

# **GreenEMPIRE**

---

*"We plant seeds of SUCCESS"*

## **Licensure Examination in**

## **Agriculture Reviewer**

(Lecture Manual and Review Questions)

**ANIMAL SCIENCE**



**Green Empire PH** is an online support group providing basic knowledge in agriculture especially to those who are planning to take the Licensure Examination in Agriculture in the Philippines.

Interact with the team and get more updates via our official FACEBOOK PAGE: [www.facebook.com/greenempireph](https://www.facebook.com/greenempireph) and TWITTER: @greenempireph



This is where GreenEmpire PH provides FREE and relevant review questions, topics, and study tips. Feel free to join our discussion, share your ideas and meet other examinees!

## SUPPORT TEAM Basic Information:

### **Marcial S. Buladaco**

Top 1 (87.17%) LEA 2014

BS Agriculture, University of the Philippines Los Baños

Univ. Research Associate at Agricultural Systems Cluster, UPLB

Contact details: msbuladaco@up.edu.ph; 09177034344

### **Maluz A. Belarma**

*cum laude*

BS Agriculture, University of the Philippines Los Baños

Univ. Research Associate at University of the Philippines Los Baños

President, Handog-Aral Inc.

Contact Details: luzzybsoils@gmail.com; 09084979142

### **Michelle Ann M. Calubaquib**

BS Agricultural Chemistry, University of the Philippines Los Baños

MS Soil Science, University of the Philippines Los Baños

Univ. Researcher at University of the Philippines Los Baños

Contact Details: mitch\_calubaquib@yahoo.com; 09178930602

### **Lovely R. Luar**

BS Agriculture, University of the Philippines Los Baños

Researcher at International Plant Nutrition Institute (IPNI)

Contact Details: lovely\_luar@yahoo.com; 09269959075

### **Ma. Theresa V. Velasco**

*magna cum laude*

BS Agriculture, University of the Philippines Los Baños

Researcher at International Rice Research Institute (IRRI)

Contact Details: t.velasco@irri.org; 09082932920

## **ANIMAL SCIENCE**

- I. Introduction
  - A. Economic utility derived from animals
  - B. Farm animals
  - C. Commonly used terms
- II. The Anatomy and Physiology of farm animals
  - A. Commonly used terms
  - B. The Nervous system
  - C. The Endocrine system
  - D. The Cardiovascular system
  - E. The Lymphatic system
  - F. The Respiratory system
  - G. The Digestive system
  - H. The Excretory system
  - I. The Reproductive system
  - J. Body temperature regulation
- III. Animal Nutrition
  - A. Classes of nutrients and their characteristics
    - i. water
    - ii. carbohydrate
    - iii. fats
    - iv. proteins
    - v. minerals
    - vi. vitamins
  - B. Growth and Maintenance
  - C. Feeds and nutrient sources
- IV. Genetics and Livestock Improvement
  - A. Important contributors to the field of Genetics
  - B. The G x E interaction
  - C. Gene action
- D. The Mechanics of Inheritance
- E. The Mendelian Inheritance
- F. Non-Mendelian Inheritance
- G. Non-nuclear Inheritance
- H. Genes in Population
- I. Animal breeding
- J. Systems of breeding
  - i. Selection
  - ii. Inbreeding
  - iii. Crossbreeding
- K. Animal Reproduction and rate of genetic improvement
- V. Slaughter, Processing and Marketing of Farm Animals
  - A. Selecting animals for slaughter
  - B. Handling prior to slaughter
  - C. Steps in general slaughtering
  - D. Meat and meat products
  - E. Milk production
  - F. Egg production
- VI. Poultry production
  - A. The chicken: classes, breeds & varieties
  - B. Specialized fields in poultry production
  - C. Poultry reproductive system
  - D. Brooding management
  - E. Growing management
  - F. Layer flocked management
  - G. System of broiler operation
- VII. Swine production and management
  - A. Breeds of swine
  - B. Production system
  - C. Management of the boar

- D. Care and maintenance of sows and gilts
  - E. Care and management of growing finishing pigs
- VIII. Goat and sheep production
- A. Sheep breeds
  - B. Goat breeds
  - C. Breeding and management practices
  - D. Feed resources and feeding management
  - E. Health management
- IX. Beef cattle production and management
- A. Beef production systems in the philippines
  - B. Beef cattle breeds, breeding and reproduction
  - C. Beef cattle nutrition
  - D. Herd management
  - E. Housing and other facilities
- X. Dairy production
- A. Milk and milk products
  - B. Breeds of dairy cattle
  - C. Dairy cattle reproduction
- XI. Carabao production & management
- A. Types and breeds of water buffalo
  - B. Breeding
  - C. Care and management of buffaloes
  - D. Management of bull
  - E. Feeding systems
  - F. Animal health management

# ANIMAL SCIENCE

## I. INTRODUCTION

### Economic utility derived from animals:

- Food – chicken, ox, buffalo, swine, etc
- Protection/Security/Guide
- Power/Work – ox, buffalo, horses, dogs
- Medicine
- Pets – dogs, cats, parrots, etc
- Sports – dogs, birds, etc
- Research
- Clothing and aesthetic use
- Others – musical instruments, etc

### Farm Animals:

- Cattle (no hump) *Bos taurus*
- Buffalo *Bubalus bubalis*
- Sheep *Ovis aries*
- Goat *Capra hircus*
- Pigs *Sus scrofa*
- Horse *Equus caballus*
- Chicken *Gallus gallus*
- Mallard duck *Anas platyrhynchos*
- Muscovy duck *Cairina moschata*
- Goose *Anser domesticus*
- Turkey *Meleagris gallopavo*
- Pigeon *Columba livia*
- Guinea fowl *Numida meleagris*

### Commonly used terms:

#### A. Cattle and Carabao

1. Bull – male breeding ox of any age
2. Bull calf – young male calf under one year of age
3. Bullock – usually a stag for draft purposes
4. Calf – young ox of either sex, under one year of age
5. Cattle – domesticated bovine animals
6. Cow – mature female ox, one that has given birth
7. Carabull – carabaobull, caraheifer, caracow, etc.
8. Caracow – mature female carabao, one that has given birth
9. Caraheifer – young female carabao under three years of age usually one that has not yet given birth
10. Heifer – young female ox under the age of three years, usually one that has not yet given birth
11. Proven sire – bull about whom one have sufficient unselected information to indicate his transmitting ability
12. Ox – ruminant member of the bovine family, or sometimes the male used for draft purposes
13. Stag – male ox castrated after sexual maturity
14. Steer – male ox castrated before sexual maturity

#### B. Horse

1. Broodmare – a female horse used for breeding purposes
2. Colt – young male horse usually up to the age of three years
3. Equitation – horsemanship; the art of riding on horseback
4. Filly – young female horse usually up to the age of three years old
5. Foal – young horse of either age below one year of age
6. Gelding – horse which was castrated while young
7. Mare – mature female horse

8. Ridgling – stallion with only one testis or none in its scrotum
9. Stallion – mature male horse
10. Studhorse – a stallion used for breeding purposes
11. Yeld mare or dry mare – one which has not produced any young during the breeding season

#### C. Swine

1. Boar – male pig of any age
2. Barrow – male pig which was castrated while young; a pig that was castrated before the secondary sex characteristics have developed
3. Gilt – young female pig under the one year of age, usually one that has not yet given birth
4. Litter – group of pigs born in one farrowing
5. Litter size – the number of young pigs born in one farrowing
6. Shote – young pig of either sex, weighing approximately 60 kg
7. Sow – mature female pig, one that has given birth
8. Stag – a male pig castrated after sexual maturity
9. Suckling – young pigs from birth up to weaning
10. Weanling – young pigs separated from the sow, about 5 weeks old

#### D. Sheep and goat

1. Billy goat or buck – male goat of any age
2. Doe – female goat of any age
3. Ewe – female sheep of any age
4. Fleece – wool covering the sheep
5. Kid – young goat of either sex below one year of age
6. Lamb – young sheep of either sex below one year of age
7. Pelt – wool and skin of sheep
8. Ram – male sheep of any age for breeding purposes

9. Shearling – yearling sheep with two teeth
10. Wether goat – male goat castrated before the secondary sex characteristics have developed
11. Wether sheep – male sheep which was castrated while young preferably between 1 to 3 weeks of age

#### E. Poultry (chicken, duck, muscovy, turkey, quail, geese)

1. Capon – a castrated male, readily distinguished by the undeveloped comb and wattles
2. Chick – young chicken while in the down stage
3. Chicken – one of the more common poultry species different from turkey, geese, etc.
4. Cockerel – a male fowl less than one year old
5. Drake – a male duck
6. Duck – a female duck
7. Duckling – the young duck in the down stage
8. Poult – the young of the domestic turkey, properly applied until sex can be distinguished
9. Poultry – a collective term for all domestic birds rendering economic service to man; can also refer to dressed carcass of fowls
10. Plumage – the feathers of a fowl
11. Pullet – a female fowl less than one year old
12. Rooster – a male fowl one year old or over

## **II. THE ANATOMY AND PHYSIOLOGY OF FARM ANIMALS**

### **Commonly used terms**

1. Parturition – the act of giving birth
  - Calving – in cows
  - Farrowing – in sows
  - Foaling – in mares
  - Kidding – in goats
  - Lambing – in ewes
2. Conception – act of fertilization
3. Dam – female parent
4. Fecundity/ prolificacy – ability to give birth to offspring frequently or numerous young at frequent intervals
5. Fertility - ability to produce fertilizable ova and to provide proper environment for and initiating cell division and embryonic development; Ability to produce large number of sperm capable of fertilization
6. Gestation – pregnancy time from conception to birth
7. Impotency – failure to copulate
8. Puberty – sexual maturity, as exhibited by first heat or ovulation
9. Sire – the male parent
10. Sterility – inability to produce normal young
11. Transmitting ability – the ability of an animal to pass on either good or bad traits to its progeny
12. Weaning – the process of separating the young from its dam
13. Weanling – young animal, after separation from its dam

**Anatomy** - the study of the form and structure

### **External Anatomy**

- Are structures found outside the body which are integral part of the organ systems located internally
- Generally involved in the following functions
  - i. Protection/covering such as feathers, hairs, horns, skin, etc
  - ii. Digestion like mouth, beak, bill, snout, muzzle, etc
  - iii. Sensation such as skin, nostril, eyes, ears
  - iv. Aesthetic like comb, wattles, feathers

### **Internal Anatomy**

- Are organs and organ systems which function in a well-coordinated manner to enable survival, growth and reproduction
- Generally located in the following
  - i. Thoracic cavity - lungs, heart
  - ii. Abdominal cavity – stomach, small intestine, pancreas, liver, spleen, large intestine, kidneys, adrenals,
  - iii. Pelvic cavity – reproductive organs

**Physiology** - the study of function of the parts or organ systems of the body; a study of function of living matter; provides the means by which environmental stimuli are perceived and a body reaction occurs

**Homeostasis** – the maintenance of static or constant conditions in the internal environment

# THE NERVOUS SYSTEM

## Basic unit of the nervous system

The nerve cells or neurons

- Specialize in impulse conduction or the relay of messages from effector organs to the nervous system and vice versa
- Synapse: a gap between two neurons; where nerve impulses are transmitted from one nerve cell to another
- May be classified according to the direction of impulse conduction
  1. **Afferent (sensory) neurons** – transmit nerve impulses from the effector organ to the spinal cord or brain
  2. **Efferent (motor) neurons** – transmit nerve impulses away from the brain or spinal cord or towards muscles or glands
  3. **Interneurons** – conduct impulses from an afferent neuron within the central nervous system

## Divisions of the Nervous system

### **1. The Central Nervous System (CNS)**

- the main processing unit of the body
- includes the brain (enclosed by the skull) and the spinal cord (enclosed by the vertebral column)

### **2. The Peripheral nervous system (PNS)**

- is composed of nerves emerging from the CNS

## Divisions of the Peripheral Nervous System:

### **1. Somatic**

- supplies & receives fibers (neurons) to & from the skin, skeletal muscles, joints, & tendons
- brings about quick adjustments of the muscles to changes in the environment

## **2. Autonomic/Visceral**

- supplies & receives fibers to & from smooth muscle, cardiac muscle, and glands
  - made up of visceral motor fibers (those supplying smooth muscle, cardiac muscle, & glands)
- 2 Subdivision of Autonomic NS:
- o **Parasympathetic division** - important for control of 'normal' Body functions; e.g. Normal operation of digestive system
  - o **Sympathetic division** - also called the 'fight or flight' Division; important in helping us cope with stress

# THE ENDOCRINE SYSTEM

**Endocrinology** – a branch of physiology dealing with the coordination of various body tissues by chemical mediators produced by restricted areas of the body and transported through the circulatory system to the organ or tissue on which they exert their effects

### **Hormone**

- a substance or chemical mediator produced by the endocrine glands and secreted into the bloodstream to some distant part of the body with the target cells where it exerts its effect

Classification of hormones according to composition:

1. **Polypeptides** - Chains of amino acids, each less than 100 amino acids long.  
Ex. Insulin which helps control glucose levels in the blood
2. **Glycoproteins** - A polypeptide chain, longer than 100 amino acids, attached to a carbohydrate.  
Ex. Follicle-stimulating hormone (FSH) and luteinizing hormone (LH)

3. **Amines** - Hormones derived from the amino acids tyrosine and tryptophan.  
Ex. Catecholamines (adrenaline and noradrenaline) which are often secreted in response to stress
4. **Steroids** - Lipids derived from cholesterol.  
Ex. Corticosteroids secreted from the adrenal gland balance solutes, such as glucose and salt, in the body.

