

**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.