

Turkey Reproduction

Core Area: Animal Science

Unit: Poultry Industry

Lesson # 4: Turkey Reproduction

California CTE Standards (Agriculture):

D3.1 Understand the major physiological systems and the function of the organs within each system.

D4.1 Understand animal conception.

D4.2 Understand the gestation process and basic fetal development.

D4.4 Understand the role of artificial insemination and embryo transfer in animal agriculture.

D4.5 Understand commonly used animal production breeding systems and reasons for their use.

FS 4.2 Understand the use of technological resources to access, manipulate, and produce information, products, and services.

FS 4.6 Differentiate among, select, and apply appropriate tools and technology.

FS 5.3 Use critical thinking skills to make informed decisions and solve problems.

FS 7.6 Know how to apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.

FS 9.3 Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.

FS 11.0 Demonstration and Application.

California Academic Standards.

Life Sciences

2a Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.

2d Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).

Investigation and Experimentation

1a Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

1m Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings.

1.0 Writing Strategies 9/10

1.3 Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

2.6a Write technical documents that report information and convey ideas logically and correctly.

1.0 Listening and Speaking Strategies 9/10

2.2a Deliver expository presentations that marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Identify and describe the parts and functions of the reproductive system of a hen and a tom.
2. Compare and contrast two methods of breeding used in turkey production.
3. Describe the stages of embryonic development in turkeys.

List of Resources. The following resources may be useful in teaching this lesson:

1. Bearden, H. Joe. Applied Animal Reproduction. Sixth ed. Upper Saddle River, N.J: Prentice Hall, 2004.
2. Oklahoma State University Poultry – <http://www.ansi.okstate.edu/poultry/turkeys/>
3. American Poultry Association – <http://www.amerpoultryassn.com/>

List of Equipment, Tools, Supplies, and Facilities.

- ✓ Female Turkey Reproductive Tract
- ✓ Male Reproductive Tract
- ✓ Incubator
- ✓ Fertile Turkey Eggs
- ✓ Egg Candler
- ✓ Computer and Data Projector
- ✓ Internet Connection
- ✓ Power Point Presentation
- ✓ Copies of Student Handouts
- ✓ Copies of Student Worksheets

Terms. The following terms are presented in this lesson (shown in bold italics):

- Artificial Insemination
- Cloaca
- Hen
- Infundibulum
- Isthmus
- Magnum
- Natural Mating

- Ovary
- Oviduct
- Reproductive System
- Testes
- Tom
- Uterus
- Vagina
- Candling
- Incubation

Interest Approach. Use an interest approach that will prepare the students for the lesson.

With the guidance from the instructor, have students discuss the pros and cons of using artificial insemination in the livestock and poultry industry. Discuss with students their level of familiarity with livestock species reproduction while making comparisons to poultry. After discussing some of the differences, introduce this lesson and explain the importance of understanding turkey reproduction and breeding as it relates to the industry.

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Identify and describe the parts and functions of the reproductive system of a hen and a tom.

Anticipated Problem: What are the parts of the female reproductive system in turkeys? What are the functions of those organs?

(Distribute Female Turkey Reproduction Student Note Sheet, refer to PowerPoint slides 3-12)

- I. Female turkeys, called hens, have a complex system of organs that make up the reproductive system. It is important that those interested in turkey production be familiar with these various organs and their functions.

(Distribute Female Turkey Reproductive Tract Worksheet, correct answers are on Slide 4)

- II. The reproductive tract of the hen is made up of two main parts:
 - a. Ovary
 - i. Only the left ovary and oviduct matures in these birds.
 - ii. The ovary begins to convert ova to egg yolks.
 - iii. Yolks are released from the ovary into the body cavity when they reach the correct size.
 - iv. Ovulated yolk is retrieved by the *infundibulum*, which is the first part of the **oviduct**.

- b. Oviduct
 - i. Has two major functions.
 - 1. Maintenance of fertility.
 - 2. Formation of the egg.
 - ii. Made up of six main parts and is in charge of egg formation.
 - iii. Main parts of the oviduct and their functions are:
 - 1. **Infundibulum** – funnel shaped, catches the released yolk or ovum after ovary releases it, fertilization occurs here.
 - 2. **Magnum**, which is the longest portion of the oviduct, produces bulk of albumen also known as the egg white.
 - 3. **Isthmus** – inner and outer shell membranes are secreted here.
 - 4. **Uterus** (Shell Gland) – adds the watery fluid to the albumen, chalazae is formed, egg shell is formed.
 - 5. **Vagina** – muscular tube through which egg is expelled, semen is stored here in deep tubule glands (semen can be stored for up to eight weeks). Duration of fertility varies depending on age of hen, semen quality, number of sperm cells inseminated. Sperm is released from the sperm storage tubule. As egg is laid, the sperm is aided by contraction of tract by squeezing and natural migration up to fertilize another egg. Sperm will also steadily be released without tract contractions.
 - 6. **Cloaca**/Vent – egg is expelled.

