

May 6 & 7th (sixth period)**Scientific Processes: Evidence & Explanations & Nature of Science****Safety Procedures:** general practices, Fume hood,**Steps to scientific process:** observations → Research → Hypothesis → Testing → Results & Conclusion**Measurements**

- ⌋ Accuracy vs. Precision in measurements
- ⌋ Quantity of measurements and metric units: length, mass, time, temperature, volume
- ⌋ Equipment uses: beaker, balance, graduated cylinder (what would be practical to use for large and small amounts)
- ⌋ Metric prefixes

Experimentation:

- ⌋ Variables in problems and graphs :
- ⌋ Inference: is an idea that follows logically from observations
- ⌋ Prediction: guess about the future based on facts or data
- ⌋ Mechanism: is a description of the process that explains how something happens
- ⌋ Control vs. experimental groups in experimenting
- ⌋ Independent variable: define
- ⌋ Dependent variable:
- ⌋ Graphs: purpose: shows trends and patterns
Types of graphs: line, scatter, bar, or circle
- ⌋ On graphs: know where to place IV and DV, how to title, meaning of outliers,
- ⌋ Know how to interpret the data from a graph: indirect, direct, no relationship, gradual changes in the variable (increasing and decreasing)
- ⌋ Recognize picture graphs meanings between the variables: L L L L L
- ⌋ Control variables in experiments
- ⌋ Theory- supported by testing done in several ways, repeatable results from peers,
- ⌋ Laws

Matter:**Atomic structure**

- ◆ Electron cloud and nucleus
- ◆ Three main particles: location, charge, and mass
- ◆ Atomic number: how to determine
- ◆ Why is the atom neutral?
- ◆ Mass number: how to determine
- ◆ Atomic mass: how to determine
- ◆ Neutron number: how to determine
- ◆ Isotopes:
- ◆ Stable vs. unstable isotopes
- ◆ Energy levels: Maximum number of electrons in each level
- ◆ Valence electrons: significance
- ◆ Why atoms combine: octet rule
- ◆ Ion vs. atom: how do they differ
- ◆ How does an atom become positive and negative charge

Atomic bonds & Naming (Nomenclature) compounds

- ◆ Stability for an atom: octet rule
- ◆ Chemical formula & subscripts
- ◆ Diatomic molecules
- ◆ Bonds are of two types: ionic (transfer of electrons) and covalent (sharing electrons)
- ◆ Binary compound
- ◆ Naming ionic compounds
- ◆ Naming covalent compounds
- ◆ Polyatomic ions
- ◆ Endings of -ide, and -ate,
- ◆ Why do compounds form?
- ◆ Transition elements: roman numeral
- ◆ How do you recognize an acid, a base, and organic and inorganic compounds

- ◆ Organic vs inorganic

Matter and its Properties

- ◆ Mixtures
- ◆ Pure substance
- ◆ Atoms
- ◆ Elements
- ◆ Suspensions
- ◆ Colloids
- ◆ Physical characteristics
- ◆ Chemical characteristics
- ◆ Physical properties & physical changes
- ◆ Physical changes vs chemical changes
- ◆ **Density = mass / volume** (units: g/l or g/ml) Water's density is 1.0 g/ml
- ◆ Solubility
- ◆ Viscosity
- ◆ Conductivity

Radioactivity: nuclear decay includes: alpha, beta, & gamma radiation

Nuclear decay: emission	Change in Mass	Change in atomic Number
Alpha	Decreases by 4	Decreases by 2
Beta	No change: e- release	Increase by 1
Gamma	No change: wave release	No change

- ◆ Half-life: the time it takes one-half of samples of radioactive material to decay
- ◆ Relationship between time and number of atoms in nuclear decay is inverse relationship: as the number of atoms decreases, time will increase for radioactive decay of elements.
- ◆ Nuclear reactions: fission or fusion
- ◆ Fission is when the nucleus is bombarded with neutrons. Occurs with elements that have an atomic number of 90 or higher.
- ◆ Fusion is when two nuclei bombard each other and form one nucleus: High energy released occurs at extremely high temperatures such as in stars.
- ◆ Compare Nuclear reactions and chemical reactions: location; subatomic particles involved, elements (are they the same or different), how does mass and energy change.

States of Matter:

- solid, liquid, gas, & plasma
- Temperature and phase changes: Melting/freezing point boiling/condensation points, sublimation
- Phase change diagram

GAS Laws

- Pressure: define and unit
- Boyle's Law: $V_1 \times P_1 = V_2 \times P_2$ (indirect)
- Charles law: $V_1 / T_1 = V_2 / T_2$ (direct)
- Gay-Lussac Law $P_1 / T_1 = P_2 / T_2$ (direct)

Solutions:

Kinetic theory and dissolving:

1. all matter is composed of small particles
2. particles in constant motion
3. particles are constantly colliding within a container
 - Solution: composed of solute and solvent
 - Factors that affect dissolving rate
 - Solubility and concentration graph interpretation
 - Mixtures: homo and hetero
 - Pure substances vs. compounds

Properties of acids, bases, & salts

- ❖ PH scale:
- ❖ General characteristics of acids & bases
- ❖ Neutralization reaction: acid + base yields salt + water

Force, Mass & Motion

Velocity & Acceleration

- Distance vs. displacement
- Speed vs. velocity
- Acceleration
- Acceleration of a free falling object: at all times during the fall
- Equation: $a = \frac{v_f - v_i}{t}$ $v = d/t$

Newton's Laws of Motion

- Force
- Net force: balanced and unbalanced forces
 Newton's three laws: applied to every day situations
- First law: law of inertia
- Second Law: equation law: $F = m \times a$
- Relationship between force, mass and acceleration
- Third law: Action forces = Reaction Forces; equal in magnitude and opposite in direction
 - Law of momentum: $p = m \times v$
- Friction: opposes motion

