Science 265
Learning Goals

The best way to study is to test yourself. Here are blank copies of Exam 1, Exam 2 and Quiz 10. Also the solutions to these. Practice with the blank ones before you look at the solutions. "Reviewing" the solution without practice, will not help you much for the Final.

Also, look through these learning objectives and make sure you know exactly how to do each one. If you are unsure talk to your group members or send us an email.

Exam 1 blank key

Exam 2 blank key

Exam 3 posted on Ross 0232C and Ross 2279 B

Quiz 10 blank key

Sound and waves

Students will be able to:

- describe and identify the source of a sound – vibrations.
- identify the difference between the direction a wave travels and the direction the medium moves.
- explain that sound carries energy and identify how sound energy transfers
- define natural frequency.
- define resonance and provide examples
- define sympathetic vibration and provide examples
- identify in a new situation if resonance or sympathetic vibration is occurring
- relate the terms pitch, frequency and high/low sounds.
- demonstrate the path that sound vibrations follow through the ear.
- describe how ears can be permanently damaged by loud sounds
- describe how tones can be varied by changing the length of the resonant cavity of a wind instrument.
- describe how string instruments change pitch by changing natural frequency
- describe how instruments use sympathetic vibration or resonance to amplify sound.
- generalize how an instrument makes music. All require a source of sound (vibrations), a way to change pitch (changing natural frequencies) and a way to amplify sound (resonance or sympathetic vibration).

- draw and label a basic transverse wave.
- identify a wavelength on a transverse wave.
- describe the difference between a transverse and a longitudinal wave.
- identify the source, receiver and medium for any type of wave.
- define frequency and amplitude in terms of a sound wave and what we hear.
- list several different types of waves and identify which need a medium and which do not.

- describe that there is a delay between when they see a sound happen and when they hear it.
- name several animals that use echolocation to find food or objects.
- describe if these animals can also use their eyes and if they do use both their eyes and ears, which one do they depend on?
- describe the limits of the size and distance that dolphins and bats can echolocate.
- describe how SONAR works
- explain the difference between *active* and *passive* SONAR/Echolocation
- describe how animals "localize" sounds
- describe how scientists find out what elephants can hear
- describe the difference in what you hear if a sound travels in the air compared to traveling in a solid
- describe how the speed of sound varies in a gas, liquid and a solid.

Electromagnetic Waves

Students will be able to

- explain how light enters the eye and we sense light
- describe the cells in the eye that sense light and color
- compare and contrast human color vision to other animals
- identify what could be wrong in a person's eye if they have a certain type of color blindness.
- list different types of electromagnetic waves
- explain how ultraviolet, visible light and infrared electromagnetic waves were named.

States of Matter

Students will be able to

- describe and draw the three main states of matter including how atoms/molecules move in each state compared to the other states.
- draw and explain why water is unique and the only material to take up more space as a solid than as a liquid.
- how to make molecules/atoms stop moving completely.
- explain what is in the bubbles of boiling water
- calculate the density of air given the mass and the volume of a measured amount.
- describe an experimental procedure for measuring the volume of a room.
- Estimate the weight of air in a room.
- Explain where the majority of mass comes from in trees.
- Explain how the largest fraction of mass leaves a person's body when they lose 15 lbs.

Density, Volume, Mass and Weight

Students will be able to:

- Define density as mass divided by volume
- Identify the relative density of different objects by observing how they float or sink in water
- Define volume
- Define how to measure volume by either using a meter stick or water

- Define mass
- Explain how mass does not change depending on location
- Define weight as how hard gravity pulls on an object (mass x gravity)
- Explain how weight changes on different planets because gravity of each planet is different
- Identify which type of scale will measure mass correctly on other planets and which type will measure weight correctly on different planets.

