Directions: Evaluate the trainee using the rating scale below and check the appropriate number to indicate the degree of competency achieved. The numerical ratings of 3, 2, 1, and 0 are not intended to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on level of student performance for each of the tasks listed below.

Rating Scale:
0 - **No Exposure** - no information nor practice provided during training program, complete training required.
1 - **Exposure Only** - general information provided with no practice time, close supervision needed and additional training required.
2 - **Moderately Skilled** - has performed independently during training program, limited additional training may be required.
3 - **Skilled** - can perform independently with no additional training.

<table>
<thead>
<tr>
<th>Student's Name</th>
<th>ZOOLOGY/SCIENCE OF ANIMAL REPRODUCTION AG 0534</th>
</tr>
</thead>
</table>

1. Number of Competencies Evaluated
2. Number of Competencies Rated 2 or 3
3. Percent of Competencies Attained (2/1)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Instructor Signature</th>
<th>Date</th>
</tr>
</thead>
</table>

01.0 **The Organisms**
The student will be able to:

<table>
<thead>
<tr>
<th>01.0</th>
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</thead>
<tbody>
<tr>
<td>01.01</td>
<td>Outline the classification system used to identify organisms</td>
</tr>
<tr>
<td>01.02</td>
<td>List the five kingdoms and describe the unique characteristics of the individuals within each kingdom</td>
</tr>
<tr>
<td>01.03</td>
<td>Explain the concept: the more closely organisms are related the more similar their classification will be</td>
</tr>
<tr>
<td>01.04</td>
<td>Outline the classification of the major livestock animals in the United States</td>
</tr>
</tbody>
</table>

02.0 **Cell Structure**
The student will be able to:

<table>
<thead>
<tr>
<th>02.0</th>
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</thead>
<tbody>
<tr>
<td>02.01</td>
<td>Identify the parts and organelles of the plant and animal cells</td>
</tr>
<tr>
<td>02.02</td>
<td>Describe the differences between plant and animal cells</td>
</tr>
<tr>
<td>02.03</td>
<td>List and describe the functions of each of the major types of specialized animal cells</td>
</tr>
<tr>
<td>02.04</td>
<td>Describe the functions of the vacuole, microtubules, and microfilaments as they relate to the cell structure and support</td>
</tr>
<tr>
<td>02.05</td>
<td>Explain how a cell is able to maintain a particular shape, and the nutrients that help it do so</td>
</tr>
</tbody>
</table>

03.0 **Functions of the Cell**
The student will be able to:

<table>
<thead>
<tr>
<th>03.0</th>
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</thead>
<tbody>
<tr>
<td>03.01</td>
<td>List and describe the nutrient and elemental composition of the cells protoplasm</td>
</tr>
<tr>
<td>03.02</td>
<td>List the cell organelles and the functions of each part</td>
</tr>
<tr>
<td>03.03</td>
<td>Trace the pathway of a glucose molecule through the cell</td>
</tr>
<tr>
<td>03.04</td>
<td>Describe the process of cellular metabolism of proteins, fats, and complex carbohydrates</td>
</tr>
<tr>
<td>03.05</td>
<td>Describe the process of cellular respiration and list the products formed by it</td>
</tr>
</tbody>
</table>

04.0 **Animal Tissues**
The student will be able to:

<table>
<thead>
<tr>
<th>04.0</th>
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</tr>
</thead>
<tbody>
<tr>
<td>04.01</td>
<td>Describe how specialized cells are organized to form a tissue type</td>
</tr>
<tr>
<td>04.02</td>
<td>List and describe the six types of specialized animal tissues and their individual functions</td>
</tr>
</tbody>
</table>

05.0 **Animal Organs and Systems**
The student will be able to:

<table>
<thead>
<tr>
<th>05.0</th>
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</tr>
</thead>
<tbody>
<tr>
<td>05.01</td>
<td>List the eight systems of animals and the major organs that make up each system</td>
</tr>
<tr>
<td>05.02</td>
<td>Explain the functions of each of the eight systems listed above</td>
</tr>
</tbody>
</table>
06.0 Genetics and Heredity
The student will be able to:

06.01 Describe mitosis and meiosis
06.02 Explain why genes are important in animal breeding
06.03 List and describe, the two ways in which genes control inherited traits
06.04 Define the following terms:
   a. Dominant gene
   b. Recessive gene
   c. Homozygous gene pairs
   d. Heterozygous gene pairs
06.05 Demonstrate the use of the Punnett square to predict the traits of the offspring when the male and female carry heterozygous gene pairs of a given trait
06.06 Define and give an example of incomplete dominance
06.07 Explain how the sex of the offspring is determined in mammals and poultry
06.08 Define and give an example of sex linked characteristics
06.09 Explain linkage, crossover, and mutation
06.10 Explain a heritability estimate and how it is used to improve livestock through breeding
06.11 List the pairs of chromosomes for each of the various species of livestock

07.0 Macroscopic Male Functional Anatomy
The student will be able to:

07.01 Identify and relate the gross anatomical structures of the male reproductive system
07.02 Describe the function of the parts of the male reproductive system
07.03 Differentiate reproductive structures of the bull, ram, boar, and stallion
07.04 Trace a spermatozoan in the male reproductive tract
07.05 Explain why temperature is so critical to the testes and what three structures regulate it
07.06 Define monorchid and explain how it may be determined
07.07 Explain the cause of a scrotal hernia
07.08 Indicate where sperm is mixed with the accessory fluids first to become semen
07.09 Diagram and label how the parts of penis of the bull differs from that of the stallion in cross section

08.0 Microscopic Anatomy of Spermatogenesis
The student will be able to:

08.01 Distinguish reproductive organs by cell type
08.02 Indicate the function of an organ to the cell types present
08.03 Diagram spermatogenesis from its beginning to the mature spermatozoan
08.04 Explain the major purpose of the ciliated columnar epithelial cells, and indicate where they are found in the male reproductive tract
08.05 Define the following terms:
   a. tunica
   b. corpus
   c. recti
   d. albuginea
   e. parietal
   f. spermatocytogenesis
   g. efferent
   h. sustentacular
08.06 Describe the function of the sustentacular cells
08.07 Indicate from what does the helical portion of the midpiece of the sperm form
08.08 Indicate at what point of sperm progression through the tract does forward motion occur
08.09 Identify the primary cells found in the seminiferous tubules
08.10 Indicate how many spermatozoa form from a single primary spermatocyte in livestock species
08.11 Indicate the amount of time spermatogenesis takes in the bull
08.12 Explain the effect of infection of a cut on the scrotum of a bull and resulting reproductive response

09.0 Hormones and Puberty in the Male
The student will be able to:

09.01 Identify the major hormones of reproduction and their actions
09.02 Distinguish between releasing hormones, hypophyseal, and gonadal hormones
09.03 Relate action to specific male hormones and their sources
09.04 Explain the factors affecting puberty and their interactions
09.05 Relate age, size and weight to puberty
09.06 Determine factors to be considered in selecting breeding stock
09.07 Define gonadotropic
0 1 2 3

09.08 Relate the four parts of the hypophysis to their function
09.09 Diagram the hormonal sequence in the male, beginning and ending with ICSHRH
09.10 List the effects of testosterone on secondary sex characteristics in the bull
09.11 Indicate the bull-to-cow ratio when using young bulls for the first time compared to mature bulls

10.0 Ejaculation and Semen Collection
The student will be able to:

0 1 2 3
10.01 Explain the process of mating
10.02 Describe the composition of semen and the point of deposition in the female, and its composition
10.03 Describe the passage of sperm through the tract during ejaculation
10.04 List the males that have fractionated ejaculates
10.05 List the advantages and disadvantages of the various methods of collecting semen
10.06 Describe in detail the use of the artificial vagina and electroejaculator for collecting semen

11.0 Breeding Soundness Evaluation
The student will be able to:

0 1 2 3
11.01 Describe and explain the criteria used for evaluating the outward signs of fertility in the male and female
11.02 Describe how to evaluate the internal reproductive organs for breeding soundness
11.03 Explain the value of the various factors used in evaluating semen
11.04 List and describe the kinds of performance records which might be used when selecting breeding animals
11.05 Explain how a pedigree might be used when selecting breeding stock
11.06 Describe the traits that are desirable in selecting a herd sire and females for each species

12.0 Semen Production, Processing, and Storage
The student will be able to:

0 1 2 3
12.01 Describe the efficacy of using fresh sperm in a breeding program
12.02 Evaluate the various ways of processing sperm
12.03 List the constituents of semen extender
12.04 Calculate semen extension for processing fresh and frozen semen
12.05 List the advantages and disadvantages of the various methods of packaging semen
12.06 Explain which method of selecting a sire is the most effective
12.07 Explain what 60-90 NR means