### **The Hypothalamus**

- An essential component of the endocrine system
- General functions:
  1. Control of the autonomic nervous system
  2. Reception of sensory impulses from the viscera
  3. Intermediary between the nervous and endocrine system
  4. Control of body temperature
  5. Regulation of body intake
  6. Thirst center
  7. Part of the limbic system-emotions such as rage and aggression
  8. Part of reticular formation

### **The Pituitary gland or hypophysis**

- With 3 lobes: i. Anterior/ adenohypophysis; ii. Intermediate/ pars intermedia; and iii. Posterior/ neurohypophysis

### **The Thyroid gland**

- With two lobes connected by Isthmus, a bridge of tissues
- Maintains the level of metabolism in the tissues optimal for the  
Normal function:  
Secretes T4, thyroxine which increases the basal metabolic rate of an individual

Secretes T3, triiodothyronine, which along with T4 stimulates the oxygen consumption of most of the cells in the body, and helps regulate lipid and carbohydrates metabolism

- Excess thyroid secretion: body wasting, nervousness, excess heat  
Production, thyrotoxicosis e.g. Graves' disease (exophthalmic Disorder) caused by thyroid-stimulating immunoglobulins (TSI)
- Hypothyroidism: simple goiter; lack of thyroxine secretion due to  
Iodine deficiency in the diet
- Also secretes Calcitonin/ Thyrocalcitonin in response to the stimulation from the parathyroid gland

### **The Parathyroid gland**

- Located near the thyroid gland
- Produces Parathyroid hormone (PTH) which increases the level of  
Calcium in the blood by mobilization of calcium from the bones, and  
Enhancement of Ca and P absorption from the intestinal tract (urinary phosphate excretion)
- The secretion in this gland stimulates the Calcitonin (lowers calcium  
Level) secretion in the thyroid gland in response to the increasing  
Calcium level in the blood

Hormone	Target Organ	Functions
<b>A. Anterior Lobe</b>		
Growth Hormone or Somatotropic Hormone (STH)	Bone and muscle cells	<p>Promotes growth of the long bones before the epiphyseal – diaphyseal plate is fused together in adulthood</p> <p>Stimulates body growth through protein synthesis, stimulates lipolysis, stimulates secretion of IGF-1, inhibits action of insulin on carbohydrates, and lipid metabolism</p> <p>Oversecretion of STH in man:</p> <ul style="list-style-type: none"> <li>Gigantism - when happened before adulthood</li> <li>Acromegaly - when happened after adulthood</li> </ul> <p>Deficiency:</p> <ul style="list-style-type: none"> <li>Dwarfism – occurs when there is deficiency during growth development</li> </ul>
Adrenocorticotropic hormone (ACTH)	Adrenal gland (cortex)	<p>Stimulates the adrenal cortex to produce glucocorticoids such as cortisol, cortisone and corticosterone</p> <p>Maintains size of zona fasciculata and zona reticularis of the cortex</p>
Thyroid Stimulating hormone (TSH)	Thyroid gland	<p>Stimulates production of thyroid hormones T3 and T4 by thyroid follicular cells, maintains size of follicular cells, increase in metabolism</p>
Follicle Stimulating hormone (FSH)	Ovarian follicle	<p>Stimulates the ovary to produce graafian follicle</p> <p>In the male, it regulates spermatogenesis in the testis by maintaining the integrity of the seminiferous tubules</p>
Luteinizing hormone (LH)	Ovarian follicle	<p>Stimulates ovulation in the maturing graafian follicle and the formation of the ovarian corpus luteum</p> <p>Stimulates production of estrogen and progesterone by the ovary</p> <p>Stimulates testosterone production by the testis</p>
Prolactin or Luteotropic hormone (LTH)	Mammary gland	Stimulates production and maintains milk secretion in lactating mammary gland
<b>B. Intermediate Lobe</b>		
Melanocyte Stimulating hormone (MSH)	Skin (Melanocytes)	Skin pigmentation (melanin)
<b>C. Posterior Lobe</b>		
Oxytocin	Mammary gland Uterus	<p>Stimulates milk ejection in lactating females</p> <p>Contraction of the uterus at parturition for fetal expulsion</p>
Vasopression or Anti-diuretic hormone (ADH)	Kidney	Maintenance of body water through reabsorption

### The Adrenal Gland

- divided into cortex and medulla
- generally located at the anterior part of the kidney

Hormones	Functions
A. Adrenal cortex	
Glucocorticoids (cortisol, cortisone, and corticosterone)	(secreted by zona fasciculata and zona reticularis) Stimulates glycogenolysis and gluconeogenesis
Aldosterone	(secreted by zona glomerulosa) Regulates mineral metabolism and water balance; regulates sodium metabolism by reabsorbing sodium from the kidney tubules
B. Adrenal Medulla	
Epinephrine (adrenalin)	Emergency hormone, increase heart rate, vasoconstriction
Norepinephrine	Maintenance of blood pressure

### The Pancreas

- Located at the duodenal loop of the small intestine
- Function as an exocrine gland: its acinar cells secrete pancreatic juices with digestive enzymes
- Function as an endocrine gland: its Islets of Langerhans alpha and beta cells produce 2 different hormones;
  - The beta cells produce Insulin which stimulates entry of glucose into the cells for metabolism, thus, lowering the blood glucose levels; the process is anabolic, increasing the storage of glucose, fatty acids and amino acids
  - Excess insulin: can cause hypoglycemia
  - Lack of insulin: can cause diabetes mellitus

- The alpha cells produce Glucagon which stimulates glycogenolysis, thereby increasing blood glucose levels; the process is catabolic, mobilizing glucose, fatty acids, and amino acids into the bloodstream
- Excess glucagon: worsens diabetes
- Lack of glucagon: can also cause hypoglycemia

### The Gonads

- Male gonad: Testes produce male gametes (sperm)
  - also produces the hormone testosterone for the development of male characteristics
- Female gonad: Ovary produces female gametes (ova)
  - produces Estrogen to enhance female receptivity during estrus, development of accessory sex glands (mammary gland)
  - produces Progesterone from the corpus luteum to maintain pregnancy and to develop alveoli of the mammary gland
  - produces Relaxin for the relaxation of the cervix during parturition

## **THE CARDIOVASCULAR SYSTEM (CVS)**

- Consists of the heart, the blood, and the blood vessels

### The Heart

- At each pumping of the heart, the aortic arterial pressure rises to its highest point (systole) and falls to its lowest point (diastole)
- its contraction is spontaneous; initiated by the depolarization of the Sino-atrial node

## **The Mammalian heart**

- has 4 chambers (upper: 2 atria; lower: 2 ventricles)
- A-V valve/ atrio-ventricular valve: prevents backflow of blood from the ventricle to the atrium during ventricular systole
- aortic valves and pulmonary valves prevent backflow of the blood from the blood vessels into the ventricles during diastole
- tricuspid: the valve on the right; bicuspid (mitral): the valve on the left

## **The Sino-atrial node (SA node)**

- the cardiac pacemaker
- its rate of discharge determines the rate at which the heart beats

## **The Heart Sound/ The Heart Beat**

- first sound (low and slight): "lub", caused by the closure of the mitral and the tricuspid valve
- second sound (shorter and high pitch): "dub", caused by the closure of the aortic and pulmonary valves just after the end of the ventricular systole
- sequence: contraction of the atria (atrial systole), followed by the contraction of the ventricles (ventricular systole), then diastole (relaxation of the heart muscles)

## **Pulse or pulse wave**

- the arterial palpation of a heartbeat
- the wave of systolic pressure which starts at the heart and spreads throughout the arterial network
- occurs due to the filling of the arteries from the left ventricle with oxygenated blood during systole
- is determined to measure the rate of heartbeat
- can be felt in arteries near the surface of the body, particularly if the artery can be pressed against an underlying bone or other solid structure

Normal average pulse rate per minute and the location in feeling the artery:

**Carabao and cattle:** 54, external maxillary artery slightly on the outer surface of the lower jaw, and at the coccygeal artery at the base of the underneath of the tail

**Goat:** 78, femoral artery

**Horse:** 38, external maxillary artery; about the middle of the lower jaw

**Chicken:** 200-400, auscultation method using stethoscope at the chest region (same with other farm animals)

## **The Blood Vessels**

Artery – the blood vessel that carries oxygenated blood away from the heart

Vein – carries unoxygenated blood back to the heart

Exception:

Pulmonary artery – carries unoxygenated blood from the right ventricle into the lungs

Pulmonary veins – carry oxygenated blood from the lungs to the left atrium of the heart

## **Sytemic blood circulation**

- the oxygen is taken in by the tissues and carbon dioxide is given off by the tissues to the circulating blood

- includes the following special systems of blood circulation:  
Coronary circulation: supplies blood to the heart

Hepatic circulation: supplies arterial blood into the liver

Cerebral circulation: supplies arterial blood into the brain

Renal circulation: supplies arterial blood into the kidney

Splanchnic circulation: supplies arterial blood into the digestive tract

## **The Blood**

- A thick suspension of cellular elements in an aqueous solution of electrolytes and some non electrolytes
- A circulatory tissue composed of blood cells, blood plasma, and other dissolved substances
- By centrifugation, it can be separated into two categories: cells and plasma

## **The blood plasma**

- the fluid portion of the blood containing a number of ions, inorganic molecules, and organic molecules which are in transport of other substances
- normal plasma volume: about 3-5% of the body weight

## **The Three Blood cells**

### **(a) Leukocytes (white blood cells)**

- responsible for the defense/ protection of the body
- classified into three
- 1. Granulocytes (neutrophils, eosinophils, basophils) – the most numerous; main function is to phagocytose
- 2. Monocytes – large and non-nuclear; actively phagocytic
- 3. Lymphocytes – mostly formed in the lymph nodes, spleen and thymus; believed to produce antibodies and counteract toxins

### **(b) Erythrocytes (red blood cells)**

- contain red pigment hemoglobin
- biconcave disks manufactured in the bone marrow
- carries oxygen for distribution to the different tissues

**Hemoglobin** – a complex conjugated globular protein containing iron responsible for its oxygen-carrying property

### **(c) Thrombocytes (platelets**

- platelets collects itself and stick into the wall of the injured site, and liberate serotonin which leads to local vasoconstriction
- also liberates thromboplastin which is essential for blood clotting

## **THE LYMPHATIC SYSTEM**

- Composed of lymph node, lymph vessel, and the lymph
- Carries fluid from the tissue spaces into the blood
- A defense mechanism to control infection by phagocytosing noxious materials, bacteria and debris from the tissues at the lymph nodes

### **The Lymph nodes**

- Bean-shaped small bodies of lymphoid tissues located in strategic points in the body through which the lymph passes on its way to the bloodstream
- Functions: production of lymphocytes and to stop foreign materials that come to them
- become swollen or inflamed during severe bacterial infections

### **The Lymph vessels**

- A system of vessels draining from the lungs and from the rest of the body tissues ending in the venous system
- Also contain valves which prevent the back flow of its contents (like the veins)

### **The Lymph**

- An interstitial fluid
- Derived largely from the blood and in similar composition with blood plasma
- The lymph flow in the lymph vessels is unidirectional, from the tissues toward the heart

## THE RESPIRATORY SYSTEM

- Refers to the structure involved in the exchange of gases between the blood and the lungs and other organ systems
- An air pump which draws fresh air through the air tubes to small air sacs
- 2 major function: supply oxygen to the blood and remove carbon dioxide from the blood

### Respiration

- Generally involves **Inhalation**, the oxygen from the environment is taken in, and **Exhalation**, carbon dioxide, a metabolic product is expelled during respiration

**Eupnea** - the normal quiet respiration

**Dyspnea** - difficult breathing

**Apnea** - the cessation/stopping of respiration

**Hyperpnea** - the increased rate/depth of breathing or both

**Polypnea** - the rapid , shallow breathing

**Diaphragm** – completely separates the abdominal cavity and the thoracic cavity which contains the lungs and the mediastinal organs

Normal ranges of respiratory rate per minute:

**Carabao: 24-27**

**Cattle: 27-28**

**Fowl: 15-30**

**Horse: 27-28**

**Pig: 29-33**

**Sheep: 35-38**

## THE DIGESTIVE SYSTEM

- includes the digestive tract and its associated glands

### Prehension

- The seizing and conveying of feed into the mouth
- The principal prehensile structures are the lips (or beak in birds), teeth, and tongue.
- When grazing, cattle utilize the tongue and lower incisors. Horses and sheep utilize their lips and teeth.
- The pig and horse possess a complete set of incisors and molars. Cattle and sheep (and other ruminants) have only a dental pad instead of upper incisors

### Mastication

- Chewing
- The mechanical breakdown of feed into finer particles
- Important because finely divided feed presents a greater surface area for the action of digestive enzymes and it allows the feed to be well mixed with the saliva to facilitate swallowing
- In ruminants, most of the mastication of coarser feed particles occurs during the process of rumination, or re-chewing.

### Insalivation

- The mixing of feed with saliva
- Greatest during feeding, mastication , or re- mastication in ruminants. Saliva lubricates the feed bolus, adds small amounts of amylase, and because of its alkalinity and large volume, buffers the pH in the rumen.

### Digestion

- The mechanical breakdown of feed and the consequent chemical changes brought about by digestive juices, bacteria and protozoa
- Breakdown of feed particles into suitable products for absorption; may include: mechanical forces, chemical action, enzyme activity; involves the processes used to prepare food for absorption

## **Enzymes**

– A complex protein produced in living cells that causes changes in other substances within the body without being changed itself (organic catalyst)

- Saliva : Salivary amylase – starch to maltose; (in swine but limited in cattle and sheep) begins the initial digestion of sugars and starch
- Rumen:  
Microbial cellulose – cellulose to volatile fatty acids  
Microbial Amylase – starch to volatile fatty acids and lactic acid  
Microbial Proteases – protein to amino acids and NH<sub>3</sub>  
Microbial urease – urea to CO<sub>2</sub> and NH<sub>3</sub>
- Stomach, Abomasum and Proventriculus: Pepsin – protein to polypeptides
- Pancreas (enzymes produced by pancreas are secreted into the duodenum)
 

Trypsin	– protein to peptides and amino acids
Chymotrypsin	– protein to peptides and amino acids
Carboxypeptidase	– protein to peptides and amino acids

## **Absorption**

- Transfer of substance from gastro-intestinal tract (GIT) to the circulatory (blood, or lymph) system; involves the processes that move small molecules through membranes of the gastro-intestinal tract (GI tract) into blood so the

molecules may be used for their specific function; occurs when nutrients are broken down to very small molecules, to their basic units, with the action of enzymes; occurs primarily in the small intestine and large intestine

## **Parts of the digestive system and their functions**

### **1. Mouth and buccal cavity**

- for prehension, mastication, and insalivation
- used in the bolus formation in ruminants
- with 3 accessory organs

**Tongue** - grasping food

**Teeth** - mastication of food

**Salivary glands** - produced saliva which contains water to moisten food; mucin to lubricate food for easy swallowing; bicarbonate salts to buffer (regulate pH); salivary amylase to start carbohydrate digestion

**2. Pharynx** - common passage for air and feed; the inspired air crosses the pharynx to enter the larynx while the feed crosses the pharynx to enter the esophagus

**3. Esophagus** - a muscular tube which connects the stomach to the mouth; allows passage of food from mouth to stomach

### **4. Stomach**

- a muscular organ which is the site for feed storage, grinding and mixing of feed, absorption, enzymatic action and microbial fermentation
- 3 major functions: storage of ingested feed, mechanical breakdown, and production of HCl, enzymes and mucus

**5. Small intestine** - has 3 divisions:

**Duodenum** – an active site of digestion that receives secretions from the pancreas, liver and intestinal walls.

**Jejunum** – middle section that is involved in nutrient absorption.

**Ileum** – last section – also involved in nutrient absorption.

Digestion in the small intestine is enhanced by:

- Proteolytic enzymes continue protein hydrolysis.
- Pancreatic amylase converts starch to maltose
- Peptidase enzymes reduce dipeptides to single amino acids.
- Bile is produced by the liver, and stored and secreted by the gall bladder (not present in the horse). Bile aids digestion in the small intestine by emulsifying fat particles.

