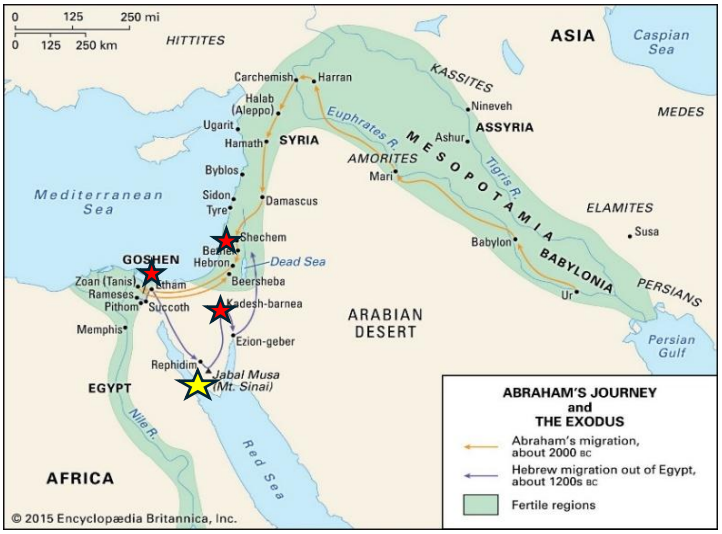
FIRE POWER

INTRODUCTION:

Hebrews 11:24-25 *By faith Moses, when he had grown up, refused to be known as the son of Pharaoh's daughter. He chose to be mistreated along with the people of God rather than to enjoy the fleeting pleasures of sin.*



What if…
God's plans for you are different than what you would choose? Would you follow Him no matter what the cost?

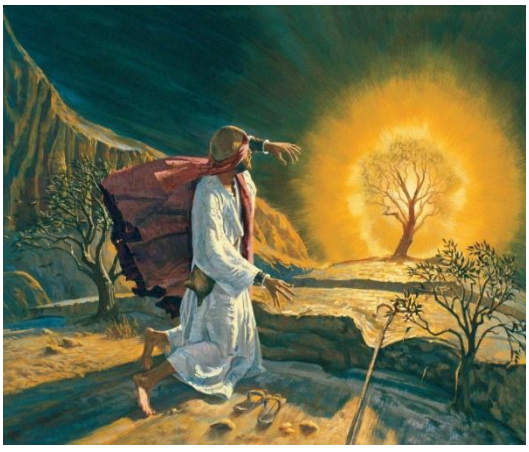
At the "burning bush" on Mt. Sinai (yellow star), God called Moses to free His people from Egypt where they were held as slaves. There again, at Mt. Sinai, God gave the Ten Commandments to Moses and the Israelites. But God wanted the Hebrews back in their homeland.

When Moses first chose to leave Egypt and become "like a slave," he wasn't helping the Hebrews. He was afraid. But with God's calling, he learned to trust and obey and do what God asked. Even though Moses was far from perfect his actions changed the world.

DEVOTIONS: EXODUS 3

EXODUS 3:5-6 *5 "Do not come any closer," God said. "Take off your sandals, for the place where you are standing is holy ground." 6 Then he said, "I am the God of your father,[a] the God of Abraham, the God of Isaac and the God of Jacob."*

A burning bush or a pillar of fire that needs no fuel is a miracle. God told Abram, *"Take off your sandals, for the place where you are standing is holy ground."* The God of Creation was speaking to Moses asking him to free His people from Egypt. The Hebrews were slaves in Egypt and God wanted them back in Canaan, their promised land.



HEBREWS 1:29 *29 By faith the people passed through the Red Sea as on dry land; but when the Egyptians tried to do so, they were drowned.*

Once freed from Egypt, the Hebrews were forced to rely on God alone for their food (manna and quail) and water. After 40 years of having nothing in the desert but what God provided, the Hebrews learned to trust God and His prophets.

VOCABULARY:

KINETIC ENERGY – can also be "thermal" energy (like body temperature) which is a measure of the energy of atoms as they move, flow, or vibrate.

