

LESSON 4.1 - AN INTRODUCTION TO THE ENDOCRINE SYSTEM

Overview:

Students research the location and function of the major endocrine glands and consider some endocrine system disorders.

Suggested Timeline: 1 hour

Materials:

- An Introduction to the Endocrine System (Student Handout)
- QUIZ – The Endocrine System (Student Handout)
- student access to computers with the internet

Method:

1. Allow students to use computers with internet access and other resources from the library to complete their questions on the endocrine system.
2. Students write quiz on the endocrine system.

Assessment and Evaluation:

- Affective assessment of student understanding of parts of the endocrine system
- Student grade on quiz

Extension:

Assign a student or group of students to ‘be’ a specific endocrine gland. Have them role play for the class to get the idea of the function of the gland across to their classmates.



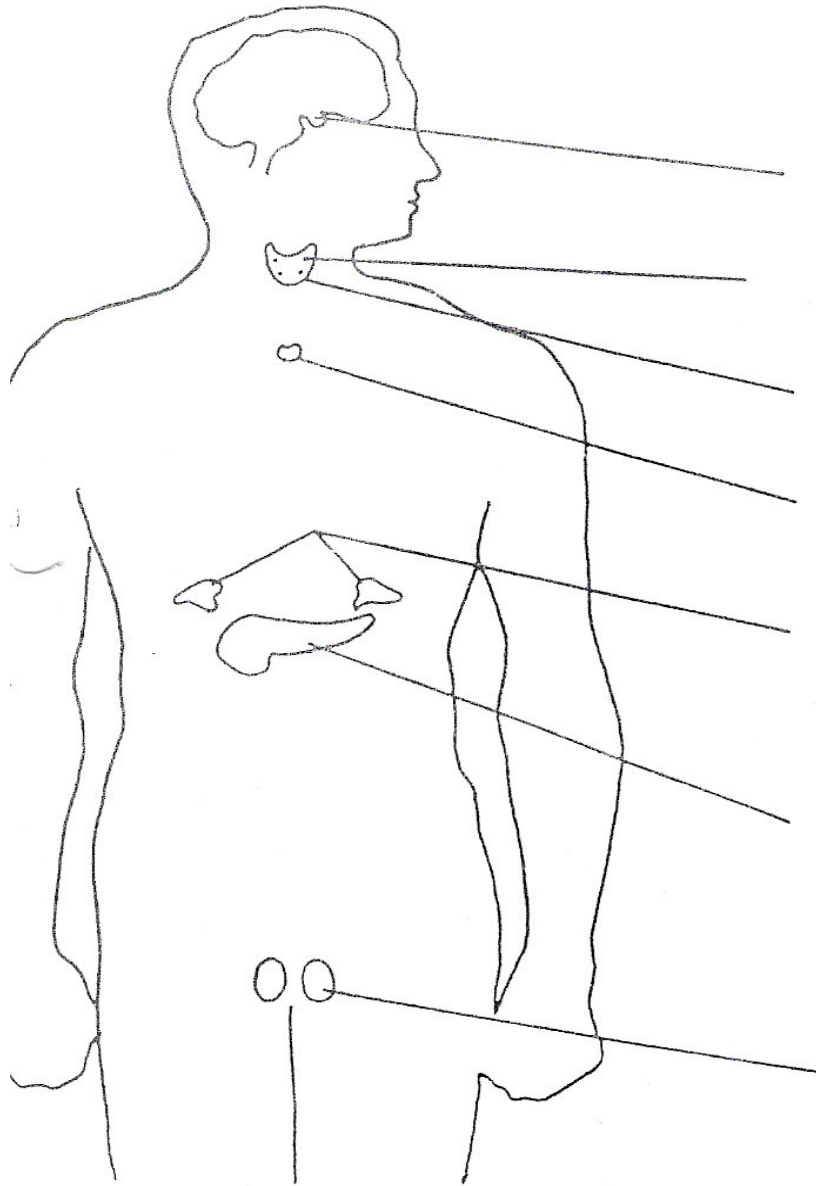
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An Introduction to the Endocrine System

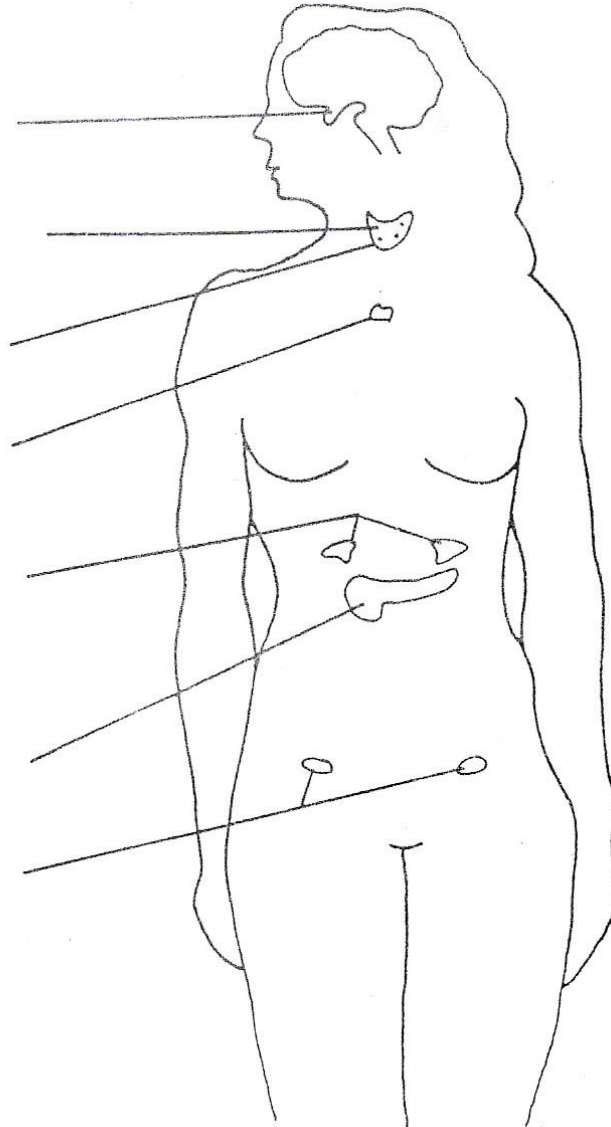
Go to the following website: <http://health.howstuffworks.com/adam-200091.htm> Watch the video to complete the following questions.

1. The endocrine system is composed primarily of _____ that produce chemical messengers called _____.
2. List the names of glands of the endocrine system, as mentioned in the video. Hint: There are 8 in total.
3. The endocrine and _____ systems work closely together. The brain sends info to the endocrine glands and the endocrine glands send feedback to the brain.
4. The part of the brain that is known as the ‘master switchboard’ and controls the endocrine system is called the _____.
5. Use the list of names of glands from #2 to label the following diagrams of the male and female endocrine systems.

MALE ENDOCRINE SYSTEM

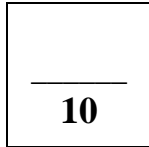
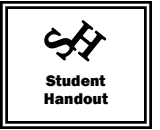


FEMALE ENDOCRINE SYSTEM



6. Search the internet to find the function of each of the endocrine glands labeled above. Beside the name of each gland, list its function. It is only necessary to do this once for each gland, since the glands are labeled on both the male and female diagrams.
7. There are many disorders of the endocrine system. Choose **two** of the following disorders, research each and describe each disorder in a paragraph.

diabetes mellitus – type 1, diabetes mellitus – type 2, hypothyroidism, hyperthyroidism, pancreatitis, polycystic ovary syndrome, prolactinoma, goiter



Name: _____ Date: _____ Period: _____

QUIZ – The Endocrine System

Match the term in the left column with the correct description in the right column by writing a letter in each blank.

