

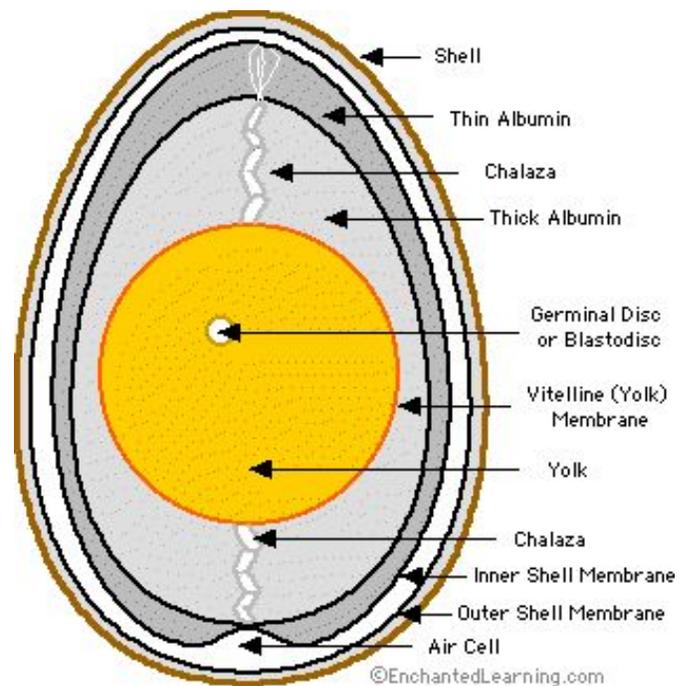
The Chicken Egg Lab¹

Question:

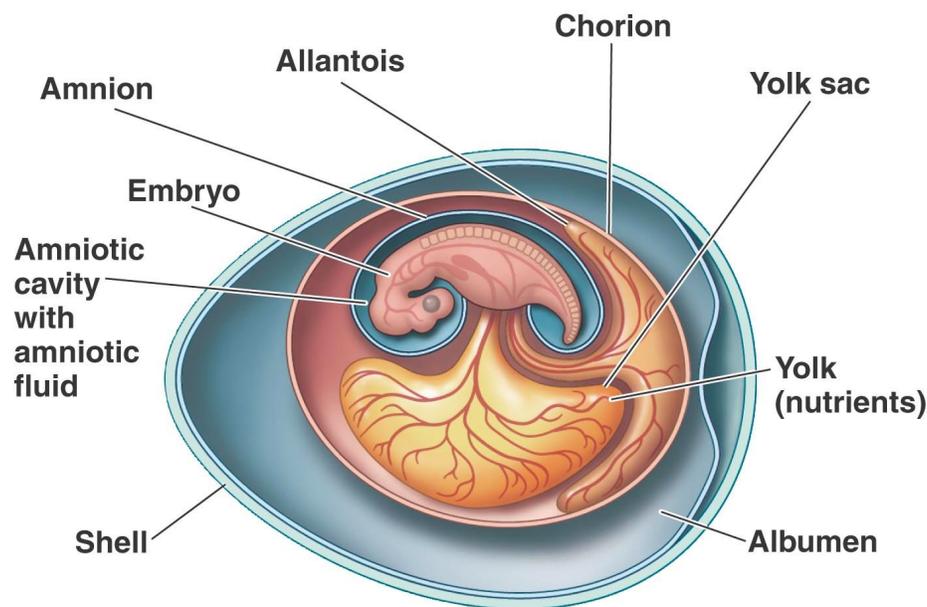
How does the **amniotic egg** help a reptile or bird reproduce?

Lab Materials:

- ❑ chicken egg (or 2, if you want a backup)
- ❑ small glass bowl (if you don't have this, you can use any clear plastic container, such as a food storage container or plastic bag)
- ❑ another bowl (this one does not have to be clear; ideally it's dark, no decorations inside)
- ❑ 2 toothpicks (or a fork... any sharp point will work)
- ❑ paper towels
- ❑ table protection
- ❑ plastic wrap (to cover keyboard & trackpad of your Chromebook)
- ❑ gloves (optional, if you don't want to or can't touch raw egg)
- ❑ pencil & lab sheet (if you can print, print; if not, follow along with this tab open online)
- ❑ sanitizing wipes or cleaning spray, for cleanup at the end!



Chicken Egg Information:



The Yolk:

The chicken egg starts as an egg yolk inside a hen. A **yolk** is produced by the hen's ovary in a process called ovulation.

Fertilization:

The yolk is released into the **oviduct** (a long, spiraling tube in the hen's reproductive system), where it can be **fertilized** internally (inside the hen) by a sperm (from a rooster). Chicks only develop from eggs that have been fertilized. Not all eggs are!

¹ Sources: Adapted by D. McBeath from http://ijhs.sandi.net/faculty/AQuesnell/Biology%20Notes/Chapter%206/6_3-6_5/ChickenEggLab.pdf
<http://www.newpaltz.k12.ny.us/cms/lib/NY01000611/Centricity/Domain/171/EggDissectionLab1.pdf>
Image 1: www.enchantedlearning.com
Image 2: biology-pictures.blogspot.com/amniotic-egg-diagram.html

The Egg White (albumin): The yolk continues down the oviduct (whether or not it is fertilized) and is covered with a membrane, structural fibers, and layers of **albumin protein (the egg white)**.

The Chalaza: As the egg goes down through the oviduct, it is continually rotating within the spiraling tube. This movement twists the **structural fibers (called the chalaza)**, which form rope-like strands that anchor the yolk in the thick egg white. There are two chalaza anchoring each yolk, on opposite ends of the egg.