13.0 Macroscopic Female Functional Anatomy
The student will be able to:

0 1 2 3
13.01 Trace the path of the ovum in the female reproductive tract
13.02 List the anatomical differences of the reproductive systems among the species
13.03 Describe the distinguishing external features of the ovaries of the cow, sow, ewe and mare
13.04 Identify the structures of the ovary and relate them to their functions
13.05 Classify the uteri of different species according to their configuration

14.0 Microscopic Female Functional Anatomy
The student will be able to:

0 1 2 3
14.01 Distinguish between a follicle, corpus hemorrhagicum, corpus luteum, corpus albicans, and an atretic follicle
14.02 List and describe the steps in follicular growth
14.03 Describe cell division during oogenesis
14.04 Describe the relationship of cell types to function in the oviduct, uterus, cervix, vagina, vestibule, and vulva
14.05 Indicate where the majority of the oocytes are located at birth
14.06 Explain how one would distinguish between a follicle and a corpus luteum by palpation in the cow
14.07 Indicate when the myometrium is most active
15.0 Hormones and Puberty in the Female
The student will be able to:

0  1  2  3

☐☐☐ 15.01 List the hormones originating in the hypothalamus, hypophysis, and the gonads that are related to female reproduction
☐☐☐ 15.02 Identify the various hormones with their resulting target organs
☐☐☐ 15.03 Describe the four factors related to puberty
☐☐☐ 15.04 List the ages and ranges for the onset of puberty in the various species
☐☐☐ 15.05 Describe the effects of hormones, genetics, nutrition, and environment on the manifestation of puberty

15.06 Explain why one would want to shorten the prepubertal interval

16.0 Estrus and the Estrous Cycle
The student will be able to:

0  1  2  3

☐☐☐ 16.01 Describe the symptoms of estrus in the various species
☐☐☐ 16.02 Describe the meaning for the following: proestrus, estrus, metestrus, diestrus, and anestrus
☐☐☐ 16.03 Diagram the hormonal pathways used to initiate the activities of the various glands and organs in the body
☐☐☐ 16.04 Match specific hormones to their specific responses from target organs
☐☐☐ 16.05 Describe the growth of ovarian structures through an estrous cycle
☐☐☐ 16.06 Indicate the length of the estrous cycle for each species
☐☐☐ 16.07 Describe when each species is most likely to be receptive to the male
☐☐☐ 16.08 Describe the activity of the oviduct at the time of ovulation
☐☐☐ 16.09 Explain how the menstrual cycle differs from the estrous cycle

17.0 Ovulation Control
The student will be able to:

0  1  2  3

☐☐☐ 17.01 List the advantages and disadvantages of ovulation control
☐☐☐ 17.02 Describe the various compounds used for ovulation control for each class of livestock
☐☐☐ 17.03 Distinguish between the action of progesterone, progestogens, and prostoglandins for ovulation control
☐☐☐ 17.04 Explain why two injections of prostoglandins are needed to control ovulation
☐☐☐ 17.05 Describe a general plan for breeding sheep in anestrus

18.0 Artificial Insemination
The student will be able to:

0  1  2  3

☐☐☐ 18.01 List the advantages and disadvantages of artificial insemination for the various classes of livestock
☐☐☐ 18.02 Describe the differences between the various techniques of artificial insemination
☐☐☐ 18.03 List the various techniques that are used to check estrus in cattle
☐☐☐ 18.04 Outline an Al program and its specific management for any class of livestock
☐☐☐ 18.05 Describe and explain the time of insemination to optimum conception
☐☐☐ 18.06 Explain the A.M. - P.M. inseminating rule
☐☐☐ 18.07 Indicate the best temperature to thaw frozen semen to be used immediately
☐☐☐ 18.08 Explain why sheep artificial insemination is so poorly accepted in the U.S.
☐☐☐ 18.09 Describe one method of restraint for mares during insemination

19.0 Fertilization and Embryo Transfer
The student will be able to:

0  1  2  3

☐☐☐ 19.01 Describe the mechanisms involved in sperm and ovum transport
☐☐☐ 19.02 List in order the barriers to sperm penetration of the ovum
☐☐☐ 19.03 Discuss the advantages and disadvantages of embryo transfer, particularly for the bovine
19.04 Describe the importance of synchronization, condition, superovulation, and insemination to embryo transfer