- | | |
|-------------------------|--|
| ____ ovaries | a) chemical messengers that are produced by glands |
| ____ pituitary gland | b) the “master switchboard” that is found in the brain and controls the endocrine system |
| ____ thyroid gland | c) the “master gland” of the body that receives messages from the hypothalamus and controls other glands |
| ____ thymus gland | d) the male organs that act as glands by releasing testosterone |
| ____ hormones | e) the glands that lie on top of the kidneys and release adrenaline |
| ____ testes | f) the female organs that release estrogen |
| ____ adrenal glands | g) found on either side and on top of the windpipe; releases hormones that affect your metabolism |
| ____ pancreas | h) a digestive and endocrine organ that makes insulin |
| ____ hypothalamus | i) found on top of the thyroid gland; control how calcium is used in the body |
| ____ parathyroid glands | j) a gland found in the chest area; makes hormones that help the body in fighting disease |

LESSON 4.2 - HUMAN REPRODUCTION

Overview:

Students consider facts and fallacies about reproduction, examine their feelings about puberty, study the parts and functions of male and female anatomy, and learn the basics of the menstrual cycle and fetal development.

Suggested Timeline: 2.5 hours

Materials:

- Human Reproduction – Fact or Fable? (Student Handout)
- Introducing Terry (Student Handout – Group)
- Reproduction in Males and Females (Student Handout)
- QUIZ – Human Reproduction (Student Handout)

Method:

INDIVIDUAL FORMAT:

1. Allow students a few minutes to complete Human Reproduction – Fact or Fable? (student handout). Correct their responses and/or discuss answers with them.
2. Have students complete Reproduction in Males and Females (student handout). Encourage them to feel free to submit to you or ask any questions that they may have pertaining to reproduction.
3. Assess students' submitted booklet.
4. Have students write quiz on human reproduction.

GROUP FORMAT:

1. Have students complete Human Reproduction – Fact or Fable? (student handout). Discuss some of the statements with students.
2. Provide students with a few slips of paper. Tell them that the slips of paper will be picked up at the end of the lesson. Instruct them to write any questions that they may have or that they may think of that pertain to reproduction. Tell students that they do not need to put their name on the paper and that all appropriate and valid questions will be discussed.
3. Break students into small groups. Give each group a different colored marker and a large sheet of poster paper. Hand out Introducing Terry (student handout - group). Provide students with 15 minutes to read the handout and complete their poster. Have one student per group share the group poster with the rest of the class.
4. Provide students with time to complete Human Reproduction in Males and Females (student handout). Review questions with them.
5. Collect all question slips from students. Consider each question in a class discussion.
6. Have students write quiz on human reproduction.

Assessment and Evaluation:

- Affective assessment of students' attitudes toward sexuality and puberty
- Student grade on quiz



Human Reproduction – Fact or Fable?

What do you know about the physical changes that take place during puberty? Below are 20 statements about puberty, menstruation and sanitary supplies used during menstruation. Place a check in the appropriate box for each statement.

	TRUE	FALSE	DON'T KNOW
1. I already know all I need to about puberty and menstruation.			
2. All females have menstrual cramps during their period.			
3. Boys undergo puberty at a different age than girls.			
4. Menstruation should have no effect on a female's ability to work.			
5. I don't like the changes that are happening to my body now.			
6. Males should know about menstruation.			
7. You can't go swimming when you have your period.			
8. Eating a nutritious, well-balanced diet can help to prevent some menstrual discomfort.			
9. Young girls can use tampons during their period.			
10. Females shouldn't exercise during their period.			
11. I'm embarrassed to talk with my parents about the changes I am experiencing.			
12. Females are more emotional during their period.			
13. During puberty, males and females can become pregnant.			
14. There is nothing that you can do for menstrual discomfort.			
15. Boys can tell when a girl has her period.			
16. Careful, thorough cleansing of your face can help to prevent skin blemishes.			
17. All boys have nocturnal emissions (also known as 'wet dreams').			
18. I have talked with my friends about the changes in my body.			
19. Tampons are comfortable to use.			
20. During puberty, boys and girls sweat more.			
21. Spontaneous erections can occur in boys for no reason.			
22. A girl could become pregnant before she has her first period.			
23. A small amount of whitish vaginal discharge in females is normal.			
24. All females have a menstrual cycle that lasts 28 days.			
25. Men cannot release semen and urine at the same time.			

Adapted from Reproduction, p. 35 *Tambrands Teaching Guide to Puberty and Menstrual Health*



INTRODUCING TERRY.....

Instructions: Read through the following passage. In your group, complete the questions that follow.

Hi! I’m Terry. Do you ever feel like I do? I feel like my whole body is changing. Sometimes, I think an alien has taken over mine. It seems that every day brings a new change.

One of the things that I notice is that none of my clothes seem to fit for very long. My jeans are too short (or my legs are too long 😊). My T-shirts are too tight. Even my feet seem to grow a size every six months. I kind of like being bigger, though. My parents say that I’ll be taller than they are.

I’m not sure how I feel about some of the changes. For example, I have hair in places I’ve never had hair before. I think that I’ll need to start shaving. And there’s someone in my class that I really like. Whenever we’re close, I get kind of nervous, and then I start to blush. What a klutz!

Some of the changes are just embarrassing. I worry about body odor, even though I shower and use deodorant every day. And then, there’s the subject of pimples. Well, we all know about them. Just when you’re getting ready to go someplace important, and you know that that ‘someone’ will be there, a pimple appears. The timing couldn’t be worse!

Sometimes I wonder what will happen next. I realize that I’m becoming an adult, and I do feel more grown up than I did a couple of years ago. Everyone seems to survive puberty. I guess that I will too. In fact, I am kinds of looking forward to seeing what will happen next.

QUESTIONS:

1. In your small group, decide whether Terry is a boy or a girl. Give a reason for your choice.

2. Using the poster paper and marker provided to you by your teacher, make a list of some of the changes that occur during puberty. Organize the changes in a chart with the following headings:

Changes	Could Only Happen to Boys	Could Only Happen to Girls	Could Happen to Both
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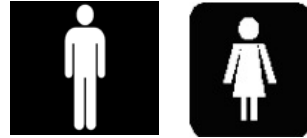
Adapted from *Introducing Terry*, p. 36 *Tambrands Teaching Guide to Puberty and Menstrual Health*



Name: _____ Date: _____ Period: _____

Reproduction in Males and Females

All About Males



As boys grow and develop into men, their bodies go through some very important changes. During this stage of growth, called puberty, changes occur on the inside of the body as well as on the outside. It is the **pituitary gland** that causes these changes to occur.

When the pituitary gland produces new hormones, these hormones cause the testicles and other endocrine glands to become more active. The testicles, or testes, begin to manufacture the sperm cells that are necessary to fertilize a female egg cell. Boys normally begin puberty a year or two later than girls.

What else do you know about the changes that boys experience as they grow into men? Below are a series of statements about male hormones, the changes that they cause during puberty, the importance of hygiene and some common myths about male sexuality. Find out how much you know about these topics by putting a check in the appropriate box.

