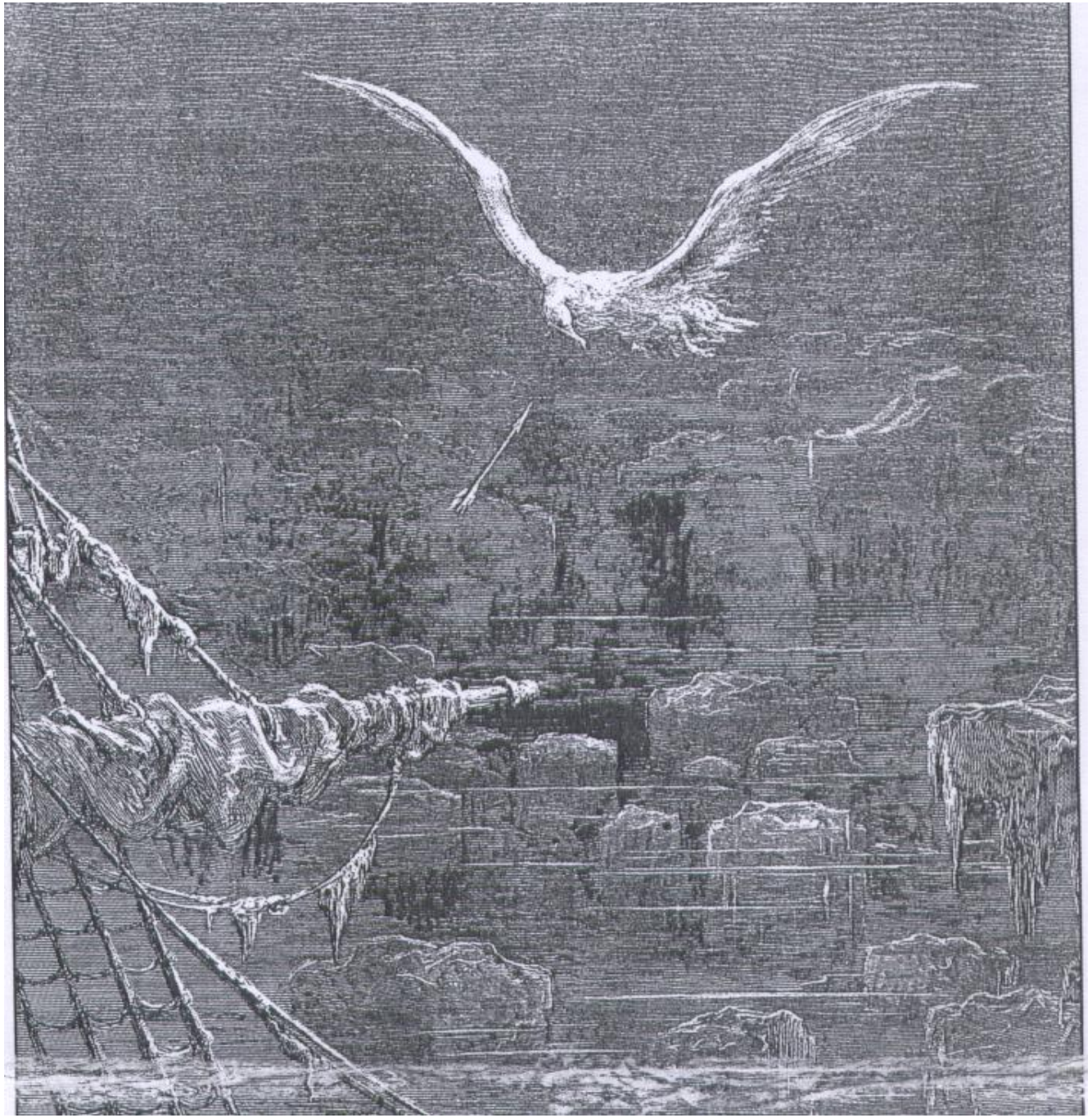
The Rime of the Ancient Mariner (in 1797)

“Water, water, everywhere, but not a drop to drink…”

He prayeth best, who loveth best
All things both great and small;
For the dear God who loveth us
He made and loveth all!

By Samuel Taylor Coleridge

Also the saying - an Albatross around one’s neck… A self-inflicted burden that holds you back.



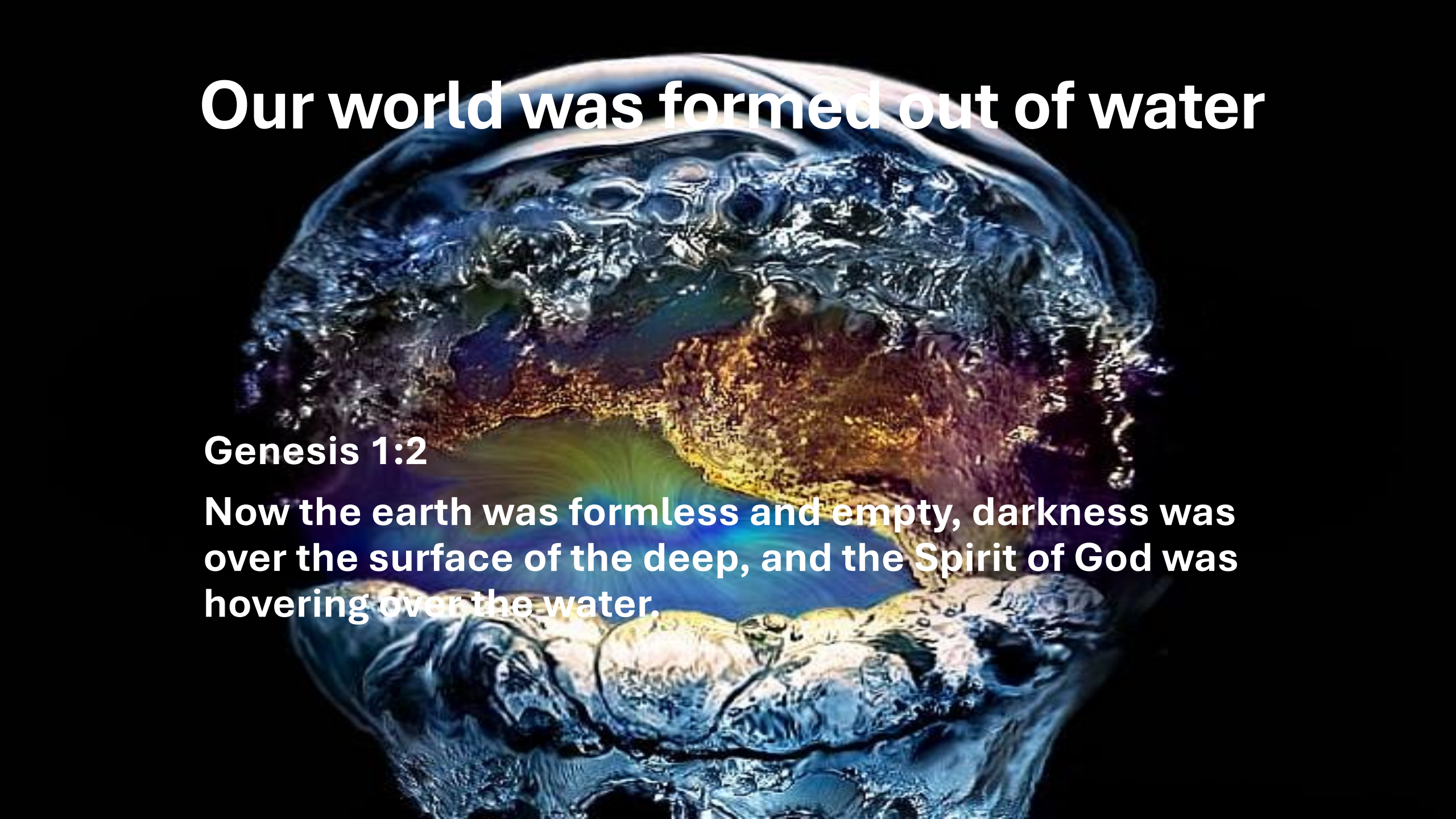


Scripture

Often references water with Christ who is:

- Our Living Water
- The Water of Life
- “A spring of water gushing up to eternal life.” John 4:14

Our world was formed out of water



Genesis 1:2

Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the water.

