Poultry Production

Level -II

Learning Guide -18

Unit of Competence: -Identify and Describe Anatomy, Physiology and Behavior of Poultry

Module Title: -Identifying and Describing Anatomy, Physiology and Behavior of Poultry

LG Code: AGR PLP M02 LO1-LG-18

TTLM Code: AGR PLP TTLM 1219v1

LO 1: Describe different planes of references and directional terms

Instruction Sheet	Learning Guide -18

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics

- **Defining and describing anatomy and physiology, Identifying the different planes of reference and using directional terms of poultry body parts**

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- **Define and describe anatomy and physiology**
- **Identify the different planes of reference (median, saggital, frontal and transverse plane) of the body**
- **Use appropriate directional terms (cranial, caudal, dorsal, ventral, proximal, distal, palmar, plantar)**

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 5.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page -5**.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Defining and describing anatomy and physiology, Identifying the different planes of reference and using directional terms of poultry body parts

Introduction

This module covers the process of understanding basic knowledge of anatomy and physiology and their clinical applicability at work place. It includes knowledge in understanding of normal functions of the different organs/structures and skills to locate organs in different systems as well as their clinical application at work place. Competency is demonstrated by application of knowledge, attitude and skill. to a limited range of task under direct supervision.

1.1. Basic terminologies

- **Anatomy**: the science of the structure of animals (derived from the Greek word “to cut up”).
- **Physiology**: the science that deals with the functions of the living organism and its parts.
- **Integumentary system**: comprises the skin and its appendages acting to protect the body from various kinds of damage, such as loss of water or damages from outside. The integumentary system includes hair, feathers, beak and nails.
- **Body Systems of Poultry**: Includes (Integumentary, Respiratory, Skeletal, Digestive, Circulatory, Urinary, and Reproductive).
- **Plumage**: the outer covering of a bird’s body.
- **Filo plumes**: hair-like structures located at the base of feathers.
- **Wattle**: a red growth underneath the beak, which works in conjunction with the comb, an excess of skin on top of their head.

1.2. Identifying planes of Reference

What are the 4 poultry body planes?

Planes of reference include median, frontal, transverse and saggital.

- **Median plane:** is an imaginary planing passing through the body so as to divides the body into equal left and right halves.
- **A saggital plane**: is any plane parallel to the median plane. It is sometimes called the midsaggital plane.
- **Transverse plane**: is at right angles to the median planes and divides the body into cranial and caudal segments(head and tail) portions.
- **Frontal plane** - passes from side to side and divides the body into the front and back. The coronal plane or frontal plane (vertical) divides the body into dorsal and ventral (back and front, or posterior and anterior) portions.

1. 3. Using directional terms to describe body parts

Directional terms like cranial, caudal, dorsal, ventral etc. are used to describe locations on the poultry body

The following terms are used to describe locations on the poultry body.

- **Dorsal**: pertains to the upper surface of the poultry.
- **Ventral**: relates to the lower and abdominal surface.
- **Cranial** (or anterior): applies to the front or head or directional terms towards the head.
- **Caudal** (or posterior): pertains to the tail or rear or towards the tail
- **Rostral**: towards the nose

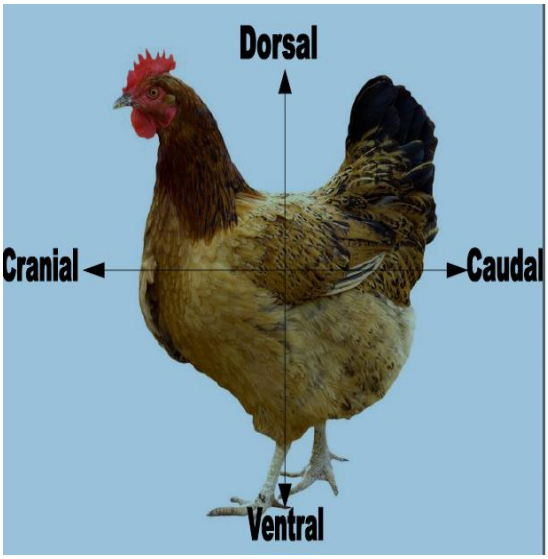


Figure 1: Anatomical directional terms

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define the following terms (2 pts)
   - Physiology
   - Anatomy
   - Integumentary system
2. Describe 4 planes of poultry body?(2 pts)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

List of Reference Materials

1. Stephen B. Adams (2016). Overview of Musculoskeletal System in poultry
2. Poultry Hub (2019). Immune system of poultry.
3. http://www.youtube.com/watch?v=ir81HfA6A0I
4. Bernard S. Jortner (2010). Preparation and Analysis of the Peripheral Nervous System

Poultry Production

Level -II

Learning Guide -19

Unit of Competence: - Identify and Describe Anatomy, Physiology and Behavior of Poultry

Module Title: - Identifying and Describing Anatomy, Physiology and Behavior of Poultry

LG Code: AGR PLP M02 LO2-LG-19

TTLM Code: AGR PLP TTLM 1219v1

LO 2: Identify the structures and locations of the different body systems

Instruction Sheet	Learning Guide -19

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- **Identifying and Recognizing the components of integumentary system in poultry**
- **Recognizing components of musculo-skeletal system in poultry**
- **Identifying components of the digestive system in different**
- **Identifying components of the respiratory system with their respective locations**
- **Identifying Components of the circulatory system with their respective locations**
- **Identifying Components of the immune system**
- **Identifying and recognizing components of the nervous system in poultry**

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- **Identify and Recognize the integumentary system components in poultry**
- **Recognize components of musculo-skeletal system in poultry**
- **Identifycomponents of the digestive system in different**
- **Identifycomponents of the respiratory system with their respective locations**
- **Identify Components of the circulatory system with their respective locations**
- **Identify Components of the immune system**
- **Identify and recognizingcomponents of the nervous system in poultry**

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 9to 33.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1, 2, 3, 4, 5, 6, 7” in page -12, 17, 22, 24, 28, 31 and 33 respectively.

5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering all Self-checks).
6. If you earned a satisfactory evaluation proceed to “next Information Sheets 2, 3, 4, 5, 6, 7”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. Submit your accomplished Self-checks.
8. This will form part of your training portfolio.

Information Sheet-1	Identifying and Recognizing the components of integumentary system in poultry

1.1. Components of the integumentary system

- The skin, feathers, and beak
  - **Skin**

Much like humans, with the exception of plumage production

- **Plumage**: the outer covering of a bird's body.

Feathers, scales, filoplumes

- **Filoplumes:** hair-like structures located at the base of feathers.
- ***Wattle:*** a red growth underneath the beak, which works in conjunction with the comb, an excess of skin on top of their head.

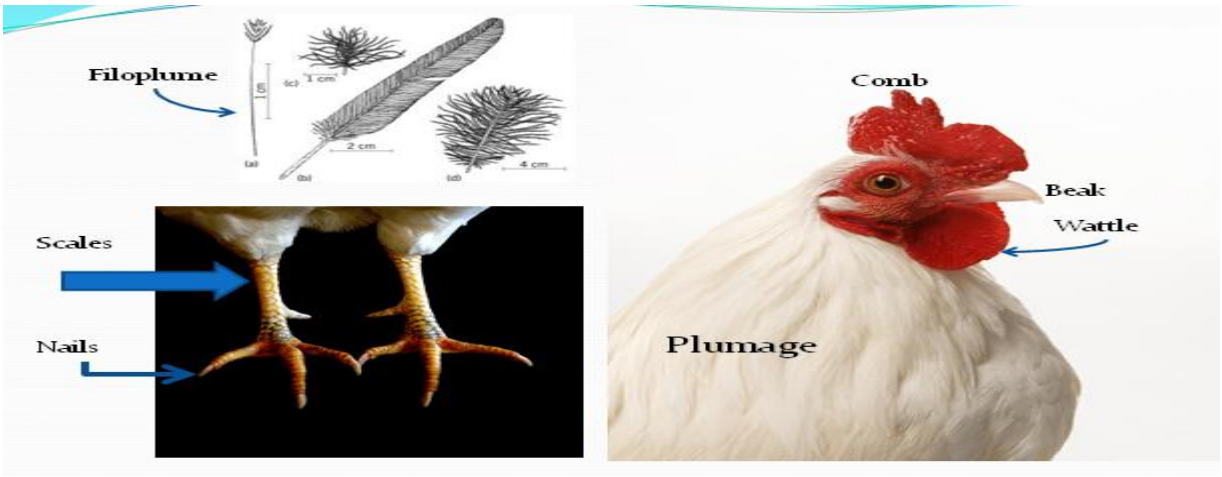


Figure 2: Integumentary organs

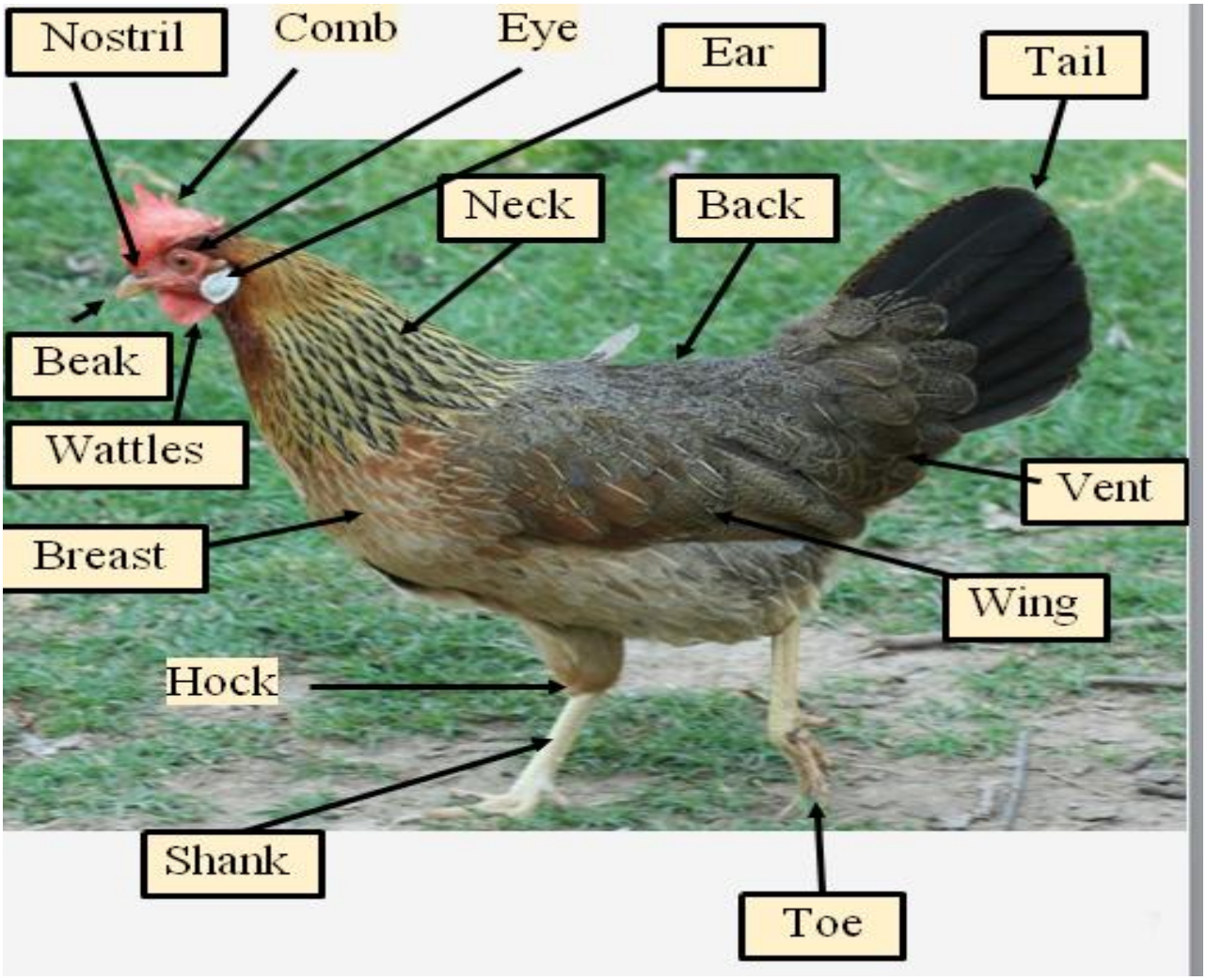


Figure 3: Basic external body parts

- **Scales and Plumage**

- **Scales are located on the legs and feet.**

  The plumage is always for altered shape.

❖ **Beaks**

Birds have beaks as opposed to lips and teeth.

The beak is used for eating and drinking, as well as in self-defense and protection from other animals

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the poultry integumentary systems? (2points)
2. Discuss the location of each integumentary system?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Recognizing components of musculo-skeletal system in poultry

2.1. Components of musculo- skeletal system

The musculoskeletal system consists of

- Bones,
- Cartilage,
- Muscles,
- Ligaments, and
- Tendons.

Components of musculo- skeletal system include

- ✓ Axial skeleton,
- ✓ Appendicular skeleton and
- ✓ Visceral skeleton.

Type of muscles includes

- Skeletal,
- Smooth and
- Cardiac muscles.

Components of musculo- skeletal system

A. Skeletons

1. **Axial skeleton**includes bones on orattached to the midline (axis) of the body andcomprises the skull, vertebral column, sternum,and ribs.
2. **Appendicular skeleton**is made up of the bones of the limbs.Thoracic and pelvic Limbs are major components.
3. **Visceral skeleton** is made of bones of visceral organs.

B. Muscles

1. Skeletal

The bulk of the muscle in the body and it is responsible for producing the voluntary movements of the limbs, trunk, and head. These are usually attached to the bones of the skeleton (hence the term skeletalmuscle)

2. **Smooth**

Involuntary or **unstriated** musclecomposed of muscle cells that have no striationsvisible with a microscope.

3. **Cardiac muscles**

Is characterized by fibers with visible striations, so it is considered a type of striated muscle and it is restricted to the heart.