	TRUE	FALSE	DON'T KNOW
1. Sperm and semen are the same thing.			
2. The hormone testosterone causes a boy's voice to deepen.			
3. The hormone testosterone causes hair to grow on the body, face and pubic area.			
4. The testicles are very delicate and should be supported during sports activities.			
5. The 'shrinking' of testicles in cold water is not a cause for concern.			
6. An erection occurs when blood vessels in the penis are filled with an extra supply of blood.			
7. A boy's breasts can get bigger and become sore during puberty.			
8. Men usually stop producing semen when they are around 60 years old.			
9. Boys who have pimples or acne have more male hormones than other boys.			
10. During puberty, a boy's shoulders broaden and he begins to grow taller.			
11. Circumcision is an operation that removes the foreskin of the penis.			
12. Nocturnal emissions ('wet dreams') are caused by eating too much fried food.			
13. The size of a boy's penis determines how masculine he will be.			
14. Sexual excitement can cause body odor.			
15. The voice deepens when the larynx (voice box) gets larger and the vocal cords get longer.			
16. Boys continue to grow until they are 20 years old.			
17. At puberty, a boy is capable of becoming a father.			

In boys, puberty usually occurs between the ages of 10 and 16. The changes that occur include an increase in growth, broadening of the shoulders, deepening of the voice, growth of facial and body hair and development of the reproductive organs. At this time, the male becomes capable of reproduction.

Read the description of each reproductive organ below. Using the information from each description:

1. Label the diagram with the names of the reproductive organs.
2. Complete the matching section.

MALE REPRODUCTIVE ORGANS

Pituitary gland: This gland, controlled by the hypothalamus, is located at the base of the brain. It produces growth and reproduction hormones. One of these hormones causes the testes to produce sperm.

Testes or testicles: Two glands that produce the male reproductive cells or sperm. Sperm cells are necessary to fertilize a female egg cell.

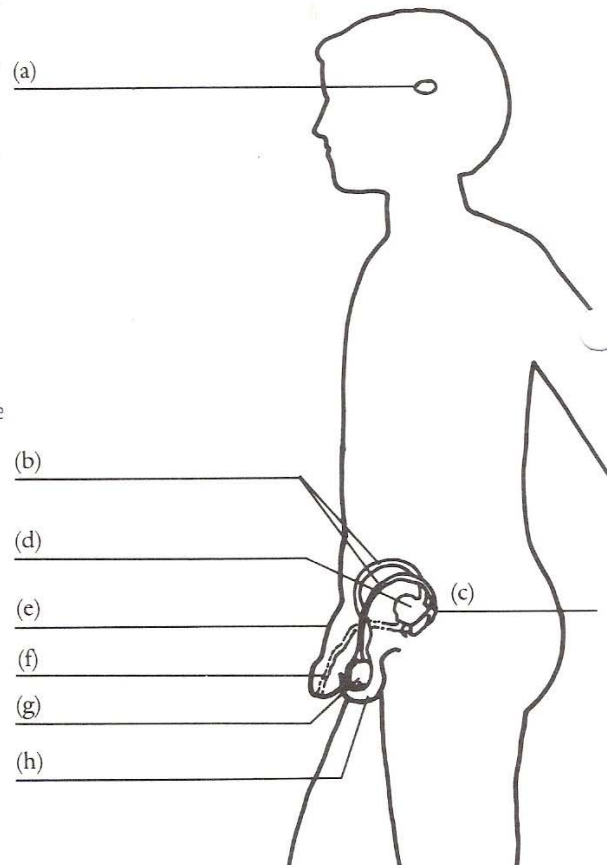
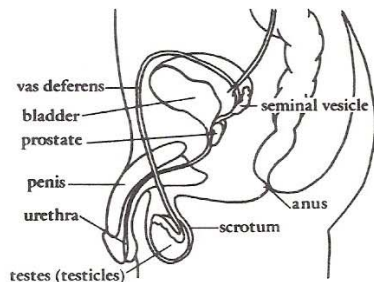
Scrotum: Soft external sac containing the testes.

Vas deferens: Narrow tubes that carry sperm from the testes to the seminal vesicles.

Prostate: A gland which produces a fluid that becomes part of the semen.

Urethra: A narrow tube that runs from the bladder through the penis. This provides a passageway to the outside of the body for urine or semen.

Penis: External male organ through which semen or urine leaves the body.



- _____ Pituitary Gland
- _____ Hypothalamus
- _____ Scrotum
- _____ Prostate
- _____ Testes (testicles)
- _____ Urethra
- _____ Penis
- _____ Vas deferens
- _____ Semen
- _____ Seminal Vesicles

1. Hormone-producing gland located at the base of the brain.
2. External sac holding testes.
3. Sperm-producing glands.
4. Narrow tubes that carry sperm from testes.
5. A fluid producing gland.
6. Narrow tube through which urine or semen pass through the penis.
7. Organ through which semen or urine leaves the body.
8. A thick fluid containing sperm.
9. Area of the brain that controls the pituitary gland.
10. Two sacs that produce a thick fluid that carries the sperm.

All About Females



In girls, puberty usually occurs between the ages of 9 and 16. Changes that occur include an increase in growth, broadening of the hips, breast development, growth of pubic and underarm hair, and the development of the reproductive organs. At this time, the female body becomes capable of reproduction. The menstrual cycle begins at this time.

Read the description of each reproductive organ below. Using the information from each description:

1. Label the diagram with the names of the reproductive organs.
2. Complete the matching section.

FEMALE REPRODUCTIVE ORGANS

Pituitary gland: This gland, controlled by the hypothalamus, is located at the base of the brain and produces hormones related to growth and reproduction. One of these hormones causes an egg to ripen in an ovary.

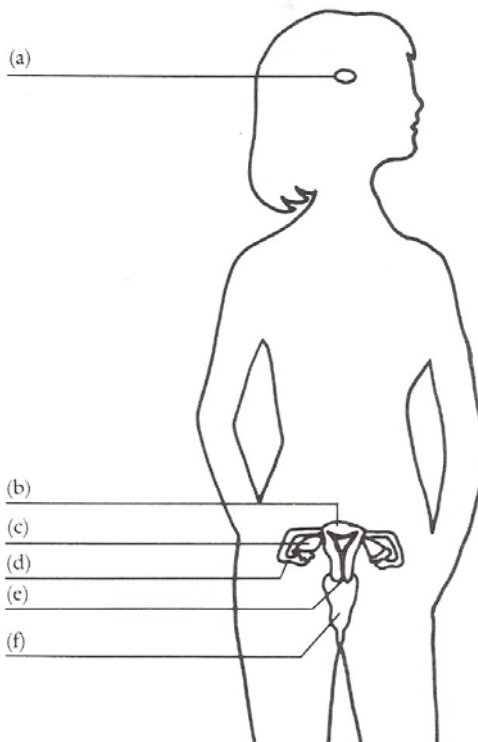
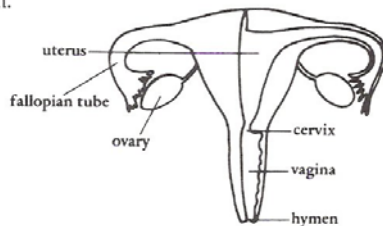
Ovaries: Two glands that contain thousands of immature egg cells or ova. Each month an egg or ovum ripens and breaks out of its sac, a process called ovulation.

Fallopian tubes: Two tubes attached on either side of the uterus through which the ripened egg travels toward the uterus.

Uterus: The organ in which a fertilized egg can develop into a baby. It has a lining called the endometrium. If the ripened egg is not fertilized, the lining of the uterus is shed. This is called menstruation.

Cervix: The lower portion of the uterus which protrudes into the vagina.