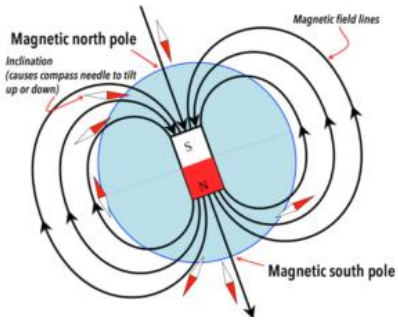
TEMPERATURE – the average kinetic energy of particles in a substance (chemistry) or in an object (physics). The speed/motion of atoms is key.

CELSIUS SCALE – a temperature scale based on "pure water." Water freezes at 0° C and water boils at 100° C.

TIME – is an irreversible continuum measured by clocks or other instruments (hourglass). It's a fundamental concept of physics linked to change. SI units are seconds, minutes, hrs.

MAGNETITE (72%), HEMATITE (70%) – these minerals are iron oxides, percentage of iron shown. Magnetite streaks are black-gray; Hematite streaks are red-brown; Only magnetite shows strong magnetism (Fe_3O_4) properties.

Earth is a magnet because it has a solid inner iron core inside a liquid outer core.



THEME: FIRE POWER

Hebrews 12:29 *For our God is a consuming fire.*

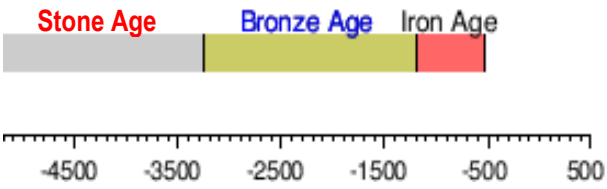
In the Bible, fire can represent the Spirit of God, His presence, power and judgment. God gave us the ability to create and use fire, to produce heat and energy when we need it; but we are far from "powerful." God is infinitely powerful.

We are weak in terms of power. Without food, we die. Without water or oxygen, we die. Without warmth, we die. These are "needs" that do not come from within us. God's power resides in Him and Him alone. With His power, He created and commands all things.

Our heart is the closest thing to a "power" source. Without a heart, we couldn't go or do. Our bodies wouldn't stay warm. Our temperature of 98.6 degrees would be whatever temperature it was around us. So, our heart is our power source.

TIMELINE/Introduction (History): The Beginning of the Iron Age

1500-1000 BC Hot Oven Metallurgy, Smelting, Iron and Magnetism.

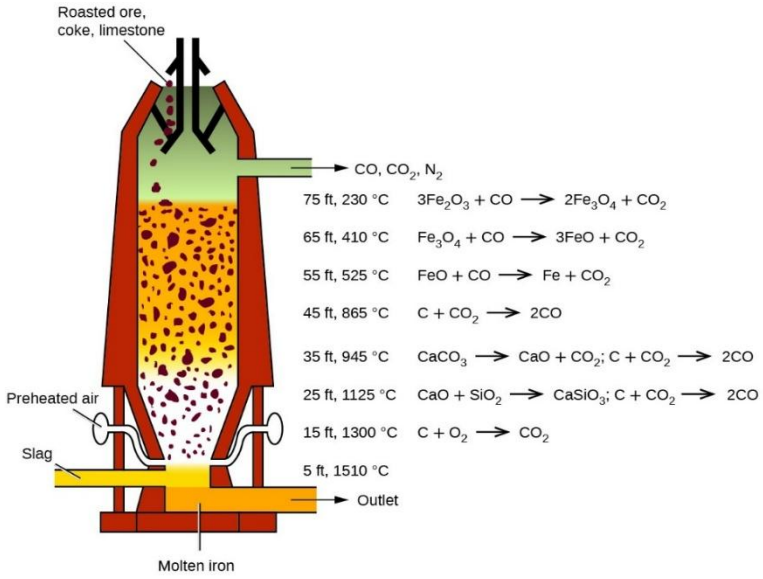


The **Iron Age** is shown on our number line (also called a time line) as 1200 – 500 BC. It started around Moses' death (~1200 BC). That is about 1200 years before Jesus was born.

During the **Bronze Age**, people searched for gold, copper, silver, tin, lead, and other metals primarily in veins or mine shafts. People used **axes**, **shovels**, **wheeled carts**, and man power. Once the **Iron Age** began, many new inventions were tied to melting iron or making things with iron, like nails or iron swords.

Separating iron from rock requires HOT TEMPERATURES. People had to find ways to make better ovens/stoves or "smelters" to melt minerals and extract iron. Balloon and fan-like bellows could push air into ovens making the fire hotter. Oxygen is fuel for fire.