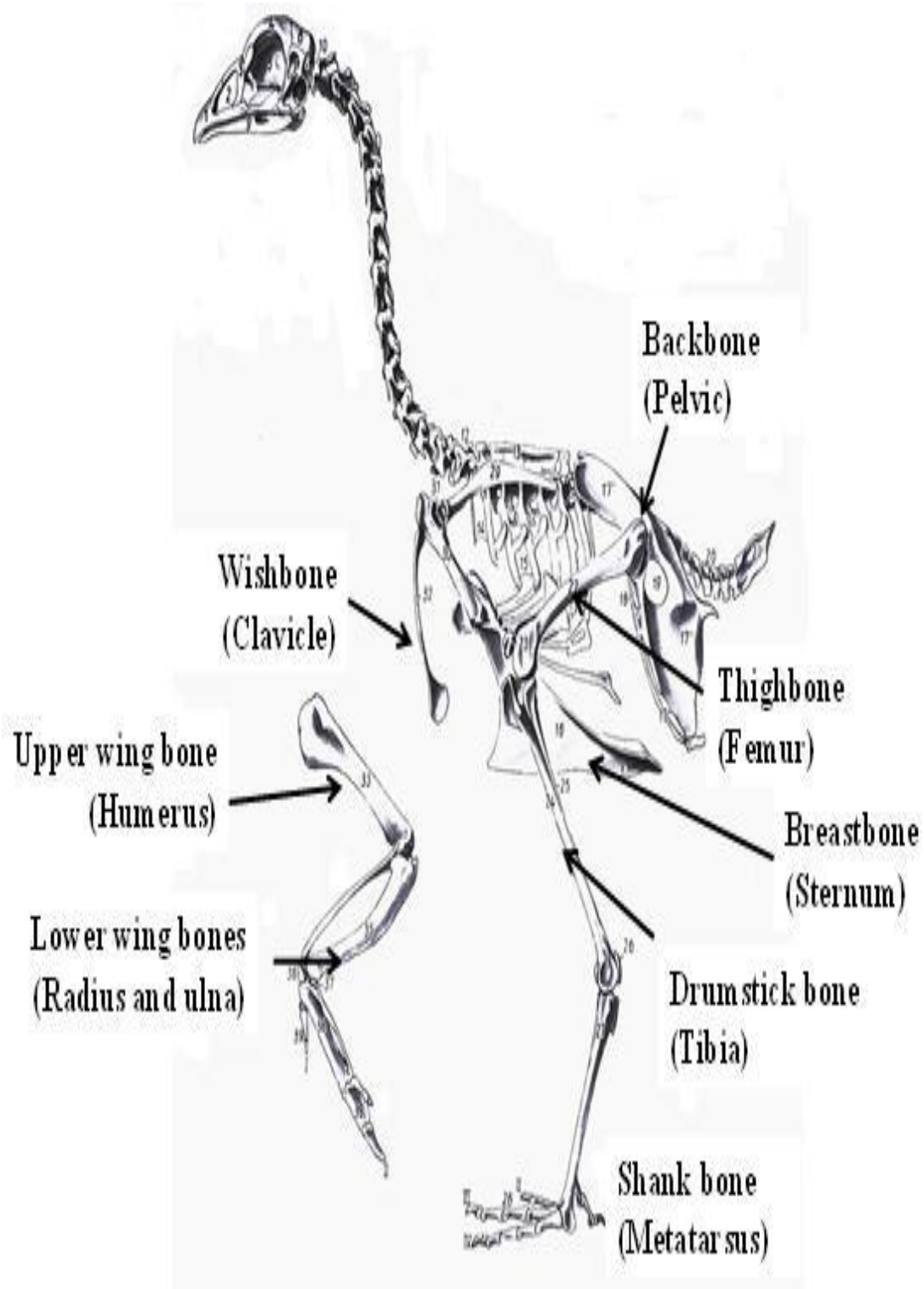


Figure 4: Skeleton of an adult chicken

C. Cartilages, ligaments and tendons

- Cartilages:Between the bones is another shiny white material that is slippery. This is cartilage, which helps the bonesmove without grinding against one another, or without causing trauma.

Ligaments:Ligaments connect bones to other bones at joints. They look like a shiny white covering of the joint surfaces.

- Tendons:Tendons are shiny white tissues at the ends of the muscles that attach muscles to bones.

D. Joints: Two bones come together at a joint

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the musculo-skeletal componentsof poultry? (2points)
2. Discuss the locations of each musculo-skeletal components?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

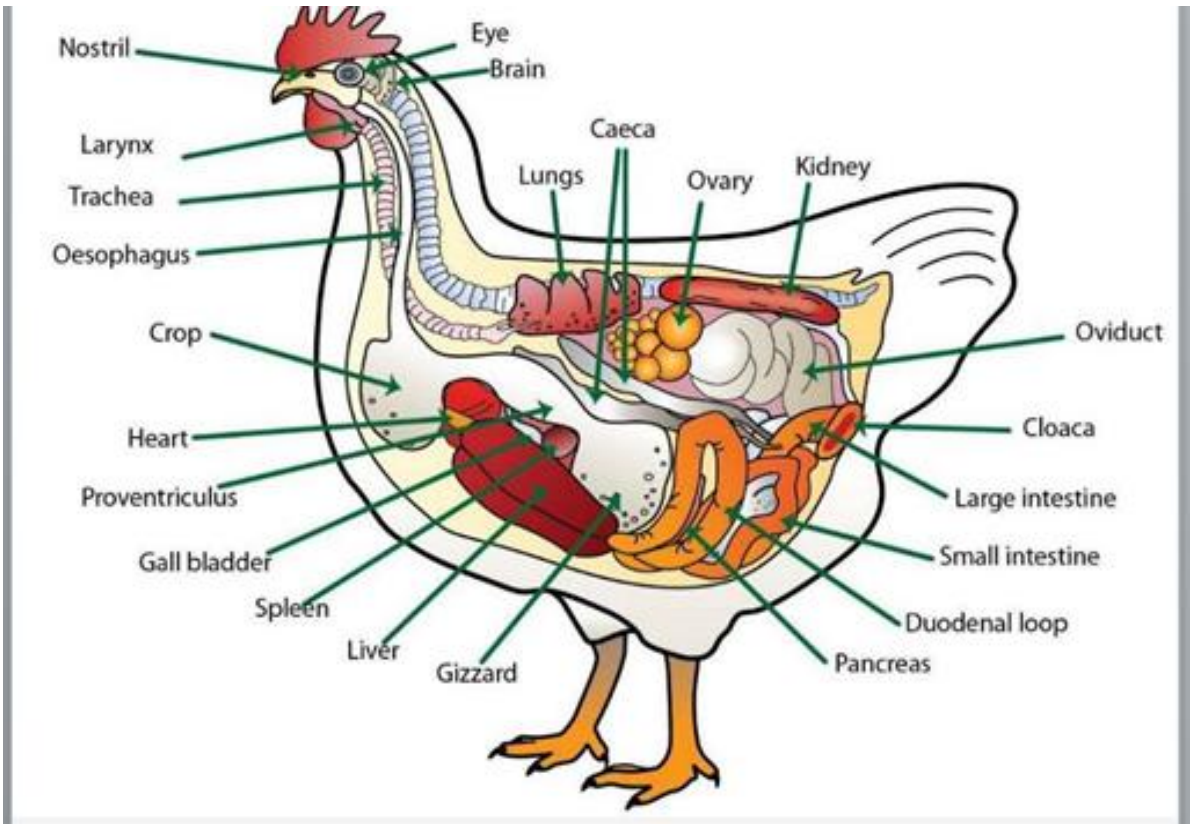
Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Identifying components of the digestive system in different

3.1.Locations of the digestive organs

Organs of the digestive system may include oral cavity, pharynx, esophagus, gizzard, small intestine, large intestine, cloacae, salivary gland, pancreas and liver.



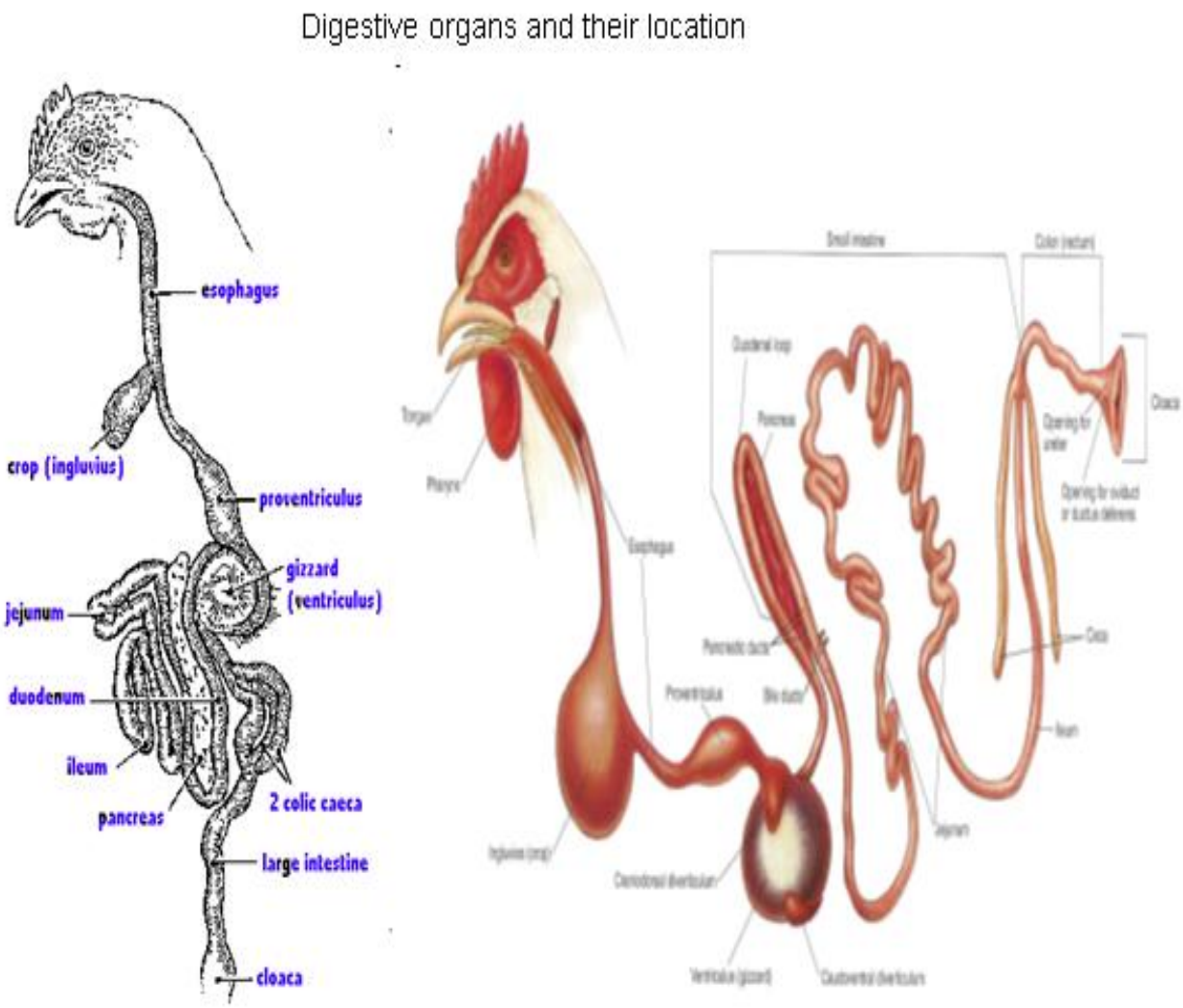


Figure 5: Digestive organs and their location

- **Mouth and its parts**
  - Tongue
  - Beak

Figure 6: Mouth and its parts

- **Esophagus**
  - Flexible tube that connects mouth to the crop.
- **Crop**

- **Proventriculus**
  - The stomach of the bird.
- **Gizzard**
- **Small Intestines**
  - Three sections:
    - Duodenum
    - Ileum
    - Jejunum
- **Ceca**
  - Two ceca that are terminal pouches.
- **Colon**
  - Large intestine
- **Cloaca**
  - Also known as the vestibule.
- **Liver**
  - Multi-lobed organ

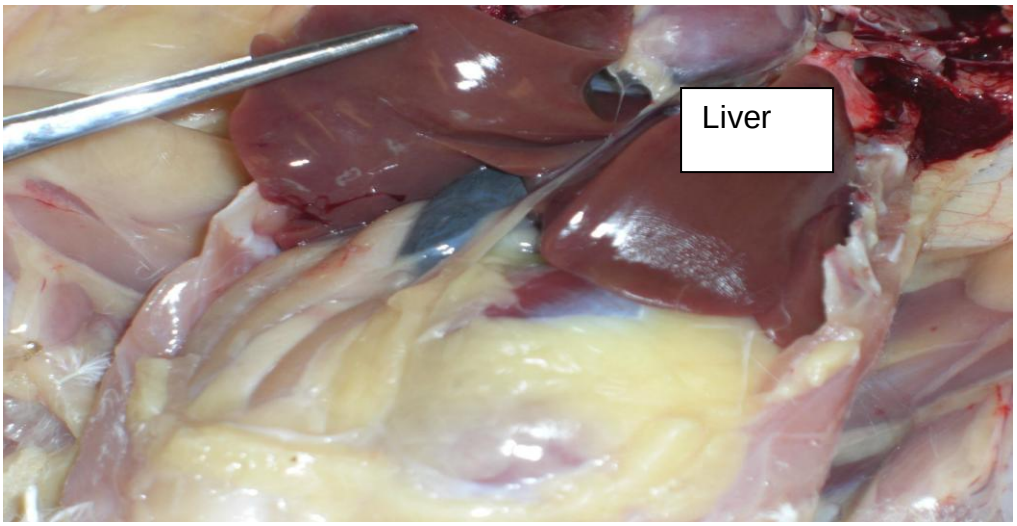


Figure 7: Liver

- **Pancreas**

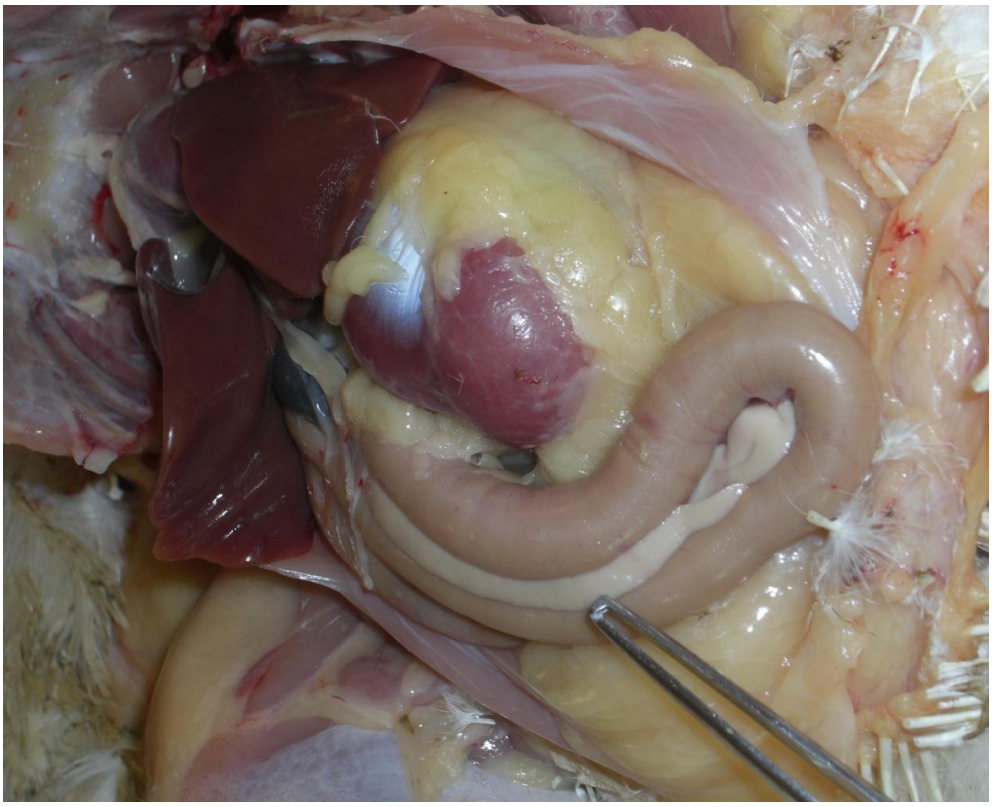


Figure 8: Differentiating accessory digestive organs

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the digestive organs of poultry? (2points)
2. Discuss the locations of each digestive organ?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Identifying components of the respiratory system and their function

4.1. Organs of the respiratory system and function

Respiratory System of poultry is vastly different than the mammalian respiratory system. Unlike mammals, birds lack a diaphragm to inflate and deflate the lungs. Instead, birds have

- Nine **air sacs** located in the neck region and body cavity that
- **Gas exchange** occurs in the **avian lung** and the **air sacs**

Organs of the respiratory system may include

- **Nasal cavity, pharynx, larynx, trachea, bronchial tree, and lung.**
- **Nares** are the nostrils located on the beak.