Throughout the Scriptures…

Water references…

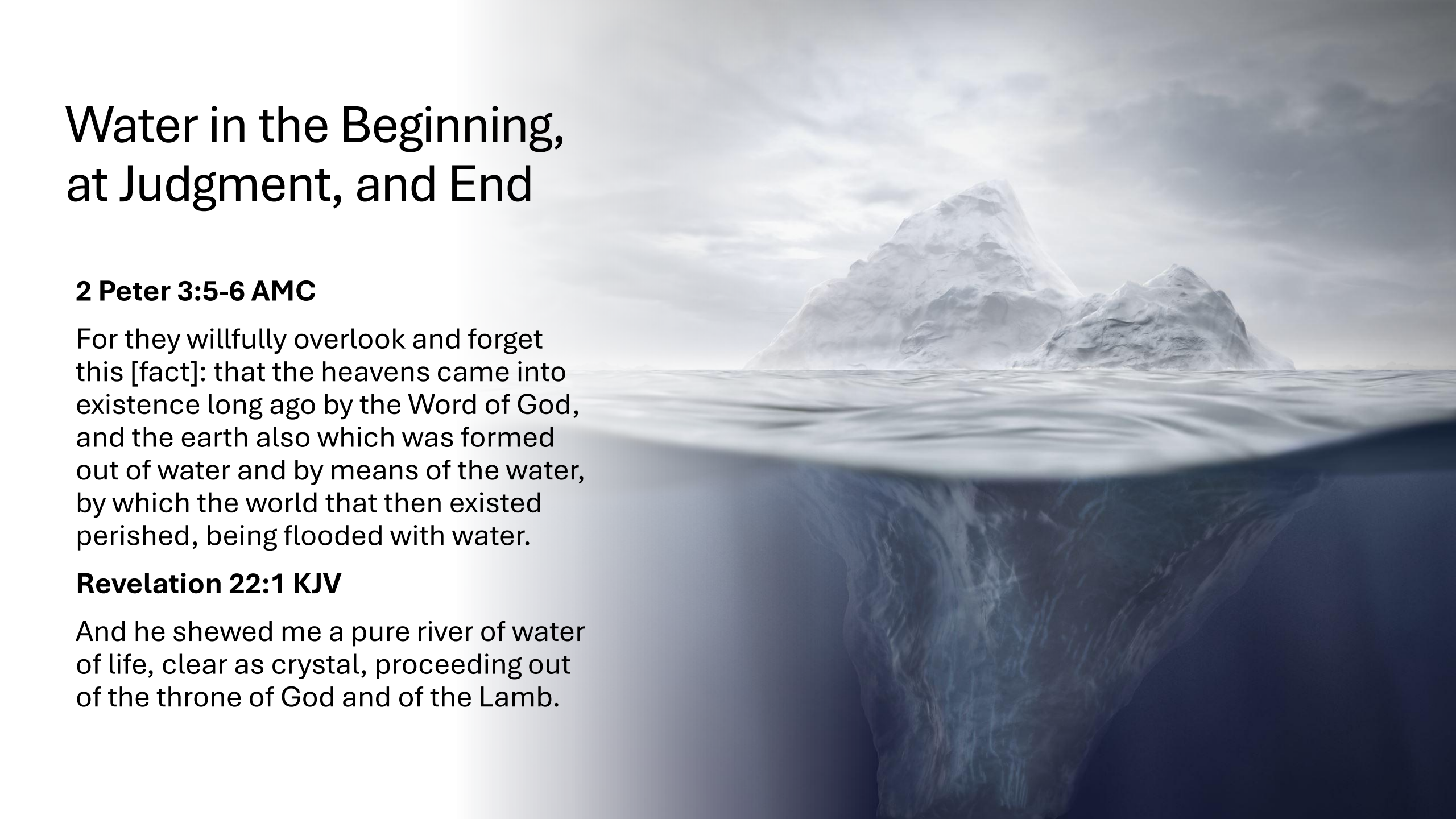
- New Creation (our earth)
- New Life (from the womb)
- New Life in Christ (baptism)

As well as…

- Judgment in the Flood
- Cleansing
- Thirst/Refreshing



Water in the Beginning, at Judgment, and End



2 Peter 3:5-6 AMC

For they willfully overlook and forget this [fact]: that the heavens came into existence long ago by the Word of God, and the earth also which was formed out of water and by means of the water, by which the world that then existed perished, being flooded with water.

Revelation 22:1 KJV

And he shewed me a pure river of water of life, clear as crystal, proceeding out of the throne of God and of the Lamb.



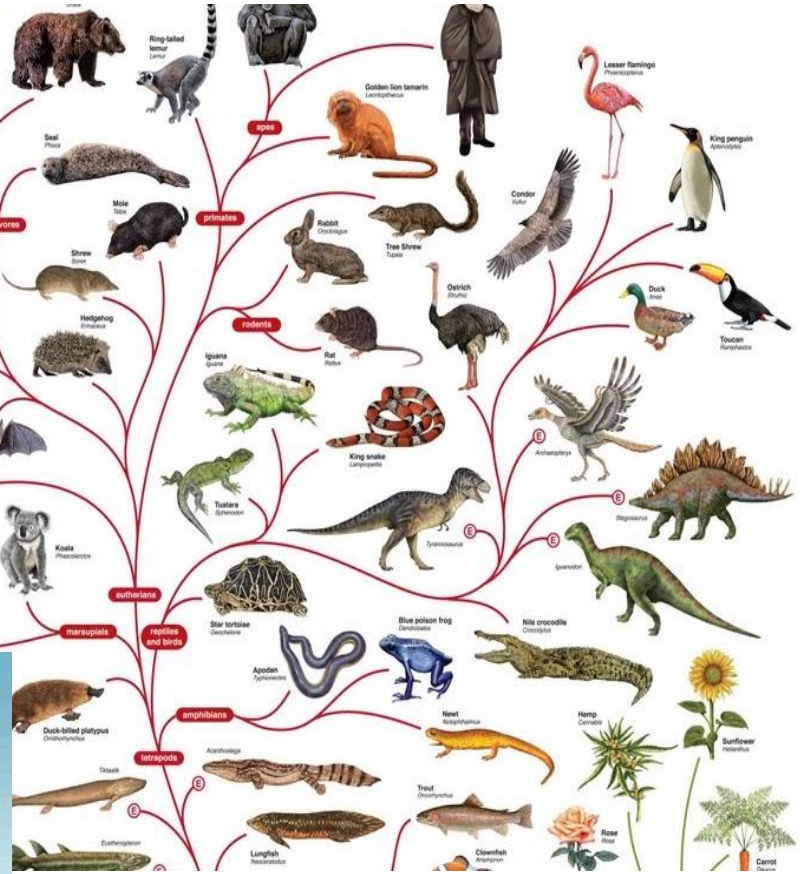
In the last days, scoffers… willfully ignorant, denying the flood

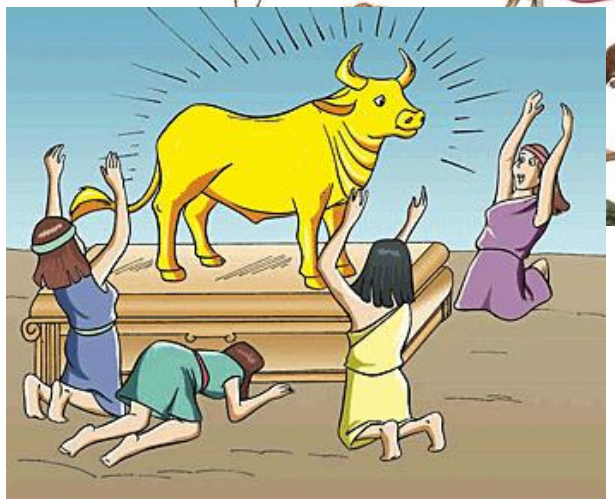
- In the past, prior to the Modern Era, scientists/naturalists used the flood of Noah’s day to interpret the rock record
- What do they do today?

Professing to be Wise, They became Fools

Romans 1:22-23

> Claiming to be wise, they became fools and exchanged the glory of the immortal God for images made to look like a mortal human being and birds and animals and reptiles





Chemistry – Matter/Water (enrichment)

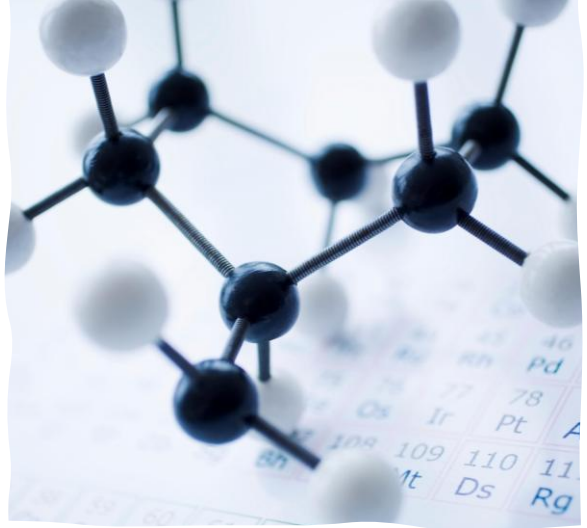
- Use reasoning to create hypotheses
- Formulate our experiment
- Test/experiment
- Examine results
- Make conclusions or theories about what you discovered



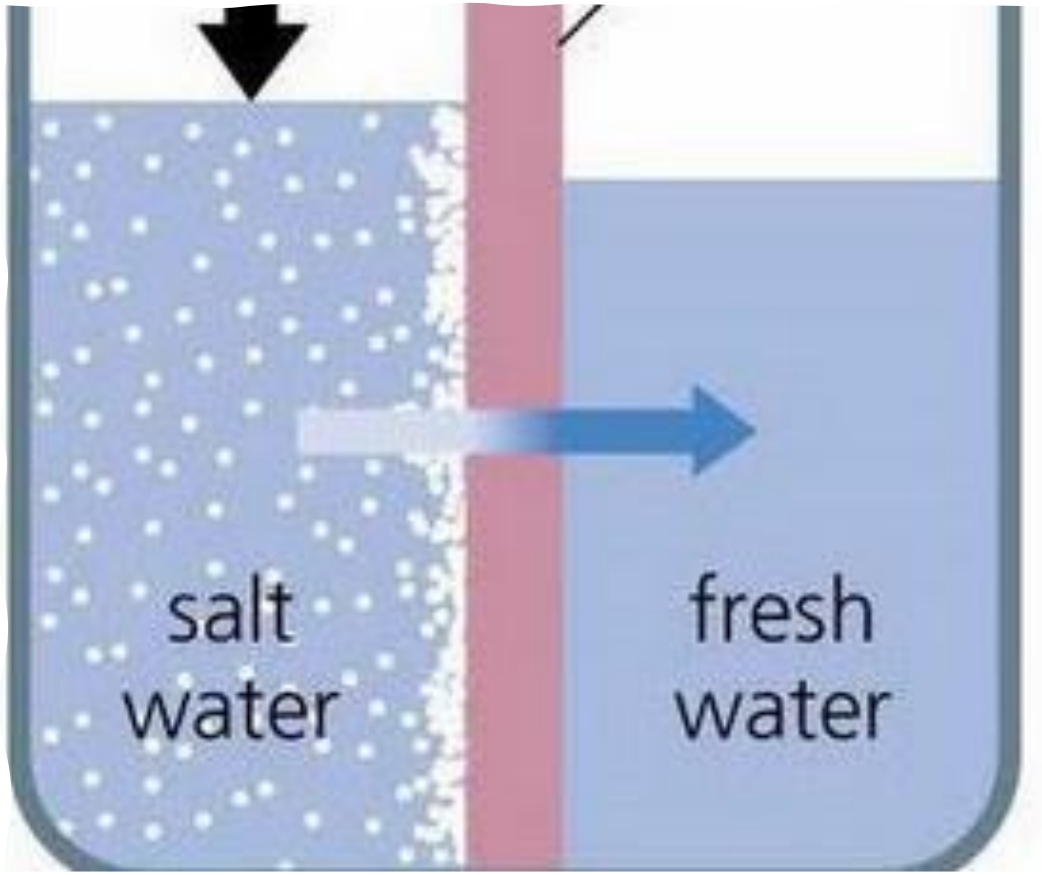
Experiment – Water Absorption

- 2 Potato Slices (permeable membrane)
- Distilled Water
- Saltwater Solution
- Kitchen Scale

Make your Hypothesis!