SMELTER DIAGRAM



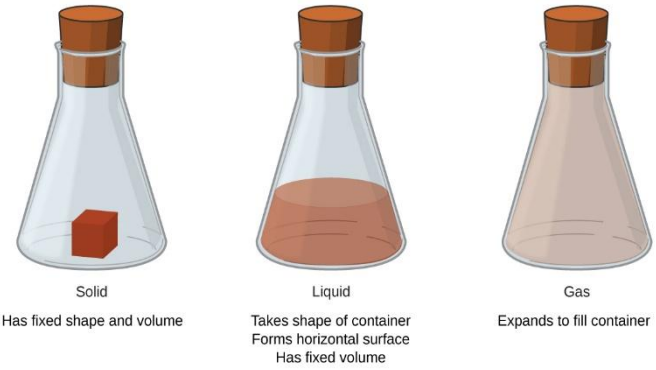
The process of turning preheated rock/ore into molten cast iron.

1. Gases released
2. FeO is an iron oxide
3. Carbon monoxide or dioxide are released
4. $CaCO_3$ limestone
5. SiO_2 quartz
6. CO_2 gas released
7. Preheated blasts of air are added (bellows).
8. Slag $CaSiO_3$
9. Molten Iron

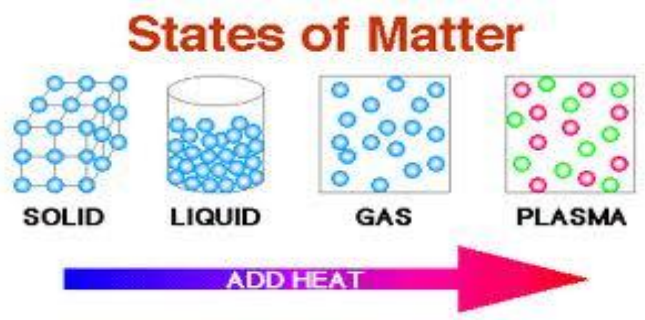
EQUIPPED/Science Principle: **STATES OF MATTER**

Temperature measures heat and energy in motion – the greater the temperature, the greater the kinetic energy of the substance. A thermometer is used to measure temperatures. With the Celsius scale, the total number of degrees from freezing to boiling temperatures of water is 100 degrees (a base 10 scale).

STATES OF MATTER change due to temperature change. Every element has a specific temperature where it freezes, melts, or turns to a gas. Water is solid (ice) at freezing temperatures (anything below 0° C or 32° F). As the temperature rises, water melts (above 0° C or 32° F) turning into a liquid. At 100° **Celsius**, water becomes a gas we call steam. Water is found in all 3 states of matter at earth temperatures, so it makes sense to use water as our standard.



Heat is a form of kinetic energy known as thermal energy that causes atomic motion. That means heat causes atoms to move faster. The higher the heat the faster the atoms are moving. A solid becomes a liquid when its atoms flow. When a liquid boils and turns to a gas, the strong bonds between molecules are broken creating a freely moving gas. Gas atoms or molecules move the fastest and often bump into each other. This motion causes the gas to completely fill its container.



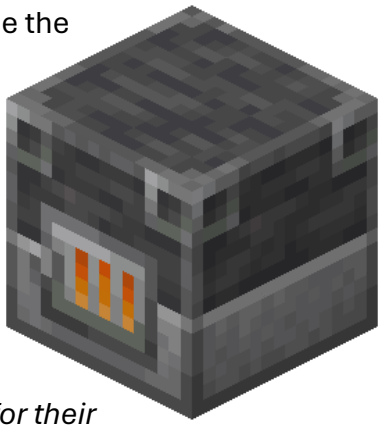
Solids have a fixed shape. Liquids assume the shape of the container without filling it because they have a fixed volume. Gases will fill all the space around us including our lungs. Without the oxygen in our air (mostly nitrogen and oxygen), we couldn't breathe or walk. We can't walk through a solid. If space was a liquid, we'd have to swim everywhere we wanted to go.

The four states of matter – solid, liquid, gas, plasma – are determined by the amount of heat energy a substance has. Temperature measures this heat energy. Higher temperatures cause solids to flow and become liquids. At even higher temps, bonds between molecules break. Ovens need vents to avoid gas explosions. Plasma requires such high temperatures that only welders, smelters, or scientists work with hot plasma. Stars are plasma's favorite place to hang around.