(Distribute Male Turkey Reproduction Student Note Sheet)

- III. The reproductive system in a male turkey, also called a tom, contains several interconnected parts that must all work together in order to have successful mating.

(Distribute Male Turkey Reproductive Tract Worksheet, correct answers are on Slide 8)

- IV. Some of the major organs found in the reproductive system of a tom are:
 - a. **Testes** – Inside the body and attached in the middle of the back, shaped like beans with a cream color in immature birds and white in mature birds; produces semen, which is a combination of spermatozoa and seminal plasma.
 - b. Sperm production increases when light increases (Spring).
 - c. Sperm production decreases when light decreases (Autumn).
 - d. Sperm is long, torpedo shaped.
 - e. Vas Deferens
 - i. Transports semen.
 - ii. Semen matures here.
 - iii. Storage of semen before ejaculation.
 - iv. Unejaculated semen is broken down and reabsorbed here.
 - f. Cloaca
 - i. End of the reproductive tract where the sperm exits the body of the tom.
 - g. Papilla of the ductus deferens
 - i. Organ that distributes semen onto the Phallus.

- ii. The phallus then puts the sperm onto the hen's reproductive tract. Organ in the wall of the cloaca that puts the sperm into the hen's reproductive tract into the inverted vagina.

Activity/Teacher Notes: Using a female reproductive tract, have students identify the major parts talked about in class. Have students label each part and explain what the major function is. If enough reproductive tracts are available, have students work in groups to dissect the tract to see how the parts are connected and what they look like inside.

Have students complete *Female and Male Turkey Reproductive Tract Worksheets* to help reinforce learning of the reproductive parts.

Objective 2: Compare and contrast two methods of breeding used in turkey production.

Anticipated Problem: What are the methods of breeding used in poultry production?

(Distribute Turkey Breeding Methods Student Note Sheet, refer to PowerPoint slides 11-15)

- I. There are two ways of breeding that can take place in the reproduction process for turkeys. They are natural mating and artificial insemination.
 - a. Natural mating
 - i. Peacocks aren't the only birds who use their fancy tails to attract a mate. Each spring male turkeys try to befriend as many females as possible. Male turkeys puff up their bodies and spread their tail feathers (just like a peacock). They grunt (make a "gobble gobble" sound) and strut about shaking their feathers. This fancy turkey trot helps the male attract females for mating.
 - ii. Male mates directly with female.
(Slide 14 has links to videos illustrating turkey behavior under natural mating conditions.)
 - b. Artificial insemination**
 - i. The process of collecting semen from the male and introducing it into the reproductive tract of the female. Placing of sperm cells in contact with female reproductive cells by a method other than natural mating.
 - ii. This is the current standard and almost exclusively used method of breeding in turkey production.

Activity/Teacher Notes: Have students debate the pro's and con's to each of these methods of breeding and why each method should be used. This activity could bring in information covered in animal welfare as well. Students will be required to research information on both sides of the argument and be prepared to debate for both sides. Select at random students to be on the Pro "Natural Mating/Anti Artificial Insemination" side of the debate and students to be on the Pro "Artificial Insemination/Anti Natural Mating" side of the debate.

Show students the following videos from youtube.com to illustrate the calls and strutting of a male turkey.

<http://www.youtube.com/watch?v=3Hpl0oGcx3o&feature=related>
<http://www.youtube.com/watch?v=frNeSUIR8ZI&feature=related>
<http://www.youtube.com/watch?v=l1NE3H6soBU&feature=related>
<http://www.youtube.com/watch?v=tiOMrg4PdKY&feature=related>

Objective 3: Describe the stages of embryonic development in turkeys.

Anticipated Problem: What are the stages of embryonic development in turkeys?