Essential Properties of Water

- Capable of 3 states of matter at earth's temperatures
- Evaporates and Condenses
- Expands when freezing
- Cleanses our planet
- High Heat capacity
- Universal Solvent
- High Surface Tension
- Promotes capillary action
- Responds to the Moon's pull
- Responds to the Sun's light





What is Water?

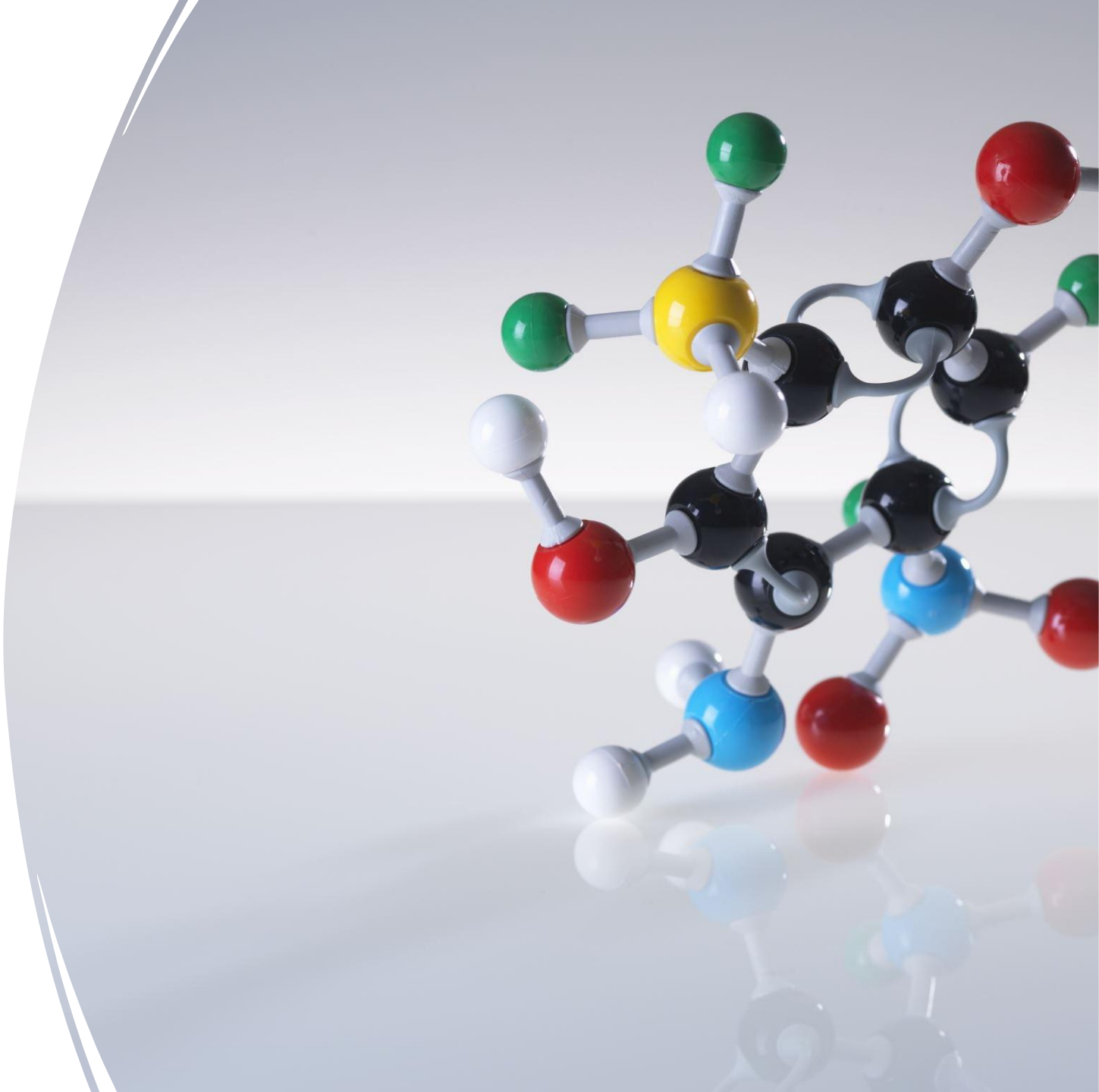
- Water is Matter
- Water is a Compound
  - 2 different elements
  - A naturally-occurring substance
  - Ice is a mineral
- Water is a Molecule
  - Smallest unit
  - 2 or more atoms
  - Bonded together
  - Pure substance

Breaking it Down!
Matter is anything with...

