LabLearner
The Science of Learning

Human Prenatal Development
Investigation 4

Faith & Reason

Student Guide

Tips for Success

- Login to your account on the Human Prenatal Development Student Portal, then leave the page open so you can access the Introduction & Fun Facts, Concept Slides, and other pages.

- A Chromebook/laptop with an Internet connection is required in the lab for each lab group to digitally enter information into this Student Guide. **Alternatively**, the PDF may be photocopied and data can be entered directly on the printed paper version.

Identify your work:

You will work with a collaborative team of scientists. Doing so will increase the reliability of your results.
You will complete the Conclusion and Discussion on your own. Doing so will enable you to reflect on your personal development and process as a whole.

Your Name:

Group or Lab Partner(s):

Baseline Observation:

Briefly explain what you currently understand about the third trimester of pregnancy, including the function of amniotic fluid and how ultrasound works and is used for. Doing so will allow you to evaluate your work over time.

Background Research:

Did you know that babies can hear sounds from outside the womb even before they're born?

During the third trimester, the developing fetus is surrounded by amniotic fluid, but sound waves can still pass through that fluid, through the mother's body, and into the baby's ears. In fact, by the time they reach about 25 weeks, babies can respond to music, voices, and even loud noises in their environment. Many parents talk, read, or sing to their unborn child during this time, knowing that the baby can recognize and respond to familiar sounds.

In this experiment, you'll explore how sound travels through fluid using a stethoscope, a jar, and water. You'll listen to the sound of your finger tapping from outside the jar and hear how it becomes clearer and louder as the jar is filled with water. This simulates how a fetus hears sounds from outside the womb, not through empty air, but through fluid and tissue. It's a powerful way to understand that the womb isn't a silent place. It's full of motion, rhythm, and sound. Babies begin to connect with the outside world through their sense of hearing long before they're born.

2D Ultrasound

3D ultrasound and same baby as a newborn

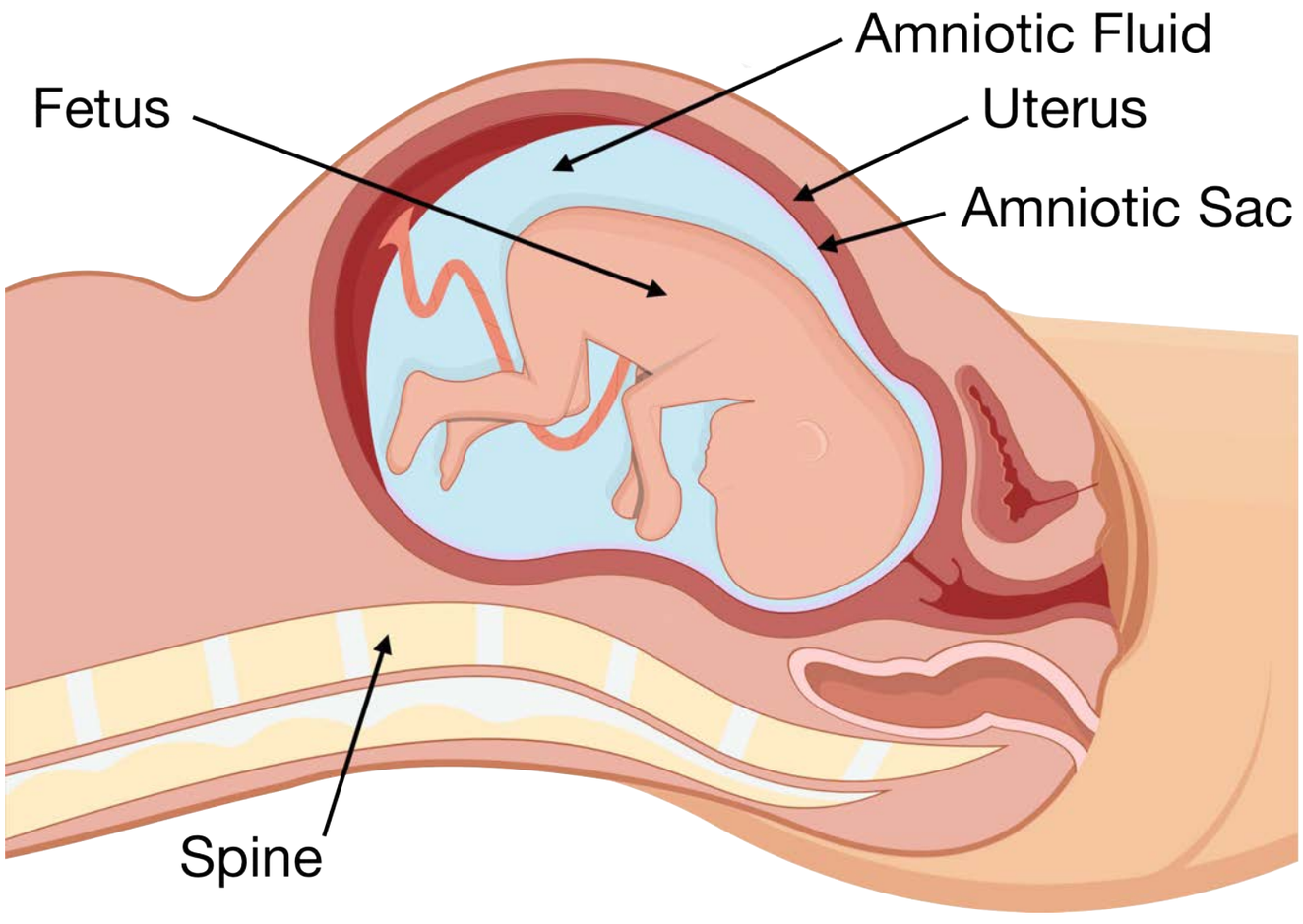
Background Research (continued):

