Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Pressure Exerted by Germinating Seeds

**Purpose**

The purpose of this exercise is to observe the pressure exerted by germinating seeds.[[1]](#endnote-1)

**Procedure:**

 **Materials**

1. Lima bean seeds
2. Dry sand
3. Glass jar with lid
4. Cloth towel or heavy duty zip-lock bag

**Sequence of Steps**

1. Place an equal amount of beans and sand in a jar. Shake the jar to mix the beans and sand completely. Push the sand in tightly. Fill the jar to the top with sand.
2. Wet the sand, but do not put enough water into the jar to flood it.
3. ![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()Screw the lid on tightly (it does not have to be airtight). Place a cloth towel over the jar(s) or place the jar(s) in a zip-lock bag and place the jar(s) in a large pan in an area away from students. (Note: the jar(s) will not explode, but will crack and sometimes crumble).
4. Record your observations.

**![C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmf]()**

**Observations**

 1. Describe your observations.

**Analysis:**

1. Why did you use sand in the experiment?
2. Could this experiment have worked with any kind of seed?
3. Can this experiment work with glassware of any thickness?

4. What do you think happens inside the seed, at the cellular level, that creates enough pressure to crack a glass jar?

5. Identify one way that cells regulate their interaction with their surroundings.

# Teacher’s Notes

**Pressure Exerted by Germinating Seeds**

**Purpose of Lab**

The purpose of these experiments is to observe the pressure exerted by germinating seeds.

**Background**

Many times, as teachers, we gloss over the impact seed germination has on the formation of soil. This little experiment will illustrate just how tough the germination of seeds can be. It is not to say that seeds can be thrown out into any soil and 100% germination will occur, this lab is simply showing that the water absorbed by the seed is powerful.

Safety precautions must be taken. Although the glass jars should only crack, there is the outside chance that the glass may fracture in a way that someone handling the jar could be injured.

It only takes a few hours for the seeds to absorb the water. The instructor may want to have the class set up the experiment, but not add the water. The instructor may want to add the water and seal the jars the next morning so that the class can observe the actual exertion of the germinating seeds during their class period.

**Materials needed**

Lima bean seeds

Dry sand

Glass jar with lid

Cloth towel or heavy duty zip-lock bag

**Procedure**

1. Place an equal amount of beans and sand in a jar. Shake the jar to mix the beans and

 sand completely. Push the sand in tightly. Fill the jar to the top with sand.

2. Wet the sand, but do not put enough water into the jar to flood it.

3. Screw the lid on tightly (it does not have to be airtight). Place a cloth towel over the

 jar(s) or place the jar(s) in a zip-lock bag and place the jar(s) in a large pan in an area

 away from students. (Note: the jar(s) will not explode, but will crack and sometimes

 crumble).

 4. Record your observations.

THE JAR CRACK, AND WATER OOZED FROM THE CRACK or THE JAR CRACK, AND NOTHING HAPPENED UNTIL THE NEXT DAY WHEN THE JAR FELL APART or THE JAR DID NOT CRACK OR CRUMBLE, IT COULD BE THAT THE LID WASN’T SEALED.

**Analysis**:

1. Why did you use sand in the experiment? SAND IS INERT AND ANY WATER WILL BE ABSORBED BY THE SEEDS; ALSO SAND IS LARGE ENOUGH TO ALLOW FOR WATER TO BE ADDED TO THE SEED/SAND MIX SO THAT THE SEEDS WILL ABSORB THE WATER.
2. Could this experiment have worked with any kind of seed? YES, LET’S TRY . . . .
3. Can this experiment work with glassware of any thickness? GOOD QUESTION, LET’S TRY . . . .
4. What do you think happens inside the seed, at the cellular level, that creates enough pressure to crack a glass jar? The seed absorbs water for its metabolic processes, embryo expansion, and radicle and hypocotyl growth (at this point in the plant’s life the plant is considered to be heterotrophic (receiving food from another source; not until photosynthesis begins does it become autotrophic.) The embryo absorbs the water and swells (the embryo was almost completely dry, almost dehydrated, prior to absorbing water. With the absorption of oxygen by the seed, (that’s why we don’t want the jar to be water-logged), energy is made available for growth in the embryo. Food has been stored in the endosperm or in the cotyledons and is broken down by enzymes. The radicle, (the root), is the first part of the embryo to break through the seed coat. The hypocotyls lengthen bringing the cotyledon (monocotyledons; grasses) or cotyledon**s** (legumes or dicotyledons) above the surface of the soil.
1. Dickson, Chris (2008).Pressure Exerted by Germinating Seeds, Lab. *North High School, Bakersfield Agriculture Department*. [↑](#endnote-ref-1)