Mass aka inertia

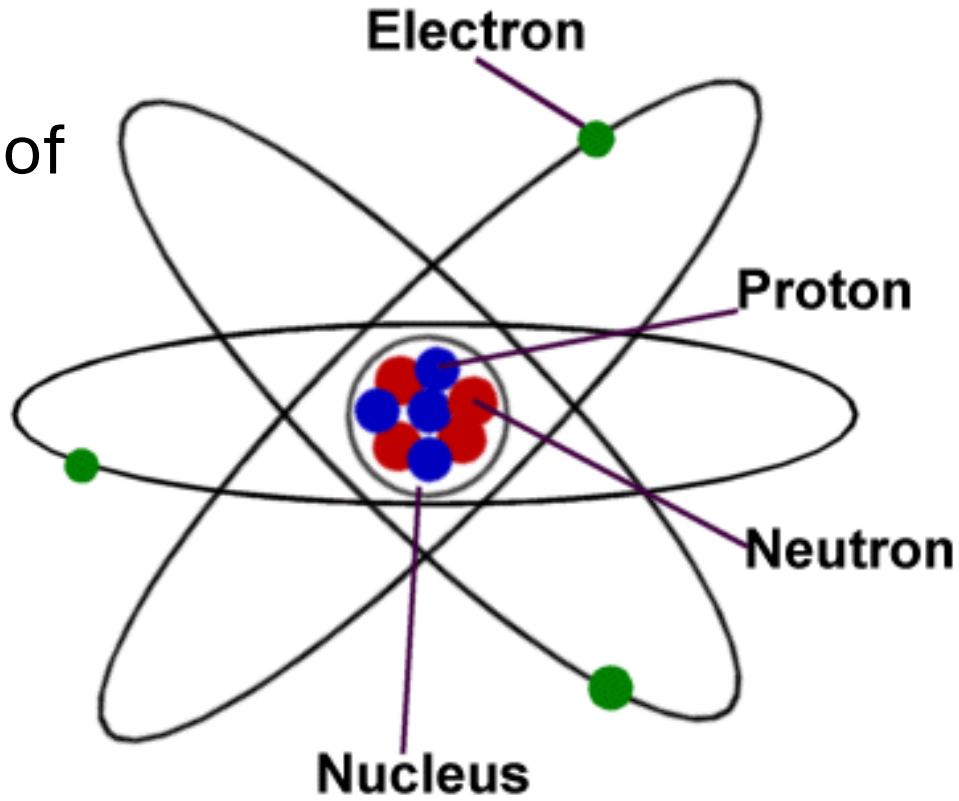
Occupies space

Matter is made up of **Atoms** – the smallest unit of matter



Atoms and Particles

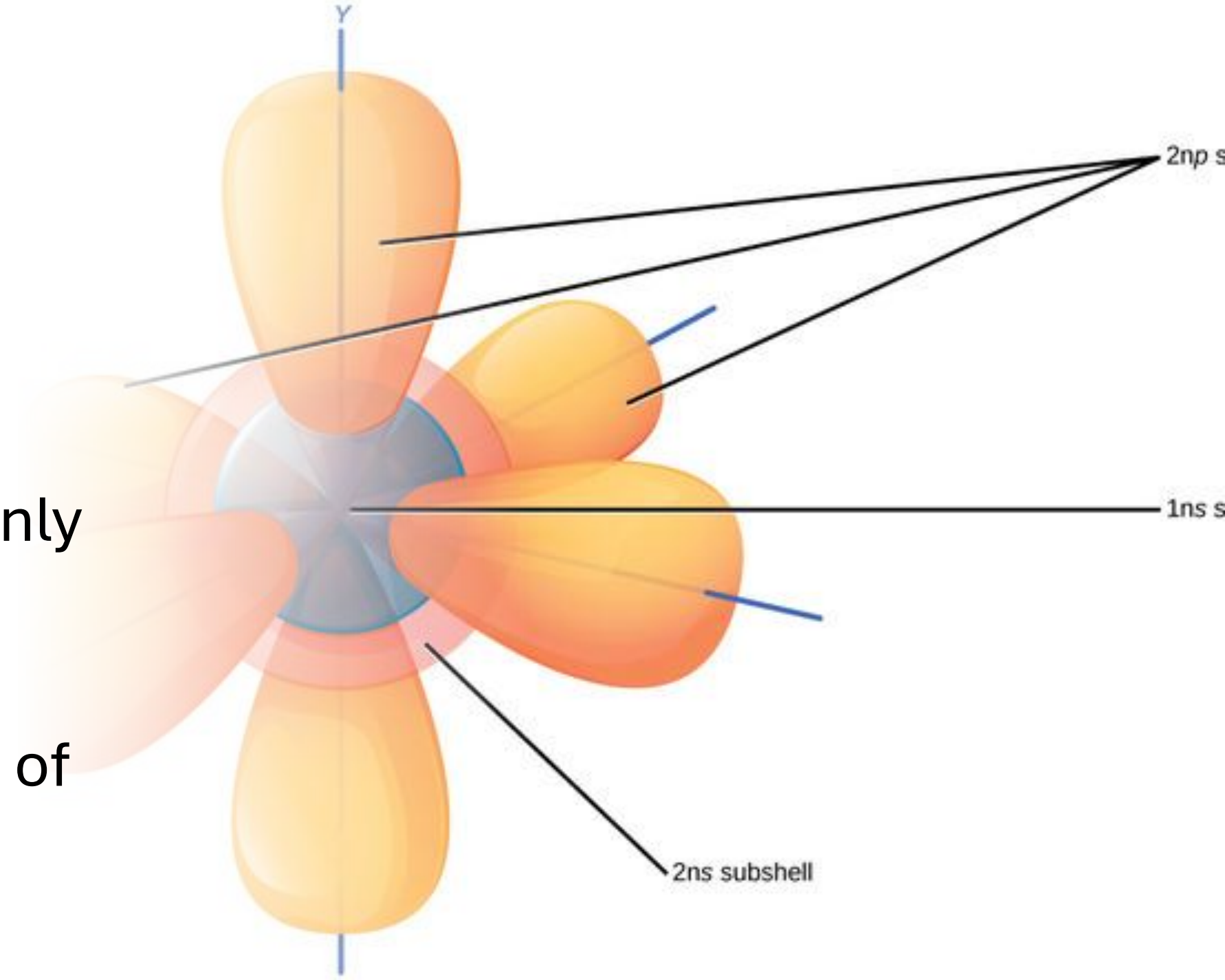
- Although atoms are the smallest unit of matter, atoms do have parts
  - Protons (positive)
  - Neutrons
  - Electrons (negative)
- Protons & Neutrons have parts
  - Up and Down Quarks
  - - 1/3 down charge; +2/3 up charge
- Although atoms are matter, they are also packages of high energy particles



Elements

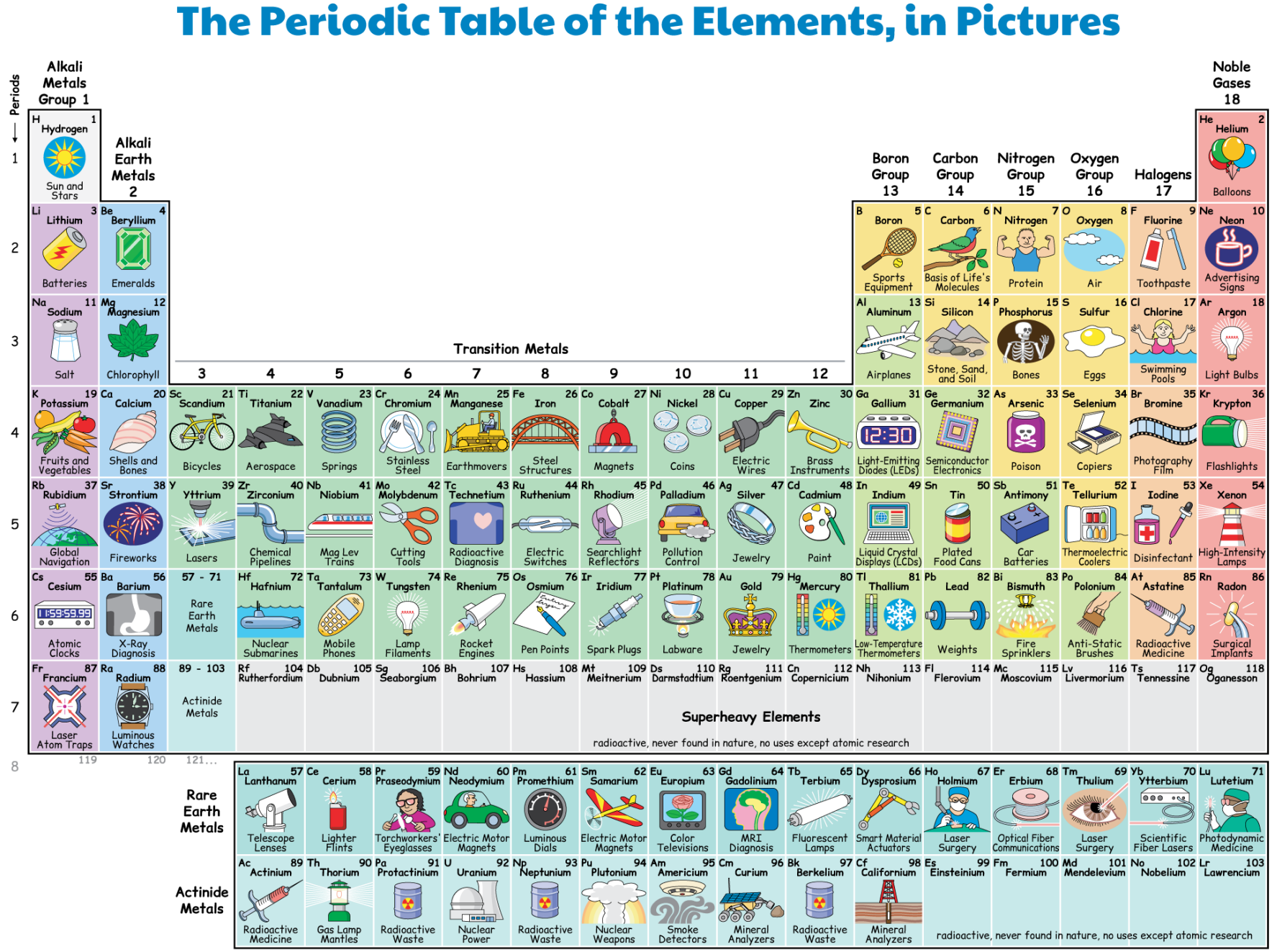
- A pure substance
- Made up of only one type of atom