#### 6. Large intestine - also has 3 sections

**Cecum** – first section which is relatively large in the horse and rabbit; when well developed as in the horse contains many bacterial which produce enzymes that digest fiber

**Colon** – middle section which is involved in reabsorption of water; length is related to amount of water reabsorption of water; length is related to amount of water reabsorption i.e., the colon is very long in the desert rat.

**Rectum** – last section

#### 7. Accessory glands

**Pancreas** – produces digestive enzyme needed in the digestive processes that take place in the small intestine

**Liver** – secretes bile needed for the emulsification of fat in the small intestine

#### Types of animals based on their stomach structure:

##### 1. Monogastric

- simple stomach, one compartment stomach
- includes swine and horses

The digestive pathway for feeds in monogastrics is:

Mouth - esophagus - simple stomach - small intestine (duodenum, jejunum, Ileum) - large intestine, (and cecum) - rectum - anus

In horses, the large intestine, especially the cecum, is highly-developed which allows microbial populations to flourish (similarly in the reticulo-rumen of ruminants) and for most of the digestion of forages to occur.

##### 2. Modified simple stomach

- can be found in poultry species with the following modifications: gizzard, crop, and proventriculus

##### **The Avian GI Tract:**

**Mouth** – does not contain teeth, but the bird's beak is used to collect particles of feed and to break some large particles into smaller pieces; a tongue and salivary glands are present and the saliva does contain salivary amylase

**Esophagus** – The esophagus of most birds include an enlarged area called the crop as a temporary storage and moistening of food, as a place for salivary amylase to work, and as microbial fermentation in some species

**Proventriculus** – corresponds to the true stomach; the site of HCl and pepsin production in the bird

**Gizzard/ Ventriculus** – a muscular area which contains grit; the involuntary muscular contraction aid in the mechanical breakdown of food

The digestive pathway in poultry can be summarized as:

Mouth - esophagus - crop - proventriculus (stomach) - gizzard - small intestine - large intestine, (and ceca) - cloaca – vent

The Non-ruminant: a general term for those possessing a single stomach compartment (as well as the modified stomach)

- Include swine, poultry, and young ruminant animals that have not developed a functional rumen, (also dogs, cats, rabbits, and man)

### 3. Compound stomach / Ruminants

- with four compartments (in mature ruminants)
- includes cattle, carabao, sheep, goat
- able to rapidly ingest and store large quantities of fibrous feeds in their rumen
- able to convert feeds that are indigestible by humans and other monogastrics into useful nutrients and products
- able to utilize fibrous feeds, non-protein nitrogen, and they can produce all of the essential amino acids and B-complex vitamins

The digestive pathway in ruminants is:

Mouth - esophagus - reticulo- rumen - (processes of regurgitation, rechewing, reinsalivation, and reswallowing) - reticulo- rumen - omasum - abomasum - small intestine - large intestine (and cecum ) - rectum – anus

**Bolus formation** - the formation of "balls" of feed out of masticated feed particles

#### The Four Compartments:

##### I. Rumen

- the main site of microbial fermentation of feeds; the largest of the four compartments; located predominantly on the left side; the muscular walls secrete no enzymes and are covered by projections called papillae which are required for absorption of nutrients
- The three major benefits of microbial fermentation in ruminants are the:

- Conversion of cellulose from vegetative materials to volatile fatty acids as sources of energy
- Production of microbial protein from feed proteins and non-protein nitrogen sources that provide the essential amino acids
- Synthesis of Vitamin K and the B-Vitamins

##### II. Reticulum

- Regulates the passage of feed from the rumen to the succeeding compartments
- Aids in the regurgitation of feed back to the mouth
- Also a site of microbial fermentation
- Has 2 functions (1) to move food into the rumen or omasum and (2) collection of dense particles of food and in regurgitation of ingesta during rumination (the process of movement of ingesta back up the esophagus to the mouth for additional mechanical breakdown – "chewing the cud").

##### III. Omasum

- A round muscular organ which contains many muscular laminae (sometimes called manyplies)
- Further grinds and reduces the feed into finer particles before the feed enters the abomasum

##### IV. Abomasum

- The true stomach of the ruminants

Additional unique features of the ruminants include:

**Esophageal groove** – begins at the base of the esophagus and when stimulated by sucking forms a tube which empties into the abomasums; function: to direct milk obtained from sucking to escape microbial digestions in the rumen

**Rumination** - the process which permits an animal to forage and ingest feed rapidly, then complete chewing at a later time; feed in the stomach is regurgitated, re-insalivated, and reswallowed; controlled vomiting/ contractions of the esophagus, reticulum and rumen allow ingesta to be regurgitated back up to the esophagus where fluids are swallowed again and additional remastication and reswallowing of solids occurs

**Eruption** – (belching of gas) allows for removal of large volumes of gas produced in the rumen; contractions of the upper part of the rumen force the gas up the esophagus and from there the gas penetrates into the trachea and lungs

## THE EXCRETORY SYSTEM

- Needed for the excretion of waste products (urine) and regulation of water balance, pH, osmotic pressure, electrolyte level, and substance concentration

Composition :

**Kidney** – paired, bean-shaped organs located on either side of the vertebral column against the posterior abdominal wall  
- site of urine formation through the nephron

### The Nephron

- composed of glomerulus, Bowman's capsule, renal tubules, descending and ascending loop of Henle, and distal tubules, which vary in its permeability to different substances and water, hence, the composition of urine

## THE REPRODUCTIVE SYSTEM

### Reproduction

- essential for the perpetuation of species, thus, prevent its extinction

### **The Female Reproductive System**

The female has an immobile haploid gamete (sex cell) called an ovum.

#### 1. Ovary

- A paired, almond shaped organ situated near the uterine horn just behind the kidney
- Produces the ova and secretes the female sex hormone estrogen

#### 2. Infundibulum

- Portion of the uterine tube adjacent to the ovary
- Shaped like a funnel in its expanded form
- Picks up the egg when released by the ovary at the time of ovulation

#### 3. Oviduct / fallopian tube

- Structure that connects the ova from each ovary to the respective horn of the uterus
- Passageway of the egg on its way to the uterus
- The site of fertilization and site of early embryonic development

#### 4. Uterus

- A tubular structure extending from the termination of both fallopian tubes to a point where the horns of the uterus joins the body of the uterus and continues to the cervix
- The site of implantation and serves in a nutritive and productive capacity for the developing embryo

#### 5. Cervix

- The neck of the uterus
- A passage way of semen and protects the uterus from foreign materials
- Secretes a sticky mucus seal during pregnancy

#### 6. Vagina

- A tube extending from the cervix down to the vulva
- Receives the penis in copulation

- Provides a passage way for the fully developed fetus during parturition

## 7. Vulva

- Common passage way for the products of reproduction and urine

## 8. Clitoris

- A rudimentary organ situated ventrally to the vulva
- Homologous to the glans penis in the male

## **The Male Reproductive System**

The male has mobile haploid gamete called a sperm.

### 1. Testis

- the paired primary sex organ of the male
- function: (i) production of the sperm; (ii) secretion of androgen, the male sex hormone
- In birds, it is located within the body cavity.
- In mammals, it is located in the scrotum, outside the abdominal cavity, specifically

### 2. Scrotum

- a pouch of skin, the external covering of the testes
- protects the testes from direct mechanical injuries
- also provides the testes an environment which is a few degrees cooler than the body temperature

### 3. The excurrent ducts

#### A. Epididymis

- a long convulated tube which connects the vasa efferentia of the testis with the ductus deferens (vas deferens)
- the place for maturation of the spermatozoa before ejaculation

#### B. Ductus deferens (vas deferens)

- a muscular tube which merges with the epididymis and extends upward to the abdominal cavity and empties in the urethra
- propels the spermatozoa from the epididymis to the ejaculatory duct in the urethra during ejaculation

#### C. Urethra

- a canal starting from the junction of the ampulla and ends at the opening of the penis
- a common passage of semen and urine

### 4. Accessory glands

#### A. Ampulla

- an enlarge portion of the ductus deferens just before its entrance into the urethra
- the temporary storage of sperm until ejaculation time

#### B. Seminal vesicles

- paired glands which are located on either side of the ampulla
- produce a secretion high in fructose which acts as vehicle for sperm transport

#### C. Prostate gland

- an unpaired gland which more or less surrounds the urethra
- produces a viscous secretion which stimulates sperm activity and gives the semen its characteristic odor

#### D. Cowpea's gland

- a small paired gland located on either side of pelvic urethra

#### E. Penis

- an erectile tissue; function: drain the urinary bladder of urine
- introduces the spermatozoa to the vagina

**Semen** – consists of sperm cells and the secretions of the accessory glands

20-30 hrs in man; 14 days in chicken – the lifespan of spermatozoa in the female reproductive tract

### **Puberty and Estrous Cycle**

**Puberty** – indication that sexual maturity is reached; capable of producing offsprings; the usual manifestation is showing signs of estrus

### **Estrous cycle**

- the interval from the beginning of one heat period (estrus) to the start of another heat period

- divided into four stages

- **Proestrus** - the period between regression of the corpus luteum (CL) and estrus, when follicular development is occurring and estrogen production is increasing; (about the eighteenth to twentieth days of the bovine cycle)
- **Estrus** - the period of sexual receptivity, due to high levels of estrogen; depending upon the species, length of estrus ranges from about twelve hours to several days; estrogen levels bring about a surge of LH and FSH)
- **Metestrus** - the phase following estrus when the CL forms and begins to produce progesterone
- **Diestrus** - the phase when the CL is highly active in its production of progesterone

Classification of animals based on the occurrence of their estrous cycle:

### **Monoestrous**

- the animal comes in heat only once a year; ex. Dogs

Seasonally polyestrous

- comes in heat in certain seasons only; ex. Sheep

### **Polyestrous**

- comes in heat throughout the year; ex. Cattle, swine, carabao

### **Signs of Heat or Estrus**

- perceived through physiological manifestations such as

- Reddening and swelling of the vulva
- Mucus discharges from the vagina
- Frequent urination
- Restlessness and lack of appetite
- Mounting other animals in the herd
- The female stands still when mounted – best sign

### When to breed or inseminate:

- Mating or insemination must be done at the time that the ovulation would likely take place, or as close as possible to the expected ovulation time.
- Too early insemination reduces conception rate due to the loss of sperm viability
- The best time to inseminate is towards the end of estrus.
- The duration of estrus is variable. When observed that the animal is in heat, inseminate right away.

Cattle and carabao – ovulation takes place about 15-18 hours from the end of estrus

Rule: estrus duration in carabao lasts from 5 -36 hours (18 hours average)

Swine – estrus duration is about 2-3 days; best to inseminate on the 2<sup>nd</sup> or 3<sup>rd</sup> day of estrus

Mares – estrus duration is about 6-7 days; best to inseminate on the 4<sup>th</sup> and 5<sup>th</sup> day of estrus

Sperm capacitation – the sperm cells reside in the female reproductive tract before becoming capable of attaching to and penetrating the ovum; believed to start in the uterus

Fertilization - the process in which a sperm fuses with an ovum to form a zygote

Zygote – a fertilized cell in which the genetic materials of the sperm and ovum are combined

#### Two methods of fertilization

- (a) **External fertilization** - both parents expel their gametes into another medium, such as water, without necessarily coming into contact with each other
- (b) **Internal fertilization** - the male deposits sperm inside the female reproductive tract.

- with three forms of development, depending on where embryonic and fetal development takes place within the organism:

- **Oviparity**: The embryo formed inside the female is deposited outside her body as an egg. After development, offspring hatch out of the egg and directly into the environment. All birds and some reptiles are oviparous.
- **Ovoviparity**: The embryo develops inside the female body, although it still obtains all nourishment from the egg yolk. The young hatches fully developed and are released from the female's body. Many reptiles and some fish undergo ovoviparity.
- **Viviparity**: The embryo develops inside the female's body and the young obtain their nourishment from the female's blood, rather than egg yolk. The young emerges fully developed from the female body. Almost all mammals undergo viviparity.

	Cattle	Horse	Sheep	Swine
Gamete longevity (hours)	30-48	72-120	30-48	34-72
Sperm	20-24	6-8	16-24	8-10
Ovum				

Frequency of ovulation and length of embryonic development and expected number of progeny per year per breeder female in the various species of farm animal species.

Species	Estrus	Incubation/ Pregnancy (Days)	Expected number of young produced per year
Poultry			
Quail	*	16-19	100-300
Pigeon	*	17	10-20
Chicken	*	21	50-300
Mallard	*	28	50-300
Duck			
Turkey	*	28	50-100
Geese	*	30	20-50
Muscovy duck	*	36	50-100
Rabbit	15-20	32	10-30
Swine	18-24	114	10-25
Sheep	17	147	1-3
Goat	20-21	148	2.5
Cattle	21	280	0.5
Carabao	22-24	3116	0.5

**Gestation period** - as the period of time from conception to birth of the offspring

#### **Placenta**

- a fusion of the fetal membranes to the endometrium of the uterus to permit physiological exchange between fetus and mother
- a unique feature of early mammalian development as it allows provision of nutrients from the maternal organism

**Parturition** – the physiological process by which the pregnant uterus delivers the fetus and placenta from the maternal organism; triggered by the fetus; may be divided into 3 stages

#### Signs of approaching parturition

- Changes in the pelvic ligament
- Enlargement and edema of the vulva
- Mammary activity – obvious enlargement of the mammary gland occurs in all farm species
- The presence of milk in the mammary gland - a strong indication

The onset of milk secretion follows parturition. When the fetus is born, the mammary gland is also ready to produce milk.