Figure 9: Identifying regional anatomy of lung

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the respiratory organs of poultry? (2points)
2. Discuss the location of each respiratory organ?(2points)
3.

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	Identifying components of the circulatory system with their respective locations

5.1. Describing the anatomy and physiology of cardiovascular system

Anatomy and physiology of cardio vascular system include heart, artery, vein, lymphatic vessel, capillary, blood and lymph.

- **Heart**

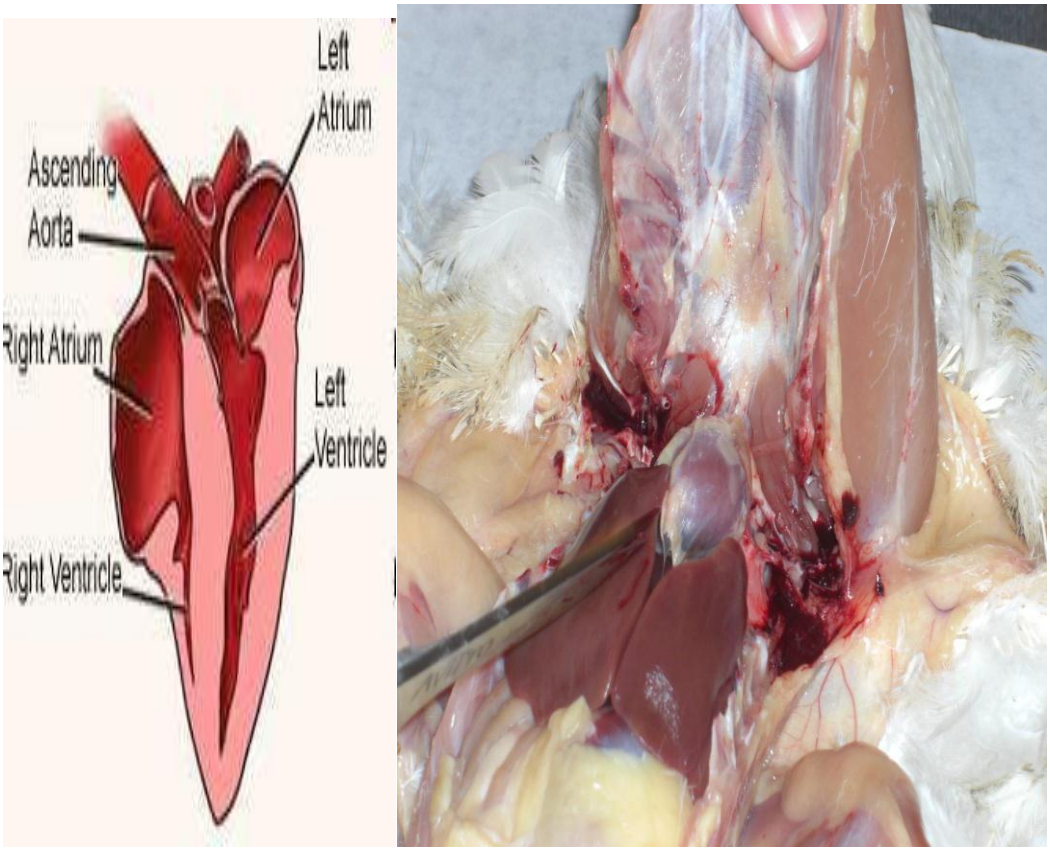


Figure 10: Heart

- **Arteries and veins**
- **Lymphatic vessels** are part of a network of structures that make up poultry lymphatic system.
- **Lymphatic capillary** are tiny, thin-walled microvessels located in the spaces between cells (except in the central nervous system and non-vascular tissues).
- **Blood Vessels**
- **The blood circulation system**

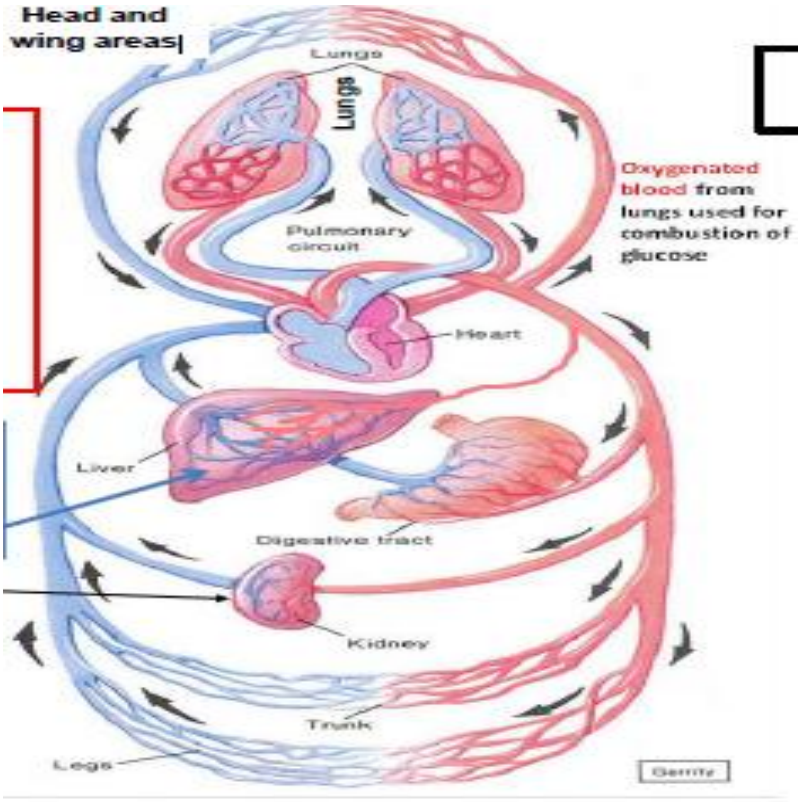


Figure 11: Illustration of a blood circulation system

- Components of Blood:
  - Red Blood Cells (erythrocyte)
  - White Blood Cells (leukocyte)
  - Plasma Red Blood

Lymphatic circulation

The lymphatic system is part of the circulatory system, comprising a network of inter-connected tubes known as lymphatic vessels that carry a clear fluid called lymph towards the heart.

The lymphatic organs play an important part in the immune system. The lymphatic system transports the white blood cells which are important in the immune response against pathogens.

5.2. Indicating sites of blood vessels in sample collection and drug administration

Blood vessels which are important for drug administration and sample collection include

- Jugular vein,
- Radial,
- Ear,
- Coccygeal,
- Saphenous,
- Cephalic etc.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the circulatory organs of poultry? (2points)
2. Discuss the locations of each circulatory organ?(2points)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-6	Identifying components of the immune system of the chicken

6.1. Immune system of the chicken

The word immunity means to be protected. It therefor means that if a chicken is immune against a particular disease it is protected against that disease. The immune system is able to produce antibodies that protect the chicken against the disease for which it was vaccinated. Poultry have specific organs that are able to produce antibodies to protect them against a disease. This is the topic of our discussion and after having studied this section, you will know where antibodies are formed and what their functions are.

6.2. Production of antibodies

Antibodies are proteins. You will also recall that proteins are chemical substances, occurring widely in nature and are the substances of meat, feathers, nails, liver tissue; too many to mention.

6.3. Organs that make antibodies

Organs involved in the production of antibodies are for example the Harderian gland, the thymus glands, the spleen, the cecal tonsils, the Bursa of Fabricius or the gland-like tissue in the gut wall, known as Peyer's patches. An organ that plays a very important role especially to protect the day-old chicken is the bursa of Fabricius

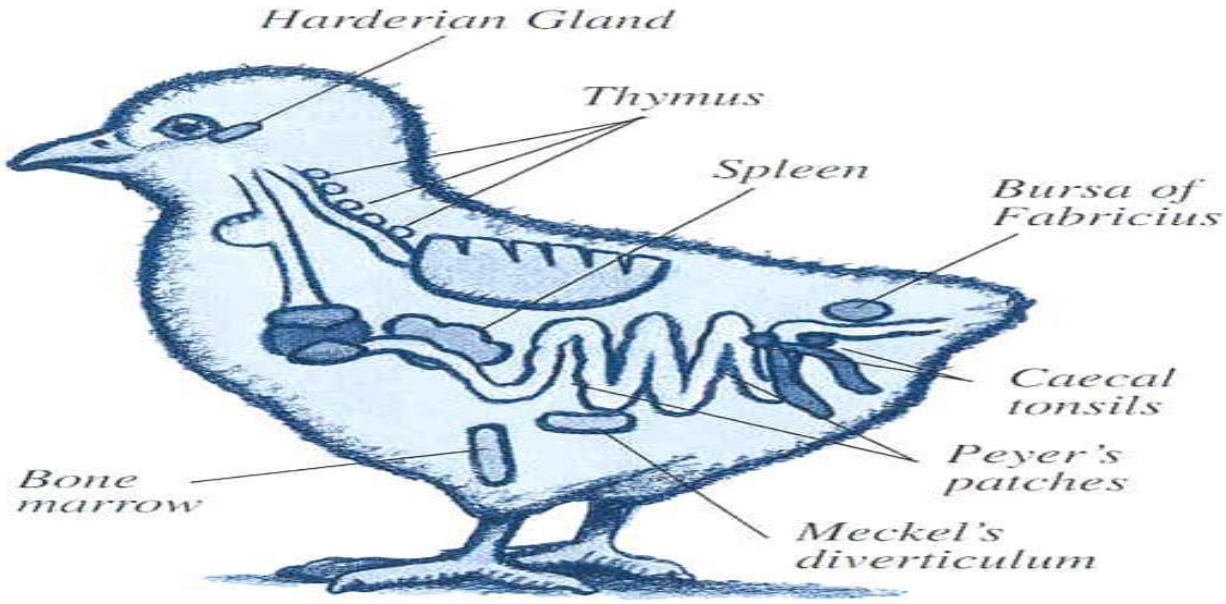


Figure 12: Organs that make antibodies

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define the word immunity means? (2points)
2. Discuss the organs that make antibodies?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-7	Identifying and recognizing components of nervous system in chicken

7.1. Types of the nervous system poultry

The nervous system and the important sensory organs play a key role in the day-to-day functioning of an animal. It is comprised of two major parts:

1. **Central nervous system (CNS)**
2. **Peripheral nervous system (PNS)**

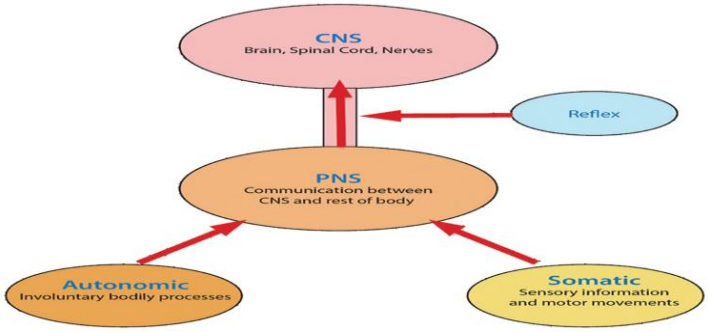


Figure 13: Diagram showing relationship of NS

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is nervous system? (2points)
2. Discuss briefly types of nervous system? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

List of Reference Materials

1. **Stephen B. Adams (2016). Overview of Musculoskeletal System in poultry**
2. **Poultry Hub (2019). Immune system of poultry.**
3. **http://www.youtube.com/watch?v=ir81HfA6A0I**
4. **Bernard S. Jortner (2010). Preparation and Analysis of the Peripheral Nervous System**

Poultry Production

Level -II

Learning Guide -20

Unit of Competence: - Identify and Describe Anatomy, Physiology and Behavior of Poultry

Module Title: - Identifying and Describing Anatomy, Physiology and Behavior of Poultry

LG Code: AGR PLP M02 LO3-LG-20

TTLM Code: AGR PLP TTLM 1219v1

LO 3: Identify the functions of the different body systems and structures

Instruction Sheet	Learning Guide -20

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- **Identifying and describing the components of integumentary system in poultry**
- **Understandingfunctions of musculo-skeletal system in poultry**
- **Identifying functions of the digestive system**
- **Identifying functions of the respiratory system with their respective locations**
- **DifferentiatingComponents of the circulatory system**
- **Recognizing the function of the urinary and reproductive systems**
- **Identifying functions of the immune system**
- **Identifying role and importance of the nervous system in poultry**

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- **Identify and describe the components of integumentary system in poultry**
- **Understandfunctions of musculo-skeletal system in poultry**
- **Identifyfunctions of the digestive system**
- **Identifyfunctions of the respiratory system with their respective locations**
- **Differentiate Components of the circulatory system**
- **Recognize the function of the urinary and reproductive systems**
- **Identifyfunctions of the immune system**
- **Identifyrole and importance of the nervous system in poultry**

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 37 to 69.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.

4. Accomplish the “Self-checks 1, 2, 3, 4, 5, 6, 7 and 8” in page -39, 44, 49, 52, 57, 62, 66 and 69 respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. Submit your accomplished Self-checks. This will form part of your training portfolio.

Information Sheet-1	Identifying and Recognizing the components of integumentary system in poultry

1.1. Components of the integumentary system

- The skin, feathers, and beak

Function: to protect the bird from external harm.

- **Skin**

Much like humans, with the exception of plumage production

- **Plumage**: the outer covering of a bird's body.

Feathers, scales, filoplumes

- **Filoplumes:** hair-like structures located at the base of feathers.
- ***Wattle:*** a red growth underneath the beak, which works in conjunction with the comb, an excess of skin on top of their head.

  Function: circulation of blood between the two regulates the temperature of the bird.

The size of the comb is an indication of the levels of testosterone in the body. If the comb is large, then this means more testosterone is present, often meaning the sex of the bird is male.

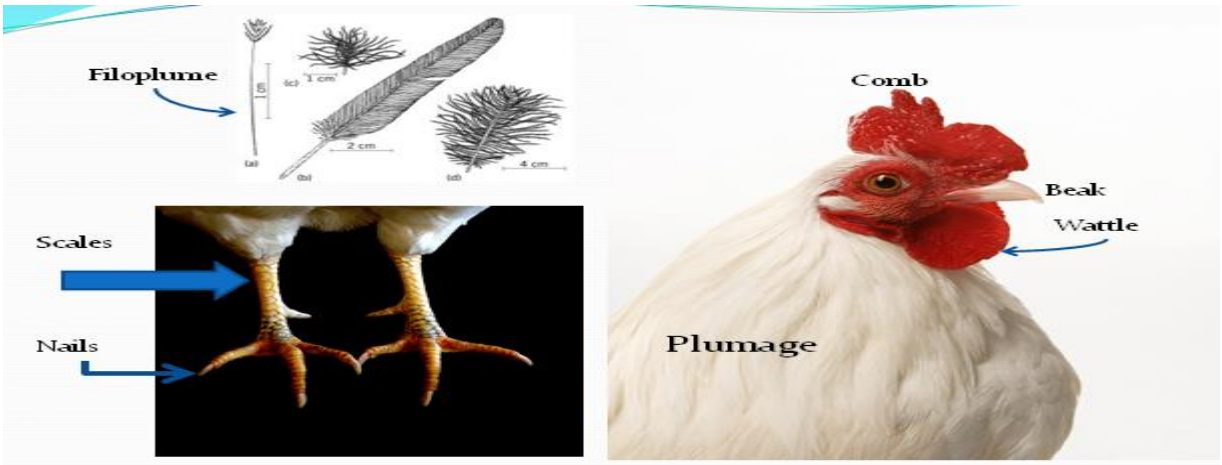


Figure 14: Integumentary organs

- **Scales and Plumage**

❖ **Scales are located on the legs and feet.**

The plumage is always for altered shape.