Same number of Protons



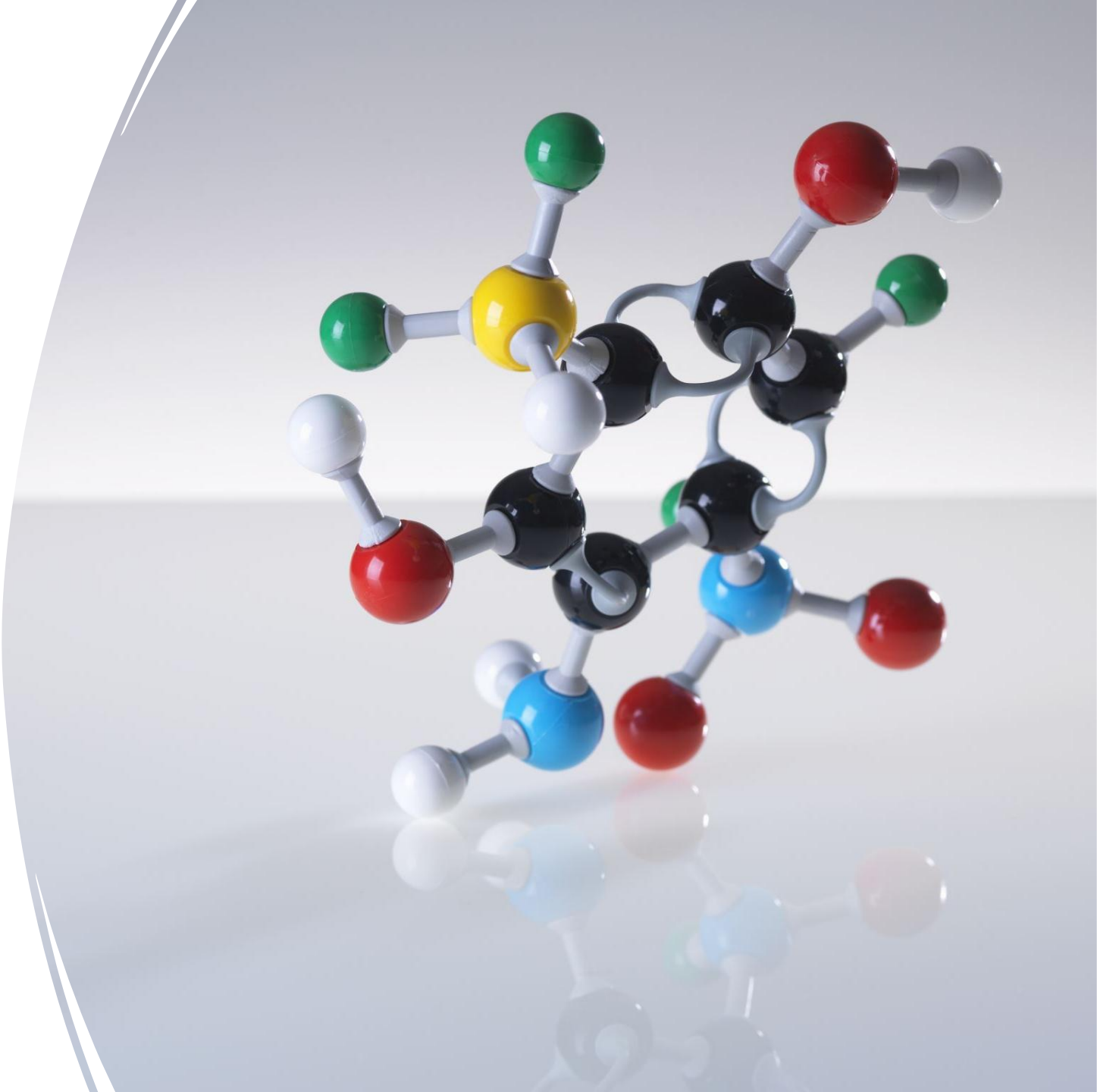
Elements

- All matter on earth or found in our universe is made up of elements



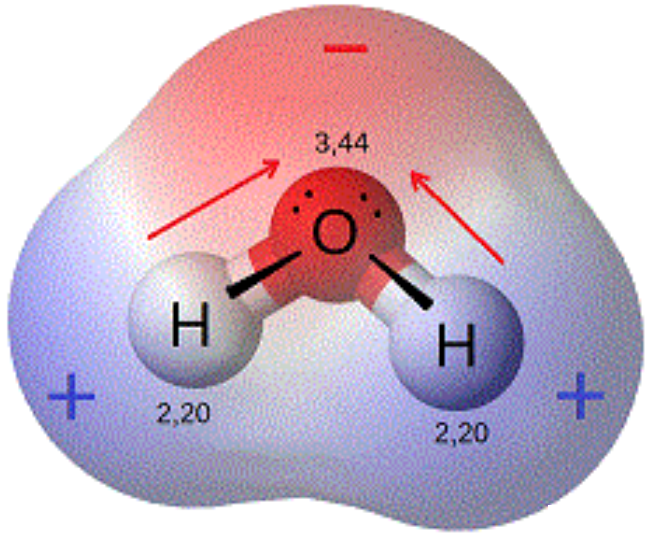
Compounds

- Pure substance
- Two or more different elements
- Joined together chemically
- Fixed Ratio



The smallest unit of a Compound is a **Molecule**

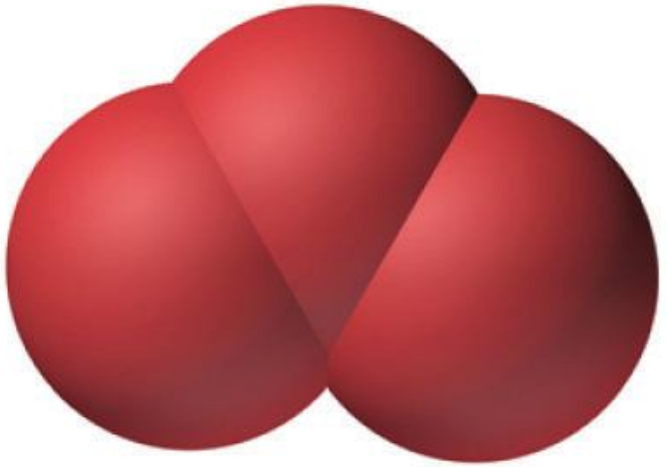
- A molecule is a smallest basic unit of a chemical substance
- Two or more atoms (can be the same element such as O_2 or N_2)
- An Ozone molecule is simply O + O + O = O_3



Water H_2O

Water is both a compound and a molecule

Ozone is a molecule, but not a compound



Ozone, O_3



Water is a Molecule

- H_2O – 2 H's + 1O
- Bonded together
- Defined ratio
- Smallest basic unit of a chemical substance

Mixtures

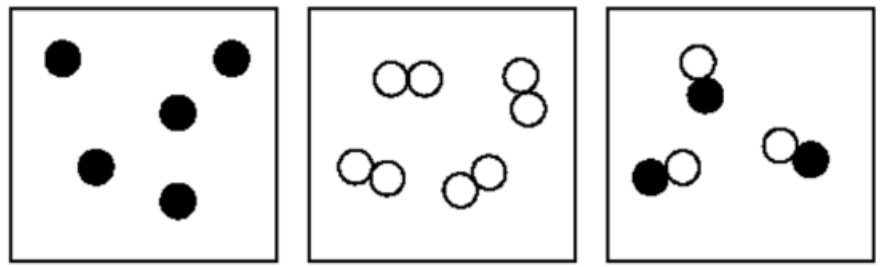
- Two or more substances
- The substances keeps its chemical identity (doesn't combine)
- Retains unique properties

Example – Air contains several gases and particulates; Soda



Elements, Compounds and Mixtures worksheet

1. Which of the boxes contains:
   a) Molecules of an element?
   b) Molecules of a compound?
   c) Atoms of an element?
   d) Do any of the boxes contain a mixture? Explain your answer.



2. Look at the following substances. Circle the elements and underline the compounds
   a) Li b) N_2 c) CO d)Cl_2 e)S_8 f)NaCl
3. How many elements make up each compound?
   a) HCl b) $CaCO_3$ c) HNO_3 d) H_2SO_4 e) CH_3OH

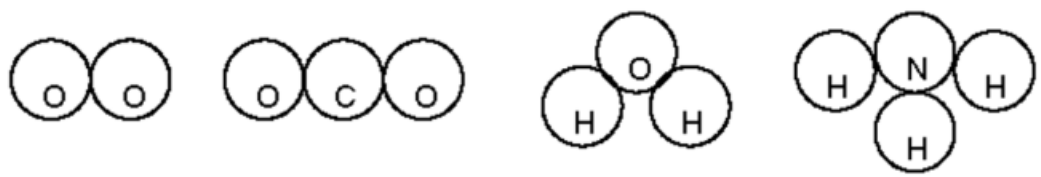
4. How many atoms are there in each of these molecules?

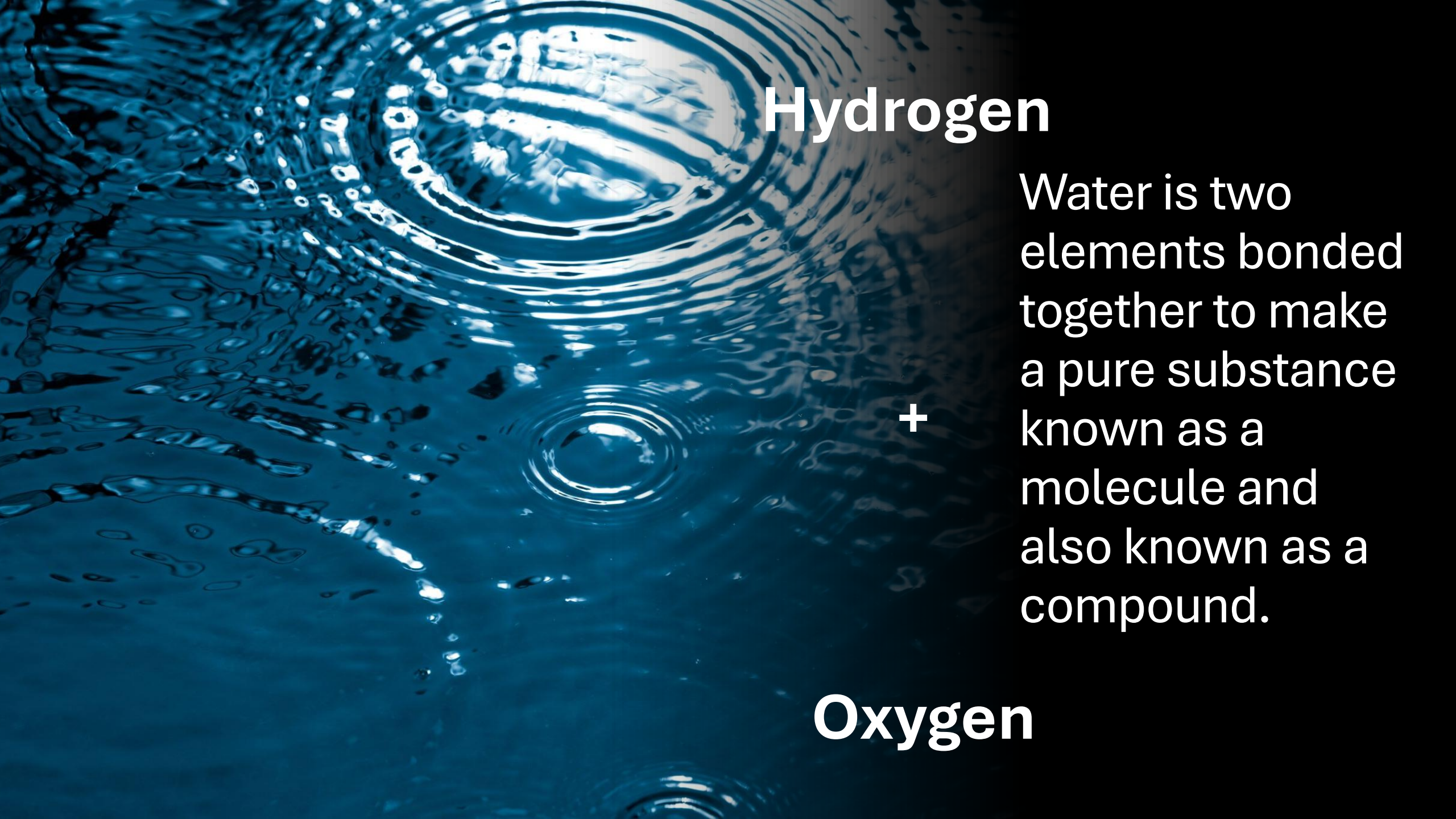
a) N_2 b) CO_2c) O_3 d) CH_4 e) SO_2 f) C_2H_4