GEAR-UP/Practical Illustration:

Metals like gold, silver, copper, and tin melt at temperatures lower than iron. They were often found in veins (mine shafts) with few impurities. Iron ore

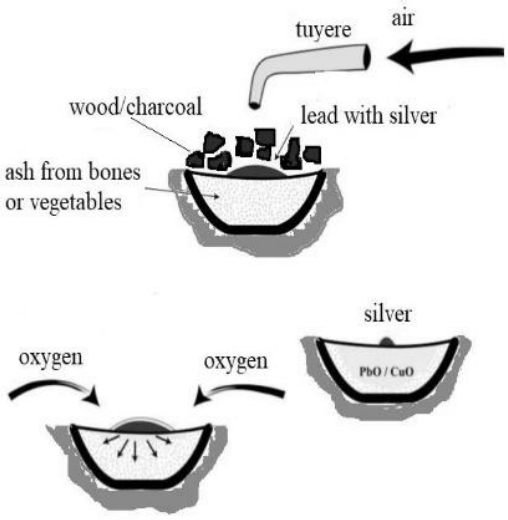
like magnetite and hematite are trapped in rocks with oxygen and silica. But iron rocks are more common than gold, silver, and copper.



Since higher **temperatures** were needed to melt ROCKS and free the METAL, better ovens were needed. High heat breaks molecular bonds and changes the state of matter from solid to liquid iron. The oxygen escapes (since it's a gas) and the silica forms on top as an impurity (called dross). It can be skimmed off leaving the denser iron in the bottom. All elements, minerals, and compounds have unique melt temperatures, but iron – the 2nd most abundant metal on earth – requires 1558 °C.

Psalm 119:118-119 *You reject all who stray from your decrees, for their delusions come to nothing. All the wicked of the earth you discard like dross; therefore I love your statutes.*

Lead and silver are often found together. In Abraham's day, metal workers knew how to separate these metals by melting them. Once melted, lead the denser element sinks, silver comes to the top, and gases escape or bond with the limestone and bone material. Gold, copper, silver, lead, tin and several other metals were easier to dig, extract, or find in pure form. Iron was not. It always wants to bond with the oxygen in our air. Rusting nails are an example of iron + oxygen. Orange dirt or rusty colored rocks are usually an example of iron + oxygen.



Smelter ovens also use air, charcoal, and limestone or ground bones to separate metal from rocks, but with higher temperatures. These ovens are better than the early ovens dug into the earth for insulation, like a survival pit or earthen oven. Blacksmiths and metal workers learned how to insulate, vent, and add fuel to a fire to achieve greater temperatures. Iron was different. It needed hotter temperatures, more air/oxygen, and ways to remove the "waste/dross."

Magnetite, an iron + oxygen mineral, was originally found near Magnesia in modern-day Turkey – in a rock called lodestone. Lodestone is naturally **magnetic**. Although iron ores and magnetite were previously known, this naturally magnetic iron was novel.

Proverbs 27:17 *As iron sharpens iron, so one person sharpens another.*

 Published 2024-2025

EXPERIMENT: Kinetic Thermal Energy

Using a camp stove you create, observe: a) temperature changes over time, b) fan motion, c) color changes. Temperature is a measure of kinetic energy; fan motion is indicative of expanding and escaping gas; color change is possible but may be primarily due to carbon/ash accumulation.

RECORD TEMPERATURES AND TIMES ON A NOTEPAD

Other observations may be recorded but will not be graphed.

STEP ONE: Set up a small firepit/stove floor. Add fuel.

STEP TWO: Test outside temperatures using thermometers or infrared sensors. Record both the beginning temps and time (T_0 and t_0).

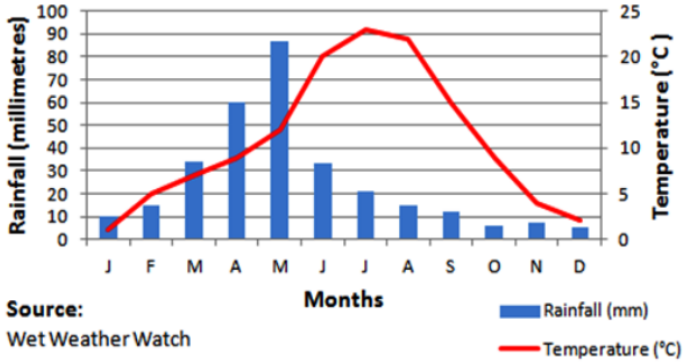
STEP THREE: Create a fire in your stove. Test can and air temperatures (10 cm from vents). Record the time and temperatures.