- Function: body cooling and heating for maintenance of body temperature, protects against abrasions and bruises when birds are in groups or lying on the ground.
- Plumage shape is particularly important for cooling since birds lack sweat glands.
- Although it is not common for production birds to fly, plumage type and form is an important determinant in flight for aerial species.

❖ **Beaks**

Birds have beaks as opposed to lips and teeth.

The beak is used for eating and drinking, as well as in self-defense and protection from other animals

Figure 15: Function of beak

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the poultry integumentary systems? (2points)
2. Discuss the functions of each integumentary system?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Recognizing components of musculo-skeletal system in poultry

2.1. Components of musculo- skeletal system

The musculoskeletal system consists of

- Bones,
- Cartilage,
- Muscles,
- Ligaments, and
- Tendons.

Primary functions of the musculoskeletal system include

- ➢ Support of the body,
- ➢ Provision of motion, and
- ➢ Protection of vital organs.

The skeletal system serves as the main storage system for calcium and phosphorus and contains critical components of the hematopoietic system.

Components of musculo- skeletal system include

- ✓ Axial skeleton,
- ✓ Appendicular skeleton and
- ✓ Visceral skeleton.

Type of muscles includes

- Skeletal,
- Smooth and
- Cardiac muscles.

The skeleton supports and protects the brain, lung, heart and other visceral organs.

The **skeleton** is a framework of bones to which muscles are attached.

Functions of skeletons

- ➢ The skeleton provides rigidity (firmness) to the body.
- ➢ The skeleton provides protection to internal organs, for example the digestive tract, heart, lungs, kidneys and the reproductive system, etc.

- Contraction of muscles results in movement of those bones to which the muscles are attached.
- All kinds of movement are brought about by such contractions: walking, flapping of wings, movement of the neck and head to pick up feed or to drink.
- Also respiration where the body cavity is contracted or enlarged to expel air or to inhale air.

Components of musculo- skeletal system

E. Skeletons

4. **Axial skeleton**includes bones on orattached to the midline (axis) of the body andcomprises the skull, vertebral column, sternum,and ribs.
5. **Appendicular skeleton**is made up of the bones of the limbs.Thoracic and pelvic Limbs are major components.
6. **Visceral skeleton** is made of bones of visceral organs.

F. Muscles

4. Skeletal

The bulk of the muscle in the body and it is responsible for producing the voluntary movements of the limbs, trunk, and head. These are usually attached to the bones of the skeleton (hence the term skeletalmuscle)

5. Smooth

Involuntary or **unstriated** musclecomposed of muscle cells that have no striationsvisible with a microscope. Smooth muscleis found in systems of the body with autonomic function.

6. Cardiac muscles

Is characterized by fibers with visible striations, so it is considered a type of striated muscle and it is restricted to the heart.

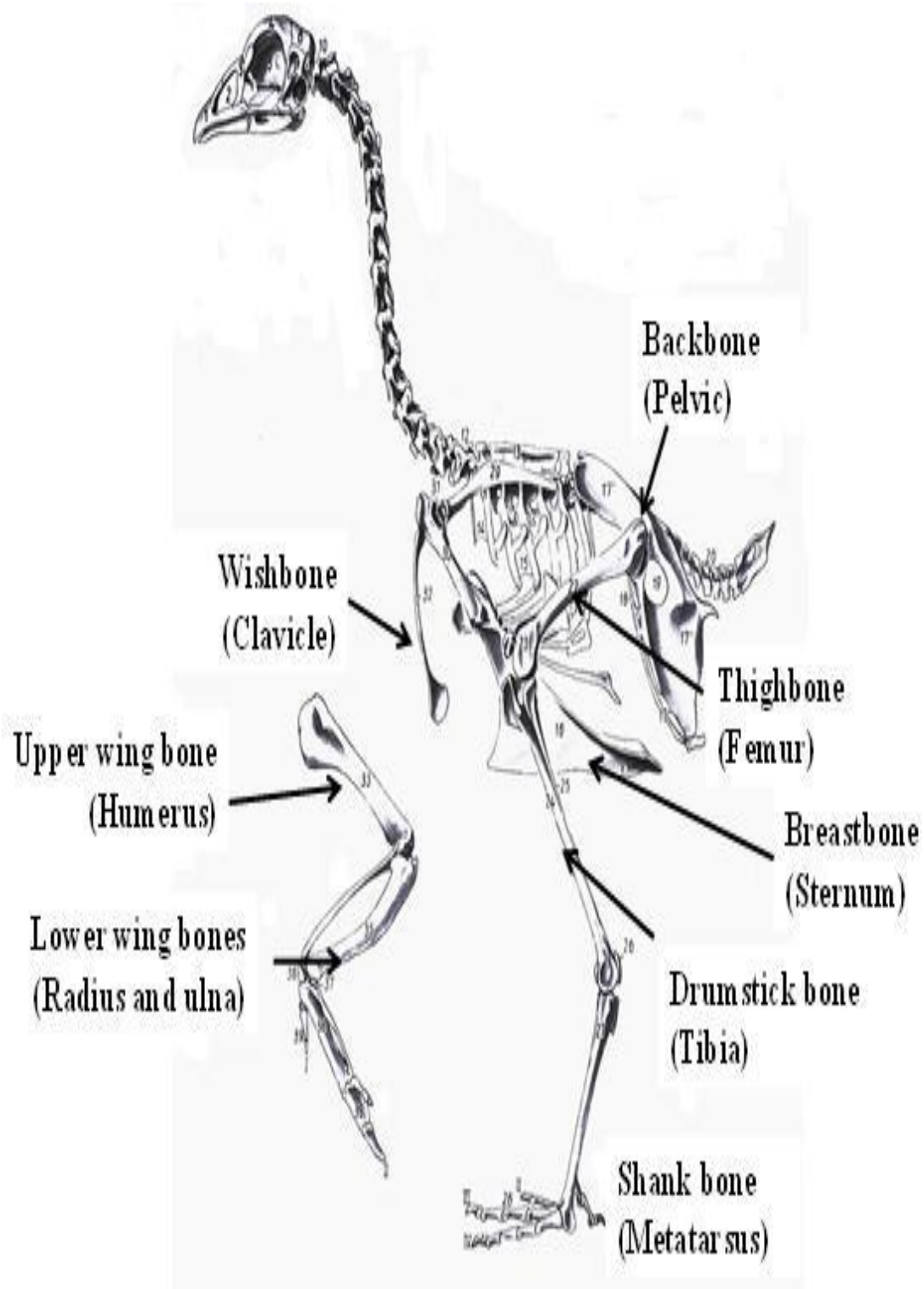


Figure 16: Skeleton of an adult chicken

G. Cartilages, ligaments and tendons

- Cartilages:Between the bones is another shiny white material that is slippery. This is cartilage, which helps the bonesmove without grinding against one another, or without causing trauma.

Ligaments:Ligaments connect bones to other bones at joints. They look like a shiny white covering of the joint surfaces.

- Tendons:Tendons are shiny white tissues at the ends of the muscles that attach muscles to bones.

H. Joints: Two bones come together at a joint

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the musculo-skeletal components of poultry? (2points)
2. Discuss the functions of each musculo-skeletal component?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Identifying components of the digestive system in different

3.1.Locations of the digestive organs

Organs of the digestive system may include oral cavity, pharynx, esophagus, gizzard, small intestine, large intestine, cloacae, salivary gland, pancreas and liver.

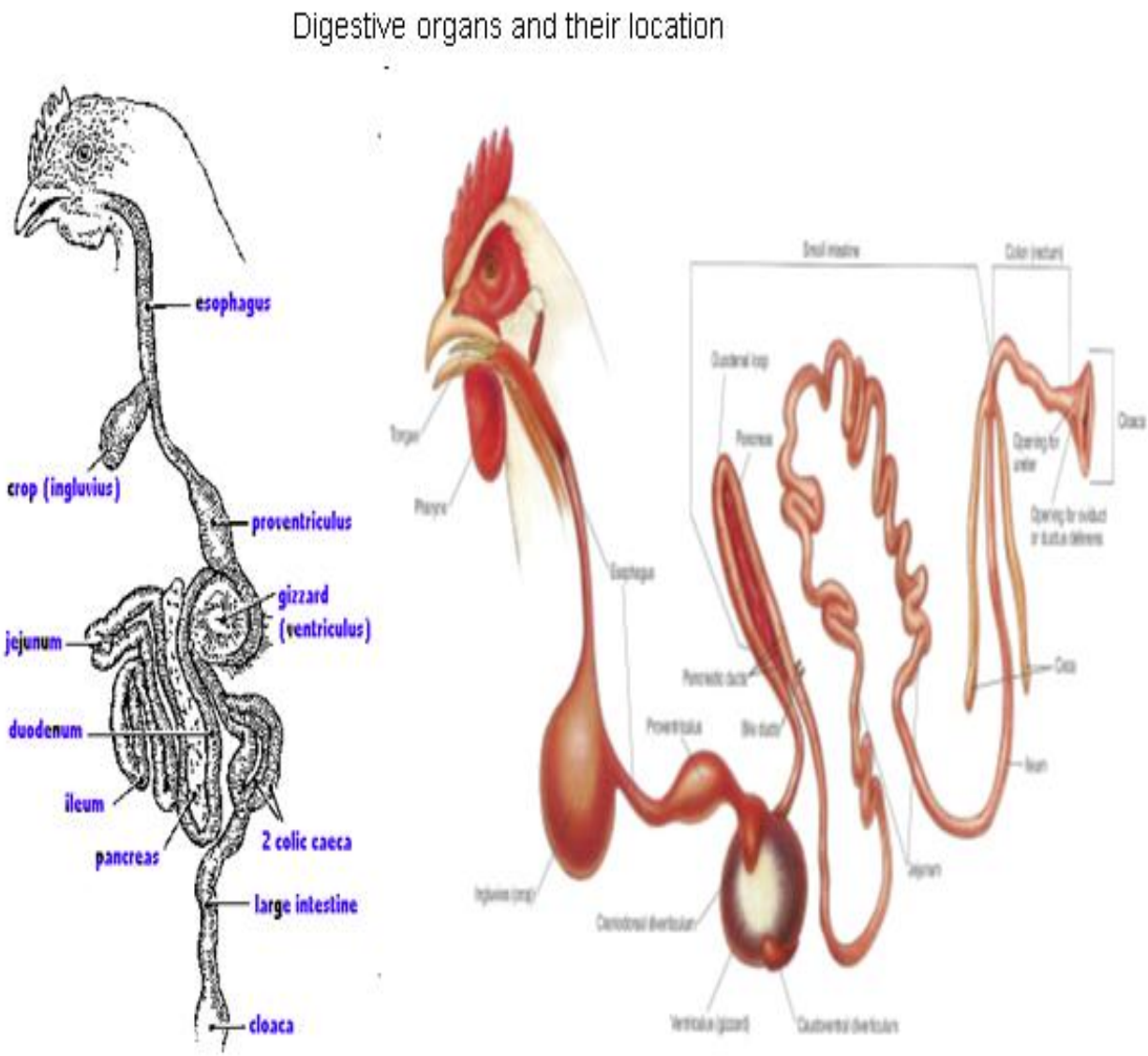


Figure 17: Digestive organs and their function

3.2. Identifying the functions digestive systems

- Their function may include ingestion, digestion, and absorption and functions elimination of waste of hen, rooster, pullet, chick, capon and fowl.

❖ **Mouth and its parts**

- Tongue
- Beak

The beak is used for eating and drinking, as well as in self-defense and protection from other animals

Figure 18: Mouth and its parts

- Taste buds

❖ **Esophagus**
- Flexible tube that connects mouth to the crop.

❖ **Crop**
- Function: moisten and temporary storage of food
- Notice the yellow feed pellets that have been moistened while they were stored in this chicken's crop.

❖ **Proventriculus**
- The stomach of the bird.
- Function: uses acids and digestive enzymes to breakdown food.

❖ **Gizzard**
- Function: like "teeth," it mechanically grinds up food particles.

❖ **Small Intestines**
- Three sections:
  - Duodenum
  - Ileum
  - Jejunum
- Function: absorption of nutrients from food.

❖ **Ceca**
- Two ceca that are terminal pouches.
- Function: fermentation of any leftover food particles/ water absorption

❖ **Colon**

- Large intestine
- Function: Further water absorption

❖ **Cloaca**
- Also known as the vestibule.
- Function: responsible for expulsion of feces and urine through the vent.

❖ **Liver**
- Multi-lobed organ
  - Functions:
    - Produce bile to digest fats (stored in gall bladder).
    - Detoxification
    - Store fat and fat-soluble vitamins (i.e., A,D,E, and K)
    - Metabolize fats, carbohydrates, and proteins that are in the diet.

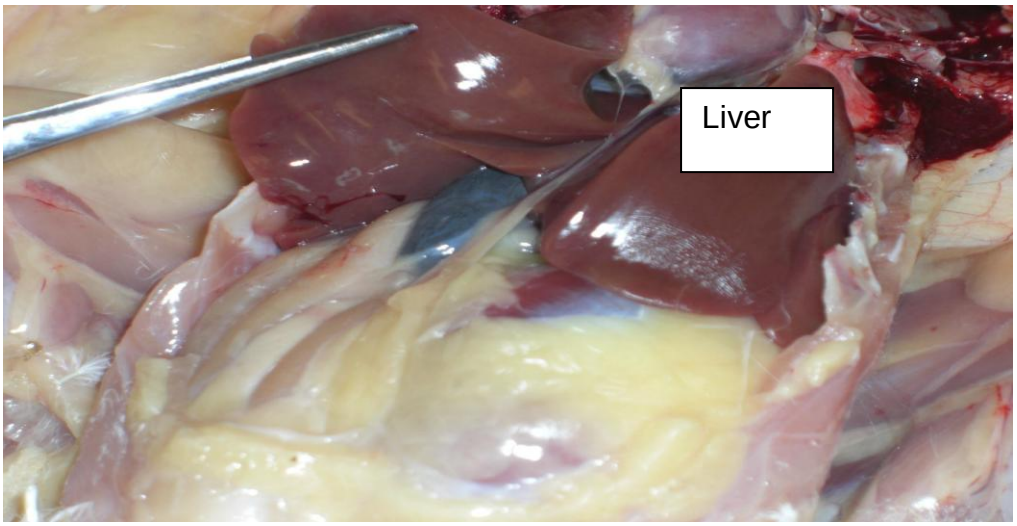


Figure 19: Liver

❖ **Pancreas**

- Function: Produces insulin, useful in carbohydrate digestion.