Open the *Introduction* and *Concept Slides* via the *Student Portal*. As you read through the information, think critically, asking questions and evaluating the claims - not simply accepting what you read. Take note of any information that will help you answer the *Phase 2.2* questions. After reading the research, complete the *Student Guide* through and including *Phase 2.2*, and prepare to share your thoughts during the class presentation of the information.

Liquid Life: The Protective Power of Amniotic Fluid

Amniotic fluid is the clear, slightly yellowish liquid that surrounds and protects a developing baby inside the mother's womb. It begins to form just days after conception and gradually increases in volume as the baby grows. This fluid fills the amniotic sac, a thin but strong membrane that forms a protective bubble around the embryo and, later, the fetus. The amniotic sac and its fluid create a safe, temperature-controlled environment where the baby can move, stretch, and develop properly.

Amniotic fluid serves several important functions. First, it acts as a shock absorber, protecting the baby from bumps or pressure by cushioning any sudden movements or impacts. It also helps maintain a stable body temperature and prevents parts of the fetus from sticking together. The fluid allows the baby to move freely, which is essential for muscle and bone development. Additionally, the fetus breathes and swallows amniotic fluid as part of its early development, which helps form the lungs and digestive system. The composition of the fluid changes throughout pregnancy, reflecting the baby's growth and needs.



Response to Your Research: Answer the question(s) then list **three things** you learned from your research.

1. If a baby can hear sounds from the outside world before it is even born, what does that tell us about how early humans begin to form connections with their environment and other people?

2. Why might it be important for a baby to float in a fluid rather than just rest in the womb without it**?**

3. Describe three things you learned in your research.

2.3 Experiment-Materials:

Modeling the Miracle

- ☐ Chromebook/or laptop (or printed PDF)
- ☐ Metric ruler
- ☐ triple-beam balance (or digital scale)
- ☐ modeling clay

Fetal Hearing Simulation

- ☐ Chromebook/or laptop (or printed PDF)
- ☐ (2) 1-liter plastic jars
- ☐ 1.5 liters tap water
- ☐ masking tape
- ☐ stethoscope
- ☐ (2) Square sterile gauze
- ☐ (2) orthodontic rubber bands

Fetal Protection Simulation

- ☐ Chromebook/or laptop (or printed PDF)
- ☐ 1-liter plastic jar
- ☐ 1.5 liters tap water
- ☐ raw chicken egg
- ☐ paper towels

2.4 Experimental-

Protocol **Modeling the**

Miracle

☐ 1. Use a triple beam balance (or digital scale) to weigh out a piece of modeling clay to the mass indicated at week 28 of the **data table** to the right. Record the mass of your 28-week model: Mass: = _____

☐ 2. Next, consult the **data table** once again to find the approximate length of the embryo at this age of gestation (28 weeks).

☐ 3. Using a metric ruler or meter stick, measure your model and form it to be the approximate length listed in the **data table**. Record the length of your 28-week model: Length: = _____

☐ 4. Describe the size and shape of your 28-week fetus model (remember that the baby is referred to as an embryo until the 9th week of gestation, thereafter it is referred to as a **fetus**).

☐ 5. Depending on your teachers instructions, either keep the 14-week model fetus to compare your model week to week, or return it to the modeling clay container.