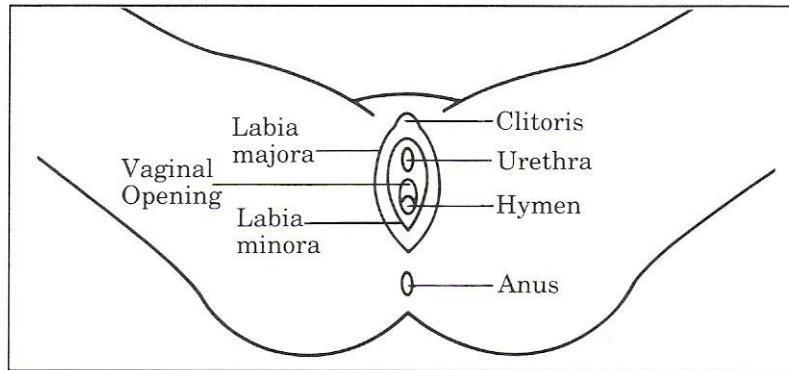
Vagina: The passageway from the uterus to the outside of the body through which the menstrual flow leaves the body. The opening to the vagina is covered by delicate folds of skin and may be partially covered by a flexible fold of tissue called the hymen.



- _____ Endometrium
- _____ Uterus
- _____ Ovary
- _____ Vagina
- _____ Menstruation
- _____ Fallopian tube
- _____ Pituitary gland
- _____ Hymen
- _____ Hypothalamus
- _____ Cervix

1. Hormone-producing gland located at the base of the brain.
2. Egg-producing gland.
3. Tube through which egg or ovum travels to the uterus.
4. Organ within which a baby can develop.
5. The lining of the uterus.
6. Passageway through which menstrual flow leaves the body.
7. Periodic shedding of the lining of the uterus.
8. Flexible fold of tissue at entrance of the vagina.
9. Lower portion of the uterus which protrudes into the vagina.
10. Controls the pituitary gland.

The external female reproductive organs



Research the function of each of the following parts, as shown in the diagram above:

- labia majora (outer lips) –
- labia minora (inner lips) –
- clitoris –
- hymen –
- urethra –
- anus –



The Female Menstrual Cycle

Fact or Fallacy?

How much do you know about the female menstrual cycle? Place a T for true or an F for false after each of the following statements.

1. Girls are often sick during their period.
2. Females are born with unripened eggs in their ovaries.
3. Girls should avoid sports when they're menstruating.
4. If a woman misses her period, she is pregnant.
5. A girl cannot get pregnant if she only has sex once in a while.
6. Girls shouldn't use tampons during their first periods.
7. Girls cannot get pregnant if they have sex while they are menstruating.

8. Girls cannot go swimming while they have their period.
9. It is only possible for one egg to be fertilized at a time in a woman’s body.
10. Ovulation is the time of the month when the egg is released to be fertilized by sperm.

A Closer Look at a Female’s Cycle

One of the signs that a female’s reproductive system is beginning to function is her first period. ‘Getting your period,’ or **menstruation** is only one phase of the menstrual cycle. It is the whole process that prepares the female body for a potential pregnancy. A male is capable of fathering a child at any time (from puberty on), but a female is only likely to become pregnant at certain times during her menstrual cycle.

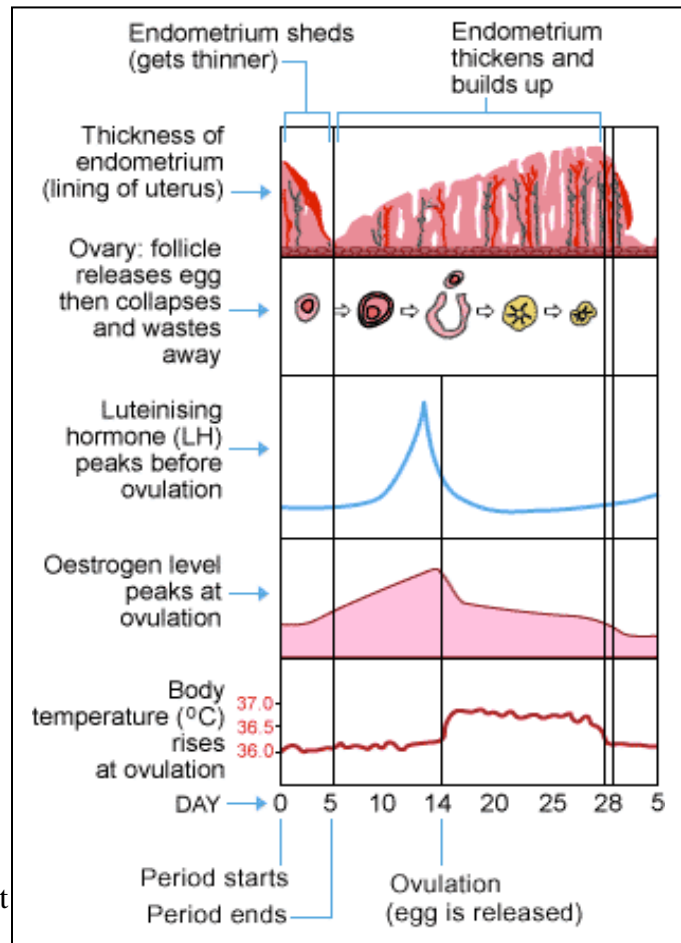
The length of a female’s menstrual cycle is counted from the first day of her period (this is day 0) to the day before the next period begins. The average cycle last about 28 days, but normal cycles can vary from 19 to 35 days. Each period can range from 3 to 7 days. It is common for young girls to have irregular cycles for the first few years following the onset of menstruation.

During each menstrual cycle, the body will respond to four different hormones produced by endocrine glands in the body. These hormones – **estrogen, progesterone, follicle-stimulating hormone (FSH)** and **luteinizing hormone (LH)**, prepare female’s body for the possibility of pregnancy.

The diagram to the right shows changes in body during menstruation. Use the diagram and the information that you have just read to answer the following questions:

1. What event marks the beginning of a female’s menstrual cycle?

2. In the menstrual cycle shown at the right, how long does the female’s menstruation last? _____
3. As the cycle continues, the endometrium, or lining of the uterus, thickens. Why do you think that this happens?



Review the list of the four hormones involved in the menstrual cycle. Which one do you think causes the follicle to develop?

5. When **ovulation** occurs, the egg is released into the oviduct, or fallopian tube. If sperm are present here at this time, the egg could be fertilized. In the 28 day cycle shown above, when does ovulation occur? _____

6. Sometimes when a woman is trying to get pregnant, she will use an ovulation test to determine if she is ovulating or is going to ovulation soon. One of the tests that is readily available at a pharmacy is a stick that is urinated on and detects the presence of one of the hormones in the urine. Which hormone is tested for? (hint: it is not estrogen)

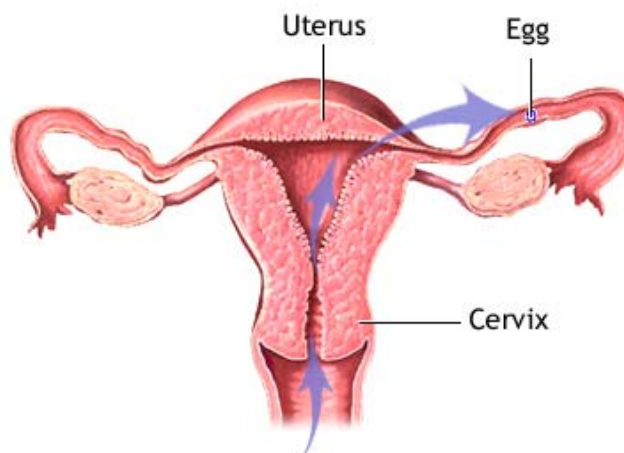
7. What else might a woman measure if she wants to know if she is ovulating?