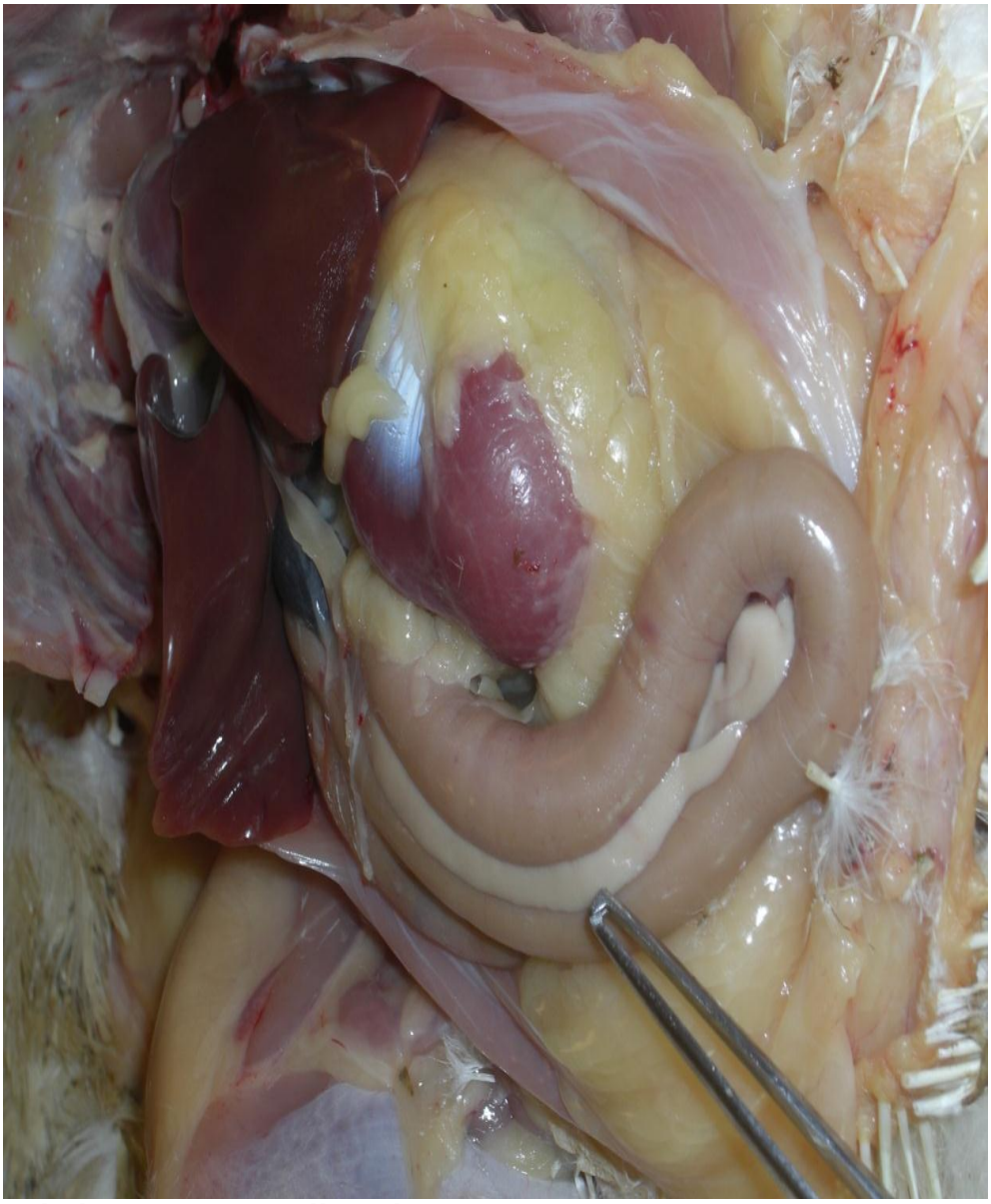


Figure 20: Differentiating accessory digestive organs

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the digestive organs of poultry? (2points)
2. Discuss the functions of each digestive organ?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Identifying components of the respiratory system and their function

4.1. Organs of the respiratory system and function

Respiratory System of poultry is vastly different than the mammalian respiratory system. Unlike mammals, birds lack a diaphragm to inflate and deflate the lungs. Instead, birds have

- **Nineair sacs** located in the neck region and body cavity that
    - **Function** to inflate the lungs.
- **Gas exchange** occurs in the **avian lung** and the **air sacs**
    - **Function** to move air in and out of the respiratory system.

Organs of the respiratory system may include

- **Nasal cavity, pharynx, larynx, trachea, bronchial tree, and lung.**
    - **Their function** includes
        - ✓ Respiration,
        - ✓ Temperature regulation, and
        - ✓ PH regulation.

Breathing process has two phases: **inhalation** and **exhalation**.

- ➢ **Inhalation**: when the bird breathes in, air bypasses the lungs and enters the posterior air sacs. At the same time, air in the lungs from the last exhalation phase exits the lungs and enters the anterior air sacs.
- ➢ **Exhalation**: the bird releases air from the posterior air sacs, which enters the lungs. The air that filled the anterior air sacs from the inhalation phase is then released from the body through the trachea.

- **Nares** are the nostrils located on the beak.
    - **Function** is the passageway for air to be breathed in and out of the trachea.
    -

Figure 21: Identifying regional anatomy of lung

2.4.2. Identifying the type of respiration in different species

Types of respiration in poultry include thoraco-abdominal, abdominal, thoracic etc.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the respiratory organs of poultry? (2points)
2. Discuss the functions of each respiratory organ?(2points)
3. What are the two breathing systems (2points)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	Identifying components of the circulatory system with their respective locations

5.1. Describing the anatomy and physiology of cardiovascular system

Anatomy and physiology of cardio vascular system include heart, artery, vein, lymphatic vessel, capillary, blood and lymph. Their functions include transportation of air and nutrients.

- **Heart**
  - **Function:**heart pumps blood throughout the body to deliver oxygen and nutrients to tissues and to remove carbon dioxide and metabolic waste from tissues.

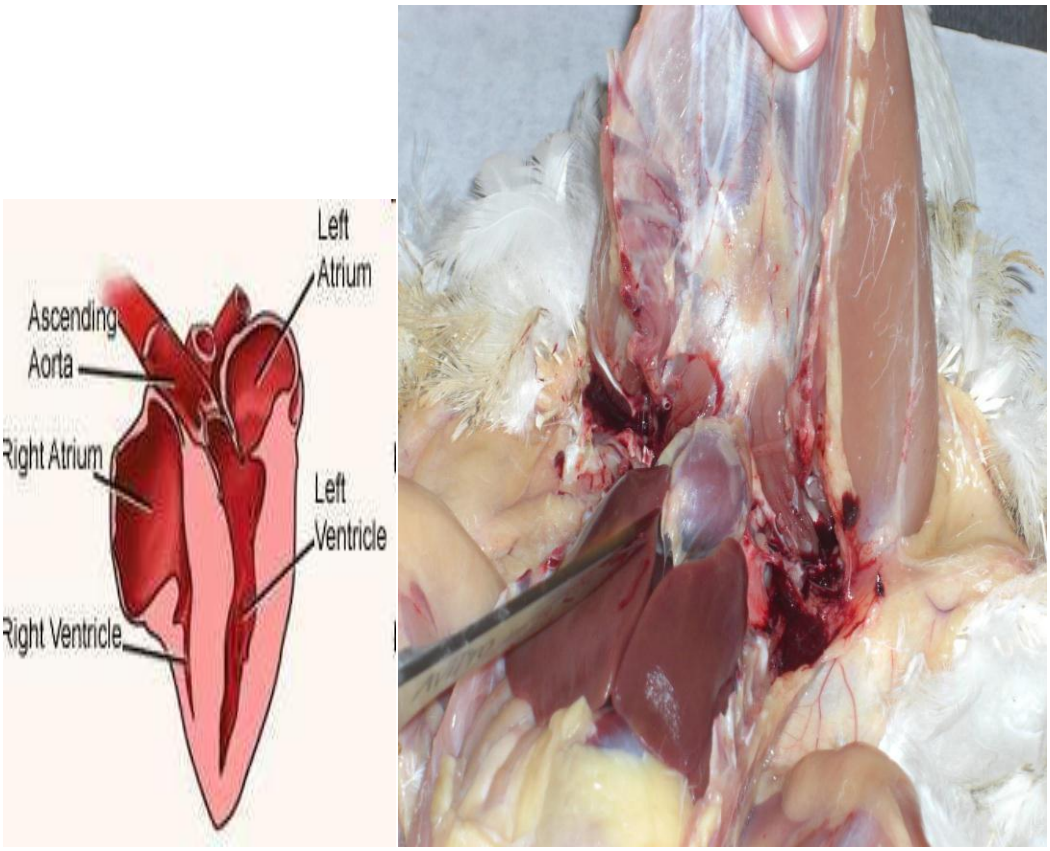


Figure 22: Heart

- **Arteries and veins**
    - **Arteries** are blood vessels responsible for carrying oxygen-rich blood away from the heart to the body.
    - **Veins** are blood vessels that carry blood low in oxygen from the body back to the heart for reoxygenation**.**
- **Lymphatic vessels** are part of a network of structures that make up poultry lymphatic system.
    - **Function**: remove excess fluid from your tissues.
- **Lymphatic capillary** are tiny, thin-walled microvessels located in the spaces between cells (except in the central nervous system and non-vascular tissues).
    - **Function** serves to drain and process extracellular fluid.
- **Blood Vessels**
    - Arteries: carries blood from heart & to the rest of the body.
    - Arterioles: directs blood to certain tissues of the body.
    - Capillaries: site of exchange between blood and tissues.
    - Veins: brings oxygenated blood back to the heart.

The blood circulation system

A simplified approach would be to view the blood system as a pipe-work of tubes, starting at the heart and branching off to enter and diffuse (getting smaller and smaller) into the tissue of organs. Inside the tissue they converge (come together again) to form veins that return the blood to the heart.

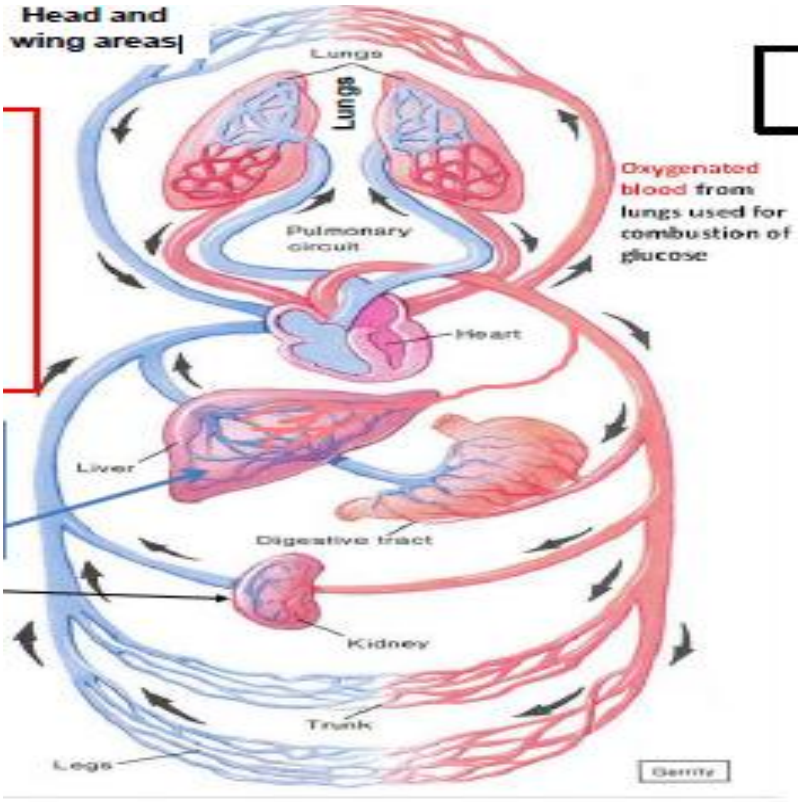


Figure 23: Illustration of a blood circulation system

- Components of Blood:
  - Red Blood Cells (erythrocyte)
  - White Blood Cells (leukocyte)
  - Plasma Red Blood

Lymphatic circulation

The lymphatic system is part of the circulatory system, comprising a network of inter-connected tubes known as lymphatic vessels that carry a clear fluid called lymph towards the heart.

The lymphatic organs play an important part in the immune system. The lymphatic system transports the white blood cells which are important in the immune response against pathogens.

5.2. Indicating sites of blood vessels in sample collection and drug administration

Blood vessels which are important for drug administration and sample collection include

- Jugular vein,
- Radial,

- Ear,
- Coccygeal,
- Saphenous,
- Cephalic etc.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the circulatory organs of poultry? (2points)
2. Discuss the functions of each circulatory organ?(2points)
3. What are the blood vessels from which samples collected (2points)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-6	Recognizing the function of the urinary and reproductive systems

6.1. Reproductive system of poultry

This material will enable you to understand the reproductive system of poultry and will include the following aspects:

- Formation of sperm in the male
- Growth of the female reproductive cell, the ovum
- Fertilization of the female ovum
- The formation of an egg

Terminology:

- **Sperm** – The reproductive cell of the male.
- **Ovum –** The reproductive cell of the female, in everyday language referred to as the “yolk”.
- **Ovary –** Organ in the female containing female reproductive cells, the ova.
- **Oviduct –** Tube in which albumen, shell membranes and shell is secreted and deposited around the ovum
- **Egg –** Shell with contents.

6.1.1. The male reproductive system

- **Two testes** are located inside the body cavity are responsible for the formation of sperm cells. Sperm produced by the testes flows by means of tubes to a storage chamber in the cloaca. During mating the rooster mounts the hen and places his **cloaca** over that of the hen and deposits sperm onto the opening of the female reproductive tract inside her cloaca.

During mating the hen would turn the opening of the cloaca upwards, with the inside out, to receive sperm cells. After mating the sperm is stored inside folds of the oviduct and can stay active for at least 2 weeks.

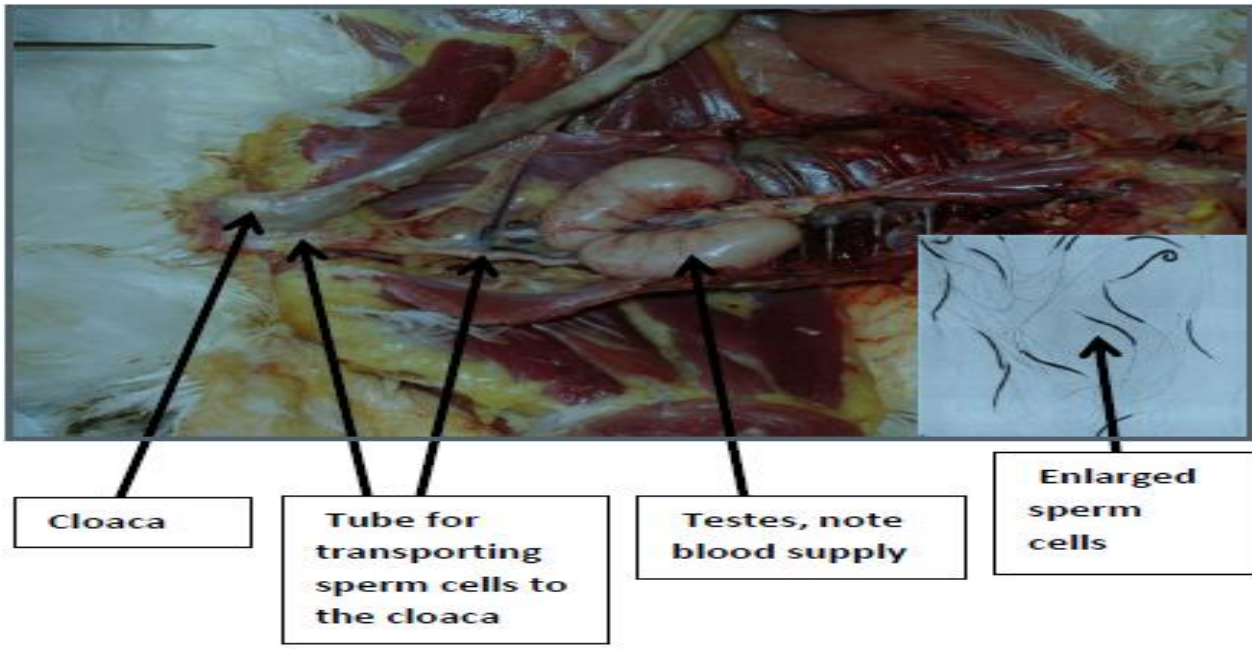


Figure 24: Male reproductive organs

6.1.2. The female reproductive system (Consists of two separate organs: the ovary and the oviduct)

The **ovary** in the day-old hen (pullet) contains all the reproductive cells, (ova) that possibly can develop into eggs. Each ovum is enclosed by an inner and outer membrane. The yellow yolk material, formed by the liver and transported by the blood stream, is deposited inside the inner membrane containing the genetic material of the hen. In a fully develop ovum the outer membrane will rip open, freeing the ovum, surrounded only by the thin inner membrane.