Gestational Age (weeks)	Mass (g)	Length (cm)
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0.2
6	0.8	0.8
7	1.6	1.3
8	2.4	1.9
9	3.2	2.4
10	4	3
11	17.2	4.5
12	30.4	6
13	43.6	7.5
14	56.8	9
15	70	10.5
16	116	13.4
17	162	16.3
18	208	19.2
19	254	22.1
20	300	25
21	390	26.9
22	480	28.8
23	570	30.8
24	660	32.7
25	750	34.6
26	900	35.7
27	1050	36.7
28	1200	37.8
29	1350	38.8
30	1500	39.9
31	1675	41.2
32	1850	42.4
33	2025	43.7
34	2200	45

2.4 Experiment-Protocol (continued):

Fetal Hearing Simulation

☐ 1. Prepare the stethoscope: **NOTE: each student should perform this step before using the stethoscope.**

☐ a. Use a small orthodontic rubber band to affixxa square sterile gauze to each of the two ear pieces of your stethoscope (see top diagram to the right).

2. Test the empty jar (**no amniotic fluid**) first:

☐ a. With the stethoscope on, carefully lower the diaphragm (end) of the stethoscope into the empty (no amniotic fluid) jar (see lower diagram to the right).

☐ b. Gently tap on the side of the empty jar and listen to the sound.

☐ c. Record what you hear tapping the empty jar:

☐ **Test the water-filled (amniotic fluid) jar next):**

a. With the stethoscope on, lower the diaphragm (end) of the stethoscope into the water-filled jar.

☐ b. Gently tap on the side of the empty jar and listen to the sound.

☐ c. Record what you hear tapping the water-filled (amniotic fluid) jar:

2.4 Experiment-Protocol (Continued)

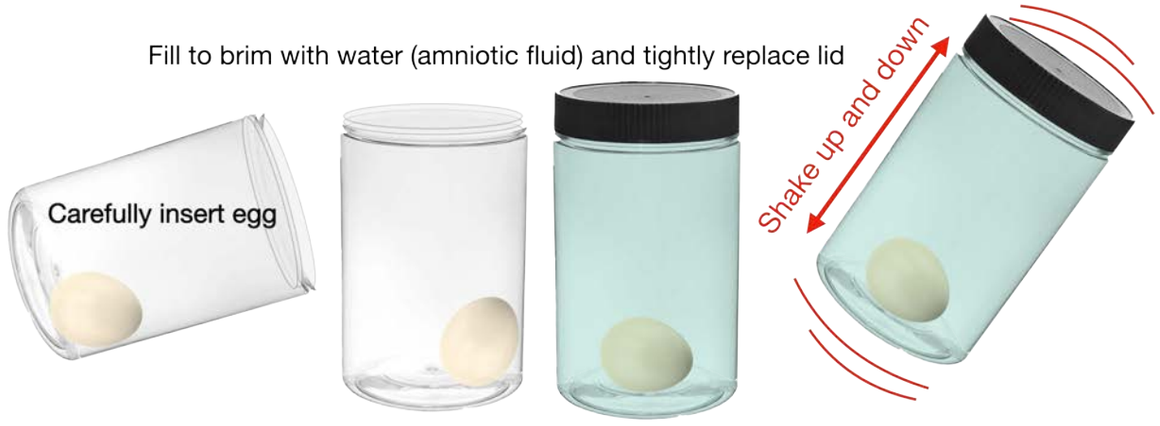
Amniotic Fluid Protection

☐ 1. After the fetal hearing experiment, turn the empty plastic jar on its side and gently lower a raw chicken egg into it.

☐ 2. Set the jar and egg upright and add water (amniotic fluid) up to the very top.

☐ 3. Tightly replace the lid and dry the outside of the jar with paper towels.

☐ 4. Shake the fluid-filled jar and egg up and down, observe what happens, and record below:



Amniotic Fluid Protection

No Amniotic Fluid Protection

☐ 5. Remove the lid and carefully pour out all of the water (amniotic fluid).

☐ 6. Set the jar and egg back upright.

☐ 7. Tightly replace the lid and dry the outside of the jar with paper towels.

☐ 8. Shake the jar and egg up and down again, observe what happens, and record below:

Focus Questions:

1. Why is the third trimester an especially important stage of human prenatal development?

2. How does amniotic fluid support and protect the developing fetus during the final months of pregnancy?

3. How can a fetus begin to sense and respond to its environment before birth?

Focus Questions (continued):

4. Why is a fluid-filled environment important for processes like movement and sound transmission in the womb?

5. How did the lab activity help you model how sound and movement are transmitted and controlled in the womb during late fetal development?