When Sperm and Egg Meet



The joining of the sperm and the egg is called **fertilization** or **conception**. This marks the beginning of a pregnancy. A female egg (ovum) is fertilized when it comes in contact with a male sperm cell. The egg can be fertilized only 6 to 24 hours after ovulation. However, sperm can remain in the female body for up to 7 days! Having intercourse days before or after ovulation can therefore still result in pregnancy.

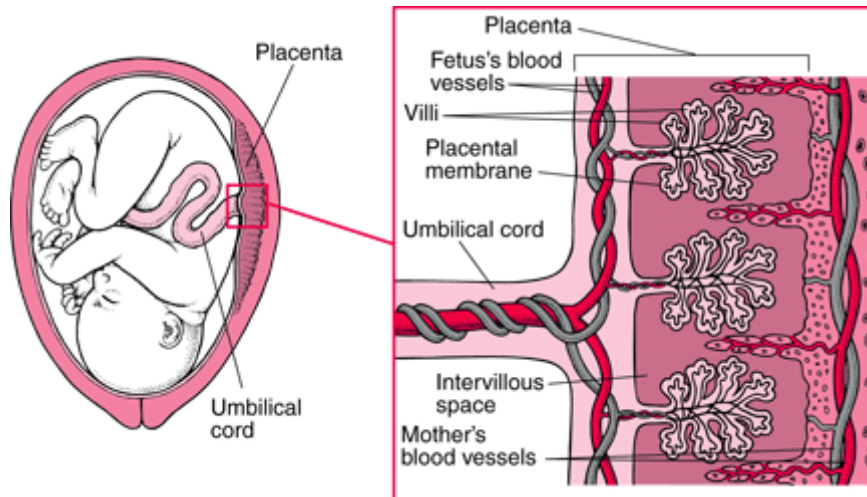
During intercourse, millions of sperm are ejaculated into the vagina, passing through the tiny opening in the cervix and into the uterus. From there, the sperm move into the oviducts, or fallopian tubes, where fertilization takes place.



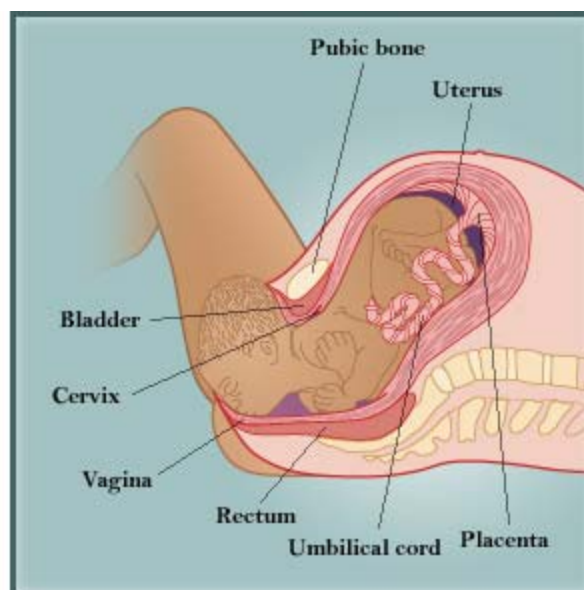
Sperm travels through cervix into uterus searching for egg to fertilize

To fertilize an egg, a sperm cell penetrates the egg and its genetic material reaches the nucleus of the cell. The two cells unite, each contributing half the genetic material (DNA) to the offspring that will develop.

The fertilized egg will now move through the fallopian tube into the uterus of the female. On the way, the cell divides many times. When it reaches the uterus, the fertilized egg will attach to the uterine wall. From this point forward in the pregnancy, menstruation, or shedding of the uterine wall, will not occur. The fertilized egg becomes implanted in the uterine wall and begins to develop into an **embryo** (term used for 2nd to 8th week of development) and then into a **fetus** (term used from the 3rd month of development until birth). After the first two weeks, a **placenta** develops to provide nourishment for the fetus. This organ is attached to the wall of the uterus and connects to the fetus via the **umbilical cord**.



A normal pregnancy lasts for 38 -40 weeks from fertilization (over 9 months). During this time, as the baby develops, the uterus expands to many times its original size. At birth, the strong muscles of the uterus contract and send the infant through the cervix and vagina and out of the woman's body. The opening to the cervix expands to 10 cm at this time to allow the baby through. After the baby is born, the **afterbirth** is delivered. This consists of the placenta and the amnion (the membrane around the baby that holds the fluid to cushion him/her).





Use the information above to answer the following questions:

1. Where in the female body does the sperm meet the egg? _____
2. Where does the fertilized egg implant? _____
3. What is the function of the placenta? _____

4. Examine the picture of the placenta of a pregnant female. While a woman is pregnant, does the blood of the mother and child mix? _____
5. a) What is the afterbirth? _____

- b) What do you think could happen if the afterbirth did not leave the mother's body?

Adapted from *Tambrands Teaching Guide to Puberty and Menstrual Health*



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Name: _____ Date: _____ Period: _____

QUIZ – Human Reproduction**PART 1 – Multiple Choice** – Circle the correct answer.

1. What is the soft sac that holds the testes called?
a) penis b) scrotum c) prostate gland d) seminal vesicle
2. Normally, when a woman becomes pregnant, where does the baby develop?
a) uterus or womb b) ovary c) fallopian tube or oviduct d) cervix
3. When fertilization takes place, where do the sperm and egg meet?
a) uterus or womb b) ovary c) fallopian tube or oviduct d) cervix
4. The _____ is a flexible fold of tissue at the entrance to the vagina.
a) hymen b) cervix c) fallopian tube or oviduct d) scrotum
5. What is the male organ through which semen or urine exits the body?
a) penis b) scrotum c) prostate gland d) seminal vesicle
6. In a female's menstrual cycle, what event marks day 0 of the cycle?
a) ovulation b) a peak in body temperature c) menstruation
7. In a female's menstrual cycle, why does the lining of the uterus thicken?
a) So that there is enough tissue present to make an egg.
b) To cushion the egg and sperm as they meet in the fallopian tubes.
c) To prepare for a possible pregnancy.
8. The _____ is an organ that develops in a pregnant woman and is the place where food, wastes and gases are exchanged between the mother and the baby.
a) placenta b) uterus c) clitoris d) labium majora
9. Which of the following is NOT one of the four main hormones of the menstrual cycle?
a) progesterone b) follicle stimulating hormone
c) luteinizing hormone d) testosterone
10. Ovulation, the release of the egg, takes place on approximately day _____ of a 28 day menstrual cycle. If sperm is present at this time, the egg will be fertilized.
a) 0 b) 5 c) 14 d) 28

LESSON 4.3 - DEVELOPMENT OF THE EMBRYO

Overview:

In a lab activity, students observe a chicken egg at various stages of development, determine the function of the extraembryonic membranes and draw connections between the development of a chicken embryo and a human embryo. This investigation is completed with either fertilized eggs or in an online activity.

Suggested Timeline: 1.5 hours

Materials:

- Investigating the Development of the Embryo – Using Fertilized Chicken Eggs (Student Handout)
- If egg dissection activity is chosen:

fertilized egg (not incubated)	dissecting scissors
fertilized egg (60 hours)	forceps
fertilized egg (120 hours)	fingerbowl
cotton	dissecting microscope
eyedropper	
- Investigating the Development of the Embryo - Using Online Resources (Student Handout)
- student access to online computers

Method:

1. **Key Q:** Has anyone ever found a blood spot in a chicken egg bought at the store? What is the blood spot?
 - Explain to students that the blood spot is actually due to the rupturing of a blood vessel when the egg is being formed inside of the chicken. These are NOT fertilized eggs and are fine to eat.
2. Tell students that today they are going to have the opportunity to examine the parts of fertilized chicken eggs and compare these to parts found in human embryos.
3. If fertilized chicken eggs are available, have students complete ‘Investigating the Development of the Embryo – Using Fertilized Chicken Eggs’ (Student Handout). Students may need instruction on the use of the dissecting microscope before they begin.
4. If fertilized chicken eggs are not available, have students complete ‘Investigating The Development of the Embryo – Using Online Resources’ (Student Handout).