As the fire burns, hold a twirly fan about 10 cm from the upper vent.

a) Is the air flowing?
b) How can you tell?
c) Do the hot gases create wind?
d) Is the hot air rising or sinking?

STEP FOUR: Once your fire is purely coals (no visible flames), test both the can and air temperatures (10 cm from vents). Record the time and temperatures.

STEP FIVE: Measure one more time giving time and temperature. (T_f and t_f).



CAN YOU READ THIS GRAPH?

This graph has 3 weather variables:

1. Rainfall in mm (blue bars)
2. Temperature (red line)
3. Time (months on the y axis.

Time is of essence. Did it take a day, an hour, a minute, or a second?

TIME IS ON THE X AXIS HERE AND IS IN MONTHS.

GOT-IT/Apologetics:

Job 28:1-28 1-2 *Surely there is a mine for silver, and a place where gold is refined. Iron is taken from the earth, and copper is smelted from ore*. **Deuteronomy 8:7 ...***For the Lord your God is bringing you into a good land,* **9** *...a land whose stones are iron and out of whose hills you can dig copper.*

The Book of Job is one of the earliest writings of the Old Testament. In Job, mining, refining, and smelting were used to picture something valuable. It's clear from Job, Chapter 28, that God's wants to share truths about life. If things get too easy, we tend to forget God and His gifts to us.

In Deuteronomy 8, God tells the Hebrews of the iron stones in Canaan. God knew the future. He knew that His people would smelt iron for good and for war. While mining is simply searching for God's earthly treasures; these "good things" are worthy of caution. How amazing and true are the Words of the Lord!

At times, God's Word reveals future events. More often, it simply reveals truth about life. The iron industry has built skyscrapers and intercontinental railways; but, it has also led to more weapons: swords, knives, chariots, bullets, and other things used to harm people. The Bible always tells us these truths!

REFLECTION/Devotion:

Malachi 3:2 *But who can endure the day of his coming? Who can stand when he appears? For he will be like a refiner's fire or a launderer's soap.*

Refining and metal working give us metaphors for life. A refiner's fire removes or separates impurities just as a smelter oven is designed to do. Laundry soap is similar. Soap "captures and binds" impurities that rinse off with water.

Impurities and dross, like dirt, are like sin we either remove or we allow to remain in our lives. The potter's hands, the shepherd's rod, the launderer's soap, and the smelter's fire allude to the purifying and refining, as well as discipline, scolding, and being molded into better, more useful vessels. These are all befitting for the child of God.

Isaiah 1:25 *I will turn My hand against you, and thoroughly purge away your dross…*

REMEMBER THESE THINGS/Devotion:

God knows our needs before we do. Moses brought Joshua and the Israelites back to the land God promised to Abraham. This fertile land, with streams and springs, had stones of iron and copper. Stones of iron were of little value in that day. The Iron Age hadn't begun when Moses wrote down these words. God warns His people to remember where wealth, power, and strength really reside. Like the manna and quail, these were His provisions.

Deuteronomy 8:7-9, 17 *For the Lord your God is bringing you into a good land, a land of brooks of water, of fountains and springs, that flow out of valleys and hills; a land of wheat and barley, of vines and fig trees and pomegranates, a land of olive oil and honey; a land in which you will eat bread without*

scarcity, in which you will lack nothing; a land whose stones are iron and out of whose hills you can dig copper. 17 You may say to yourself, "My power and the strength of my hands have produced this wealth for me."

"Redeeming time" refers to making the most of every opportunity and using time wisely, recognizing its value and the potential for spiritual growth and service (AI). To redeem, we must do something. Prayer is doing. "The prayer of the righteous is very powerful in its working." James 5:16b. Time is irreversible.

Ephesians 5:15-16 *See then that you walk circumspectly, not as fools but as wise, redeeming the time, for the days are evil.*