## **Body Temperature Regulation**

### **Body temperature**

- the resulting balance of heat production and heat dissipation
- its stability is a prerequisite for high productivity in animals

2 groups based on the ability to regulate body temperature with respect to their environment

**Warm-blooded** – homeotherms; body temperature is largely independent of that of the environment

**Cold-blooded** – poikilotherm; body temperature varies directly with that of the environment

### Process of heat dissipation:

1. **Conduction** – involves direct contact of the animal with a part of its environment
2. **Convection** – heat is transferred to or from the animal by the movement of the heated air particles; posture of the animal and other conditions affecting surface area affect heat convection
3. **Radiation** – transfer of heat by electromagnetic waves; no material medium or physical contact

4. **Vaporization** – the most important process by which animals lose heat to maintain a constant body temperature; heat loss from the skin and respiratory surfaces

**Thermal neutrality** – body temperature is normal without much regulation; the environmental temperature at which the heat loss is equal to the minimum heat production

## **III. ANIMAL NUTRITION**

### Nutrition

- The series of processes by which an organism takes in and assimilates food for promoting growth and replacing worn-out or injured tissues
- Encompasses several fields of discipline like biochemistry, chemistry, physiology, endocrinology, microbiology, genetics

### Nutrients

- Any feed constituents or a group of feed constituents of the same general chemical composition that aids in the support of life
- May include synthetically produced vitamins, chemical action, enzyme activity
- Its basic unit is the form of the nutrient which may be absorbed

### Metabolism

- Combination of anabolic and catabolic reactions occurring in the body with the liberation of energy
- Can occur only after the basic units of the nutrients have been absorbed into the blood
- Involved all the chemical reactions performed by the cells to use the basic units of the nutrients for their specific functions i.e., glucose for energy or amino acids for protein synthesis

<b>Nutrient</b>	<b>Basic Unit</b>
Protein	Amino acid
Starch	Glucose (non-ruminant) Volatile fatty acids and lactic acid (ruminant)
Cellulose	Volatile fatty acids
Sucrose	Glucose and fructose
Lactose	Glucose and galactose
Lipids	Fatty acids and glycerol
Minerals	Any soluble form
Vitamins	Any soluble form

### **Classes of nutrients and their characteristics**

#### **I. Water**

- Cheapest and most abundant nutrient
- Makes up to 65-85% of animal body weight at birth and 45-60% of body weight at maturity
- Percentage of body water decreases with animal age and has an inverse relationship with body fat

#### **II. Carbohydrate**

- Made up of C (40%), H (7%) and O (53%) by % molecular weight
- Functions in the animal body
  - o Source of energy
  - o Source of heat
  - o Building stores for other nutrients
  - o Stored in animal body by converting to fats
- Deficiencies of abnormal metabolism
  1. Ketosis
  2. Diabetes mellitus

#### **III. Fats (Lipids or Ether Extract)**

- Made up (molecular weight) of C (77%), H (12%) and O (11%)
- Fat will yield 2.25 times more energy than carbohydrates or proteins
- Functions
  - o Dietary supply
  - o Source of heat, insulation and protection for animal body
  - o Source of essential fatty acids, linoleic, linolenic and arachidonic acid
  - o Serve as a carrier for absorption of fat-soluble vitamins
- Deficiency and abnormal metabolism
  - o Skin lesions, hair loss and reduced growth rate
  - o Ketosis – catabolism of body fat
  - o Fatty liver – abnormal metabolism of liver
- Location and natural sources of fat  
Animal Body: Subcutaneous, surrounding internal organs, Marbling and milk

#### **IV. Proteins**

- Large molecules made up (by molecular weight) of C (53%), H (7%), O (23%), N (16%) and P (1%)

**Crude protein** – composed of true proteins and any nitrogenous products; crude protein = %N x 6.25  
Protein quality – refers to the amount and ratio of essential amino acids present in protein

**Essential amino acids** – those amino acids which are essential to the animal and must be supplied in the diet because the animal cannot synthesize them fast enough to meet its requirements:

Phenylalanine	Methionine
Valine	Histidine
Threonine	Arginine
Tryptophan	Leucine
Isoleucine	Lysine

**Non-essential amino acids** – amino acids which are essential to the animal but are normally synthesized or sufficient in the diet and need not be supplemented.

Alanine	Glutamine
Asparagines	Glycine
Aspartic Acid	Hydroxyproline
Cysteine	Proline
Cystine	Serine
Glutamic acid	Tyrosine

- Functions
  - Basic structural unit of the animal body, i.e., collagen, elastin, contractile protein, keratin proteins, blood proteins
  - Body metabolism – enzymes, hormones, immune antibodies, hereditary transmission
- Deficiencies and abnormalities
  - Symptom: reduced growth rate and feed efficiency, anorexia, infertility
  - Amino acid deficiency – a lack of an important amino acid which result to deamination

## V. Minerals

- The total mineral content of plants or animals is often called ash.

## – Classification

- Major minerals – normally present at greater level in animal body or needed in relatively large amounts in the diet. Include Ca, P, Na, Cl, K, Mg, S.
- Trace minerals – normally present at low levels in animal body or needed in very small amount in the diet (Cu, Zn, Co, F, I, Fe, Mn, Se, and are toxic at large quantities)

## – General Functions

- Skeletal formation and maintenance – Ca, P, Mg, Cu, Mn
- Function in protein synthesis – P, S, Zn
- Oxygen transport – Fe, Cu
- Fluid balance (osmotic pressure) - Na, Cl, K
- Regulating acid-base balance of the entire systems – Na, Cl, K
- Activators and/or components of enzyme systems – Ca, P, K, Mg, Fe, Cu, Mn, Zn
- Mineral – vitamin relationship – Ca, P, Co, Se

## VI. Vitamins

- Essential for development of normal tissue necessary for metabolic activity but do not enter into structural portion of body
- Cannot be synthesized by the animal
- Related substances
  - Provitamins or precursors, i.e. Carotene
  - Antivitamins, vitamin antagonists or pseudovitamins
- Classification and structure
  - Fat soluble – ADEK
  - Water soluble vitamins – thiamine, riboflavin, niacin, pyridoxine, pantothenic acid, biotin, choline, folic acid
- Functions and Deficiencies
  - Play role as regulator of metabolism; necessary for growth and maintenance

- Vitamin requirement may also increase in old age due to difficulties in absorption and utilization.

### **General Symptoms Indicative of Marginal or Advanced Vitamin Deficiencies**

#### **Poultry**

1. Nervous disorders such as convulsion -A, E, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub> and Fol
2. Skin or mouth lesions - A, B<sub>2</sub>, B<sub>6</sub>, H, PP and Pant
3. Discharge from eyes or swollen, pasted eyelids - A and Pant
4. Reduced resistance to infectious diseases - A, E, B<sub>2</sub>, B<sub>6</sub>, Pant & C
5. Poor feathering - A, D, B<sub>6</sub>, H, Fol., PP and Pant.
6. Bone abnormalities - A, D, H, Fol. And PP
7. Leg weakness or paralysis - A, D, E, B<sub>2</sub>, B<sub>6</sub> and H.
8. Egg production reduced full potential - A, D, E, K, B<sub>2</sub>, B<sub>6</sub> and B<sub>12</sub>
9. Retarded growth - A, E, K, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, H, Fol., PP, Pant. & C.
10. Hatchability reduced/below full potential - A, D, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, H, Fol. And Pant.

1. Muscular in coordination or other nervous signs - A and B<sub>1</sub>
2. Reduced feed intake - A, D and PP
3. Impaired vision or blindness - A
4. Digestive disturbances - A and B<sub>1</sub>
5. Rough hair coat - A
6. Degeneration of heart and skeletal muscle - E
7. Poor reproduction - A, D and
8. Retarded growth - A, D and E
9. Bone deformities or swollen joints - A and D

#### **Pigs**

1. Muscular in coordination or other nervous signs - A, D, B<sub>6</sub>, B<sub>12</sub> and Pant.
2. Reduced feed intake - A, D, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, H, Fol., PP & Pant.
3. Impaired vision or blindness - A, B<sub>2</sub> and B<sub>6</sub>
4. Scours and/or vomiting - B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub> and PP.
5. Hair, skin and claw problems - A, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, H, PP and Pant.
6. Anemia - E, K, B<sub>6</sub>, B<sub>12</sub>, Fol., PP and Pant.
7. Impaired feed conversion - B<sub>1</sub>, B<sub>6</sub>, B<sub>12</sub>, H, PP and Pant.
8. Lameness or unsteady gait - A, D, E, B<sub>2</sub>, B<sub>6</sub> and Pant
9. Poor reproduction - A, E, B<sub>2</sub>, B<sub>12</sub>, H, Fol. And Pant.
10. Retarded growth - A, D, E, B<sub>1</sub>, B<sub>6</sub>, B<sub>12</sub>, H, Fol.

#### **Ruminants**

<b>Vitamins</b>	<b>Modes of Action</b>	<b>Natural Occurrences</b>	
<b>Fat-Soluble</b>		<b>In Feeds</b>	<b>In Food</b>
Vitamin A (Retinol)	Promotes the development of visual pigments; Indispensable for the formation and protection of epithelial tissues; Improved resistance to infections	Only as provitamin A in green crops; fish liver oil	Liver, egg-yolk, milk, dairy products
Vitamin D (Calciferol)	Regulates the incorporation of Ca and P into the bone matrix and Ca absorption from the intestinal lumen	Sun-dried green forage, fish liver oil	Eggs, milk, dairy products
Vitamin E (Tocopherol)	Works as a biological antioxidant, as a detoxifying agent and participates as a component off the respiratory chain; Functions in nucleic acid metabolism and in endocrine glands	Green crops, cereal germs, milling by-products	Leafy vegetables; some animal organs, milk butter
Vitamin K (Menadione)	Functions in the blood coagulation system; Acts in the maturation of the bone structure	Green forage; liver oils	Green vegetables; potatoes, fruits; (tomatoes and strawberries)
<b>Water Soluble</b>			
Vitamin B <sub>1</sub> (Thiamin)	Participates in the process of carbohydrates metabolism	Cereal germs, milling by-products, oil cakes, yeast	Cereals, vegetables, potatoes, fruits; animal organs, egg-yolk, milk
Vitamin B <sub>2</sub> (Riboflavin)	Acts in the respiratory chain as a constituent of the flavin enzymes concerned with hydrogen transfer	Some oil seeds, yeast, brewery by-products, vegetables, fish meal, meat and bone meals, skimmed milk	Liver, kidney, eggs, milk, dairy products
Vitamin B <sub>6</sub> (Pyridoine)	Active in amino acid metabolism as a coenzyme of several enzyme system	Grains, milling by-products, oil cakes, yeast	Cereals, green vegetables; red meat, liver, egg-yolk, milk
Vitamin B <sub>12</sub> (Cyanocobalamin)	Essential in the reduction of one-carbon compounds in the fat and protein metabolism	Does not occur in plants. Skimmed milk powder, fish and meat meals	Liver, kidney, eggs yolk
Biotin (Vitamin H)	Necessary for gluconeogenesis and fatty acid synthesis where it acts in carboxylation reactions	Occurs in feeds of vegetable and animal origin, but only in partly available form	Vegetables, yeast, mushrooms, liver, kidney, meat, egg-yolk, milk
Folic Acid	Acts in the one-carbon metabolism where it is indispensable in the formation of amino acid and nucleic acids	Lucerne meal, extracted soybean meal; fish meal	Dark leafy vegetables; liver, kidney, muscle, milk, dairy products
Nicotinic Acid (Niacin)	Acts as an active group of different coenzymes which are related to the citric acid cycle	Brans, dried green crops, yeasts, vegetable and animal proteins	Liver and meat of hooved animals

Pantothenic Acid	Part of coenzyme A, which occupies a central position in the intermediary metabolism by activating weakly active acids	Dried green crops, milling by-products, oil cakes, yeast	Cereals, legumes, liver, kidney, egg-yolk, milk products
Vitamin C (Ascorbic Acid)	Essential in the formation and maintenance of skeletal tissues participates as an oxidation – reduction system in cellular oxidation processes. Involved in defensive mechanisms.	Beef, green plants, skimmed milk powder	Potatoes, cabbage, lettuce (and other vegetables), citrus, tomatoes (and other fresh fruits)

Macro Minerals	Functions	Deficiency
Calcium	Bone and teeth formation – 99% of body calcium in the bones and teeth Nerve and muscle function ; Acid-base balance Milk production, also egg production	Rickets in young animals; Joints become enlarged; Bones becomes soft and deformed. Osteomalacia or osteoporosis in older animals; Bones becomes porous and weak.
Chlorine and Sodium	Formation of digestive juices Control of body fluid concentration Control of body fluid ph Nerve and muscle activity	Unthrifty appearance and impaired performance With heavily perspiring animals, an acute salt deficiency may develop resulting in disrupted nerve and muscle function and possible nervous prostration.
Magnesium	Necessary for many enzyme systems Plays a role in carbohydrate metabolism Necessary for the proper functioning of the nervous system	Hypermagnesemic tetany – hyperirritability of the neuromuscular system producing hyperexcitability, incoordination.
Phosphorus	Bone and teeth formation – about 80% of body phosphorus is in the bones and teeth. As a component of protein in the soft tissues. Milk production – also egg production In various metabolic processes.	Rickets in young animals similar to that of calcium deficiency. Osteomalacia or osteoporosis in older animals similar to calcium deficiency. Poor appetite, slow gain, lowered milk production, low blood and chew on nonfeed objects, but this is not specific for phosphorus deficiency.
Potassium	Required by livestock for a variety of body functions such as osmotic relations, acid-base balance, rumen digestion, and the primary intracellular cation in neuromuscular activity.	Most unlikely under ordinary conditions. Symptoms of deficiency rather nonspecific such as decreased feed consumption, lowered feed efficiency, slow growth, stiffness and emaciation.