(Distribute Embryonic Development Student Note Sheet, refer to PowerPoint slides 16-22)

- I. Before egg laying
 - a. Fertilization occurs.
 - b. Division and growth of living cells.
 - c. Segregation of cells into groups of special functions (tissues).
- II. Between laying and incubation
 - a. No growth; stage of inactive embryonic life.
- III. During incubation
 - a. Day one – blastoderm resumes activity, which means cells will continue to grow and divide.
 - b. Day two – start of backbone; nervous system; head; blood islands: there is no heart yet, but a system of blood vessels is forming that lies on the yolk.
 - c. Day three – heart beats, blood vessels very visible.
 - d. Day four – start of tongue; continued development of spine and beak, eye pigmented.
 - e. Day five – development of legs, wings.
 - f. Day six – formation of reproductive organs and differentiation of sex, beak is barely visible, has all organs needed to sustain life.
 - g. Day seven – comb growth begins, egg tooth begins to appear.
 - h. Day eight – wing bent in elbow; ear passages visible.
 - i. Day ten – egg tooth prominent, toe nails visible.
 - j. Day twelve – lengthening of beak; feather germs more visible; eyelids start to grow over eyeball; ends of wings and legs getting longer.
 - k. Day sixteen – mostly feathered; scales on legs; external ear almost surrounded by feather germ; beak hardening.
 - l. Day twenty – beak, claws, and scales becoming firm and horny.
 - m. Day twenty-two – beak turns towards air cell.
 - n. Day twenty-four – eyes open and close; beak claps; starts to tuck; can sleep; vocal apparatus functional; yolk begins to be pulled into the body cavity.
 - o. Day twenty-six – break into air cell; begins to breathe; makes noise; pips egg; nostrils open; yolk sac should be completely drawn into body cavity; embryo occupies almost the entire egg except the air cell still not ready to hatch.
 - p. Day twenty-eight – hatching should occur.

Activity/Teacher Notes: Egg break out – Have 28 eggs (one from each day of incubation) for students to crack open as a group to see what goes on during each day of the incubation process. Incubated eggs should be put into the freezer prior to this activity to insure that the embryo is no longer living, but make sure that eggs do not become frozen. Allow students to break open each egg one at a time in order of development into a Petri dish. Have students describe and draw what they see in each stage of development. (See Teacher Resource – Hatching Eggs for tips on using an incubator.)

Egg candling – Set up an incubator in class prior to lesson. Place eggs inside incubator on different days to insure different stages of development. Have students candle each egg, draw or describe what they see and have them determine which stage the egg is at and approximately how long it has been in the incubator.

Review/Summary. Focus the review of the lesson around the student learning objectives. Ask students to explain the content associated with each objective. Use their responses as the basis for determining any areas that need to be covered again.

Application. Application can involve student activity with the provided labs.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as a written test. A sample test is attached.

Answers to Sample Test:

Part One: Matching

K	1. Papilla of the ductus deferens
F	2. Uterus
C	3. Oviduct
G	4. Vagina
I	5. Testis
A	6. Ovary
D	7. Magnum
J	8. Vas Deferens
E	9. Isthmus
H	10. Cloaca-female
L	11. Cloaca-male
B	12. Infundibulum

Part Two: T / F

- | | |
|------|-------|
| 1. T | 8. T |
| 2. F | 9. T |
| 3. T | 10. F |
| 4. F | 11. F |
| 5. T | 12. T |
| 6. T | 13. T |
| 7. F | 14. F |

Female Turkey Reproduction Student Note Sheet

Female turkeys, called _____, have a complex system of organs that make up the _____ system. It is important that those interested in turkey _____ be familiar with these various _____ and their _____.

The reproductive tract of the hen is made up of _____ main parts:

I. _____

- Only the _____ ovary and oviduct matures in these birds
- The ovary begins to convert _____ to egg _____
- Yolks are released from the _____ into the body cavity when they reach the correct size.
- Ovulated yolk is _____ by the infundibulum, which is the first part of the oviduct.

II. _____

- Made up of _____ main parts and is in charge of egg formation.
- Main parts of the Oviduct and their functions are:
 1. Infundibulum – _____ shaped, catches the released yolk or ovum after ovary releases it, fertilization occurs here.
 2. Magnum – _____ portion of the oviduct, produces bulk of albumen also known as the egg _____.
 3. Isthmus – inner and outer shell _____ are secreted here.
 4. Uterus (_____ Gland) – adds the watery fluid to the _____, chalazae is formed, egg shell is formed.
 5. Vagina – Muscular tube through which egg is _____, semen is stored here in deep tubule glands (semen can be stored from _____ days to _____ weeks), as egg is laid the sperm is squeezed into tract and migrate up to fertilize another egg.
 6. Cloaca (_____) – Egg is expelled.