Measurement

Common Metric Units

Length, mass, time, volume, temperature, energy

Common Metric Prefixes

tera to pico

factor-label method of conversions (be able to show work)

Periodic table

When, why, and by whom was the modern periodic table developed

How are elements basically arranged in the periodic table

What is a family, group, row, series on the periodic table

Identify the major divisions of the periodic table

representative elements, transition elements, metals, non-metals, noble gases

What are the alkali metals, alkali earth metals, halogens, and noble gases

How does the periodic table give an indication of the arrangement of electron in atoms and the number of valence electrons

What is the difference between an atom, an isotope and an ion

How can we use the periodic table to predict whether an element will gain or lose electrons

Energy

Students will be able to:

- Explain why energy does not contain mass
- Identify the form of energy that an object has depending on its motion or position
- Compare the amount of potential energy objects have depending on their height and mass.
- Compare the amount of kinetic energy objects have depending on their speed and mass
- Identify the energy form before and after a particular event
- Apply conservation of energy to different events
- Explain what “The lion eats the sun” means in terms of conservation of energy
- Predict the final location of an object (pendulum or skater) based on its initial height
- Explain the behavior of electrically charged objects

- Explain some differences between magnets and electrical charges. For example, electric charges are attracted to all metals but magnets are not attracted to all metals, only those that can be magnetized.
- Explain that a positive charge can exist separately from a negative charge; however a magnetic North pole cannot exist without a magnetic South pole.
- Describe how induction occurs and which variables increase the induction
- Describe how a generator produces electricity from a water wheel
- Describe how a wind turbine produces electricity and trace the energy conversions a step at a time from wind to the motion of electrons
- Describe the difference between a direct current (DC) and an alternating current (AC)
- Describe how an AC or DC current is able to light a light bulb or heat a toaster
- Calculate the horsepower produced by a person based on data from running up a set of stairs.

Atomic Structure

Three fundamental particles that make up atoms

charge, mass in AMU, location

Where are fundamental particles found in the atom

How are fundamental particles related to atomic number and atomic mass

Lewis electron dot diagrams

predict how chemicals will combine

Chemical Bonding

Compounds and mixtures

Chemical changes vs physical changes

Two important types of chemical bonding that form compounds

what kind of atoms form the bonds

how the two kinds of bonds different

Differences in naming the two kinds of compounds

Names of chemical changes that give off energy and take in energy

Balance simple chemical equations

Acids and Bases

What was the original theory of acids and bases by Arrhenius

What are the properties of acids and bases

What is an indicator

Motion and Forces

Students will be able to:

- Given two tracks (with different shapes) identify on which track a ball will take less time to roll to the end. In other words, the ball on which road will win.
- Define speed

- Define acceleration
- Identify the acceleration of an object in free fall
- Identify the acceleration of an object on a ramp compared to when in free fall
- Read a motion diagram. Identifying when an object is moving at a constant speed, speeding up or slowing down.
- Create a motion diagram for any given scenario
- Identify when an object is moving at its fastest speed while in free fall
- Identify when an object has zero velocity when in free fall
- Identify the acceleration of an object at all positions in free fall including at the top of the flight.
- Explain in detail why every object falls at -9.8 m/s^2 when in free fall (no air resistance) and how this depends on both weight and inertia.
- Apply Newton's first law the natural state of an object is at rest or in motion at a constant speed in a straight line (constant velocity).
- Define inertia
- Use the idea of inertia to explain how objects speed up, slow down or turn.
- Show the path of an object that was traveling in a straight line but receives a force in a new direction.
- Show the path of an object that was traveling in a circle but suddenly loses the force that is causing it to travel in a circular motion.
- Explain why water stays in a bucket when you swing it in a circle from the floor to above your head.
- Explain why a penny stays on the tip of a hanger when you swing it around.
- Apply Newton's second law to show that the result of a net force acting on an object is for the object to accelerate.
- Identify the forces acting on an object at rest
- Identify the forces acting on an object as it slides across the floor.
- Identify the forces on an object when it is in free fall
- apply Newton's third law to forces (every force has an equal and opposite force)
- Determine the relative acceleration of two objects that receive the same force but have different mass.
- Define friction
- Explain how friction changes the natural motion of an object
- Identify the net force on an object when it's moving at a constant speed