Sulfur	<p>As a component of the amino acid cystine and methionine and the vitamins, biotin and thiamine.</p> <p>In the synthesis of sulfur containing amino acids in the rumen.</p> <p>In the formation of various body compounds.</p>	Seldom experienced under ordinary conditions. Deficiency will express itself as a protein deficiency – a general unthrifty condition and poor performance.
--------	---	--

<b>Micro Minerals</b>	<b>Functions</b>	<b>Deficiency</b>
Cobalt	<p>As a component of the vitamin B<sub>12</sub> molecule</p> <p>In the rumen synthesis of vitamin B<sub>12</sub></p>	General malnutrition symptoms – poor appetite, unthriftiness, weakness, anemia, decreased fertility, slow growth and decreased milk and wool production.
Copper	<p>In iron absorption</p> <p>In hemoglobin formation</p> <p>In synthesis of keratin for hair and wool growth</p> <p>In various enzyme systems</p>	Low blood and liver copper; bleaching of hair in cattle; Abnormal wool growth in sheep; abnormal bone metabolism Muscular incoordination; weakness at birth; anemia
Fluorine	<p>Reduces incidence of dental caries in humans and possibly other animals.</p> <p>Possibly retards osteoporosis in mature animals.</p>	In children – excessive dental caries
Iodine	In the production of thyroxine by the thyroid gland.	Goiter at birth or soon thereafter; Dead or weak at birth; Hairlessness at birth; Infected navels – especially in foals
Iron	<p>Necessary for hemoglobin formation</p> <p>Essential for the formation of certain enzymes related to oxygen transport and utilization</p> <p>Enters into the formation of certain compounds which serve as iron stores in the body – specially ferritin, found primarily in the liver and spleen and hemosiderin, found mainly in the blood.</p>	In the young pig: Low blood haemoglobin; Labored breathing; Listlessness; Pale eyelids, ears and nose; Flabby, wrinkled skin; Edema of heart and shoulders
Manganese	In enzyme systems influencing estrus, ovulation, fetal development, udder development, milk production and growth and skeletal development.	Delayed estrus; Reduced ovulation; Reduced fertility; Abortions; Resorptions; Deformed young; Poor growth Lowered serum alkaline phosphatase; Lowered tissue manganese; "Knuckling over" in calves
Molybdenum	As a component of enzyme xanthine oxidase – especially important to poultry for uric acid formation.	

	Stimulates action of rumen organism.	
Selenium	In vitamin E absorption and utilization Essential component of enzymes – glutathione peroxidase, which functions to destroy toxic peroxides in the tissue thereby having a sparing effect in the vitamin E requirement. Other compounds of selenium seem to work in concert with vitamin E in the maintenance of normal cell functions and membrane health.	Nutritional muscular dystrophy (white muscle disease) in lambs and calves: Retained placenta in cows, Heart failure, Paralysis, Poor growth, Low fertility, liver necrosis Pancreatic fibrosis in chicks
Zinc	Prevents parakeratosis Promotes general thriftiness and growth Promotes wound healing Related to hair and wool growth and health Deficiency impairs testicular growth and function	Frequently experienced in growing and fattening swine being fed on concrete with rations containing recommended levels of calcium. Deficiency symptoms include: Parakeratosis, General unthriftiness, Poor growth, Unhealthy looking hair or wool, Slow wound healing

## GROWTH AND MAINTENANCE

Basal metabolism or Fasting Catabolism – refers to the minimum energy expenditure to maintain essential life processes

### Growth

- the correlated increase in the mass of the body to reach the size at maturity fixed by heredity
- reflected in increased weight and size
- characterized by: Increase in the number of cells, Increase in size of the cells

### Protein requirement for growth and maintenance

The "adult growth" functions – i.e., feathers, hairs, hoofs, nails, etc.

A broiler starter and pig starter mashes may require more than 20% protein (with good quality protein feeds like fish meal, meat meal, soybean meal, skim milk powder, etc.) Whereas the hog/finisher mash may contain only 14% protein (with little amount of the good quality protein in feeds).

### Energy requirement for growth

Energy coming mainly from carbohydrates; provided also by fats and proteins) is the driving force for tissue synthesis or anabolism.

Ways of energy restriction – to limit the energy intake of an animal, either or both of these ways may be followed:

Limits the total feed intake

Lower the energy content or density of the ration – i.e., make the ration bulky

The energy: protein ratio is an important factor in the efficiency and economy of growth.

### Growth rates and feed efficiency

- The practical measure of growth performance of farm animals are average daily gain in weight (ADG) and feed efficiency (F/G).
- The values are greatly affected by two major factors:  
Hereditary (particularly the breed or strain of the animal)  
Environment (particularly by the nutrition and management)

	<u>ADG (kg)</u>	F/G kg feed/kg <u>Liveweight gain</u>
Growing pigs (improved crossbreds)	0.4 – 0.6	2.5 – 3.5
Growing cattle (native)	0.4 – 0.5	11.0 – 12.0
Growing cattle (native-Zebu grades)	0.5 – 0.7	10.0 – 11.0
Broiler (modern strains)	1.5 – 1.8 (6-7 weeks)	2.0 – 2.3

### **Feeds and Nutrient resources**

Feeds – constitute a large portion of expenses in any livestock enterprise

#### Roughages

Alabang X (*Dicanthium aristatum*)

Centrosema/Kudzu/calopogonium (*Centrosema pubescens*)

Guinea grass (*Panicum maximum*)

Ipil-ipil (*Leucaena leucocephala*)

Kakawate/madre de cacao (*Gliricidia sepium*)

Napier grass (*Pennisetum purpureum*)

Para grass (*Brachiaria mutica*)

Star grass (*Cynodon plectostachyus*)

Rice straw

Corn stover

Setaria

#### Concentrates

Banana meal

Bloodmeal

Bonemeal

Casava meal

Coconut oil

Copra meal

Corn grain

Dicalcium phosphate

Di-methionine

Fish meal

Limestone

L- lysine

Meat and bone meal

Molasses

Monocalcium phosphate

Oyster shell

Rice bran

Salt

Sorghum

Soubean oil meal

Skimmilk

Tricalcium phosphate

Urea

Wheat pollard/wheat bran

Whey

#### Feed evaluation and quality control

Proximate analysis/ Weende analysis – most extensively used method for determining the nutritive value of feeds; includes the following analyses in:

Moisture – determined by accurately weighing finely ground sample before and after drying to constant weight at 105C for at least 5 hours

Crude fat – a residue that includes all ether soluble substances such as waxes, essential oils, and pigments but is mostly fat and fatty acid esters

Crude fiber – a rough measure of the portion of carbohydrates poorly used by monogastric animals

Crude protein – the total nitrogen multiplied by a factor 6.25 based on the data that protein contains as average of 16% nitrogen

Ash – the residue remaining after combustion

## IV. GENETICS AND LIVESTOCK IMPROVEMENT

**Genetics** – the branch of biology that deals with the principles of heredity and variation in all living things

### Important contributors to the field of Genetics:

**Gregor Mendel** (1866) – the Father of Genetics; an Austrian monk who conducted breeding experiments on garden peas (*Pisum sativum L.*) , formulated and published his hypothesis about the mechanics of inheritance of characteristics in plants; discovered that hereditary characteristics were determined by elementary factors (now called genes)

**Hugo de Vries** (in the Netherlands), **Carl Correns** (in Germany) and **Erick Von Tshermark** (in Austria) - independently rediscovered the works of Mendel in 1901

**William Bateson** (1906) an English biologist who studies the inheritance of certain characteristics of the chicken, showed that the Mendelian laws also applied to animals

**Johannsen** (1909) a Danish biologist, coined the term "gene" to refer to the particulate factor that Mendel hypothesized as the basic unit of inheritance

**James Watson and Francis Crick** (1956), two young scientists of Cambridge, University of England, hypothesized the chemical nature and function of the gene which is now universally accepted;

### Genetic improvement

- Improvement with the performance of the animals brought about by selection assuming that the environment is favourable

### DNA

- Deoxyribonucleic acid; the primary genetic material of all cells
- A biochemical compound consisting of a chain of nucleotides called polynucleotide; each nucleotide consists of phosphate (P), and sugar (S), and a base (B)

**Chromosome** – threadlike structures found in the nuclei of the cell

**Amino acid** – the building blocks of proteins; specific combinations of 3 bases; 20 of which are normally found in proteins and referred to as essential amino acids

### Gene

- A segment of the DNA which determines the base sequence of nucleotide in the messenger ribonucleic acid (m-RNA) that makes up the code for a certain biological function
- ❖ The genetic information that is stored must be such that it can be decoded and translated into action in the developing individual.

### Mitosis

- the mechanism of cell division by which the genetic and chromosome composition of a cell is faithfully reproduced in each of the daughter cells
- a means of growth and replacement in multicellular organisms

### **Meiosis**

- a special kind of cell division in sexually reproducing organisms whereby the chromosome number of the cells is reduced to half; a process by which the germinal cells divide to produce haploid cells each carrying only one-half of the genetic complement of the individual
- the genetic materials is transmitted from parent to offspring is made possible through the reduction division of the germinal cells and subsequent union of the gametes

**Diploid** – a cell, tissue, or organism that contains two genomes or chromosome set

**Haploid** – cells that contain half as many chromosome as the somatic cells

### **The G x E interaction**

- ❖ The mechanics by which the gene is able to synthesize protein in the cell underlies the relationship among the genotype (G) and the environment (E) in the formation of the phenotype (P) of the organism.

**Genotype** - refers to the specific combination of genes that are associated with a particular characteristic of the individual; ex. In breeding, the accumulation of and proper combination among the genes that are favorable to the expression of superior performance is desired

**Environment** - the totality of non-genetic factors affecting the individual; ex. Provided well-balanced and nutritious feed, good housing and other favorable environmental factors is the aim of good husbandry practices

**Phenotype** - the observable manifestation of a given character of an individual; the phenotype may change but the genotype remains

- ❖ Expressed mathematically as  $P = G + E + (G \times E)$   
Where  $G \times E$  is the interaction between the genotype of the individual and the environment under which it is raised
- ❖ The effect of  $G \times E$  interaction becomes significant when certain genotypes perform well under certain environments than other genotypes. For example, the Zebu (humped) called grow and reproduce better in warm tropical environment than the European (humpless) cattle and vice-versa.

### **Gene Action**

- ❖ Gene may be active only when they occur in pairs of alleles during the diploid phase.

**Allele** – one of two or more alternative forms of a gene which are usually recognizable by the phenotype

**Structural genes** - directly responsible for the synthesis of certain biochemical products during cell metabolism

**Regulator genes** - control or regulate the function of other genes; may function in terms of quantity, quality or timing of the activity of certain structural genes

- ❖ The action of genes as they influence genotypic values may be any or a combination of the following types:

- a. Additive - a pair of allelic genes contribute independently to the genotypic value; Ex. Inheritance of the roan coat color in cattle
- b. Dominance
  - the corresponding trait determined by an allele which is manifested in the heterozygote form
  - a gene suppresses the expression of its allele, the former is called the dominant gene while the later is referred to as the recessive gene
  - Ex. A homozygous pea comb (genotype PP) and a single comb (genotype pp) are crossed, the progeny will be heterozygous pea comb (genotype Pp)
- c. Epistasis
  - taken from the Greek word which means "to stand upon"
  - interaction of between two or more genes so that one of them (epistatic gene) interferes with or even inhibits the phenotypic expression of the other gene (hypostatic gene)
  - special form of epistasis: complementary gene action

### The Mechanics of Inheritance

**Animal reproduction** – allows the flow of the genetic material from generation to generation; involves two processes: gametogenesis and fertilization

**Gametogenesis** - the process of producing the reproductive cells

Spermatogenesis - the process of differentiation of a mature sperm cell from an undifferentiated germ line cell, including meiosis; male produces sperm cells

Oogenesis – the process of differentiation of a mature egg cell from an undifferentiated germ line cell, including meiosis; female produces eggs

**Gamete** – a mature reproductive cell capable of fusing with a similar cell of the opposite sex to form a zygote; also called sex cell

Spermatozoa – the male gametes of animals

Ovum – the female gamete

**Fertilization** – the fusion of two gametes of opposite sexes to form a zygote or an embryo

### The Mendelian inheritance

- ❖ The process of segregation and recombination of genes is governed purely by chance and that the occurrence of each new combination may be predicted according to the rules of probability.

**Law of segregation** - states that the unit of hereditary characters occur in pairs, and that in the formation of gametes during meiosis, these separate from each other so that only one member of the pair goes into the particular gamete; Each parent must have contributed equally to the progeny; It is a matter of chance whether the gamete gets the dominant or the recessive allele.

**Law of independence** - states that genes for the different characters are inherited independently from each other and randomly combine during meiosis

### Non-Mendelian inheritance

- ❖ The inheritance of some characters did not follow the Mendelian laws
- ❖ The deviations were due to chromosomal phenomena

**Linkage** – a measure of the tendency of some genes to be inherited as a group rather than individually because of the proximity of their loci in the chromosome

**Locus** – (plural. Loci) – a place at which a particular gene resides on the genetic or linkage map

**Autosomes** - carry genetic material but do not determine sex

**Sex chromosomes** - determine the sex of the individual

The types of sex-chromosomes are the following:

Class of Animal	Sex Chromosome Pair	
	Male	Female
Mammals	XY	XX
Birds	ZZ	ZW

**Sex-linked genes** - genes that are located in the sex chromosomes

**Sex-linkage**

- the inheritance of certain characteristics that are associated with one sex or the other because the genes controlling them are located in the sex chromosomes
- the heterogametic offspring could only receive the gene from its homogametic parent while the homogametic offspring receives the allelic genes from both parents.
- the distribution of the genotypes in the male and female progeny is not the same when reciprocal crosses are made between pure recessive and dominant genotypes.
- Ex. Haemophilia; color-blindness (in some mammalian species); barring plumage pattern and dwarfism (in some species of poultry)

### **Non-nuclear inheritance**

#### I. Cytoplasmic inheritance

- Occurs in plants; the chlorophyll – bearing plastids are carried in the cytoplasm
- Quite rare in animals

- There are some evidences that cytoplasmic genetic material affecting milk production may be present in cattle.

#### II. Maternal influence

- Other than the genetic materials in the chromosomes and the possibility that there may be genetic materials in the cytoplasm, the mother could further influence the characteristics of her offspring because of the material care she provides to her young.
- Maternal effect forms part of the total environment of the individual.

