**Exam 1 – 2014**

Learning Goals

**Scientific Practices**

Students will be able to:

* Explain what it is to “do science” and how the idealized steps of the “scientific method” do not do an adequate job of explaining what it is to do science.
* Describe what a generalization is and what it takes to prove and to disprove a generalization or scientific theory.
* Describe the necessity for observations and characterization of patterns to understand the invisible
* Describe differences in the process of scientific discovery as described in Derry.
* Compare and contrast the five examples of scientific pathways presented by Derry: Serendipity and Methodical Work, Detailed Background and Dreamlike Vision, Idealized models and Mathematical Calculations, Exploration and Observation, the Hypothetico deductive method
* Describe the value of a model regardless of whether it models the phenomena exactly.
* Describe how a person becomes an expert.
* Describe a growth mindset vs. fixed mindset and how this applies to learning.

**Content Goals.**

Genetics

Students will be able to:

* explain the difference between mitosis and meiosis.
* describe why meiosis is necessary to create gametes (eggs and sperm)
* describe simple inheritance and calculate the probability of particular traits showing up in offspring.
* explain how certain diseases and genetic defects can occur in newborns.
* explain what stem cells are, their purpose and where they exist.
* describe the basic process of invitro fertilization (IFV) and genetic testing
* describe how the two different types of twins can come about – fraternal and identical.

Earthquakes

Students will be able to:

* describe where earthquakes can be located and how it takes two pieces of information, the epicenter and the depth, to fully describe the location of the quake.
* explain how and why earthquakes are not predictable
* define resonance and how this applies to building damage
* provide some examples of the type of work a seismologist does.

Science of Sound

Students will be able to:

* identify the source of sound based on the idea that vibrations make sound
  + Our throat vibrates to make voice
  + Straw tip vibrates to make sound
  + Plucked string vibrates to make sound
* Describe how sound travels as sound waves (not particles), showing how sound waves travel through air molecules
* Apply the idea that sound carries energy and it can be transferred to other objects or into other forms
* Define pitch and frequency and how they relate to treble and bass notes.
* Describe natural frequency (The frequency an object “likes” to vibrate at) and how it affects the sounds we hear from different instruments such as:
  + Different lengths of straw “like” different frequencies so we hear a different note.
* Describe the three things that are required to make a musical instrument: 1. A source of vibration, way to change the pitch and a way to amplify the sound.
* Identify how sound is amplified in different instruments. Either via a resonance chamber or sympathetic vibration.

Students will be able to:

Describe the basic function of the ear:

* The ear flap is called the pinna and is used for funneling sound into the ear.
* sound waves travel into the ear and through the inner ear into the cochlea
* The cochlea is filled with thousands of tiny sensors called hair cells
* These hair cells turn vibrations into electrical signals that are sent to the brain and the brain interprets the source of the sound (piano vs. a guitar).
* Different parts of the cochlea resonate with certain frequencies....

Some like high pitches and some like low pitches…

* Listening to loud sounds for too long can damage the hair cells
* Damaged hair cells can’t be fixed.