Evaluation:

Student grade on lab

Name: _____ Partner(s): _____ Date: _____
Period: ____

Investigating the Development of the Embryo

Using Fertilized Chicken Eggs

VOCABULARY – 12 definitions x 0.5 mark/each = 6 marks

yolk –

blastodisc –

vitelline membrane –

albumen –

chalaza –

air space –

somite –

amnion –

allantois –

shell –

chorion –

neural tube -



Purpose:

1. To observe a chicken egg at various stages of development.
2. To determine the function of the extraembryonic membranes of the chicken.
3. To make connections between the chicken embryo and a human embryo.

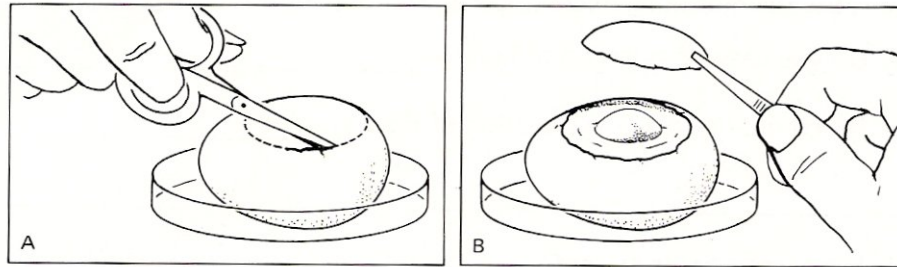
Materials:

fertilized egg (not incubated)	dissecting scissors	eyedropper
fertilized egg (60 hours)	forceps	access to online resources
fertilized egg (120 hours)	fingerbowl	
cotton	dissecting microscope	

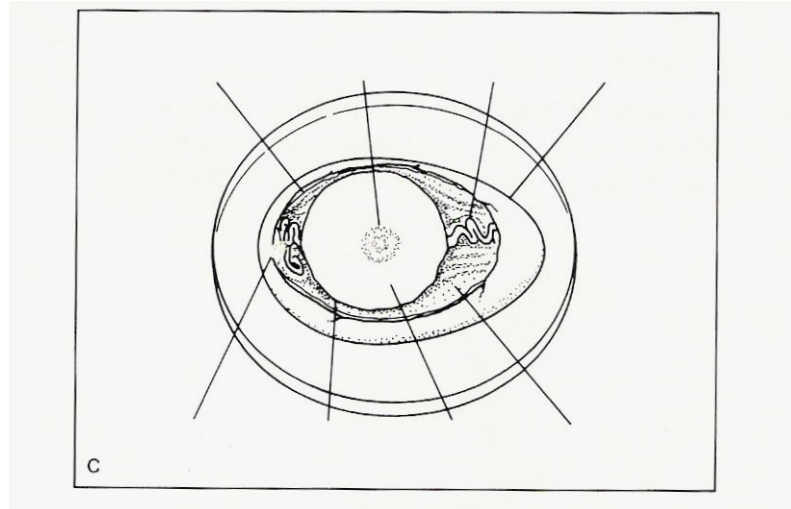
Procedure and Observations:

PART 1 – The Unincubated Fertile Egg

1. Place some cotton in a fingerbowl and place an unincubated egg on the cotton so that the egg is held in position. Open the egg with your forceps and scissors, as is shown in figures A and B below. This will allow you to see inside.



2. Observe the large, yellow **yolk** which contains stored food for the developing embryo. On the upper surface of the yolk, observe a red **blood spot**. This locates the position of the embryo which can be seen as a small white spot.
3. The area where the embryo develops is called the **blastodisc**. Examine the blastodisc with the dissecting microscope. A group of cells will spread out from this area as the embryo grows. The membrane that surrounds the yolk and the developing embryo is the **vitelline membrane**.
4. Locate the ‘white’ of the egg. This is composed of **albumen**. Notice that the albumen forms a tough cord on each side of the yolk. This is called the **chalaza**.
5. Locate the **air space** on the blunt end of the egg. At the air space, you can identify the **shell membrane** and the **inner egg membrane**.
6. On figure C, label the following structures: shell, shell membrane, air space, chalaza, albumen, vitelline membrane, yolk, blastodisc



8 labels x 0.5 mark/each = 4 marks

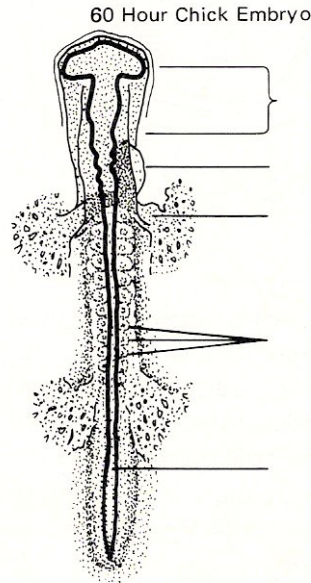
PART 2 – The 60 – Hour Incubated Egg

1. Place a 60 hour incubated chicken egg on a cotton bed in a fingerbowl. As before, cut and remove a portion of the shell so that you can see inside. Remove some of the fluid albumen with an eye dropper so the embryo can be clearly seen. Look at how the embryo is positioned with respect to the blastodisc. How does this compare to what you saw in part 1? – **1 mark**

2. Use the dissecting microscope to examine the embryo.
 - a) Do you see any evidence of blood? - **1 mark** _____
 - b) If you do, describe the direction in which the blood is flowing. – **1 mark**

- c) Is a beating heart present? - **1 mark** _____
 - d) Can you identify a head? – **1 mark** _____

3. Identify the following structures and label them in the figure below:
 - developing brain
 - neural tube (the developing spinal cord)
 - somites (paired sections of developing muscle tissue)
 - heart
 - blood vessels



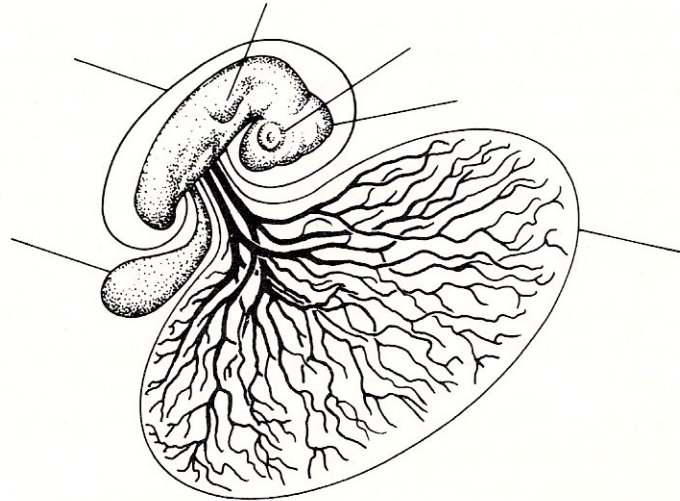
5 marks x 0.5 mark/ea = 2.5 marks

PART 3 – The 120 – Hour Incubated Egg

1. Place a 120-hour incubated chicken egg on a cotton bed in a fingerbowl. Open it carefully as before and draw some of the fluid albumen out with the eye dropper.
2. Find the clear membrane, the **amnion** that covers the embryo. It forms a fluid sac called the **amniotic sac**. What is the function of the amniotic sac? – **1 mark**