### **Genes in Population**

**Gene pool** - the totality of the genes that could potentially be transmitted by individuals in a population to the next generation

### **Population**

- a group of individuals sharing a common gene pool; a community of sexually interbreeding or potentially interbreeding individuals
- characterized by the frequencies in which the genes and genotypes occur in them
  - ❖ The genetic composition of most populations is in a flux. It changes from generation to generation.

**Equilibrium population** - a state when no change may occur; in Hardy-Weinberg equilibrium stating that in an indefinitely large population undergoing random mating, the gene and genotypic frequencies will remain constant from generation to generation provided that there are no selection, migration and mutation

- ❖ The British mathematician Hardy and the German physician Weinberg independently formulated the principle in 1908.

## **Factors affecting the genetic composition of a population:**

### **I. Selection**

- process in which certain genotypes contribute more progeny in the next generation than other genotypes

### **II. Migration**

- process in which individuals from one population transfer to another population
- the change in the genetic composition in the host population after migration is directly proportional to the following two factors:
  1. The number of migrants in proportion to that of the resulting population after migration and
  2. The difference in the gene frequencies between the migrants and the natives

### **III. Mutation**

- a spontaneous change in the biochemical structure of the gene resulting in an entirely different phenotypic effect.
- If mutation occurs in the somatic cells (as in the case of cancer), it is not heritable.
- If it occurs in the germinal cells, then it could be transmitted to the next generation.

- ❖ Small population size would result in change in the gene frequency simply because of chance variation.
- ❖ Because of certain physical, physiological or psychological factors, some individuals tend to mate more often together than with some other individuals.

### **IV. Non-random mating**

- occurs when some individuals do not have the same chances of mating with individuals of the opposite sex
- only changes the genotypic frequency in the population
- important forms of non-random mating

1. Assortative: individuals that are more phenotypically similar

tend to mate more often; tend to drive the population toward homozygosity

2. Disassortative matings: individuals which are less phenotypically similar tend to mate more often together than would be expected by chance; tend to maintain the production of more heterozygotes at the expense of homozygotes

❖ Complete disassortative mating - Sex dimorphism in mammals (i.e. The maintenance of male and female sexes) where only the mating between XX and XY genotypes is successful

3. Inbreeding: individuals that are related by descent tend to mate more often than under random mating; also tend to drive the population towards the increase in the frequency of homozygotes

### **Animal Breeding**

- is the art and science of the genetic improvement of farm animals

### **Economically important traits in farm animals:**

Beef cattle	Dairy cattle	Goat	Sheep	Horse
-post weaning rate of gain -marbling score	-milk yield -butter yield -milk total solids	-multiple births (twinning) -weaning weight -milk yield	-fleece weight -fiber diameter	-galloping speed -trotting speed -jumping style -trotting pace length

Chicken – for meat	Chicken – for eggs	Ducks – for eggs	Swine
-growth rate	-egg production	-egg production	-average daily gain
-feed conversion ratio	-egg weight	-egg weight	-litter size
-dressing percentage	-shell thickness	-fertility	-loin eye area
	-haugh unit	-yolk color	-backfat thickness

### Heritability

- Measures the proportion of the total phenotypic variance that are attributable to the additive effects of genes that influence the given trait
- Heritability ranges from 0 to 1
- Heritability value of 0 suggests that all the phenotypic variation among individuals in the population is due to environmental and non-additive genetic effects
- A heritability of 1 means that all the variability among individuals are only attributable to additive effect of genes

- ❖ In general, traits that are associated with reproduction (e.g., fertility and litter size) have lower heritabilities than those that are associated with physical conditions (e.g., body weight and backfat thickness).

The estimated heritability of some of the more economically important traits among farm animals are given in the following table:

Characteristic	Heritability
Cattle	
Amount of spotting (Holstein)	0.9
Adult body weight	0.6
Milk Production	0.3
Pigs	
Percent of ham	0.5
Litter size	0.2
Chicken	
Egg size	0.7
Adult body weight	0.4
Egg production	0.2

### Pedigree

- A record of an individual's ancestors related to it through its parents
- Ancestral relationships among individuals of a family over two or more generations

### Systems of breeding

- May include selection, introduction of exotic animals (migration) and subsequent crossbreeding, induction of mutation and assortative and disassortative mating including inbreeding.

### I. Selection

- Process in which some individuals are chosen over others as parents of the next generation
- ❖ Most of the economically important traits of domestic animals are influenced by many pairs of genes acting in various and complicated ways including additive, dominance and epistatic effects.

## **2. Inbreeding**

- A form of non-random mating or a special case of assortative mating where individuals that are related by ancestry are mated together
- ❖ Hybrid – an offspring of a cross between two genetically unlike individuals
- ❖ Inbreeding depression – reduction in fitness or vigor because of inbreeding or normally cross-pollinate organisms

## **3. Crossbreeding**

- The mating between animals of different established breeds
- Results to large improvement in the average performance of the F1 progeny over that of the parents (called hybrid vigor or heterosis effect) in the presence of large dominance effects crossbreeding

## **Animal Reproduction**

- Involves the physical and physiological processes in both sexes leading to the fertilization of the egg by the sperm cell and the subsequent development of the young

## **Artificial Insemination (AI)**

- Process of inducing fertilization in the female reproductive tract without the benefit of sexual contact between the male and female animal

## **Multiple ovulation and embryo transfer (MOET) technology**

- increase the rate of reproduction of the females that are selected to serve as embryo donors to as much as 30 to 50 times; already been successfully demonstrated in cattle; not as widely practiced as AI

**Multiple ovulation** - a process by which the female animals is induced to simultaneously ovulate more eggs than what is normally shed

**Embryo transfer** - a technique wherein a young embryo is collected from a donor female parent and then implanted into the uterus of a recipient female parent

## **V. SLAUGHTER, PROCESSING AND MARKETING OF FARM ANIMALS**

**Slaughtering** – from fasting through stunning, bleeding up to skinning and evisceration

**Butchering** – from splitting and quartering, to cutting the carcass into the retail cuts

**Abattoir or slaughterhouse** – the premises used in the slaughter of animals for human consumption

### **Basic principles of selecting animals for slaughter**

- ❖ The meat produced should possess the characteristics necessary for the products to make.

#### **Considerations:**

##### **1. Sex**

- Barrows and gilts have no distinct differences in meat quality.
- Boar taint odor is only apparent in uncastrated males after reaching seven months of age. Thus, less than seven months boar is fit for slaughter.
- Meats from castrated hogs are fatter than their female and uncastrated male counterparts of the same age. The quality

of meat obtained from stags partly depends on the age of the animal and on the length of time from castration to slaughter.

- Meat from pregnant animal is low in quality. The meat may be fishy in odor when the animal is at an advance stage of pregnancy.
- In cattle, meat from bull is generally less tender and lower in overall acceptability than that of steers.

## **2. Age**

- Recommended for swine is 6 to 12 months, 3 years of younger for cattle and carabao, and about a year for goats.
- Meat from older animals tends to become darker, tougher, fatter and poorer in quality than meat from younger animals. However, it is flavorful, has a high water binding and emulsion capacity which is associated with high degree of marbling.
- In beef, marbling increases up to 30 months but beyond this age limit, it is already stationary.
- The most important quality factor which changes with age is tenderness. Beyond 42 months of age, meat from young and old animals is already equal in terms of tenderness.
- In general, meat from old animals is juicier than meat from young ones.
- Pork follows the same trend as beef. Very little change in tenderness occurs after eleven months of age.

## **3. Size**

- The recommended slaughter weight of animals for fresh meat retailing and intact meat processing are of hogs, 80 to 110, and for cattle and carabao, 300 to 450 kg. Within these weight ranges, the retail cut yield from the different livestock is optimum.

## **4. Class**

- Shotes are utilized for the production of quality lechon or roasted pigs, it command the highest price.

- The differences in carcass yield and characteristics are the function of sex, age, size and amount of exercise each class receives.

## **5. Health**

- Only healthy animals shall be considered for slaughter, however, those with minimal defects can also be slaughtered when they pass the anti-mortem inspection.
- Unhealthy animals must first be treated to become normal prior to slaughter. Meat from unhealthy animals is poor in quality and is not recommended.

## **6. Meat Yield**

- The average dressing percentage of swine in the Philippines, head off is about 69% and the total trimmed lean cuts amount to 36% of the live weight.
- Beef and carabeef have similar average dressing percentage of 48% but differ in the total lean yield with 34% and 33% respectively.
- Goats on the other hand have 43% dressing percentage and 27% total lean yield.

## **7. Loin Eye and Other Measurements**

- Wide loin eye area in swine is indicative of high lean cut and low fat cut yields.
- Slaughter hogs with wide loin eye area are ideal for slaughtering.

## **8. Degree of Fatness**

- Consumers discriminate fatty meat, however, fat greatly influences flavor, tenderness and juiciness.
- For comminuted beef and pork products, 30 to 40% fat seems to be the most acceptable in terms of flavor, tenderness, juiciness and overall acceptability.

## **Handling Prior to Slaughter**

### **Fasting**

- Feed is withdrawn but sufficient water is given.

- Pigs being simple stomach animals are fasted for 12-24 hours while carabaos and cattle being ruminants are fasted for 24-48 hours.
- Advantages of fasting:**
  - Savings of feed
  - Ease of cleaning entrails
  - Ease of cleaning and eviscerating carcass
  - A thoroughly bled and brightly colored carcass
  - Long shelf-life
  - Low shrinkage of the resulting meat

**Stress** - shipping stress, over-crowding stress, driving stress, heat stress and others

- Any form of stress should not be given to the animal prior to slaughter
- Animals must be allowed to relax for 1-3 days in the luggage area and be properly conditioned before they are slaughtered.
- Disadvantages of stress:**
  - Loss of muscle glycogen
  - High temperature of carcass
  - Low water binding capacity of meat
  - Low aroma, flavor, texture and juiciness scores
- Meat from stressed animals is not recommended for curing.
- The condition of the meat is pale, soft, and exudative (PSE) if the stress is not severe and it becomes dry, firm and dark (DFD) when the stress is severe.
- The pH of meat from unstressed animals is 5.3 and the drop is very gradual. The meat from stressed animals has pH within the range of 6.0 to 7.0 and the pH drop is rapid.

#### **Mishandling**

- Blood clots developed in the part of an animal whipped, kicked or boxed prior to slaughter due to the breaking of some blood vessels in these affected areas.

- Meat with blood clots and red spots are not good materials for processing because they always spoil before the curing period is completed.

#### **Slaughtering guidelines:**

- Set by the The National Meat Inspection Commission now, NMIS or National Meat Inspection Service
- Provided the minimum set of equipment and the standard features of a slaughterhouse

#### **Classifications of Slaughterhouses in the Philippines :**

**AAA:** Those adequate facilities and operational procedure of which meat processed herein is eligible for sale in any market in and out of the country

**AA:** Those with facilities and operational procedures sufficiently adequate that the meat processed herein is eligible for sale in any market in the Philippines

**A:** Those with facilities and operational procedure of minimum adequacy, the meat processed herein is eligible for sale only in the city or municipality in which plant is located

#### **Basic Requirements in Slaughtering**

- The cleanliness of the meat produced
- The hygiene of production
- The efficiency of meat inspection
- The adequacy of meat preservation

#### **Steps in General Slaughtering**

- Antemortem inspection** – conducted by a qualified meat inspector to determine whether the animal is fit for slaughter
- Stunning** – rendering the animal unconscious without killing them to make the restraining easy and sticking humane

- iii. **Sticking** – withdrawing blood from the carcass; cautioned not to pierce the heart that may cause instant death of the animal and will prevent thoroughly bleeding; efficiently cutting the carotid artery or the jugular vein not later than 3-5 minutes after stunning
- iv. **Cleaning of the carcass** – includes scalding, scraping, shaving, flaying, dehiding
- v. **Eviscerating** – removing visceral organs from the carcass
- vi. **Splitting** – cutting of the entire backbone of the carcass
- vii. **Washing** – with clean potable water to remove dirt, blood, etc.
- viii. **Post-mortem inspection** – done by qualified meat inspector to determine if the meat is fit for human consumption

**Inspected and passed:** the carcasses so marked have been found to be sound, healthful, wholesome and fit for human consumption

**Passed for sterilization:** carcasses or parts of carcasses so marked inspected and passed for food, subject to the condition that these must be sterilized by steaming in an appropriate apparatus or by boiling in an open kettle

**Inspected and condemned:** carcasses or parts of carcasses so marked are unsound, unhealthful, unwholesome or unfit for human consumption; those unfit for both human and animal are denatured with strong chemical disinfectants prior to final disposal.

**Passed for rendering:** carcasses or parts of carcasses that may be converted into animal feed  
After sufficient heat treatment; shall be dyed (food grade blue color) and cooked

- ix. **Chilling** – the carcass chilled at 0-4°C for 24 hours before fabrication to allow the rigor mortis to pass, to check on microbial growth, and to firm up the meat for easy fabrication

#### In Swine

Antemortem inspection - Stunning – Sticking – (cleaning) Scalding and Scraping – Removal of Head – evisceration – splitting – washing – post mortem inspection – chilling (12 – 24 hrs)

- **Scalding** - dipping the carcass in hot water to loosen up hairs and scarf; the water temperature must be maintained at 54 to 84°C; Too hot water can cause hair setting while too cold water cannot effect loosening of hairs and scarf
- **Scraping** - removal of hair using a scraping knife

#### In Cattle and Carabaos

Antemortem inspection - Stunning – Sticking – (cleaning) Flaying – Removal of Head – evisceration – splitting – washing – post mortem inspection – chilling (36-48 hrs)

- **Flaying or Skinning** – this is the removal of the hide.
- **Shrouding** – this is wrapping the carcass with cheese cloth. The cloth is soaked in luke warm water and wrapped around the carcass while it is warm. The cloth absorbs the remaining blood at the surface of the carcass, smoothens the internal fat covering, causes fat to appear white and dense and prevents excessive shrinkage and oxidation.

#### In Goats

There are two methods of slaughtering goats, the singed method and the flayed method.