The ovum is thus what we know as the yolk. The terminology is indeed not correct as the *yolk* contains the genetic material of the hen and is thus the ovum. However, we have become so used to the terminology that it will be impossible to change. As long as we know the yolk is the ovum and the ovum is the yolk, let terminology rest in peace.

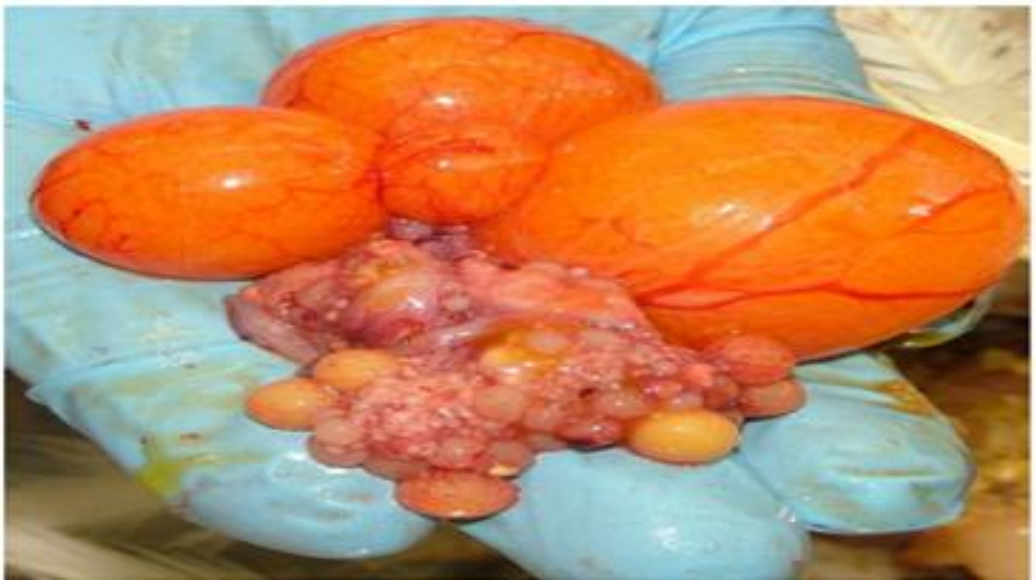


Figure 25: The ovary with small and mature ova

The oviduct

The ovarium, marked A in the picture, is surrounded with the funnel-shaped upper part of the oviduct, marked B in the picture. The oviduct thus *catches* the ovum when it comes free from the ovarium. Sperm cells have moved up from the cloaca, marked as F, and are present in the funnel portion, marked B. Thus when the ovum enters that area, B, sperm will penetrate the membrane of the ovum and one of them will fuse with the genetic material of the hen. This is called fertilization. When an egg is placed in an incubator a chick will hatch. Other components such as egg white (albumen), is secreted in section C and the egg shell in section D.

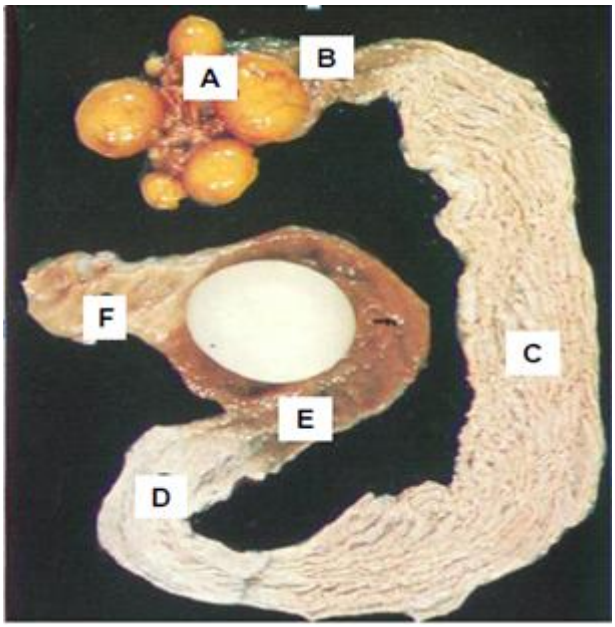


Figure 26: Oviduct

6.2. The function of the urinary system in poultry

The major organs involved in the urinary system are the kidneys, the ureter and the cloaca. This system functions to excrete water, remove nitrogenous wastes, and regulate the osmotic fluid, or acid-base balance of the bird's body.

The urinary (excretory system) in the domestic fowl consists of the two kidneys, each with a ureter that carries the urineproduced by the kidneys to the cloaca where it leaves the body. Its functions in the domestic fowl are to: maintain the electrolyte balance.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are male reproductive organs in poultry? (2points)
2. Discuss briefly two types of female reproductive organs? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-7	Identifying components of the immune system of the chicken

7.1. Immune system of the chicken

The word immunity means to be protected. It therefor means that if a chicken is immune against a particular disease it is protected against that disease. The immune system is able to produce antibodies that protect the chicken against the disease for which it was vaccinated. Poultry have specific organs that are able to produce antibodies to protect them against a disease. This is the topic of our discussion and after having studied this section, you will know where antibodies are formed and what their functions are.

7.2. Production of antibodies

Antibodies are proteins. You will also recall that proteins are chemical substances, occurring widely in nature and are the substances of meat, feathers, nails, liver tissue; too many to mention. Secondly, those amino acids are the building blocks of proteins. It thus means that a chicken will only be able to make antibodies if it is healthy and consuming feed.

7.3. Organs that make antibodies

Organs involved in the production of antibodies are for example the Harderian gland, the thymus glands, the spleen, the cecal tonsils, the Bursa of Fabricius or the gland-like tissue in the gut wall, known as Peyer's patches. An organ that plays a very important role especially to protect the day-old chicken is the bursa of Fabricius

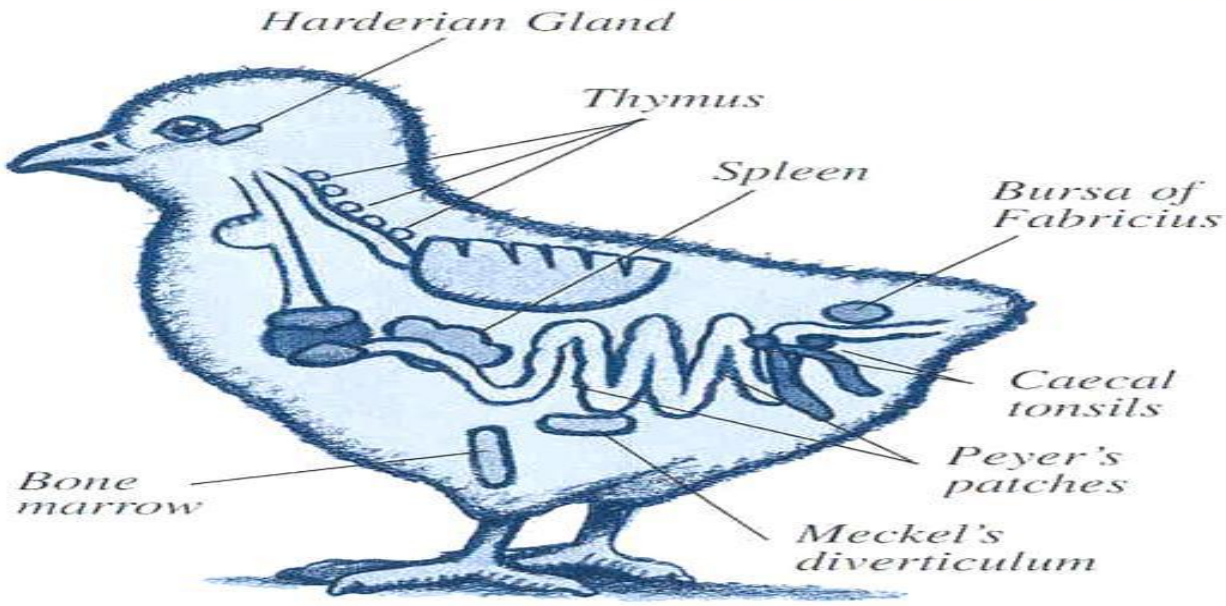


Figure 27: Organs that make antibodies

1. **The skin:** The skin is a barrier against invasion of the body by microorganisms. It is only when the skin barrier is broken that invasion through the skin can occur.
2. **Mucous membranes:** These linings of the digestive tract, respiratory tract and other body systems provide a good barrier against invasion by microorganisms. If anything should harm the mucous membranes invasion may occur. An example is when diets deficient in vitamin A cause damage to the mucous membranes which results in an increase in the incidence of infectious disease.
3. **The immune system:** Notwithstanding the efficiency of the skin and the mucous membranes as defence mechanisms, microorganisms often find their way into the body.Many of these are harmless, while others cause disease, usually specific diseases caused by specific organisms.

The primary role of the immune system is to recognise organisms and substances that are considered foreign, or “non-self” (antigens), that are able to enter the body. The immune system initiates and manages the appropriate physiological responses to neutralise and/or eliminate these “non-self” organisms and substances. A variety of mechanisms are employed to achieve this goal, including inactivation of biological agents, lysis (rupture) of foreign cells, agglutination (clumping) or precipitation of molecules or cells, or phagocytosis (engulfing and inactivating) of foreign agents.

- **Lymph nodes** (lymph glands): are small, encapsulated bean-shaped structures composed of lymphatic tissue.
- **Spleen** is found in the abdominal cavity behind the stomach. Although structurally similar to a lymph node, the spleen filters blood rather than lymph. One of its main functions is to bring blood into contact with lymphocytes. The functional tissue of the spleen is made up of two types of cells: the red pulp, which contains cells called macrophages that remove bacteria, old blood cells, and debris from the circulation; and surrounding regions of white pulp, which contain great numbers of lymphocytes.
- **Tonsil**: small mass of lymphatic tissue located in the wall of the pharynx at the rear of the throat of man and other mammals.
- **Mast cells**: The innate immune cells residing in connective tissues and mucous membranes are known as mast cells. These cells are involved in wound healing and defense against pathogens. The substance released by activated mast cells “histamine” also initiate the recruitment of neutrophils and macrophages.
- **Bursa of Fabricius** (Latin: Bursa cloacalis or Bursa fabricii): is the site of hematopoiesis, is necessary for B cell (part of the immune system) development in birds.
- **The thymus**, where T cells develop, is located in the neck of birds. The Bursa of Fabricius is an organ that is unique to birds and is the only site for B cell differentiation and maturation. Located in the rump of birds, this organ is full of stem cells and very active in young birds but atrophies after six months.

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define the word immunity means? (2points)
2. Discuss the organs that make antibodies?(2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-8	Identifying and recognizing components of nervous system in chicken

8.1. Types of the nervous system poultry

The nervous system and the important sensory organs play a key role in the day-to-day functioning of an animal. The nervous system integrates and controls the various functions of the body, while the sensory organs detect the various stimuli in the bird's environment that it reacts to.

It is comprised of two major parts:

1. Central nervous system (CNS)

Additional stimuli are received through the senses and interpreted by the brain to alert our fowl of the constantly changing environmental conditions. The central nervous system is composed of the brain, spinal cord and nerves. Within this system, the brain acts as the “main office” by processing the information it is given through various stimuli and returning a decision for an appropriate response. The spinal cord collects micro-electric responses from the nerve endings, and like a major phone line, transfers the messages to the brain.

2. Peripheral nervous system (PNS)

PNS (peripheral nervous system): That portion of the nervous system that is outside the brain and spinal cord. The peripheral nervous system (PNS) is one of the two major divisions of the nervous system.

The nerves in the peripheral nervous system (PNS) connect the central nervous system (CNS) to sensory organs (such as the eye and ear), other organs of the body, muscles, blood vessels and glands.

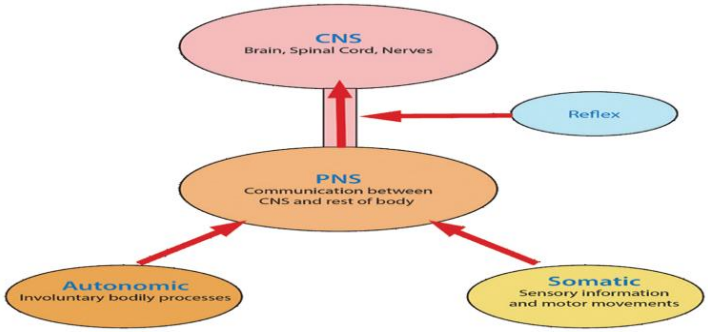


Figure 28: Diagram showing relationship of NS

Self-Check -8	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is nervous system? (2points)
2. Discuss briefly types of nervous system? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

List of Reference Materials

5. **Stephen B. Adams (2016). Overview of Musculoskeletal System in poultry**
6. **Poultry Hub (2019). Immune system of poultry.**
7. **http://www.youtube.com/watch?v=ir81HfA6A0I**
8. **Bernard S. Jortner (2010). Preparation and Analysis of the Peripheral Nervous System**

Poultry Production

Level -II

Learning Guide -21

Unit of Competence: - Identify and Describe Anatomy, Physiology and Behavior of Poultry

Module Title: - Identifying and Describing Anatomy, Physiology and Behavior of Poultry

LG Code: AGR PLP M02 LO4-LG-21

TTLM Code: AGR PLP TTLM 1219v1

LO 4: Identify clinically/production important structure of animal body

Instruction Sheet	Learning Guide 21

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- **Identifying muscles involved on meat inspection and administration of drugs**
- **Identifyingmuscles involved in breathing and the different types of respiration**
- **Identifying locations of blood vessels used in blood sample collection and drug administration;**
- **Identifyingappropriate sites for Beak trimming**
- **Identifyingdifferent poultry meat for processing and market value**

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- **Identify muscles involved on meat inspection and administration of drugs**
- **Identifymuscles involved in breathing and the different types of respiration**
- **Identify locations of blood vessels used in blood sample collection and drug administration;**
- **Identifyappropriate sites for Beak trimming**
- **Identifydifferent poultry meat for processing and market value**

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 73 to 90.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1 to 5” in page -76, 79, 83, 85 and 90 respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering all the Self-checks).