3. Another membrane grows from the embryo and surrounds the yolk. Recall that the yolk contains food for the growing embryo. The membrane that is the **yolk sac**.
4. Find the small sac at the hind end of the embryo. This is the **allantois**. As development progresses, this will spread out until it lines the entire shell. What is the function of the allantois? – **1 mark**

5. Carefully lift up the amnion with the forceps and cut it with the scissors to free the embryo. Examine the embryo with the dissecting microscope. Using what you see, label the following structures on the figure below: brain, eye, limb buds, amnion, yolk sac, allantois



6 labels x 0.5 mark/ea = 3 marks

Analysis Questions:

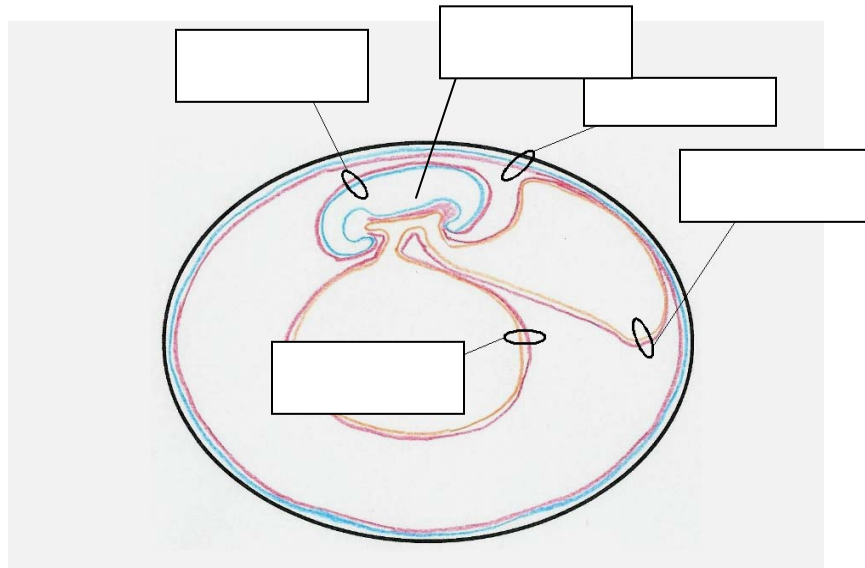
1. List two ways in which a 120-hour incubated chicken embryo differs from a 60-hour incubated chicken embryo. – **2 marks**

2. When they are developing, all land-based animals have membranes that surround the embryo. That includes humans! The extraembryonic membranes, as they are called, are adaptations that protect the embryo, prevent it from drying out and enable it to obtain food and oxygen and eliminate waste.
 - a) As you know, human embryos develop inside of their mother, whereas chicken embryos develop outside of the mother's body. What structure do chicken embryos have around them that human embryos do not? - **1 mark** _____
 - b) Both embryos are surrounded by a sac that surrounds the embryo and is filled with fluid. What is this sac called? – **1 mark** _____
 - c) Both chicken and human embryos have a yolk sac, but the amount of yolk in a chicken egg is much greater than that found by the human embryo. Explain why this is so. – **2 marks**

3. Match each term in the left column to the statement to which it is best suited. You may use a term more than once and some terms may not be used at all. **9 marks**

- | | |
|-------------------|---|
| a) air space | _____ grows from the digestive tract and surrounds yolk |
| b) allantois | _____ form the muscles |
| c) amnion | _____ secreted by membrane and encloses embryo |
| d) amniotic fluid | _____ grows from digestive tract of embryo and functions in respiration and waste removal |
| e) blastodisc | _____ holds yolk and developing embryo in centre of egg |
| f) chalaza | _____ prevents water loss but allows gas exchange |
| g) chorion | _____ contains network of blood vessels and absorbs yolk |
| h) neural tube | _____ forms the spinal cord and brain |
| i) shell | _____ rapidly dividing cells forming a plate at the surface |
| j) somites | _____ of the yolk |
| j) yolk sac | |

4. Label the following diagram of the extraembryonic membranes of a human with the following terms: amnion, chorion, allantois, yolk sac, embryo



5 labels x 0.5 mark/ea = 2.5 marks

Adapted from *How Does an Embryo Develop?*, pp. 293-296 *Biology Investigations*

Name: _____ Partner(s): _____ Date: _____
Period: ____

Investigating the Development of the Embryo Using Online Resources

VOCABULARY – 12 definitions x 0.5 mark/each = 6 marks

yolk –

blastodisc –

vitelline membrane –

albumen –

chalaza –

air space –

somite –

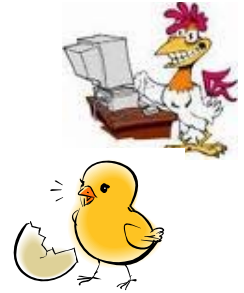
amnion –

allantois –

shell –

chorion –

neural tube -





Purpose:

1. To observe a chicken egg at various stages of development.
2. To determine the function of the extraembryonic membranes of the chicken.
3. To make connections between the chicken embryo and a human embryo.

PART 1 – The Fertilized Unincubated Egg

Access the following website: <http://chickscope.beckman.uiuc.edu/explore/embryology/>
Click on ‘Day 1: The Journey Begins’. Read the information and click on the images to find the answers to the following questions.

1. The **yolk** is the yellow part of the egg. A membrane surrounds the yolk and developing embryo and is called the **vitelline membrane**. What is the function of the yolk in an egg? – **1 mark**

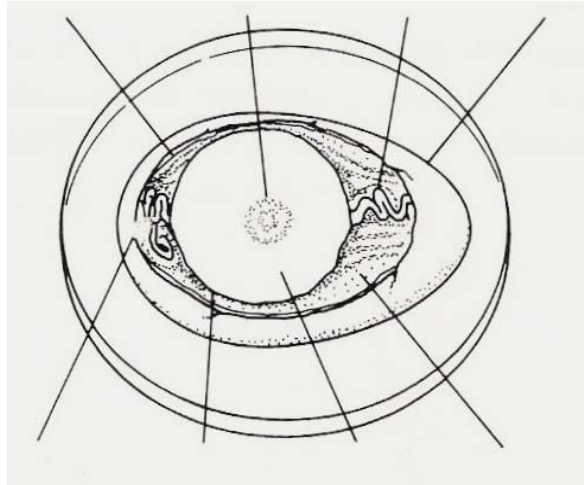
2. What is the difference between a fertilized and an unfertilized egg? – **1 mark**

3. What is the **blastoderm**, or blastodisc, in a fertilized egg? – **1 mark**

4. Note the tough white cord that is attached to the yolk, called the **chalaza**. What is its function? **1 mark**

5. Click on the black and white MRI of the egg on day 1. Examine the image of the **albumen** of the egg. This is the white of the egg and surrounds the yolk. Note the **air space** on the blunt end of the egg. Sometimes when you peel a hard-boiled egg, you can see the **shell membrane** attached to the shell and the **inner egg membrane** clinging to the white of the egg.

6. Label the diagram with the following terms: shell, shell membrane, air space, chalaza, albumen, vitelline membrane, yolk, blastodisc

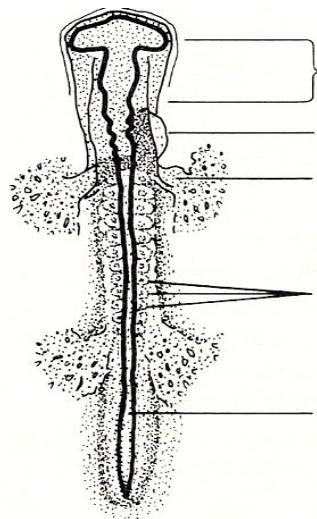


8 labels x 0.5 mark/each = 4 marks

PART 2 – The Incubated Egg on Day 2

Click on ‘Day 2 – The Heart of the Matter’. Read the information in this section to answer the following questions.