19.05 Describe in outline form embryo transfer in any domestic species

19.06 Distinguish between 'good' and 'bad' eggs

19.07 Describe some of the problems of and need for continued research on embryo transfer

19.08 Explain how sperm moves so rapidly from the point of natural deposition to the point of fertilization

19.09 Indicate where fertilization takes place

19.10 Indicate how long it takes sperm to reach the point of fertilization in the cow, ewe, and sow

19.11 Explain where sperm is deposited in the normal copulation of the horses

19.12 Define syngamy

19.13 Explain what is so critical about the synchronization of the donor and recipient for embryo transfer

19.14 Explain what must be considered when inseminating the donor cow

19.15 Describe the nonsurgical approach to embryo transfer in the mare

19.16 Describe the main reason for transferring embryos in swine

20.0 Biotechnology
The student will be able to:

20.01 Explain biotechnology

20.02 Discuss the use of genetic engineering in agriculture

20.03 List and describe 5 current genetic activities that have the potential to have a major impact on agriculture

20.04 Discuss the problems relating to the use of genetic engineering

20.05 Explain Recombinant DNA technology

20.06 List the possible effects of the recent patent office ruling concerning the patentability of genetic engineered animal and plant products

21.0 Gestation and Pregnancy Determination
The student will be able to:

21.01 List the gestation lengths for domestic animals

21.02 Describe the importance of progesterone and its source to maintenance of pregnancy

21.03 List the embryonic membranes of the embryo

21.04 List the major developments of the prenatal young

21.05 Describe the age to developmental periods of the embryo

21.06 Distinguish placentas by structure, shape, and animal in which each is found

21.07 List reasons for pregnancy determination and outline methods for determining pregnancy

21.08 List the determining characteristics for age of the fetus in the cow at different stages of development

22.0 Parturition and the Postpartum Period
The student will be able to:

22.01 List and describe the factors influencing parturition

22.02 Describe the stages of parturition as they apply to the various species

22.03 List the problems that may arise during birth and methods of alleviating them

22.04 Relate and describe the postpartum period to ensuing estrous activity and conception

22.05 Explain what changes occur in progesterone and estrogen at parturition in the cow, ewe, sow, mare

22.06 Define terms associated with parturition and the postpartum period

22.07 List the beginning and ending activities of the three stages of parturition in the cow

22.08 Define dystocia

22.09 Explain what should be done if the cow retains her placenta

22.10 List the problems involved with induced parturition in cattle

22.11 Indicate when it would be profitable to induce birth in cattle

22.12 Describe the farrowing process

22.13 Describe the birth process of a foal

22.14 Explain what 'foal heat is, and how it differs from postpartum estrus in the sow

23.0 Reproductive Diseases
The student will be able to:

23.01 Identify symptoms of major reproductive diseases

23.02 List the necessary specimens needed for diagnosing by the veterinarian or diagnostic laboratory
23.03 Identify those diseases transmitted by coitus only (venereal diseases)

23.04 Describe the importance of preventive measures and the need for the veterinarian and diagnostic laboratory

23.05 Indicate that specimens that are most commonly needed to diagnose the cause of an abortion

23.06 Indicate the hormone that may be deficient during gestation

23.07 Explain why torsion of the umbilical cord would cause abortion

24.0 Relationship Between Nutrition and Reproduction
The student will be able to:

24.01 Describe the reproductive benefits which are derived from flushing, and the rations that are needed to derive these benefits

24.02 Describe the reproductive problems encountered from deficient nutritional levels

24.03 Describe the reproductive problems that result from over feeding

24.04 Describe the role of minerals in the reproductive process

24.05 Describe how the nutrient levels required for reproduction change as each animal species proceeds through pregnancy

24.06 Describe the differences in nutrient requirements between growing and mature animals as related to reproductive efficiency

24.07 Indicate the most critical nutrient for lactating animals

24.08 Indicate the minimum level of fiber needed in the ration of lactating dairy cows and why is it needed

24.09 Describe how proper nutrition during pregnancy will prevent postpartum diseases and ailments in the offspring

24.10 Describe the role of antibiotics in animal rations during gestation

24.11 Describe how sires should be fed for best reproductive performance

24.12 Describe the all the nutrient requirements associated with lactation

24.13 Describe the importance of the calcium - phosphorous ratio to reproductive performance

24.14 List the recommended protein and energy requirements for pullets and hens of the egg laying species