Male Turkey Reproduction Student Note Sheet

The _____ system in a male turkey, also called a _____, contains several interconnected parts that must all work _____ in order to have successful mating.

Some of the major _____ found in the reproductive system of a tom are:

- Testes – _____ the body and attached in the middle of the back, shaped like _____ with a cream color in immature birds and white in mature birds, produces sperm.
 - Sperm production increases when light _____ (Spring)
 - Sperm production decreases when _____ decreases (Autumn)
 - Sperm is long, torpedo shaped
- Vas Deferens
 - _____ semen
 - semen matures here
 - storage of semen _____ ejaculation
 - unejaculated semen is broken down and reabsorbed here.
- Cloaca
 - end of the reproductive tract where the _____ exits the body of the tom
- Papilla
 - organ in the _____ of the cloaca that puts the sperm into the hen's reproductive tract.

Turkey Breeding Methods Student Note Sheet

- There are _____ ways of breeding that can take place in the reproduction process for turkeys. They are:
 - _____ Mating
 - Artificial _____

Natural Mating

- Peacocks aren't the only birds who use their fancy tails to _____ a mate.
 - Male turkeys puff up their bodies and spread their _____ feathers (just like a peacock).
 - They grunt, make a "gobble, gobble sound" and _____ about shaking their feathers.
 - This fancy turkey trot helps the male attract _____ for mating.
- Male mates _____ with female

Artificial Insemination

- The placing of _____ cells in contact with female reproductive cells by a method other than _____ mating.
- This is the _____ standard and almost exclusively used method of breeding in turkey _____.

Embryonic Development Student Note Sheet

Before Laying

- _____ occurs
- Division and growth of living cells
- Segregation of cells into groups of special functions (_____).