Gravity

- Acceleration due to gravity: objects in free fall.
- Law of Universal gravitation: gravity works to pull objects together, acts between all objects in the universe no matter how large or small
- The effects of mass on gravity:
- Force of gravity between two objects depends on two factors: mass and distance
- As mass increases, gravity increases
- The force of gravity is inversely proportional to the square of the distance. (as the distance increases the gravity decreases dramatically. $F_g = 1/d^2$)

Mass vs. Weight

Unit of mass

Unit of weight

$F = m \times a$ where $a = 9.8m/s^2$

Simple Machines: lever, ramp, pulley, wheel & axle, wedge, screw

- Compound machines
- Force, work, & Power
- Work define
- Work: $W = F \times d$
- Power define
- $P = W/t$
- Mechanical Advantage: define
- Fulcrum placement for most MA
- MA determine for a pulley
- Effort force: (F_e) is what you are applying
- Resistance force : (F_r) is the weight
- Effort Distance: (d_e) the distance you must cover to do work
- Resistance distance : (d_r) the distance the object being moved

Equations for machines

$F = m \times a$ (Force = mass x acceleration) (newtons (N) = kilograms (kg) x meters/second squared (m/s^2)

$v = d/t$ (velocity = distance / time) units: ($m/s = m/s$)

$A = \Delta v / t$ (Acceleration = change in velocity / time) units: ($m/s^2 = m/s / s$)

$W = F \times d$ (work = Force x distance) units: (joules (J) = N x m)

P = W/t (Power = Work / time) units: (watt (W) = J/s)

p = m x v (momentum = mass x velocity) units: (kg · m/s = kg x m/s)

MA = F_o / F_i or MA = D_i / D_o (force or distance)

(sometimes input is called effort and written like (F_e or D_e)

and output force is called resistance and written like (F_r or D_r)

Efficiency of machine = W_o / W_i x 100 % Work output / work input x 100%
units : percent

Energy transformations

- Define energy and compare to work definition
- Kinetic vs. Potential energy (macro scale)
- Equations: KE= $\frac{1}{2} mv^2$ PE= mgh (where g is 9.8m/s²)
- KE converts to PE and vice versa
- KE = PE for a falling object (what is lost by one is gained by the other form of energy)
- Transfer of energy is never 100% efficient: some energy is lost to friction in the form of heat (the most useless form of energy)

Heat transfer

Conduction, Convection, Radiation: define and know examples

Good conductors & insulators

Heat capacity & Phase diagrams

- Phase: object's state of matter. s,l,or g particle motion and temperature
- Heat capacity: specific heat & define
- Equation: Q=mcΔT Units are Joules = kg x c x °C
- Temperature: define
- Phase diagrams: meaning of flat lines, slope lines
- Where is freezing/melting, boiling/condensation occurring on the diagram?
- Energy absorption and releasing: endothermic vs. exothermic

Waves

General characteristics and Basics all waves have in common

- ❖ Waves: a disturbance that carries energy
- ❖ Medium: define
- ❖ Two types of waves: electromagnetic & mechanical (longitudinal & transverse)
- ❖ Longitudinal: sound: define
- ❖ Compressions and rarefactions
- ❖ Transverse: light: define
- ❖ Period: define and unit
- ❖ Cycle: define
- ❖ Frequency: define & unit
- ❖ Wavelength: define & unit
- ❖ Amplitude: define & unit
- ❖ Crest and trough
- ❖ Wave behaviors: reflection, refraction, absorption, diffraction
- ❖ Interference: constructive & destructive on graphs

Sound

- ◆ Interference: when will sound grow louder or softer
- ◆ Music vs. Noise
- ◆ Pitch & frequency
- ◆ Loudness & amplitude
- ◆ Echo
- ◆ Doppler effect
- ◆ Speed of sound in different mediums

Light

- Interference: when will light be darker or brighter
- Electromagnetic Spectrum and components compare frequency and wavelength

- Polarized
- Interference
- Diffraction
- Law of reflection
- Law of refraction

Equations for Problems: $v = f / \lambda$ (velocity = frequency / wavelength)
 (unit: m/s = Hz /m)

Electricity and magnetism

- Electricity: energy that can be transferred by electric charge
- Static:
- Induction:
- Conduction:
- Conductivity of materials: metals(silver) has highest, styrofoam has the lowest
- Semiconductor
- Behavior of like and opposite charges
- Ohms Law: define
- Circuits:
- Alternating Current
- Direct Current:
- Voltage
- Resistance
- Current
- series circuit
- Parallel circuit
- Batteries: direct current,
- Generator vs. motor
- Equations for Problems: Ohms Law: $V = I \times R$ voltage = current x resistance
 (units: volts = amps x ohms)
 $R = V/I$ resistance = voltage / current
 (units: ohms = volts/ amps)
 $P = V \times I$ power = voltage x current
 (units: watts = volts x amps)
- Electromagnetism: both electricity and magnetism
- What particle is responsible for both electricity and magnetism
- Electromagnets
- Magnetic domains:
- Permanent vs. temporary magnets
- How a compass works

Physical Science -EOCT Equations and unit review

Measurement	Symbol of Measurement	Unit and symbol for measurement
Velocity or speed		
Distance		
Time		
Acceleration		
Force		
Mass		
Momentum		
Weight		
Acceleration due to gravity		
Work		
Power		
Mechanical Advantage		
Potential energy		
Kinetic energy		
Resistance		
Voltage		
Current		
Wave speed		
Frequency		
Wavelength		
Period		
Pressure		
Volume		
Quantity of Heat		
Mass		
Specific heat		
Change in Temperature		