- **Singed Method** – after stunning and sticking, singeing is done with either a blow torch or an open fire. While singeing, the hairs are continuously scraped with a dull knife until the hairs are all burned. The belly must be

- pinched to avoid bursting of the whole belly cavity. After singeing, the canked skin is sliced off for the preparation of kilawan. Evisceration is done similar with that in cattle.
- **Flayed method** – the process of stunning and sticking in the singed method is followed but the skin is not utilized for food. The removal of fleece or flaying is made slightly different from that in cattle and carabao. Be sure not to allow the meat to come in contact with hairs to avoid imparting goat odor to the meat. Evisceration and chilling in goats are similar with that in cattle except that in goats, splitting of the carcass is not done.

### **Meat and meat products**

**Meat** – properly dressed flesh derived from mature animals in good condition at the time of slaughter.

**Carcass** – the body of any slaughtered animal after bleeding and dressing

**Dressing percentage** – percent yield of the carcass, carcass weight divided by the slaughter weight multiplied by 100

**Loin ear area** – the cross sectional area of the longissimus dorsi muscle of pork/beef.

**Fresh meat** – meat from an animal that has not undergone any substantial physical, microbiological and chemical change from the time of change

**Finish** – the amount, character and distribution of fat in the carcass.

**Lean Cuts** – cuts of pork composed of the loin, ham and shoulder.

**Retail Cuts** – Cuts of meat handled in small quantities and which may be prepared for the table without further cutting and trimming

**Wholesale cuts** – meat cuts that are handled in bulk and usually require further cutting before these are prepared for the table.

**Green weight** - weight of a cut of meat in its fresh state before curing or processing

**Green hams** -uncured smoked hams

**Brand** – any mark or stamp approved by the controlling authority

**Rigor Mortis** – the stiffening of the muscles after an animal dies, believed to be due to muscle contraction

**Greening** - formation of green color in the skin and other collagenous tissues as a result of excess nitrite; may also be due to microbial action

**HACCP** - hazard analysis critical control points the fat granules

**Hot boned meat** - eat deboned before the development of rigor mortis

**Hot meat** - meat from an unaccredited slaughterhouse, or obtained from illegal source of meat

The following are terms used to refer to the meat of a specific animal:

- a. Beef – ox, one year old and above
- b. Carabeef – carabao beef, caraveal
- c. Chevon – goat
- d. Game meat – game animals (wild hunted)
- e. Horsemeat - horse
- f. Lamb – sheep, less than one year old
- g. Mutton – sheep, one year old and above
- h. Pork – pig
- i. Veal – ox, less than one year old
- j. Venison – deer

### **Meat Composition**

- Contains lean, fat, bones, connective tissues and other similar elements
- The lean is the most important part of meat in relation to human nutrition.
- Meat protein has high biological value. It can supply the essential nutrients needed for normal growth and physiological function of human adults without being fortified.
- Meat also contains sufficient B-vitamins, phosphorus, iron and potassium but deficient in calcium.

## **Meat Fabrication**

- cutting carcasses into standard wholesale and retail cuts
- proper fabrication lowers of cutting losses
- basic principle: Separate tender meat from tough meat and thick portion from the thin portion because they require different methods of cooking.
- the cheap parts must be separated from the expensive parts
- the cutting of the muscles across the meat fibers to improve the tenderness of the cut

## **Meat Processing**

**Chilling** – to firm up the meat and check on the growth of microorganisms (2-4 C for 24 hrs)

**Trimming** – removes excess fat, parts with blood clot and bruises; includes deboning when necessary  
Weighing, Washing, and Dripping

## **Meat curing**

- The meat is subjected to the process of salting, pickling, drying, and/or smoking
- The meat is being preserved because some of the curing ingredients have antagonistic effect on the microorganisms
- With four general methods:
  - Dry cure method – curing ingredients are applied (rubbed) in dry form; ex. Tocino, tapa, bacon
  - Sweet pickle method – similar to dry cure but the ingredients are dissolved in water; ex. Corned beef, chicken ham
  - All injection method – ingredients are dissolved in water and injected to the meat; ex. Cured ham
  - Combination method – injection method is combined with either dry cure or sweet pickle method; ex. Cured ham

## **Milk Production**

- ❖ Relatively good dairy cows in the Philippines and in most of the tropics correspondingly yield only about 8-12 kg daily.

- ❖ A common "rule of thumb" is to feed one kg of reasonably good concentrate mixture for every 2.5 kg of milk in excess of 5 kg if the forage is of good quality.

## **Milk composition**

- Mainly of water, fat, protein, lactose (milk sugar) and ash
- Varies depending upon the animal species, breed, individuality, season, lactation, level of nutrition and management
- A rich source of calcium, riboflavin (B<sub>2</sub>), vitamin B<sub>12</sub>, iodine and phosphorus
- Contains all the essential amino acids
- Its protein is composed of globulins, casein and lactalbumin. Portions of the globulins of milk are structural parts of antibodies. Casein is the most abundant protein constituent of milk.

**Colostrum** - the first secretion of the mammary gland; higher than milk in dry matter, protein, vitamins and minerals; also contains antibodies that give newborn animals protection against diseases

- ✓ Milk produced under ideal condition has slightly sweet and pleasant taste.
- ✓ Milk with low fat content tends to be flat while that with higher fat has creamy and fuller flavor.
- ✓ Milk fat is the most variable milk constituent.

**Lactose** – a sugar milk and can be digested by the enzyme lactase produced by humans.

**Lactose Intolerance** – occurs when man does not produce enough lactase to completely digest the lactose. This undigested lactose stays in the intestinal tract, and with the action of microorganisms causes abdominal pain, diarrhea and flatulence (gas.)

- ❖ **Pasteurization** - process of heating milk to a certain temperature for a certain period of time required to destroy any pathogenic microorganisms.

### **Milk Products**

#### **Whole milk**

- Upon drying: whole milk powder
- Upon separation: cream and skim milk

#### **Cream**

- Upon churning: butter and buttermilk

#### **Butter**

- Upon evaporation: butteroil or anhydrous milk

#### **Buttermilk**

- Upon drying: buttermilk powder

#### **Skimmilk**

- Upon drying: skimmilk powder or non fat dry milk
- Upon acidification or addition of rennet: cheese (add casein) and whey

#### **Whey**

- Upon drying: whey powder

**Evaporated milk** - whole milk from which about 60% of the water has been removed and contains not less than 25.8% total milk solids and 7.8% milk fat; Also known as unsweetened condensed milk; Compared to raw milk, it has greater viscosity and is creamy in color.

**Homogenized milk** - milk which has been treated in such a manner as to ensure break-up of the fat granules

### **Egg Production**

- ❖ The major factors affecting nutrient requirements for egg production are:
  - Rate of egg production
  - Egg size or weight
  - Egg shell thickness
  - Body size of layer
- ❖ The principal factor affecting egg shell quality is dietary calcium.
- ❖ Egg shell quality can be measured by specific gravity of egg, shell thickness, shell smoothness, breaking strength, and percentage of cracks or shell appearance.
- ❖ Low dietary calcium levels, less than 2.0 percent, decrease egg shell quality in chickens.

#### **Egg composition**

- largely proteins and lipids and various minerals and vitamins with A, D, thiamine and riboflavin in bulk amount; poor source of carbohydrates

## **VI. POULTRY PRODUCTION**

### **POULTRY**

- Popular because they are fast multipliers.
- Quick growers, more efficient feed converters
- Chicken- most popular poultry species.
- Duck – 2<sup>nd</sup> most popular (for balut, salted and century eggs)
- Quail – 3<sup>rd</sup> most popular (for its eggs)

#### **Orders:**

<sup>1</sup>Galliformes- don't have true phallus (copulatory organ), v-shaped breast

<sup>2</sup>Anseriformes- have true phallus, v-shaped breast

<sup>3</sup>Struthioformes – have flat breast

<sup>4</sup>Columbiformes – secrete "milk"

## POULTRY SPECIES:

Common Name	Scientific Name	Egg Weight (g)	Incubation period (days)
1. Chicken <sup>1</sup>	<i>Gallus gallus</i>	58	21
2. Ducks <sup>2</sup> Mallard pekin(meat) Mallard (egg) Muscovy (meat)	<i>Anas platyrhynchos</i> <i>Anas platyrhynchos</i> <i>Cairina moschata</i>	80 – 83 60 70	28 28 35 – 37
3. Turkey <sup>1</sup>	<i>Meleagris gallopavo</i>	85	28
4. Quail <sup>1</sup>	<i>Coturnix coturnix</i>	12	16-18
5. Pigeon <sup>4</sup>	<i>Columba livia</i>	17	18
6. Geese <sup>2</sup>	<i>Cygnopsis cygnoides</i>	200	30 – 31
7. Swan <sup>2</sup>	<i>Olor columbianus</i>	285	35
8. Ostrich <sup>3</sup>	<i>Struthio australis</i>	1400	42
9. Peafowl <sup>1</sup>	<i>Pavo cristatus</i>	95	28
10. Pheasant <sup>1</sup>	<i>Phasianus colchicus</i>	32	23 – 24
11. Guinea fowl <sup>1</sup>	<i>Numida meleagris</i>	40	28

## THE CHICKEN: CLASSES, BREEDS & VARIETIES

### The Origin of the Chicken

\*The exact ancestry of the present-day chicken is not known.

### Common Origin of the Chicken Breeds and Varieties:

1. Red jungle fowl. (Sc. Name: *Gallus gallus*) a native of Southeast Asia.
2. *Gallus sonneratii* (gray jungle fowl)
3. *Gallus lafayetti* (Ceylonese jungle fowl)
4. *Gallus varius* (Javan jungle fowl).

### Development of Modern Breeds and Varieties

- Hen of the wild jungle fowl is 0.9 kg in weight and lays only a few eggs
- Modern hen weighs 1.5 to 2.0 kg at 6 weeks of age and lays as much 320 eggs

### What brought the change?

#### 1. Genetic mutation

- Some changes in the genetic make-up of certain individuals due to factors that are within as well as factors that surround the subject.
- The changes have been transmitted to generation to generation with the possibility of being modified from time to time as more factors and more individuals interact with each other.

#### 2. Selection

##### a) Natural Selection (survival of the fittest)

1. Climatic differences
2. Differences in nutrition

##### b) Artificial Selection – the interference of man in achieving certain goals and personal ideas – for example.

1. For meat
2. For eggs
3. For fighting cocks
4. For fancy feathers

## CLASSIFICATION OF BREEDS AND VARIETIES OF CHICKEN

1. **Breed** – a group of chicken (fowls) possessing certain conformation or shape of body that distinguishes them from other chickens.
2. **Variety** – a group of chicken within the breed which possesses the same plumage color and type of comb.

### Example:

Breeds	Variety
Leghorn	White, single comb
Brown, Rose comb	
Plymouth rock	White Barred

3. **Strain** – a group of chickens within a variety of a breed which has under constant specific section of certain traits by a specified breeder for periods of about 5 to 8 years.

### 4. Strain Crosses

### 5. Line crosses or Family lines

Breeds of chicken can be classified by its utility. This is based on the purpose for which the breed or variety is most sufficient.

#### 1. Egg Class

- The breed belonging to this class is characterized by their comparatively small size.
- They lay large white shelled eggs, very active and nervous in temperament.
- They are non-sitters.
- Examples: Leghorn, Minorcas, Anconas, Mikawa.

#### 2. Meat Class

- Large breed, slow in movement, quiet and gentle in disposition.
- Generally poorer egg layers and generally lay browned shelled eggs.
- Examples are: Brahma, Cochins, Langshans, Cornish, white rocks.

#### 3. General purpose class

- Breeds of chickens in this class are medium sized, good layers and the young are fast growers.
- They are not as nervous as the egg class but much more active than the meat class.
- Examples: New Hampshire, Rhode Island Red, Plymouth Rock, Lancaster, Nagoya, Cantonese.

#### 4. Fancy Class

- Breeds beautiful plumage or form of having a rare unusual appearance.
- Most of them are raised chiefly as ornamentals or pets by hobbyists, regardless of their value as a source of food.
- Examples: Frizzle, Bantams, Long tailed.

#### 5. Fighting Class

- There are groups of these kinds of chickens now developed by national and international aficionados in this game.
- The popular ones are the Ruble, Hulsey, Claret, and Oasis.

**Standard Classification** – under this classification, breeds and varieties are grouped according to their geographical origin.

#### 1. American Class

- Breeds and varieties that were developed in the American continent.

- The most popular are: Plymouth Rock (White, Barred, Speckled, Brown), Wyandottes, Rhodes Island Reds, New Hampshire, Land Caster.

## 2. Asiatic Class

- This breeds were developed in Asia
- Examples: Brahma, Cochins, Langshans, Cantonese, Nagoya.

## 3. Mediterranean Class

- It is related to its utility grouping since of the Mediterranean origin are of the egg type breeds. They produced large white shelled eggs.
- Examples: Leghorns, Minorcas, Anconas.

## 4. English Class

- Specifically the breeds that were developed in England and in its colonial territories like Dorkings, Australorps, Cornish, Orpington.

## 5. Other Classes by origin

- Of development are: Polish, Hamburg, French and oriental classes.

There are 189 varieties and about 40 breeds of chickens recognized by the American poultry association as of 1953 based on registry.

## SPECIALIZED FIELDS IN POULTRY PRODUCTION

### Three Categories of poultry production:

#### 1. Breeding Farm

- It is the system of researching or discovering the best combination of genes of parent stocks that will be the source of commercial chicks for the poultry producer.

- The existing "strains" or probably across of various lines now available to a commercial poultry raiser is a product of very long studies by the geneticist.

- There is no true commercial poultry breeding farm existing in the Philippines of 2003.

- Poultry breeding farms in the country are franchised breeder farms from other international breeders.

#### 2. Egg Farm

- Egg production is the older scheme of poultry production engaged in by many research.

Two phases of operations.

- The first phase can be strictly for raising pullets.
- The 2<sup>nd</sup> phase is the keeping of layers per se when they are on the stage of egg production.

- All female type chicks are obtained from the reputable hatchery for this kind of stock.

#### 3. Broiler Farm

- It is the most recent specialized field in the Philippines.
- This is the growing of meat - type chicken essentially for meat production.
- Stocks used for this purpose are so called broiler-type chicks which are known for their fast growth, meaty conformation and good feed conversion.
- Broiler chicks are grown for a period of only about 6 to 7 weeks.
- Both male and female chicks are utilized for growing broilers. However, the males grow faster than females.