6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Identifying muscles involved on meat inspection and administration of drugs

1.1. Muscles involved on meat inspection

Poultry meat inspection is carried out immediately after slaughter, and includes primarily visual examination of:

• Wholedefeathered birds before evisceration; this is not a statutory requirement, but is advisable, so that obviously diseased birds can be removed from the line to prevent contamination of equipment;

• Surface of the carcass, excluding the head and the feet, except where these are intended for human consumption;

• Viscera, which can remain (but not necessarily) attached to the carcass – with ensured correlation between carcass and viscera being essential; and

• Body cavity.

Post-mortem inspection of chicken (partly eviscerated poultry), in which the non-edible intestines are removed but the edible viscera remain attached to the carcass, includes:

- Inspection of 5% of birds from the batch;
- Examination focuses on external surface, viscera and body cavity;
- If no abnormal conditions are found, other birds are not inspected; and
- If any anomalies are found, all birds in the batch must be inspected.

Post-mortem inspection of birds that are subject to delayed evisceration must be carried out within the 15-day period after slaughter. These poultry can be eviscerated either at the abattoir, or in a cutting plant that has been specifically approved for that; the meat inspection is carried out at the place of evisceration. In the meantime, these birds must be refrigerated a**Muscles**

Only the groups that have peculiarities will be mentioned. Consists mainly of 2 types of muscles namely:

- **White muscle tissue**–which is found in the breast meat of the chicken.

- **Red muscle tissue** – it functions more effectively than white tissue and is therefore adapted forcontinuous exertion.

Cutaneous Muscles - (Those associated with the skin)

There is much closer association of the underlying muscles with the skin for functional purposes such as, these associated with the wing and tail to assist with motion and support of the large feathers of these areas.

Pectoral Muscles - (Chest or breast muscles)

These muscles are highly developed to enable flight and the degree of development under natural conditions is proportionate to the amount and speed of flying done by the species of bird concerned.

Abdominal Muscles

This group is much thinner and has less strength than mammals, in fact; they are only thin sheets of muscle and fibrous tissue.

Tendons of the Leg Muscles

Ossification or the formation of bone tissue in these tendons is common in manypoultry

The Diaphragm

In mammals this forms a complete muscolo-tendinous sheet separating the thorax from the abdomen.

In poultry this is only a thin membrane-like structure and there are two distinct parts. The first is something similar to that of the mammal - the second divides the thorax or chest into upper and lower compartments. These sheets are very light and possess large openings for the air sacs. The lack of a complete diaphragm and the air sac in addition to the lungs are some of the anatomical reasons why poultry cannot cough or sneeze to expel mucous and debris of a respiratory disease, to the same extent as mammals.

1.2. Post-mortem inspection Procedures

1. Viewing, incision, palpation and olfaction techniques.

2. Classifying the lesions into one of two major categories - acute or chronic.
3. Establishing whether the condition is localized or generalized, and the extent of systemic changes in other organs or tissues.
4. Determine the significance of primary and systemic pathological lesions and their relevance to major organs and systems, particularly the liver, kidneys, heart, spleen and lymphatic system.
5. Coordinating all the components of ante-mortem and post-mortem findings to make a final diagnosis.
6. Submitting the samples to the laboratory for diagnostic support, if abattoir has holding and refrigeration facilities for carcasses under detention.

1.3. Administration of drugs in different poultry species

Drugs can be administered to birds either individually or as a flock treatment. For poultry, drinking water and feed medication are preferred, but in the case of serious disease, parenteral administration can be an alternative. For an efficient and safe therapy, data on drug pharmacodynamics and pharmacokinetics are required. Therefore, the gastrointestinal anatomy and physiology of birds and the elimination of drugs in birds are discussed in this review. In addition, important aspects of drinking water medication, such as water quality, individual water uptake, drinking water system, lighting periods and drug formulations are discussed. Also, some requirements concerning feed medication are mentioned. Finally, parenteral and vaccine administration in the poultry industry are described.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What muscles involved on meat inspection? (2points)
2. Define meat inspection mean? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Identifying muscles involved in breathing and the different types of respiration

2.1 Muscles involved in breathing

The main job of the respiratory system of birds is to absorb oxygen and rid the body of carbon dioxide. In addition, the respiratory system also gets rid of excess heat, detoxifies some of the waste products of the body, and makes noise — most noticeably, crowing noise, much to the annoyance of our neighbours.

Like humans, birds have a windpipe and two lungs, but from there, birds are distinctly unlike mammals. Air flows into a bird's lungs during the intake of breath, it continues through the lungs into nine *air sacs,* and then it goes back out through the lungs again.

Birds get two doses of oxygen for the price of one breath! The air sacs are arranged around the inside of the chest and abdominal cavity, and they connect with some of the bones of the skeleton.

Birds don't have a working diaphragm; instead, a bird moves its rib cage and keel (breastbone) to draw air into the lungs and force it back out.

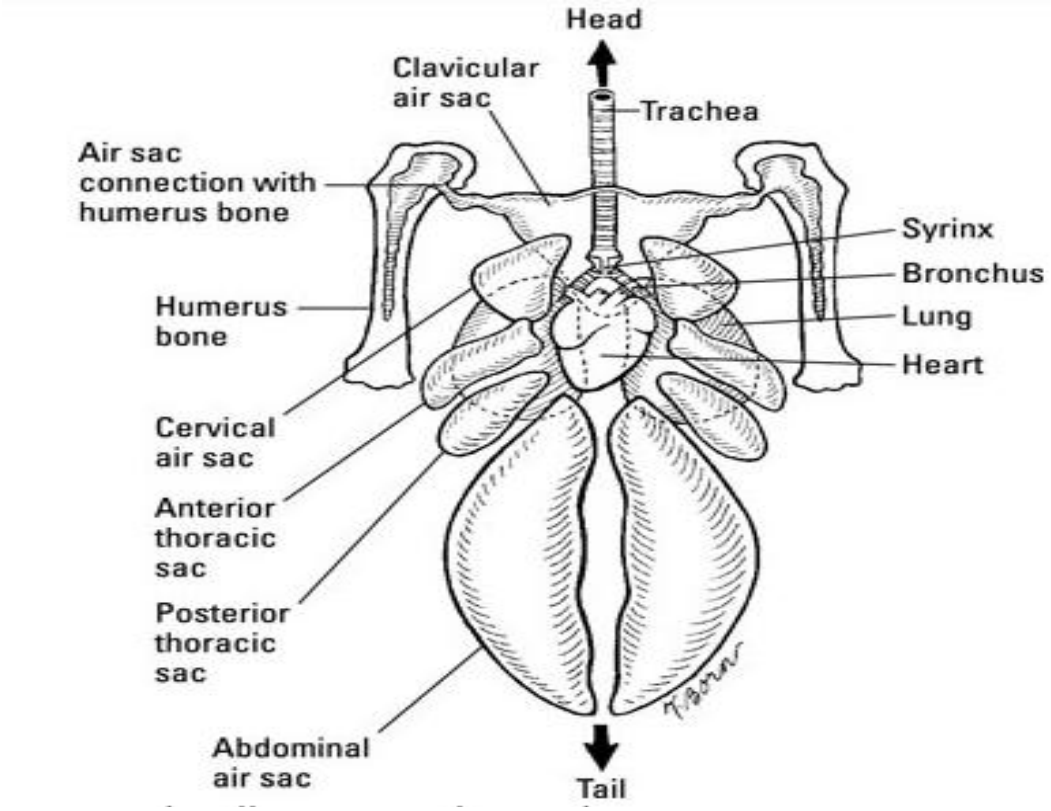


Figure 29: Breathing muscle and organ

The voice box in chickens is called the **syrinx,** located down in the chest cavity where the windpipe splits to enter each lung. Both male and female chickens have a syrinx, so hens can crow, too, if they feel like it. The syrinx isn't an optional piece of anatomy though. A rooster can't live with his syrinx removed.

The layout of a chicken's heart isn't so different from the layout of a human heart. It has four chambers and pumps blood through two loops: one loop through the lungs, and the other loop through the rest of the body. A chicken's heart is relatively large for its body size, compared to mammal hearts.

2.2. Respiration in chicken

The respiratory tract of poultry plays a very important role for chicken, layers, and duck: it provides oxygen from the air to the various cells of the body.

The organs involved in the respiratory system are constantly exposed to the external environment and they are therefore subject to infections.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What muscles involved in breathing? (2points?

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Identifying locations of blood vessels used in blood sample collection and drug administration;

3.1. The locations of blood vessels used in blood sample collection and drug administration

Introduction

Blood is collected from chickens for two purposes:

1. To obtain serum which will be tested for Newcastle disease virus antibodies, no anticoagulant is required and the blood is allowed to clot. The levels of antibody detected in individual birds and flocks give an indication of the response to a vaccination. It also indicates whether birds have been challenged by field strains of Newcastle disease virus.

2. To obtain red blood cells, the blood is collected into anticoagulant. The cells are washed and used to test for the presence of virus in the haemagglutination test. They are also used in the haemagglutination inhibition test for the presence of antibodies.

Where Are the Blood Collection Sites?

1. The large vein under the wing (brachial vein)
2. The vein on the side of the outstretched neck (jugular vein)
3. The vein on the inner leg, above the hock(medial metatarsal vein)

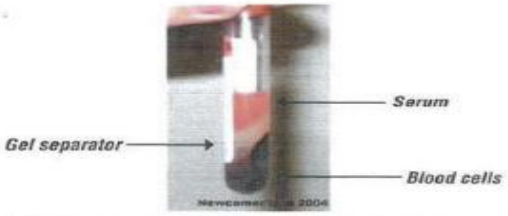
Separation of wing feathers, exposing the brachial vein (left). Vein puncture and the withdrawal of blood (right).

Exposed jugular vein (left) and withdrawal of blood (right).

Withdrawal of blood from the medial metatarsal vein.

Vial with gel separator and whole blood before centrifugation.

Filling of EDTA vial by allowing vacuum to empty the syringe.



Vial with gel separator after centrifugation. Note the gel separator separates the blood cells from the serum.

Examples of sick birds that have ruffled feathers and appear "depressed."

Example of a hematoma.

It is important that those who bleed chickens use a quick and effective technique. This will develop with practice and by applying the following advice.

- Handle the chickens gently.
- Collect the blood samples quickly.
- Take care not to damage the vein. Damaged veins will result in haematomas being formed.
- Minimize the loss of blood. This minimizes trauma to the chickens and stress to their owners.

Wing vein bleeding

Materials

- 2.5 mL syringes
- 25 gauge needles for small chickens
- 23 gauge needles for larger chickens
- Cotton wool
- 70 percent alcohol solution
- Labels or marking pen to label each syringe
- 

Needles and syringes commonly used to bleed poultry.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write two reasons of blood sample collection? (2points?)
2. List blood collection tools(2points?)

Note: **Satisfactory rating - 4points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

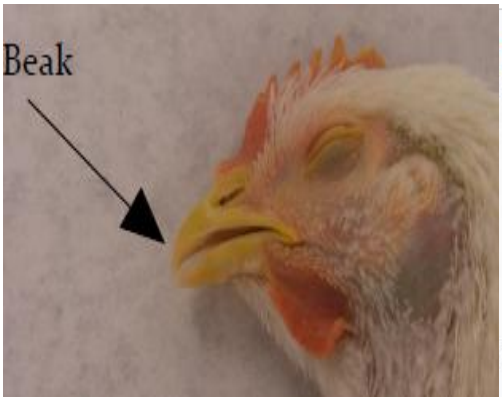
Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Identifying appropriate sites for Beak trimming

4.1. Appropriate sites for Beak trimming

Beak trimming is the removal of part of the top and bottom beak of a bird. It is also called “debeaking”, although this term is inaccurate as only part of the beak is removed. It is an animal husbandry practice commonly carried out in the poultry industry. Farm managers have their flocks beak-trimmed to blunt the beaks enough to prevent the occurrence of damaging pecking.



Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the two positions for beak trimming in poultry? (2points)

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	Identifying different poultry meat for processing and market value

Definition of terms

- **Poultry meat processing:** the term “processing” to include all the steps involved in turning a live animal into meat for sale.
- **Slaughter**: stunning, skinning, eviscerating, and cleaning; end products are carcass halves orquarters, which go into a cooler for immediate chilling.
- “**Cut and wrap**”: cutting chilled half/quarter carcasses to desired end size (primal, subprimal, or retail cuts) and packaging as desired (e.g., vacuum-packed subprimals, “caseready” retail packages).
- **Value-added processing**: grinding, casing, smoking, cooking, drying, and otherwise transforming meat and trimmings from the cutting step into sausage, ham, bacon, jerky, and other products; includes “portion cutting,” cutting subprimals into fixed-weight steaks, roasts, and other retail cuts.

5.1. Poultry processing

1. Killing

Fig.Making the cut.

2. Stunning

It provides a uniform heartbeat for better bleeding, and relaxes the feather follicles for easier picking. Furthermore, stunning is considered more humane than not stunning. In large plants, stunning works as follows.

3. Bleeding

Bleeding takes 1.5 to 3 minutes. According to industry thought, if the bird is not stunned, the bleed-out is slower and not as complete, because the bird is struggling and its organs are

using blood. Maximum drainage of blood is desirable so there won't be dark spots on the meat, especially on wing veins.

4. Feather Removal

4.1. Scalding

Birds are scalded (immersed in hot water) to loosen the feathers. Heat breaks down the protein holding the feathers in place. Scalding is very temperature-sensitive. Lower temperatures are used with longer periods of immersion in the scald water. The hotter the water the shorter the scald time and more chance of overscalding.

4.2. Picking

The quality of the pick is related to the scald. If the scald water was too cool, the feathers won't loosen; if it was too hot, the skin will tear in the picker. But if it was just right, the feathers usually come out easily and can even be removed by hand. However, hand picking is time-consuming.

A mechanical picker used for many birds. Older laying hens are harder to defeather.

fig. picking

5. Evisceration

Remove head and neck. Cut off the head between the head and the first neck vertebra using a twisting motion to cut through the joint. Do not try to cut through the bone.

For birds to be roasted, split the neck skin, inserting the knife through the skin at the point of the shoulders, cutting forward guiding the knife up the back of the neck . Pull the skin loose from the neck. Pull the crop, trachea (windpipe), gullet (esophagus) loose from the neck skin and cut off where they enter the body cavity.

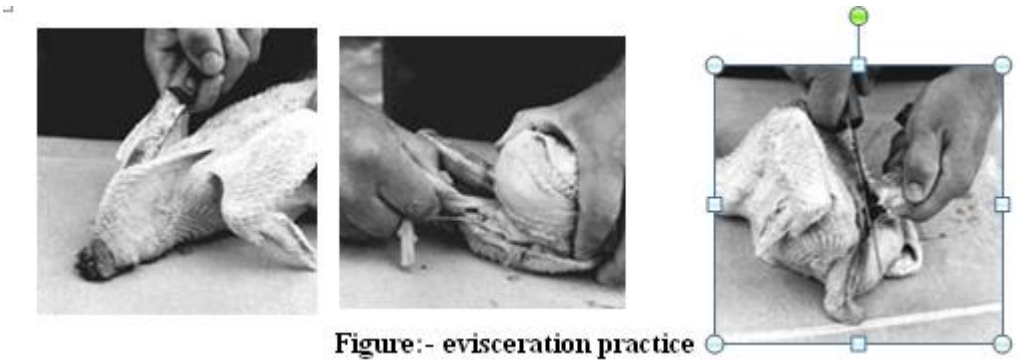


Figure:- evisceration practice

6. Remove shanks. With the bird breast up on a table, hold shank with one hand, applying upward pressure on the hock joint. With a sharp knife, cut through the hock joint starting on the inside joint surface. Pull the joint into the knife with a slight movement of the bird's feet to aid in cutting through the joint.