Between Laying and Incubation

- No growth
- Stage of _____ embryonic life

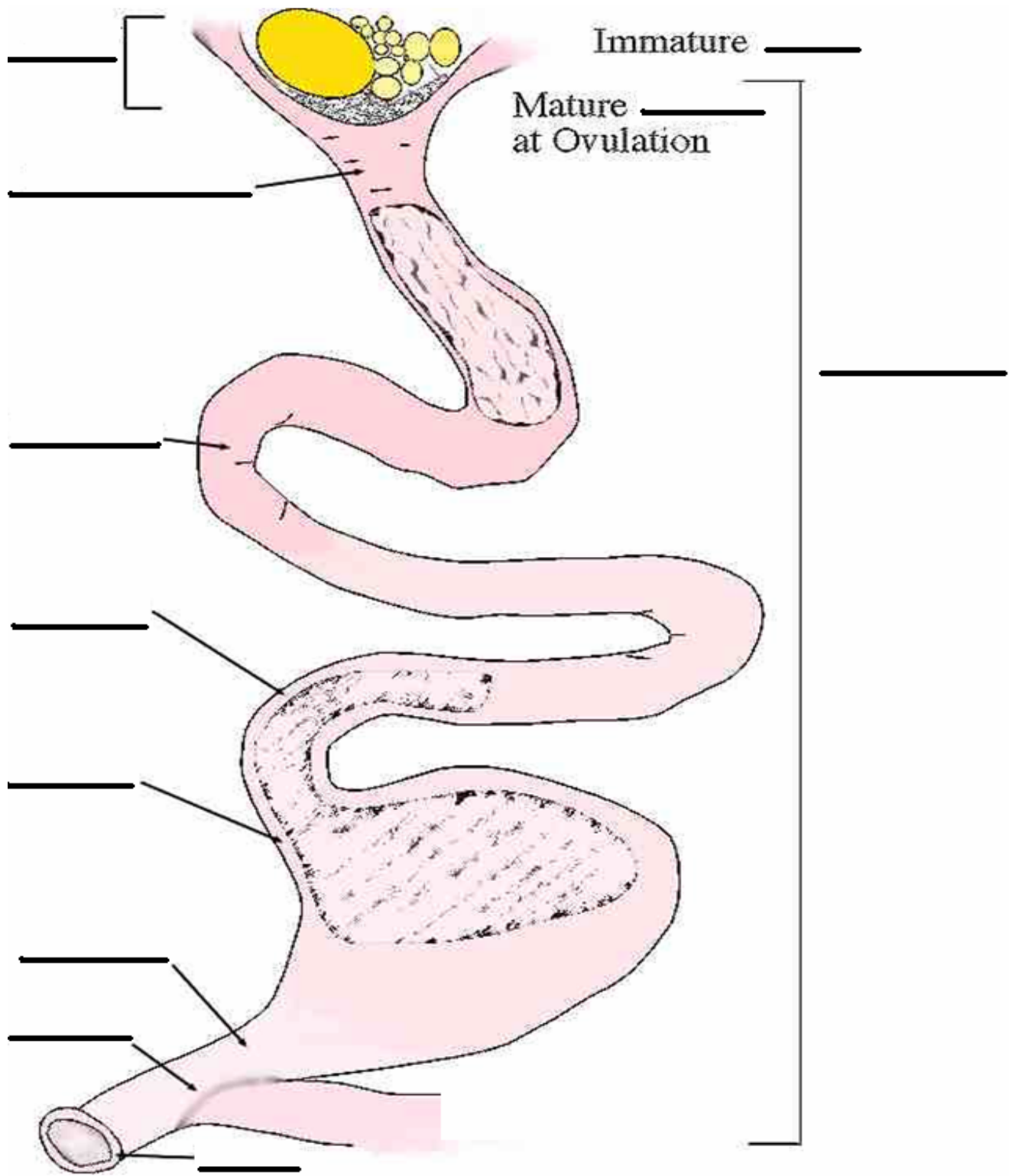
During Incubation

- Day one – blastoderm _____ activity, which means cells will continue to grow and divide.
- Day two – start of backbone; _____ system; head; blood islands: there is no heart yet, but a system of blood vessels is forming that lies on the yolk.
- Day three – _____ beats, blood vessels very visible.
- Day four – start of tongue; continued development of spine and beak, _____ pigmented.
- Day five – development of legs, _____
- Day six – formation of reproductive organs and differentiation of sex, beak is barely visible, has all _____ needed to sustain life.
- Day seven – comb growth begins, _____ begins to appear
- Day eight – wing bent in elbow; ear passages visible.
- Day ten – egg tooth prominent, _____ nails visible.
- Day twelve – lengthening of beak; feather germs more visible; _____ start to grow over eyeball; ends of wings and legs getting longer.
- Day sixteen – mostly _____; scales on legs; external ear almost surrounded by feather germ; beak hardening.
- Day twenty – beak, claws & scales becoming firm.
- Day twenty-two – beak turns towards _____ _____.
- Day twenty-four – _____ open and close; beak claps; starts to tuck; can sleep; vocal apparatus functional; yolk begins to be pulled into the body cavity.

- Day twenty-six – break into air cell; begins to ____; makes noise; pips egg; nostrils open; yolk sac should be completely drawn into body cavity; embryo occupies almost the entire egg except the air cell still not ready to hatch.
- Day twenty-eight – ____ should occur.