5. Circle the molecule with the most atoms, in each pair;

   a) HCl or POCl
   b) NH_3 or HNO_3
   c) C_3H_8 or C_2H_5OH
   d) CH_3COCH_3 or C_6H_6

6. What is the formula for each molecules shown below

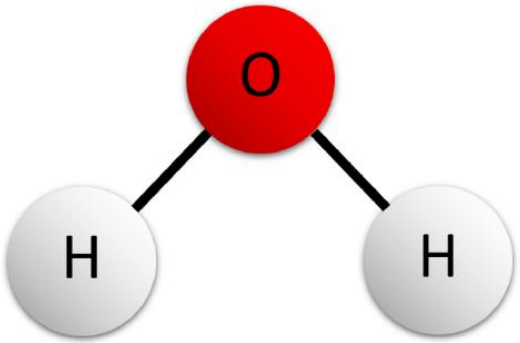




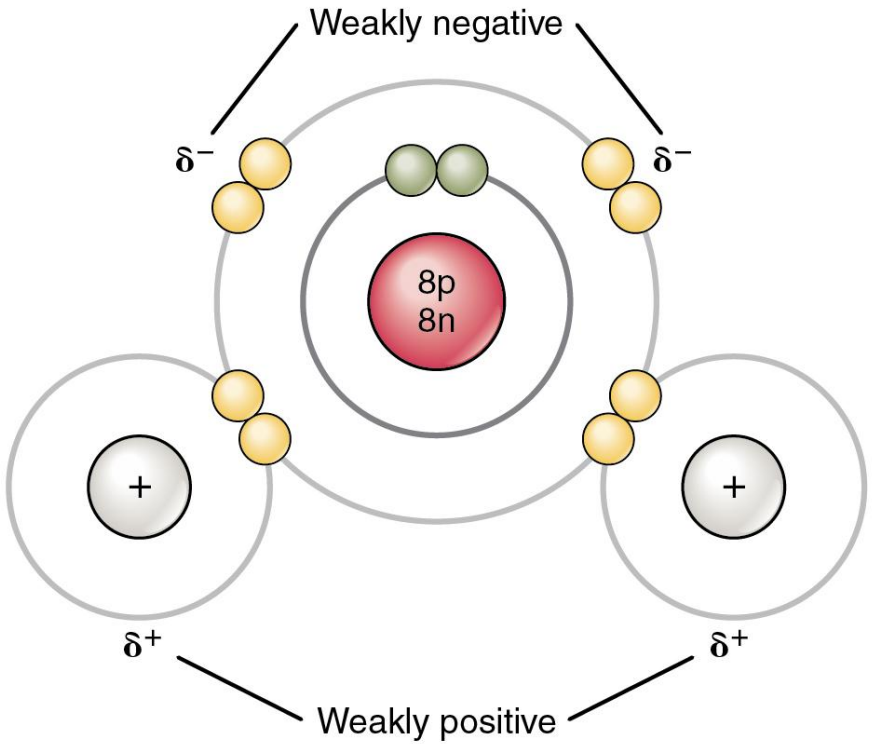
Water is two elements bonded together to make a pure substance known as a molecule and also known as a compound.

Molecules/Water

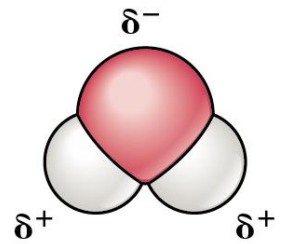
- Ball and stick
- Structural
- Planetary
- Lewis Structure
- 3-D Models



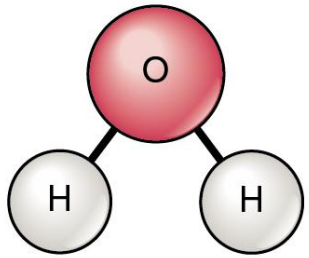
Hydrogen (H)
Oxygen (O)



(a) Planetary model of a water molecule

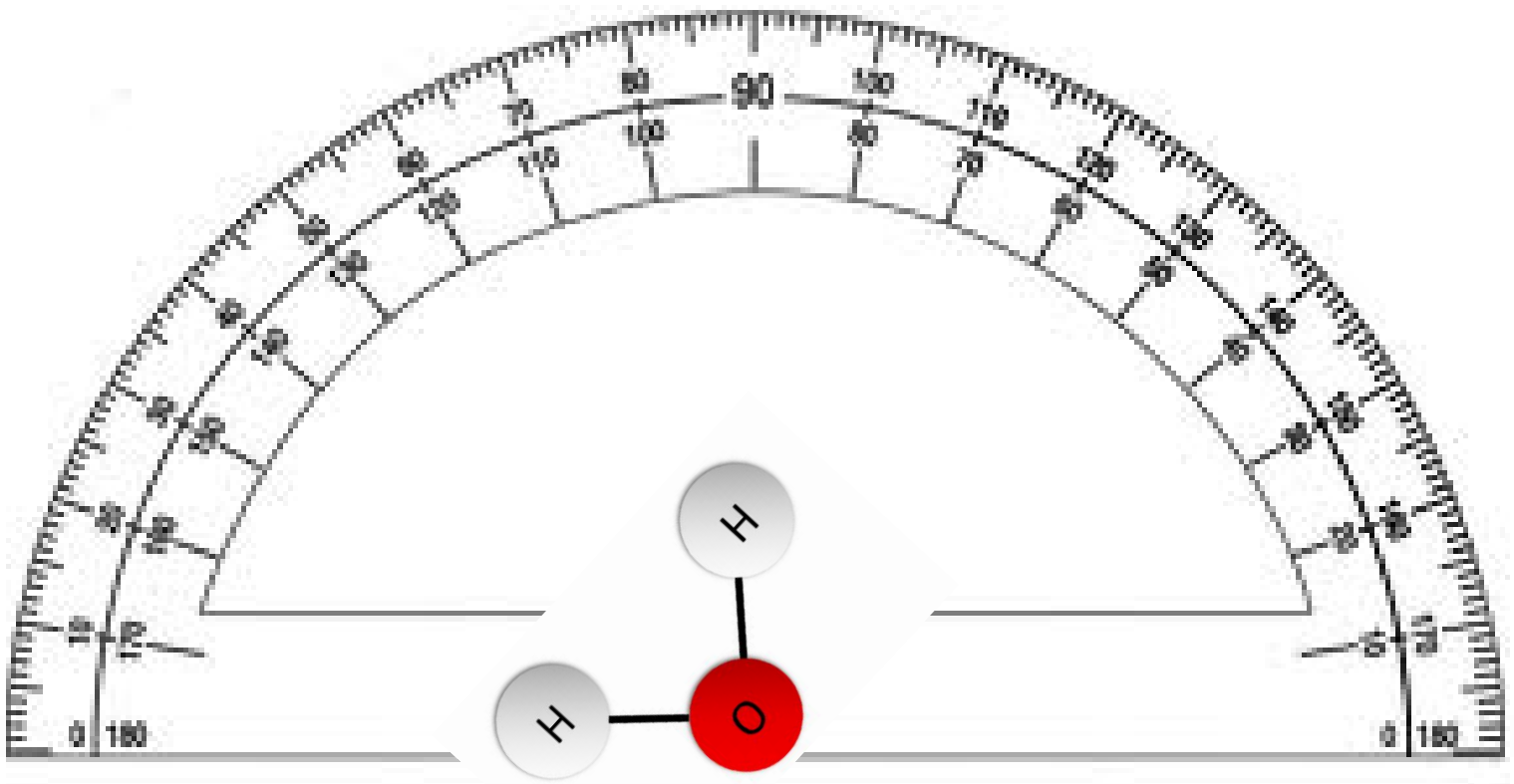


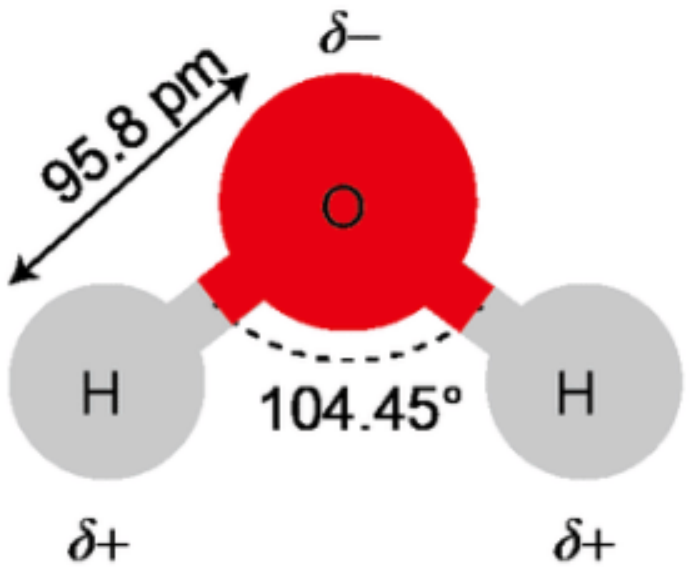
(b) Three-dimensional model of a water molecule



(c) Structural formula for water molecule

Measuring Angles





The Problem with Models

They can be deceiving

They're generally not the correct size (WHY?)



Lesson 1 – 4 Levels (Grade/Proficiency)

VOL 1 O2K SCENIC SCIENCE LEVEL 1

SCENIC SCIENCE **LESSON 1 CHEMISTRY**

MATTER: WATER

Ready Answer

Lesson #: Vol 1 Lesson 1a - **Level 1**
MATTER: Water
Devotion 1: Genesis 1:1-3 In the Beginning, God…



Lights, Cameras…

Scene 1: Our story begins without the heavens and the earth – dark and empty.

Scene 2: Then, God created our universe – the beginning of time and space.

INSTRUCTIONS:
1. Complete Lab Explorations Level 1
2. Challenge – Review and/or complete Level 3
3. Apply what you learn in the lab

FOUNDATIONS

GENESIS 1:1 *[1]In the beginning, God created the heavens and the earth.*



Earthrise was taken by NASA.