1. At this time, blood vessels can be seen on the surface of the yolk. What name are these blood vessels given? – **1 mark** _____
2. Find the images of whole embryos mounted on slides and viewed under a light microscope. On the diagram below, label: developing brain, heart, neural tube (the developing spinal cord), blood vessels, somites (the paired sections of developing muscle tissue)



5 labels x 0.5 mark/each = 2.5 marks



3. a) What are TWO ways in which the chicken's heart is like a human heart? – **2 marks**

b) What is ONE way in which the heart of a chicken is different from that of a human? – **1 mark**

PART 3 – The Incubated Egg on Day 10

Click on Day 10 – Egg Chemistry. Read the information in this section to answer the following question.

1. List TWO of the key events that occur on this day. – **2 marks**

2. Why is it difficult to get clear images of a live embryo within the egg at this time? – **1 mark**

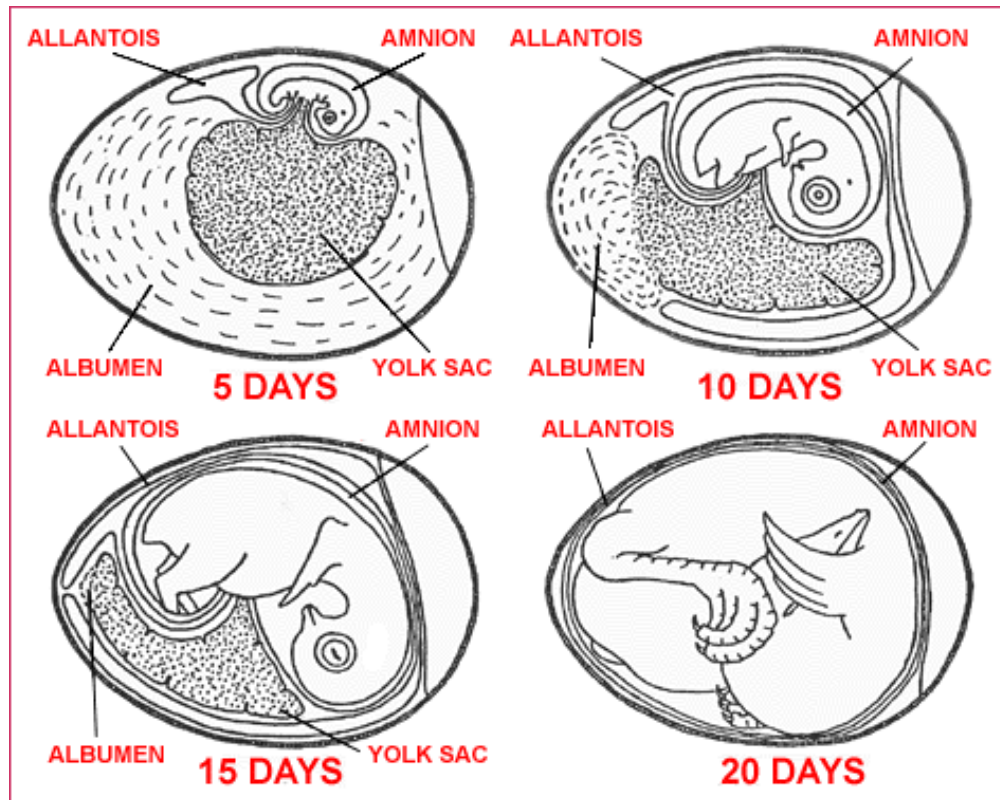
3. In the MRI photos on the website, it is evident that a clear membrane, the **amnion**, covers the embryo. It forms a fluid sac called the **amniotic sac**. What is the function of this sac? – **1 mark**

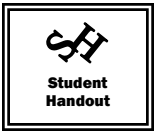
4. Another membrane grows from the embryo and surrounds the yolk. This is the **yolk sac**.
a) As the embryo grows, what happens to the size of the yolk sac? – **1 mark**

b) Why does this occur? – **1 mark**

5. As can be seen in the series of diagrams below, there is a small sac found at the hind end of the embryo called the **allantois**. As development progresses, it spreads to line the entire shell.

What is the function of the allantois? – **1 mark** _____





Part 4 - Putting it All Together

Test what you have learned by matching the term in the left column to the statement to which it is best suited. You may use a term more than once, and some you may not use at all.

1. Match each term in the left column to the statement to which it is best suited. You may use a term more than once and some terms may not be used at all. **9 marks**

- | | |
|-------------------|---|
| a. air space | _____ grows from the digestive tract and surrounds yolk |
| b. allantois | _____ form the muscles |
| c. amnion | _____ secreted by membrane and encloses embryo |
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| h. neural tube | _____ forms the spinal cord and brain |
| i. shell | _____ rapidly dividing cells forming a plate at the surface |
| j. somites | _____ of the yolk. |
| k. yolk sac | |

2. When they are developing, all land-based animals have membranes that surround the embryo. That includes humans. The extraembryonic membranes, as they are called, are adaptations that protect the embryo, prevent it from drying out and enable it to obtain food and oxygen and eliminate waste.

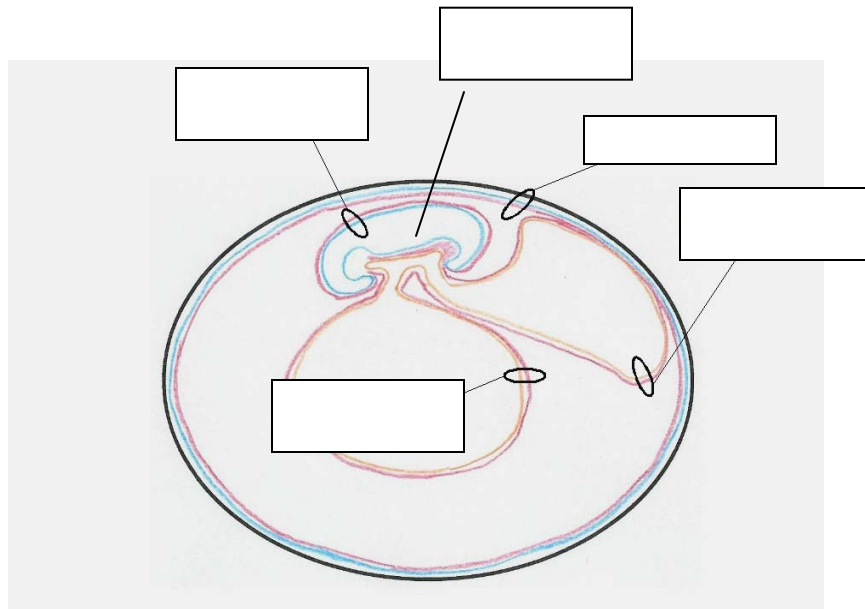
a) As you know, human embryos develop inside of their mother, whereas chicken embryos develop outside of the mother’s body. What structure do chicken embryos have around them that human embryos do not? - **1 mark** _____

b) Both embryos are surrounded by a sac that surrounds the embryo and is filled with fluid.

What is this sac called? – **1 mark** _____

c) Both chicken and human embryos have a yolk sac, but the amount of yolk in a chicken egg is much greater than that found by the human embryo. Explain why this is so. – **2 marks**

Label the following diagram of the extraembryonic membranes of a human with the following terms: amnion, chorion, allantois, yolk sac, embryo



5 labels x 0.5 mark/ea = 2.5 marks

Adapted from *How Does an Embryo Develop?*, pp. 293-296 *Biology Investigations*