The Eggshell: The **eggshell** is deposited around the egg in the lower part of the oviduct of the hen, just before it is laid. The shell is made of calcite, a crystalline form of calcium carbonate. This is the same material as sea shells and chalk. This entire trip through the oviduct takes about one day.

Growth of the Embryo: The fertilized blastodisc (now called the blastoderm) grows and becomes the **embryo**. As the embryo grows, its **primary food source is the yolk**. Waste products (like urea) collect in a sack called the allantois. The chick breathes through the eggshell by exchanging oxygen and carbon dioxide gas through a thin layer called the chorion. This membrane lines the inside surface of the egg and is connected to the blood vessels of the embryo, taking gases to and fro.

The Incubation Period: The **embryo develops inside the egg for 21 days (the incubation period)**, until a chick pecks its way out of its eggshell and is hatched.

Lab Procedure

1. Gather all materials.
2. OBSERVE the outside of the egg.
 - a. Hold the raw egg in the palm of your hand. Gently close your fingers around the egg. Begin to squeeze the egg *slowly*, gradually increasing the pressure until you are squeezing quite firmly. Imagine... about the same amount of pressure a mama hen might put on the eggs as she sits in her nest! Note how much force the egg can withstand. (Do NOT squeeze extra hard or punch your finger through the shell... you will break it.)
 - b. Gently move/shake the egg back and forth in your hand. Note whether you feel anything moving inside the egg.
3. Open the egg.
 - a. Gently, carefully crack open the shell over the glass bowl/dish.
 - b. Carefully pour the contents of the egg into the dish.
 - c. *Place the shell on a double layer of paper towel.*
4. OBSERVE the inside of the egg.
 - a. How is the egg built? What does it feel like, inside and out?
 - b. Look in the shell halves. Locate the air cell/pocket. It will be in the closed/more rounded end of the shell. When you gently press on it, you should feel the air bubble. Some air cell/pockets may be on the side of the egg, but this is very rare.
 - c. Once you have located the air cell/pocket, *leave it intact (don't break it) and place it on your paper towel.*

5. Find the shell membrane.

- a. Split the other part of the shell (not the part with the air cell) completely in half. Take out the shell membrane. The shell membrane is very thin, but flexible like our skin.
- b. Remove this skin and place on the paper towel.

6. Identify the inside parts of the egg.

- a. Examine the contents of the egg in the dish. Refer to the above pictures as you work. Find the **yolk** (yellow) and **albumen** (egg white, made of proteins).
- b. Then, try to find the division between the thin and thick albumen (two parts of the egg white). This **protein** will be used by the developing embryo (baby) for growth. In an intact egg, the albumen completely fills the space between the yolk and the membrane beneath the shell.
- c. How can you tell the difference between the thin and thick albumen (egg white)? What does it look like? How does the color or consistency change?
- d. Look carefully at the yolk. The yolk is the yellow material. The yolk is rich in carbohydrates (complex sugars) and is used by the embryo for energy. Note how the yolk appears to form a slightly flattened sphere.
- e. Find the **germinal disk**, a small white spot on the top of the yolk.
 - i. This is the spot where fertilization and the development of the embryo occur.
 - ii. If the egg has already been fertilized, the germinal disk may appear red or brown. This shows that the embryo has already started growing.
- f. Find the **chalazae**. These are the whitish strands attached to both sides of the yolk or running under the yolk. When the egg is intact, the chalaza stretch from the yolk to the membrane located just beneath the shell. The chalaza twist when the egg rolls, keeping the germinal disk and the embryo at the top of the egg. Using the toothpick, remove the chalazae without piercing the yolk. Place the chalazae on the specimen sheet.

7. Separate the yolk from the egg white.

- a. Using another dish to catch the albumen, pour the entire contents of the first dish through your hand. Be sure to catch the yolk, but let the albumen pass through. Be careful not to break the yolk. Put the dish containing the albumen to the side.

8. Examine the yolk more closely.

- a. The yolk is surrounded by a membrane that helps it maintain its shape. Can you tell that there is a little bag holding the yolk in?
- b. Puncture the membrane surrounding the the yolk with the toothpick. What happens? Place the dish containing the yolk in its designated area on the specimen sheet as well.

9. Cleanup:

- a. Make sure to dispose of all parts of your specimen in a trash can. Your dishes and any other equipment should be washed, dried, and returned to their locations. Wipe your table and/or counters down with sanitizing wipes or spray & paper towels. Dispose all trash.

Egg Dissection Lab

Name: _____

Followup Questions

Date: _____

(Assigned after the dissection, these are due two days after the lab).

1. How is the yolk of an egg produced?

2.

- a. Where does fertilization take place?

- b. Did you look at a fertilized egg?

3. Which part of the egg will the embryo use for energy?

4. Which part of the egg will the embryo use for growth?

5. Why does the egg have holes in it? What cell process could not occur without these holes?
(In other words, what could the developing baby chick NOT do if there weren't tiny holes in the eggshell?)

6.

a. When does the hard calcium shell form around the egg?

b. Does this affect fertilization?

7. What do the different membranes do? How do they help the developing embryo?
(Shell membrane and yolk membrane)

8. What does the chalaza do (procedure #6f)?

9. Why might you (or another animal) want to eat a chicken egg?

10. Explain how the evolution of a hard eggshell helped reptiles adapt and survive in the late Paleozoic and Mesozoic (Time Periods 3 and 4). Please write a paragraph. Some hints:

- a. How might the egg protect an embryo from predators?
- b. How might the egg protect the embryo from the sun?
- c. How else might the egg protect the embryo? What else might it protect it from?