Figure :-removing shank

7. Remove oil gland. With the bird breast down on the table start the cut 1 inch forward from the oil gland nipple. Cut deep to the tail vertebra, then follow the vertebra to the end of the tail in a scooping motion to remove the oil gland.

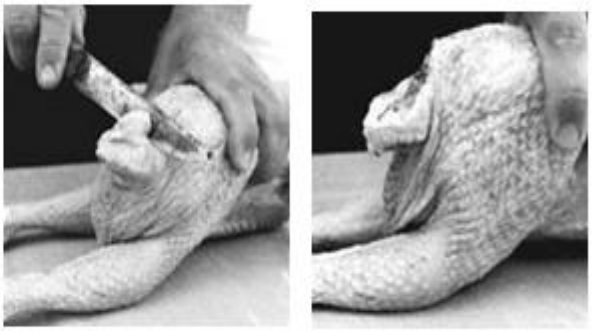


Figure: removing oil gland

8. Abdominal opening

9. Removal of internal organs (viscera or entrails)

1o. Harvesting giblets

11. Washing the Carcass

5.2. Market value of poultry meat

Most of the poultry meat available on the global market comes from large-scale specialized commercial poultry production systems. In low-income countries, imports of cheap low-quality cuts such as wings, lower legs, necks and giblets sold by the piece, make chicken meat more accessible to the average consumer. This coincides with changing eating habits in developed countries, where consumers tend to buy chicken breast and thigh meat and, to a lesser extent, drumsticks.

Poultry meat products are usually exported frozen. In many low-income countries, particularly those with tropical climates, trade in frozen food entails risks. It is not uncommon to see defrosted poultry meat displayed for sale on open market stalls without refrigeration, which presents a risk to human health.

The smaller the pieces, the higher the risk of contamination, owing to the increased surface area. Carcasses or cut-up pieces must remain frozen throughout the marketing chain. When the refrigeration chain is interrupted, infectious agents start to multiply on the meat. The consumption of contaminated meat can cause diseases, especially if the meat is not well cooked.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Discuss all poultry processing methods? (5points)
2. List the two feather removing methods?(2 points)
3. How can you add market value of chicken meat? (2 points)

Note: **Satisfactory rating - 9 points** **Unsatisfactory - below 9points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

List of Reference Materials

- FAO. (2013). Poultry development review
- Taylor & Francis Web site at http://www.taylorandfrancis.com and the CRC Press Web site at http://www.crcpress.com
- Alan R. Sams. (2001). Poultry MeatProcessing
- Elsevier (2002). Advanced Drug Delivery Reviews (ADV DRUG DELIVER REV)
- Van der Marel, G.M., De Vries, A.W., Van Logtestijn, J.G. and Mossel, D.A.A. (1989) Effect of lactic acid treatment during processing on the sensory quality and lactic acid content of fresh broiler chickens. International Journal of Food Science and Technology 24, 11–16.
- Meat Inspection Regulations, 1990: Stamps by Government of Canada, Department of Justice. Reproduction of this image is permitted for non-commercial purposes. It was not produced in affiliation with, or with the endorsement of the Government of Canada.

Poultry Production

Level -II

Learning Guide -22

Unit of Competence: - Identify and Describe Anatomy, Physiology and Behavior of Poultry

Module Title: - Identifying and Describing Anatomy, Physiology and Behavior of Poultry

LG Code: AGR PLP M02 LO5-LG-22

TTLM Code: AGR PLP TTLM 1219v1

LO 5: Identify behavior of poultry

Instruction Sheet	Learning Guide 22

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- **Observing, interpreting and recording behavior of poultry**
- **Identifying and implementing strategies to encourage natural behavior**
- **Recognizing, recording signs of stress in poultry and taking appropriate measure**

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- **Observe, interpret and recordbehavior of poultry**
- **Identify and implement strategies to encourage natural behavior**
- **Recognize, recordsigns of stress in poultry and taking appropriate measure**

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 93 to 105.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1, 2, and 3” in page -99, 102 and 105 respectively.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering all the Self-checks).
6. If you earned a satisfactory evaluation proceed to each “Information Sheets”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. Submit your accomplished Self-checks. This will form part of your training portfolio.

Information Sheet-1	Observing, interpreting and recording behavior of poultry

1.1.Identify behavior of poultry

- **Behavior** is the way that animals respond to the different stimuli they encounter in their environment.
- The **stimuli** may be from other birds, their environment, people or any other thing or occurrence.
- Pecking and the peck order: as a skill is recognized as being species specific for fowls. They peck to escape from the shell, to feed, to drink, to obtain and keep personal space etc. Main purpose of pecking is for eating which is a precisely tuned movement of the head and neck.

Figure 30: Normal behaviour

1.2. Normal behaviours of chickens

- **Preening**

Figure 31: Preening chicken

Grooming activity in birds is referred to as preening. Feathers are important for insulation and waterproofing (in addition to flight for those birds that can fly).

Feathers are composed of a shaft with several long thin structures called barbs. These barbs are held together by smaller barbules.

Sometimes the barbs are pulled apart, which makes the feather ineffective for insulation and waterproofing.

A bird runs its feathers through its beak when it preens, which realigns the barbs and makes the feathers better able to perform their functions.

Birds also need to keep their feathers oiled to prevent them from becoming brittle and to help with insulation and waterproofing.

Birds have a single oil gland near the base of the tail, referred to as the preen gland. Birds pinch this gland with their beaks to extract waxy oil, which they then apply as they pass their feathers through their beaks. Chickens preen on their own but they prefer to do it as a group activity.

- **Fighting**

Chicks start fighting when they are only a few weeks old. They are already starting to establish their rank in the flock. This fighting often continues until they reach maturity and the pecking order is well established. Sometimes fights occur among adult birds. This can occur when a member of the flock becomes tired of its position in the social hierarchy and decides to challenge a higher-ranking bird. More commonly, however, fights occur when a new bird is introduced into the flock and has to find its place in the pecking order or when a bird is reintroduced to the flock after a long absence.

Figure 32: Cocks fighting

Although both male and female chickens fight, fights between males tend to be more violent and are more likely to result in injury or death. When two birds are on the verge of a fight, they will eye each other and may casually circle around each other, each pretending to peck at something on the ground while watching the other. When the fight begins, the birds will raise their neck feathers and point their wings toward the ground, spreading them apart from the body. They will then stand as tall as they can and try to face each other down. If neither bird backs down, they will start pecking, scratching, and jumping at each other. They will also beat at each other with their wings.

- **Foraging**

Figure 33: Hen foraging

In the wild, jungle fowl spend 61% of their time foraging. Foraging behaviors include pecking and scratching at potential food sources, as well as looking for and sampling possible food sources. Providing chickens with a complete feed eliminates the need for foraging in order to obtain nutrients, but the hens will continue performing this behavior. Although finding food is

not the ultimate goal of the foraging behavior in domesticated fowl, researchers have not yet been able to determine the motivation for this behavior. There are a number of theories, but little evidence to support them.

- **Nesting**

Domestic hens prefer to lay in nests containing loose material that they can settle into, moulding the material with their bodies and feet, and that they can manipulate with their beaks. When given a choice, the former condition is more important than the latter. It is important for pullets to have access to nesting boxes before they start to lay. If a hen will have jump up to nest, she must be trained to do so as a pullet. If she does not learn in the laying house, she could end up laying greater number eggs on the floor. Birds are mimics, and the first layers become the teachers for the remaining pullets in a flock.

Figure 34: Nesting hen

Hens can differ in their preference for a nesting location. When a group of hens was given the choice between a nest box and a litter tray, the majority preferred the nest box. There were some hens, however, which preferred the litter tray. Those that selected the litter tray tended to spend more time exploring during the hour prior to laying an egg than did those that selected the nest box. Their final trip to the nest, when the egg was laid, was shorter for those that selected the litter tray.

- **Dust bathing**

Figure 35: Chickens dust bathing

Dust bathing is the act of rolling or moving around in the dirt to cleanse the skin and feathers of parasites, dead skin, and other skin irritants. It also helps prevent the buildup of the oil from preening. When chickens do not have access to dust baths, they will nonetheless go through the motions of dust bathing. In behavioral studies, hens have shown a willingness to work to gain access to material for dust bathing. (Note that access to a dust bath does not prevent feather pecking.)

- **Perching**

Figure 36: Perching hens

Chickens have a desire to roost. At about three weeks of age, chicks start to jump up to higher surfaces. The structure of a chicken's claws ensures a firm grip while the chicken is perching and will prevent the chicken from falling off a tree branch, even when the bird is asleep.

Chickens go to perches about half an hour before twilight, with the actual time depending on light intensity. For example, they will perch earlier than expected on a dull, cloudy day and later than expected on a bright, clear day. They seem to perch when the light is about 1.25 foot-candles. The “flying down” time in the morning is typically 30 minutes before dawn, at around 0.003 foot-candles of light. Again, the actual timing of this activity varies depending on the weather conditions. Chickens snuggle together during the night and start spreading out about two hours before the lights come on.

- **Responding to high ambient temperatures**

Chickens can tolerate cold weather better than hot. Chickens cannot sweat—they cool themselves by dunking their beaks in cold water or flapping their wings to air out their feathers. They may also pant when they are desperate to cool down.

Drinking

Figure 37: Cleft palate of chicken

Chickens must have access to a supply of clean, fresh water. Water in the crop softens feed so that digestion can occur. Without water, dry feed forms clumps in the crop. The clumped feed can press on the bird’s carotid artery, decreasing blood flow to the brain. This can cause paralysis and possible death. Poultry have a split in the upper hard palate of the beak that allows air into the nasal passages. This prevents a vacuum from forming in chickens’ mouths. As a result, chickens rely on gravity to draw water into the crop. This is why chickens lift their heads after dipping their beaks in water.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the normal behavior of chicken? (5 points)
2. How chickens respond to high ambient temperatures? (5 points)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Identifying and implementing strategies to encourage natural behavior

2.1. Natural behavior of chicken

Normal behaviors in chickens can seem odd to us. However, for this article, note that there is a difference between "normal" and "natural" behaviors.

Natural behaviors can change by the situation that the bird is in, and is driven by it's instinct, though it may not be normal because it's not something the bird does under typical circumstances. For example, cannibalism in chickens is not normal in a flock with plenty of space, but is caused by a natural instinct when overcrowded. Cannibalism is a natural behavior that suggests a problem.

2.2. Abnormal Behaviour

- **Pecking and Feather Picking**. Pecking is a common problem, and is abnormal when it becomes obsessive. Whether you have a chicken that is doing it to themselves or others, it's a sign that your bird is bored or overcrowded. If you have enough space for your chickens, then it may be due to a specific bird which, if excessive, may need to be culled for the health of the rest of the flock.
- **Cannibalism**. Chickens are naturally cannibalistic. If they see a dead chicken, they have no problem eating it, and it will not hurt them as long as the carcass is not diseased. However, killing and eating a fellow flock member is not normal. It suggests that your flock is overcrowded. This is often a problem seen in commercial flocks, both in battery cages and in barns. If you're having this problem, you need to reduce your flock size or increase your coop/run size.
- **Over mating/Aggressive Mating**. Aggressive mating is often a problem with young cockerels and pullets. Cockerels will gang up on a pullet, forcing her down, one after another. This is not normal mating and may seriously injure the pullet, and she should be removed if this happens. Though they are inexperienced and aren't sure what to do, mating should be a quick process that she can get up and shake off. Over mating is a bit more normal, but still suggests a problem. It is when the cock's spurs tear off the feathers on the back and/or on the neck (from his beak) due to mating too

often. This can happen when there is not enough hens for one rooster, or adolescent cockerels which tend to be a little rough. The problem can be solved by culling* excess roosters, adding more hens, or outfitting your hens with chicken saddles.

- **Wing Drooping**. Droopy wings and tails are a common sign of multiple illnesses. If you notice a chicken with droopy wings, you should immediately examine your chicken. It appears as the chicken is slightly squatted, with its wings a bit spread and pointed downward, rather than held against the body as they would be normally.

- **Lethargy**. Not to be confused with broodiness, lethargy suggests illness. Chickens normally like to stay up, awake, and peck around. A chicken that is lying in one spot for extended periods of time, unable to hold its head up, or have difficulty walking is lethargic and possibly sick.
- **Human Aggression**. This is actually a normal, but intolerable, behaviour, most commonly among males. A rooster may fly up to you, flapping his wings and trying to hit you with his claws and spurs. This can be very dangerous, especially around children, as a cock's spurs can grow over two inches long and are sharp. If a rooster attacks you from above (flying), knock him directly to the ground. If he attacks your feet, give him a little shove-kick (not enough to injure him). Then, pick him up and force him to stay still under your arm, or just chase him around for a few seconds.

- **Inter-species mating**. This is generally abnormal behaviour, but isn't always a problem. Guineas and chickens can mate fairly safely. However, a male duck over a chicken hen can be dangerous. Male chickens do not have penises, so hens are not meant to breed that way. Male ducks not only have a penis, but a corkscrew-shaped phallus that may be covered in small barbs. A drake mating with a chicken could be very harmful.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is the difference between natural and abnormal behavior in poultry? (2points)
2. List abnormal behaviors in poultry? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Recognizing, recording signs of stress in poultry and taking appropriate measure

3.1. What is stress?

The factors which interfere with the well- being of the bird are called stressors or stress factors, and the result of the response or the effort that costs the chicken while trying to cope with the stressor is what constitutes stress. As a result, their response (a must for survival) to such stimuli is also negative.

3.1.1. Causes of stress in poultry

One of the most significant causes of poultry stress is

- **Heat stress**. Chickens do not have sweat glands and are thus unable to regulate their own body temperature. A very common sign of heat stress is rapid panting, which indicates the chicken is in distress.

Common causes of poultry stress:

- Disease
- Poor nutrition
- Genetics
- Egg production
- Poor management
- Vaccination
- Overcrowding
- Temperature fluctuations

The effects of heat stress are:

- a progressive reduction in feed intake as ambient temperature rises;
- an increase in water consumption in an attempt to lower temperature;
- a progressive reduction in growth rate; and
- Disturbances in reproduction (lower egg weight, smaller chicks, reduced sperm concentration and an increased level of abnormal sperm in cocks).

3.1.2. Signs of stress in poultry

The 5 most common symptoms of poultry stress:

1. Weight loss
2. Reduced egg production
3. Lowered liveability

4. Increased feed conversion ratio
5. Immune suppression and increased susceptibility to diseases

Figure 38: Sign of stress/frightens

3.2. Methods for Minimizing Poultry Stress

Solutions for addressing poultry stress include

- ✓ Maintaining a clean, calm,
- ✓ Disease-free environment.
- ✓ Reducing noises, extreme heat, and
- ✓ Other unusual circumstances.
- ✓ Making sure your flocks have access to clean water and a healthy supply of pelleted feed will go a long way towards minimizing the risk of creating a stressful environment.
- ✓ Identifying common areas where stress occurs should begin with an examination of living conditions.
- ✓ Provide fresh air and enough space to room

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write causes of stress in poultry? (2points)
2. List Methods for minimizing Poultry Stress? (2points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

List of Reference Materials

- Managing symptoms of poultry stress in broiler chickens
- Dr. Jacquie Jacob. Normal behaviours of chickens in small and backyard poultry flocks