"In the beginning, God…" Genesis 1:1 tells us 1) there was a time when our world didn't exist, and then, 2) God created the heavens and the earth. From the Bible, we can know how and when things happened. While science can help us **know**. God's Word is a **higher way of knowing**.

So, what does the Bible tells us about the CREATION event?

TAKE

a. **In the Beginning tells us WHEN!**
b. **God Created tells us WHO!**

SCENE #1 – DARKNESS with no earth or heavens (no sky, planets, stars, or galaxies)
SCENE #2 – CREATION through an act of GOD.

Only God could tell us about the Beginning because no one else was there (God the Father, Son, and Spirit were acting together to create). No earth-based life existed; therefore, the only eyewitnesses were God. However, all of creation is evidence for the beginning. Even scientists have concluded our universe had a beginning.

MATTER – What was created?

Genesis 1:3 tells us, the Spirit of God moved on face of the waters. 2 Peter 3:5 says the earth was formed out of water. The earth, the heavens (sky and space), and water – all are matter.



1. **Matter** is anything that has mass (aka inertia) and occupies space.
2. Matter is made up of atoms. **An atom** is smallest unit of matter.
3. An **element** is a pure substance made up of only one type of atom.

O2K CODES IN SCIENCE LEVEL 2

LESSON 1 CHEMISTRY

MATTER: WATER

a - **Level 2**

-3 In the Beginning, God…



INSTRUCTIONS:
1. Complete Lab Explorations Level 1
2. Challenge – Review and/or complete Level 3
3. Apply what you learn in the lab

FOUNDATIONS

GENESIS 1:1-2 *[1]In the beginning, God created the heavens and the earth. [2]And the earth was without form, and void; darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters.*

Detectives investigate. They search for evidence and they analyze what they find. This process is called science or forensic science. Our challenge is to use a similar method to explore creation.

…inning! But what it doesn't tell us is, "Who *done* it?" We can …tion, but we can't observe the "event" of creation or WHO … in the past.

…eavens and the earth in verse 1. In verse 2-3, the Bible tells us …e way a detective would. If you were a detective and you had …/HO did it and HOW – your investigation would be finished.

…se questions about creation without using the eyewitness …/theorize what happened: HOW was it done? WHAT CAUSED …nd? The EVIDENCE for a creation event is the universe itself



O2K CHEMISTRY SS+ LEVEL 3

…AL SCIENCE **LESSON 1 CHEM**

MATTER: WATER

Vol 1a: Lesson 1 - **Level 3**
Chemistry: Elements & Molecules/Water
Devotion 1: Genesis 1:1-3 In the Beginning, God…



…val Challenge: 1) Why is water …ial to survival? 2) How do its …ties promote life? And 3) How can I …dvantage of these properties?

INSTRUCTIONS
1. Complete Lab Explorations Levels 1-2
2. Challenge – Review and/or complete Level 4
3. Apply what you learn in the lab

…TIONS

…1:1-2 *[1]In the beginning, God created the heavens and the earth. [2]And the earth was without form, … darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters.*
…:5b *…earth was formed out of water and by water.*

…TED: Verse 1 is considered an introduction to the 6-days of Creation – the topic sentence …mmarizes the "rest of the story." The verb, created, indicates action/energy was used. The …word "bara" meaning a NEW CREATION suggests it never existed before or it was created …othing."
…ook up the Latin expression *ex nihilo* & define: _____ _____

…LESS: Based on verses 1 & 2, would you assume that the earth was destroyed and …d, or that verse 2 is simply telling how God formed the earth?

…D UPON: Truth and insights were wrapped in these 2 verses. Science reveals 2 primary …ls are needed to build any substance. These are form and energy. Without them, there is …otiness – a void. Is it coincidence that both are included in these verses? Y / N

…ETICS

Survival Tips

…rom your …ent.
…e SEEKING …ding resources …dge.
…ment to find out …ks.

2 COR 10:5 We demolish arguments and every pretense that sets itself up against the knowledge of God, and we take captive every thought to make it obedient to Christ.

Science is the quest for knowledge. Seeking answers is a God-given pursuit. "Seek and you will find. Knock and the door will be opened to you." Mathew 7:7 "Beloved, do not believe every spirit, but test the spirits to see whether they are from God, for many false prophets have gone out into the world." John 4:1

Finding answers through seeking and testing isn't unique to the "field" of science, rather it's the route to discovery for all. Therefore, we shouldn't dismiss things labeled "science" as something scientists do.

O2K - Chemistry Level 4

LESSON 1 CHEM

…TER: WATER

…lecules/Water
In the Beginning, God…



INSTRUCTIONS
1. Review CHEM Lessons Levels 1-3 (built on previous levels MATTER: Water)
2. Challenge – Use Apologetics & Applications in Class
3. Be Prepared to Give an Answer/Evidence for your Hope

…ited the heavens and the earth. [2]And the earth was without form, …he deep. And the Spirit of God moved upon the face of the waters. …ter and by water.

…n verse 1, "*bara*" indicates a NEW CREATION, *ex nihilo*. …lways associated with God's actions. In the Bible, if man …d (*asah* and *yatzar*). In addition, Genesis1:26 uses the word …xt, "*Let us make man in our image.*" Immediately following, …n… Does using *bara* seem purposeful in Genesis 1:1-2?

…is translated as deep, abyss, or chaotic mass of elemental … abode previously, or came about "In the beginning…," we *…e showed me a pure river of water of life, clear as crystal, …d of the Lamb. In the middle of its street, and on either side …ore twelve fruits, each tree yielding its fruit every month."*

…ving from the throne of God (described in Rev. 22:1-2). …heaven, a river flows that is known as the "water of life." …' flowing out from the Temple (Ezekiel 47). It's also revealed …h was formed (2 Peter 3:5), and out of water the heavens

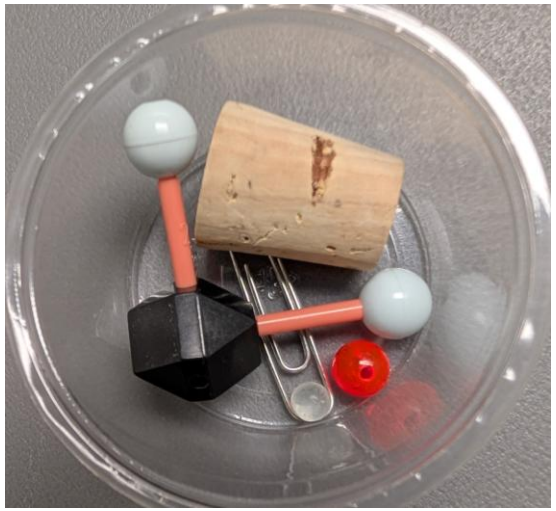
…5. New life in the womb is surrounded by an envelope of …w life is imminent. Read John 3:5, 8 and Titus 3:5. What …y water?

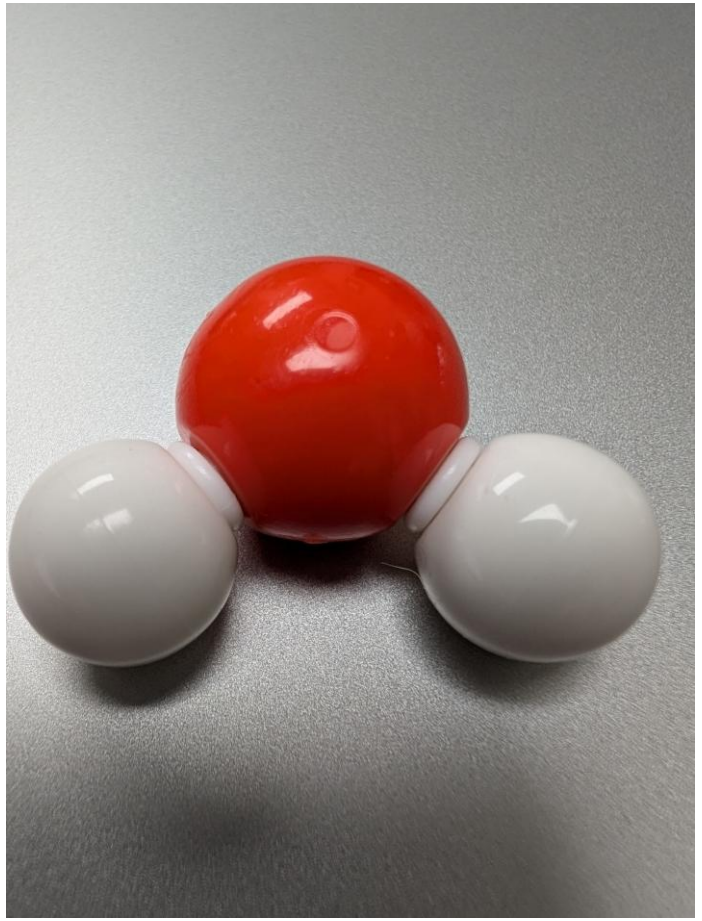
…ord *ruach* for Spirit is also translated life giving power, wind … translated hover, flutter, or shake. It's clear that God's … What two entities are all creation, all-natural physical

Lab Enrichment











Lab Worksheets

WATER LAB WORKSHEET #3

WATER
Chemistry

In the Bible, water often symbolizes cleansing and indeed it's our body's best friend both inside and out. Raindrops form on dirt particles to clean our air. "Wash yourselves; make yourselves clean; remove the evil of your deeds." Isaiah 1:16

WATER IS:
Odorless, tasteless, and transparent/colorless. In chemistry, it is a universal solvent, dissolving molecular substances. It's the standard (1) used in measuring volume, weight, densi specific gravity. More than 70% of earth, of our muscles and organs, and of our diet i water for hydration and cleansing. Many cleansing systems are sustained by water's

VOCABULARY:

Ocean Circulation	water cycle	filtration system (2)	Fresh Water S

1. Our kidneys serve as a _____ for fluids and require lo

2. The _____ circulates water from Earth's surface to the air and back rivers/streams, lakes, and the ocean.

3. _____ transfer water or melted ice from mountains to streams, lakes, and oceans.