Name: _____ Date: _____ Period: _____

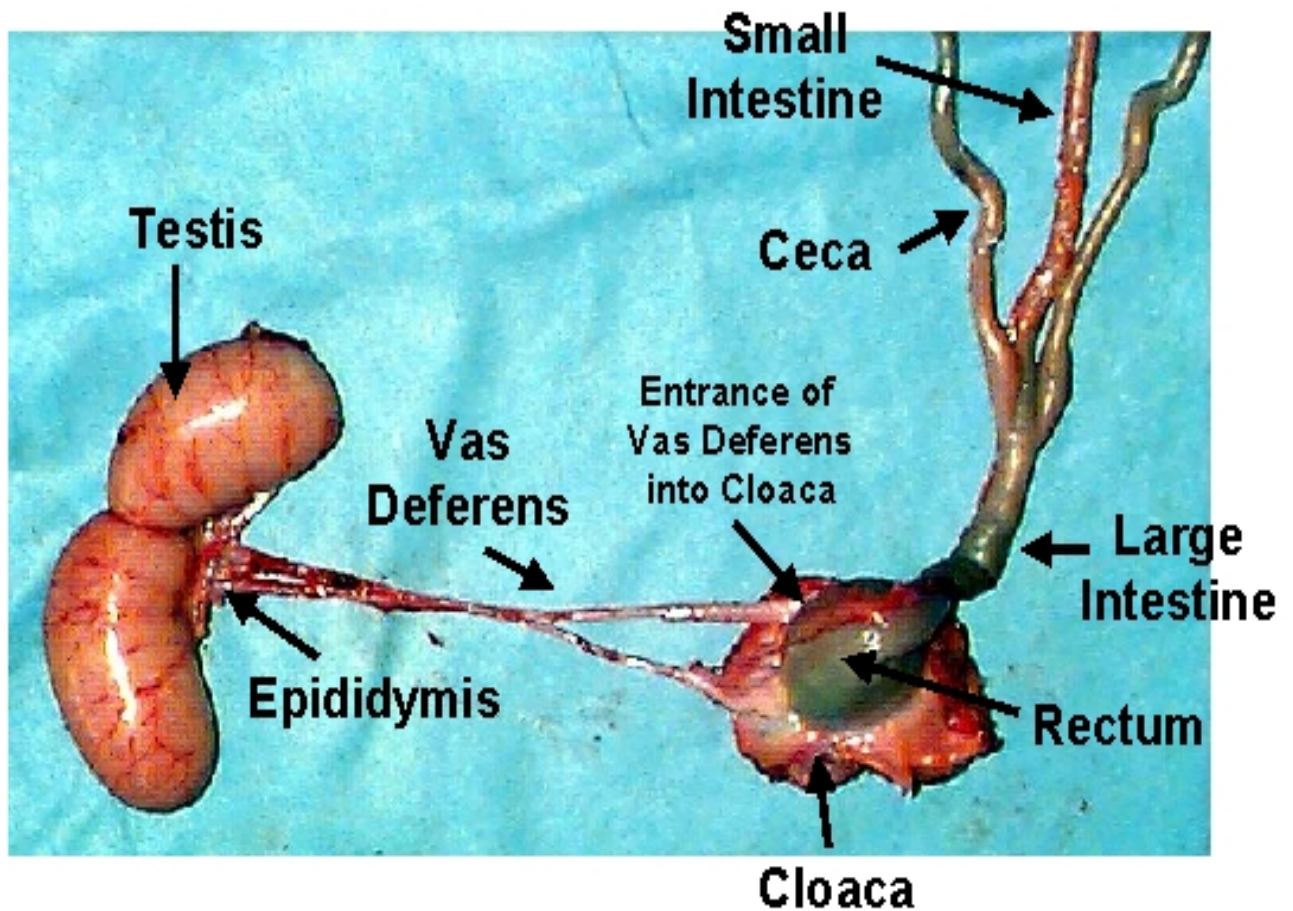
Female Turkey Reproductive Tract Worksheet



Name: _____ Date: _____ Period: _____

Male Turkey Reproductive Tract Worksheet

Reproductive System



Teacher Resource – Hatching Eggs

Preparing to Hatch Eggs

1. Step 1 – Order fertilized eggs from a hatchery or from poultry farmers. The eggs should be medium sized and free from holes or cracks. If you are breeding chickens, the best way for the eggs to hatch is to allow the hens to sit on them. This is called setting.
2. Step 2 – Choose an incubator. A forced-air incubator is large, great for large numbers of eggs and has a fan. A still-air incubator is smaller, hatches a fewer number of eggs and does not have a fan. Most experts prefer a forced-air incubator. Speak to a veterinarian or a poultry farmer to find out which incubator is best to for your needs.
3. Step 3 – Test the incubator before putting eggs into it for about twenty-four hours to make sure the temperature and humidity stays consistent within the incubator. The incubator should be placed indoors and the room should have proper ventilation and the ability for moving air.

The Eggs and the Incubator

1. Step 1 – Place the eggs into an incubator. The temperature will naturally go down in the incubator for the first few hours. Do not adjust the temperature for the first 48 hours after setting the eggs. The incubation period is about 21 days.
2. Step 2 – Keep the temperature steady at about 100 degrees Fahrenheit in a forced-air incubator. In a still-air incubator, the temperature should be kept at about 102 degrees Fahrenheit.
3. Step 3 – Set the humidity at 58 to 60% and then increase it to 65% when the eggs start hatching.
4. Step 4 – Turn the eggs about half a turn four to six times a day. However, do not turn the eggs within three days of hatching. Never set eggs with the small ends pointing upward. All the eggs should hatch within about twenty-four hours.
5. Step 5 – Do not help any of the chicks out of the shells once the eggs start hatching. Chicks need to work their own way out of the egg for proper maturity.
6. Step 6 – Clean the incubator after the eggs have hatched and before reusing the incubator.