4. _____ moves water in the ocean supplying oxygen, nutrients cleansing power to prevent stagnation.

5. To survive in the wilderness where water may contain harmful impurities, carrying _____ is advisable. Clean water is essential to staying alive.

Due to a water molecule's polarity, many impurities are attracted to it and can b of our bodies or other systems.

FRESH VS OCEAN WATER:

Saltwater has a lower temperature of freezing than freshwater.

Name 2 examples of freshwater organisms and include something unique about its c

a. b.

Name 2 examples of saltwater organisms and include something unique about its de

a. b.

WATER LAB WORKSHEET #5

WATER
ICE

Water ice covers about 10% of Earth's surface. Its presence promotes a temperate climate. Too little ice means more solar radiation is absorbed and the Earth heats up too much. Too much ice and the Earth is too cold. God "...created Earth to be inhabited." Is 45:18

Because water expands in its frozen state, it is lighter and floats. Without this unusual property, Earth would become frozen solid.

VOCABULARY:

floats	hexagonal	salt/ocean water	90%	9%

1. _____ Water ice or snow reflect _____ of sunlight and help climate cooling.
2. _____ When water freezes, it expands by _____.
3. _____ The structural/atomic shape of ice molecules.
4. _____ Ice _____ and forms a protective insulating layer for marine life.
5. _____ Melting ice/fresh water is lighter than _____ and provides drinking water for various species, including humans.
6. _____ One reason water can dissolve other molecules.

SUBLIMINATION CAUSES:

Photoelectric/molecular effect	Kinetic Energy	Vapor Pressure Drop

Give 2 examples of water ice sublimating at cold temperatures due to one of the above?
a. b.
b.

1. _____ Transferring wind or circulation energy to an ice molecule increasing its vibrational energy (thermal energy rise).
2. _____ "Zapping" ice with light/photon energy from electron transitions energizing the phase change.
3. _____ happens with an imbalance of low and high moisture saturation on an icy surface resulting in a vacuum or pump-like action. Dry winter air or a freezer circulation system will "pump" water

WATER LAB ENRICHMENT Worksheet 3

WATER
Phase Change

God's amazing grace showers us with life-giving rain, freshwater streams, and a world where water exists naturally in 3 states of matter. All 3 phases are essential for life to exist on Earth.

VOCABULARY: Change Actions/Conditions

Melting	Freezing	Condensing	Evaporating	Boiling	Sublimation

1. _____ a solid turns into a gas/vapor, skipping the liquid phase.
2. _____ a liquid hardens into a solid (ice).
3. _____ a gas/vapor transforms to a liquid (rain/water).
4. _____ a liquid slowly converts a gas/vapor (steam/clou
5. _____ a solid transforms into a liquid (water).
6. _____ an action or temperature where liquid quickly tu

NGE:

100° C	32° F	212° F

ıs) – water freezes.

elow _____ (Celsius) – water is a liquid.

elow _____ (Fahrenheit) – water is a liquid.

nheit) – water is a solid.

ıs) and _____ (Fahrenheit) – water boils and va

WATER LAB WORKSHEET #5

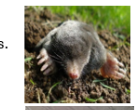
WATER
Mole Chem

Isaiah 40:12 asks, "Who measured heaven with a span," and Revelation 21:16 gives the measures of the New Jerusalem, a perfect square, at 12,000 stadia – length, width, and height. Chemistry uses moles and molar mass to measure, compare, balance, and equilibrate.

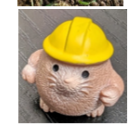
CHEMISTRY:
Chemistry often deals with mixtures and precise amounts, much like baking in a kitchen. Too much or too little of any ingredient can ruin the "kitchen chemistry" you're hoping will be edible. Chemistry reactions deal with precise amounts of specific elements and substances to achieve: equilibrium, phase change, chemical reactions, atomic bonding, and so on... To measure and achieve these goals, "**MOLES**" are used to gage and predict the outcome.

A Mole: A mole is the SI unit used to measure substances. *Avogadro's number, 6.022... x 10^{23} atoms, is the total number of atoms in ONE mole (mol) of a substance. Its numerical count is derived from the number of atoms in 12 grams of carbon-12.*

Molar Mass: The mass of one mole of a substance expressed in grams/moles.



FACTS ABOUT 1 mol of H_2O: Water has a molar mass of ~18 g/mol. It's volume is 18 mL (milliliters). As an example of what this size looks like, it's sphere with a 3.25 cm or 1 ¼", about the size of a small rubber ball.



A mole of sulfur (yellow) is a bit smaller, about the size of a pom pom. And a mole of silica/quartz/sand is a little larger, about the size of a 1 1/2" glass sphere or large shooter marble size.

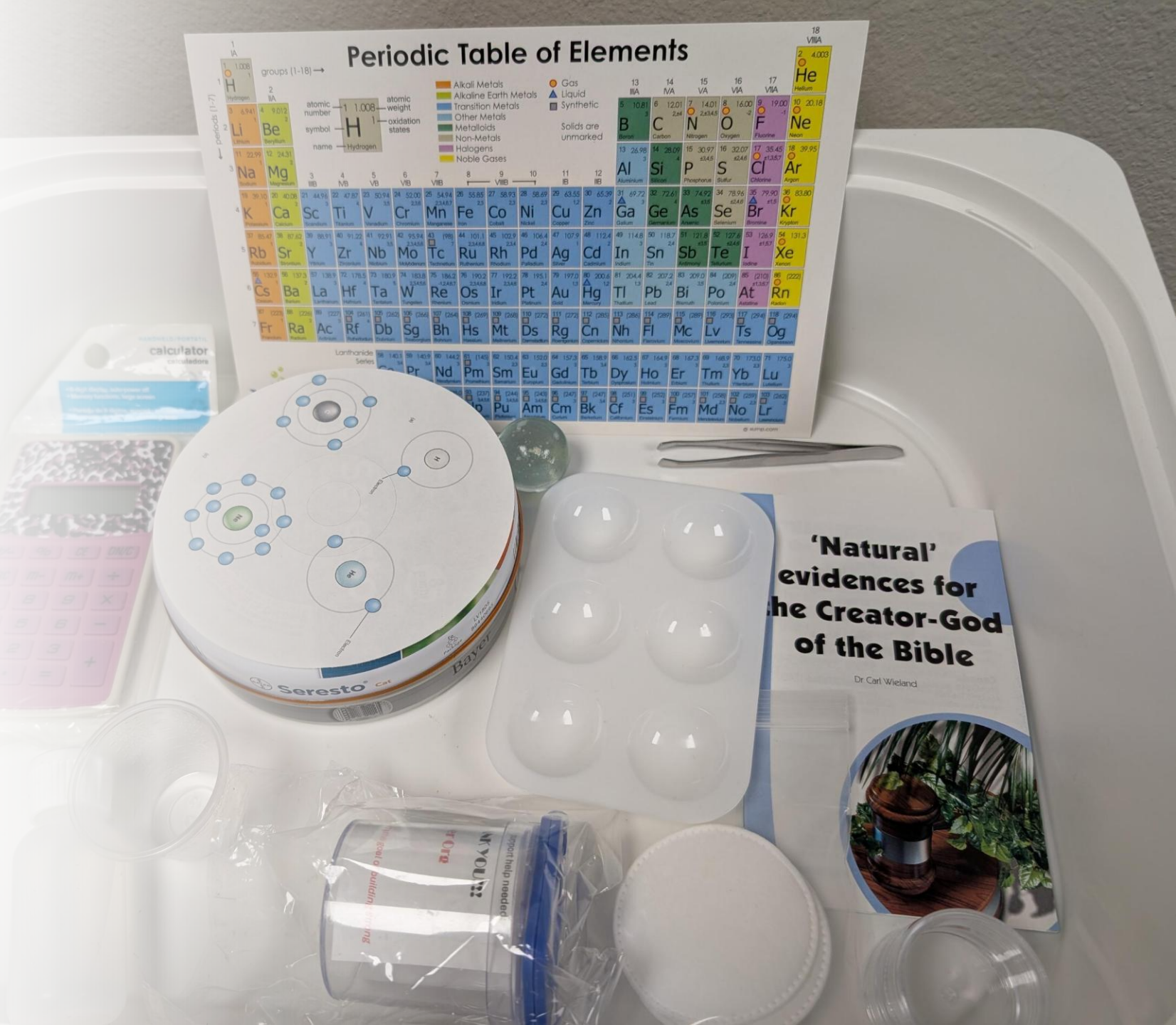
VOCABULARY:

Mole (mol)	Atomic Mass	Molar Mass	Hydrogen	Oxygen	Polarity	Molecule

1. _____ Water contains 2 of these atoms per every 1 oxygen atom.
2. _____ The sum of protons + neutrons in an element (or an average).
3. _____ A unit amount of 6.022 x 10^{23} atoms of an element.
4. _____ The mass in grams of 1 mol of a given substance.
5. _____ The "heavier" element bonding with 2H's in a molecule of water.
6. _____ One reason water can dissolve other molecules.

Lab Kits

- Dissolution Experiment
- Polarity Exploration
- Mole Units
- Angle of Sunlight to Evaporate Water
- Capillary Action
- Surface Tension
- Periodic Table Exercises
- Water Filtration
- Diffusion



Classes + Lessons; Optional Enrichment
Lab Supplies + Lab Posters + Worksheets