## POULTRY REPRODUCTIVE SYSTEM

**Testicles:** Produce sperm

**Vas Deferens:** Carries seminal fluid and sperm from testicles to cloaca

**Papilla:** The organ in the wall of the cloaca that places the sperm inside the female's reproductive tract

**Ovary:** Produces the ovum

**Infundibulum:** Receives yolk from ovary, where sperm is stored, and fertilization takes place

**Magnum:** Secretes the thick white of the egg (3 Hours)

**Isthmus:** 2 shell membranes are placed around the yolk and thick white (1 1/4 Hours)

**Uterus:** Thin white and outer shell are added to the egg (20 Hours)

**Vagina:** Completed egg is stored for a short time till laid (Total: 25-27 Hours)

### Environmental Requirements to Hatch Chicken Eggs

#### Natural:

- The hen lays eggs (1 per day) over period of several days
- After 21 days, the eggs hatch
- A hen who is laying on her eggs is referred to as "broody"

#### Artificial Incubation:

- The hen lays eggs and they are placed in an incubator
- Incubator keeps eggs at proper temperature and humidity
  - **Temperature: 97-102 degrees**
  - **Humidity: 60%**
- Eggs are turned 3-5 times daily to prevent embryo from sticking to the inside of the shell

### Selection of Hatching Eggs

#### Grading Exterior Quality:

- 1-Cleanliness - Shell should be free of debris or organic matter
- 2- Shape -Small end and large end. Not round or oblong

3- Soundness -No Cracks

4- Size -Not very small nor extremely large

#### Grading Interior Quality:

- 1- Air Cell
- 2- Viscosity of Albumen (white)
- 3- Check for abnormalities (Blood/Meat Spots, Cracks or leaks in shell)

#### Candling

- It is done to test for fertility and viability
- Done by placing the eggs against a bright light such that the outline of the contents of the eggs is seen from the outside
- Used a candler or tester
- Done in 3 periods:
  - 4<sup>th</sup> or 5<sup>th</sup> day – to remove infertile eggs
  - 13<sup>th</sup> day or 14<sup>th</sup> day and on the 18<sup>th</sup> day – remove dead embryos
- *Candle eggs to determine their interior and exterior quality grade.*

## BROODING MANAGEMENT

#### Brooding

- Starts as soon as the chicks are placed in the brooder area where heat is supplied until the chicks have grown to the point where they no longer need additional heat to keep them comfortable
- This period lasts for approximately 4 weeks

#### Type of brooder

1. **Battery-type brooder** – composed of compartments called tiers constructed on top of another, each compartment equipped with separate heater and provisions for feeding and drinking

2. **Cage brooder** - can be elevated slatted-floor or litter-floor type with capacity varying from few to several hundreds

#### **Temperature requirements:**

Day old	- 1 week	90 - 95 °f (32.2 - 35 °c)
1	- 2 weeks	85 - 90 °f (29.4 - 32.2 °c)
2	- 3 weeks	80 - 83 °f (26.7 - 29.4 °c)
3	- 4 weeks	80 °f (26.7 °c and below)

**Growing period** – 75 °f or cooler temperature. The chick's physiological reaction to existing environmental temperature will indicate whether the temperature is right, too low or too high.

#### **Floor space requirements:**

Egg type chickens	Meat type Broiler
1 day - 3 wks	0.3 sq.ft/bird
3 - 8 wks	0.5 sq.ft/bird
8 - 12 wks	1.0 sq.ft/bird
1day - 2 weeks	0.3ft <sup>2</sup> /bird
2wks - market age	1.0 ft <sup>2</sup> /bird

After 12 weeks, the floor space requirement of growing pullets varies according the systems of housing used.

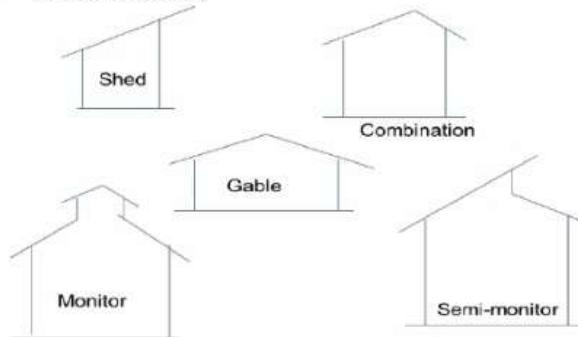
Litter floor	-	2.0 - 2.5 sq.ft/bird
Slat floor	-	1.5 - 2.0 sq.ft/bird
Cages	-	0.75 - 1.0 sq.ft/bird

#### Sources of heat for brooders

- A.) Electricity
- B.) LPG (liquefied petroleum gas)
- C.) Infrared lamp
- D.) Kerosene lamp
- E.) Charcoal

#### **House Features**

- Construction materials
  - Bamboo slats, nipa shingles, coco lumber
  - GI sheets, aluminum sheet, wood, welded wire, plastic nets
- Shape
  - Long and narrow with east-west orientation
- Width
  - 10 to 12 meters
- Height
  - Floor height (1.8 m or 5.9 ft)
  - Floor to ceiling (2.4 m or 8 ft)
- Roof style
  - Shed type
  - Gable type
  - Combination (shed-gable)
  - Monitor type
  - Semi-monitor



#### **Light Requirement**

- Light management is very important in the development of new layers.
- The correct light to dark ratio in the rearing house will influence the production of larger eggs.

- During the first few days of brooding, lighting the chicks throughout the night (24 hours light) is favorable for growth because there is eating time if food is available.
- The light in the brooder will encourage the birds to keep close to source of heat, feed and water.

One cardinal rule: *Never increase light during growing period and never decrease light during the laying period.*

\* Increasing day length (light) during the growing period of birds will hasten their sexual maturity, which will result to production of more pullet eggs (small eggs), layers are prone to prolapsed and shorter egg production cycle.

Under local conditions where there is only slight variation in day length, it is recommended day must not exceed 11 - 12 hours during the growing stage (4 - 18 weeks) of the developing pullets.

#### Feeds, Feeding and Watering

- The availability of drinking water to the chicks must be emphasized.
- The addition of 5-10% of sugar in the drinking water can be done for the first 6 - 8 hours during the arrival of the day old chick (DOC).
- Supplementation of water-soluble vitamin-mineral antibiotic preparation can give the chicks a good start too.

Adequate feeder and watering space should be provided to the birds. The following allowances are considered minimum for bird:

	<u>Feeder (linear)</u>	<u>Waterer</u>
Day old	2.5 cm	0.5 cm (1 gal/100 chicks)
2 - 6 weeks	4.5	1.0
6 - 10 weeks	7.5	2.0

## Vaccination, Medication and Debeaking

<b>Age</b>	<b>Medication</b>	<b>Route</b>
Day old chick	Mareks Vaccine	Mass method/spray
5-12 days	NCD or Avian Pest Vaccine	Intranasal/ Intraocular
21 days	NCD	Mass method via drinking water
6-8 weeks	Fowl pox	Wing web

#### Cannibalism among growing chickens

**Cannibalism** - is a bad habit developed by some growing birds. It usually starts from feather or toe picking which may result to serious wounding and death of birds.

The possible causes of cannibalism are:

1. Imbalanced ration - a high energy diet with low protein leads to this problem
2. Overcrowding and insufficiency of feeding and drinking space
3. Extended period without feed and water
4. Poor ventilation
5. Excessive heat and too much light.
6. It may also be a strain characteristic.

#### Factors affecting length of brooding period

- A. *Weather/climatic conditions* – longer during cold & rainy months, shorter during dry & warm months
- B. *Rate of feathering* – shorter for fast feathering breeds/ varieties/strains, longer for slow feathering: can be due to genetic makeup or nutrition of the birds.

## GROWING MANAGEMENT

### I. System of Rearing

1. **Range System** – this is a good system but because of more land area required, this system is commonly practice by native chicken growers & by duck raisers.
2. **Semi -confinement system** – this is a system of raising poultry where the birds are provided w/ shed or housing & an area to graze or pasture. E.i in native chicken, organic chicken production.
3. **Complete – confinement** – the modern trend in raising commercial strains.
  - a.) Litter floor
  - b.) Slat floor
  - c.) Combination
  - d.) Cages

### II. Rearing of Pullets

#### 1. Feeding requirements of growing pullets

6 -14 weeks	Grower ration	16% protein
14 – 20 weeks	Pullet developer ration	14% protein

\*Birds tend to lay eggs early when feed of high protein content. - This is not desirable since early sexual maturity results in smaller pullets & consequently production of smaller eggs.

#### Feed wastage (conventional feeding through & a mash ration):

Completely full	- 30% of feed is wasted
2/3 full	- 10% of feed is wasted
1/2 full	- 3 %
1/3 full	- 1 %

**Note:** Feeding through should not be filled more than 1/3 to prevent feed wastage. The feeder should be replenished 3-4 times a day to stimulate feed consumption.

### 2. Signs of sexual maturity

Change in appearance of the secondary sexual characters.

1. Comb & wattles begin to increase in size & the color becomes red
2. Pullets become friendly & cackle
3. Pullets instinctively looks for nest
4. Pullets become docile (easily manage) & gregarious (sociable)
5. The vent & abdomen become enlarge.

**Note:** The surest sign of sexual maturity is the laying of the 1<sup>st</sup> egg.

## LAYER FLOCKED MANAGEMENT

#### Systems of rearing of layer flocks

- Range system – good system but needs more land area, commonly practiced by native chicken growers and duck raisers
- Semi-confinement = a system where birds are provided with shed and an area to graze
- Complete confinement- modern trend in raising chicken. Ex. Litter floor, slat floor, combinations and cages

#### Housing

- Small poultry housing – shed or gable type
- Large poultry house monitor or semi monitor
- Open sided
- Housing units for layers

**Brooder house** – 4 to 6 weeks old; slatted or litter floor

**Growing house** – 4 or 6 weeks old to 14-16 wks. Old; slatted or litter-floor

**Layer house** – 14-16 wks onwards;

- Cages

Single, multiply (2-10 pullets) or colony (20-30 pullets)

Local conditions – 3-4 birds/cage give good performance

- Majority of hens lay their eggs b/w 10:00 a.m to 2:00 p.m.

- The concentration of egg laying takes place before noon as a common observation.

- \* Eggs must be collected in wire baskets to provide good air circulation.

### Daily Routine of Work in the Layer House

#### A. Feeding

- Layers must be fed a dietary composition referred to as layer ration or breeder ration.
- Layer ration will generally contain a 15-18% protein level.
- Day – old to six weeks old – chicks starter mash (20% CP
- Six to twelve weeks old – grower feeds; 16% CP
- Twelve to 18 weeks old – developer feeds; 14%CP
- 18 to 42 wks. Old – layer 1 feed; 18% CP
- 42 wks to culling – layer 2 feeds; 17% CP

**Note:** Mature laying hens will consume about as low as 90 grams to as high as 140 grams a day.

One year consumption varies from 40 to 42 kilos per layer.

#### B. Watering

- Drinking water must be available to the layers all the time.
- The egg is about 65 to 70 % water.
- One hundred layers can consume about 7 gallons of water during a normal day and will drink much more when the temperature of the environment becomes higher.

#### C. Egg Collection

- They are capable of laying one a day but it is next to impossible to realize one-egg-one-day for long period of time.
- They are expected to skip some days in egg production.
- Oviposition (the act of egg laying) takes place normally as early as 7:00 a.m to as late as 4:00 p.m.

#### Flock Replacement Program

- Programs of replacement can vary from a set of one flock every 3 months.
- It can be as often as a monthly set up of replacement stocks depending on the program and availability of facilities.

#### Feeds and Feed Supplement

\*Feed is the biggest item in the operational cost.

#### Capitalization

Broiler raising needs intensive capital, returns are quick but investments are high.

## SYSTEM OF BROILER OPERATION

#### All-in-all out system

- Only broiler of one being raised and all of them are sold at the same time.
- Most desirable to affect a simple disease control measure, especially if in one locality, community or area, there will be no other age groups of birds

#### Two stage operation

- Two age groups of broiler are being kept in the farm. If the principle that no different ages of chicks are not to be mixed in one house will be followed, the two stage operation certainly calls for separate brooder house and grower house.

#### **Multiple stage broiler operation**

- This is similar to the two stage broiler operation except that there should be more units to facilitate as many stages or accommodate various ages of broilers
- The turn-over of chicks can be either daily every 2 days, weekly bi-weekly, etc.

#### **Contract growing of broilers**

1. Integrator company (contractor)
2. Farmer (grower)

#### **Classification of broilers raisers**

- A. Independent raiser
- B. Contract grower

#### **Broilers strains marketed in the Philippines**

- |               |            |             |
|---------------|------------|-------------|
| a. Anak 2000  | d. Cobb    | g. Peterson |
| b. Anak 180   | e. Pilch   | h. Ross     |
| c. Arbor acre | f. Starbro | i. Avian    |

#### **Important Parameters in Broiler Production**

- |                                   |                    |
|-----------------------------------|--------------------|
| A) Cost of day-old chicks:        | P13.00-18.00/chick |
| B) Total amount of feed consumed: | 3.5-3.75 kg/bird   |
| C) Feed conversion ratio (FCR):   | 2.0-50.00/kg       |
| D) Mortality:                     | 5%                 |
| E) Dressing percentage:           | 70%                |
| F) Price of live weight chicken   | P40-50.00/kg       |
| G) Number of batches per year:    | 5-6                |
| H) Feeding system:                | ad libitum         |
| I) Cost of feeds                  |                    |
| Chick booster                     | - P385.00/25kg     |
| Broiler starter                   | - P615.00/50kg     |
| Broiler finisher                  | - P600.00/50kg     |
| J) Labor: Broiler ratio           | -1:5,000 birds     |

## **VII. SWINE PRODUCTION AND MANAGEMENT**

#### **HOG ZOOLOGICAL SCHEME**

<b>KINGDOM:</b>	Animalia
<b>PHYLUM:</b>	Chordata
<b>CLASS:</b>	Mammalia
<b>ORDER:</b>	Artiodactyla
<b>FAMILY:</b>	Suidae
<b>GENUS:</b>	<i>Sus</i>
<b>SPECIES:</b>	<i>Scrofa/vittatus</i>
<b>SUB-SPECIES:</b>	<i>domesticus</i>

*Sus scrofa* - is a wild hog of continental Europe from which most domestic swine have been derived.

*Sus vittatus* - was the chief, if not the only species of the East Indian pig that contributed to domestic swine.

## **BREEDS OF SWINE**

#### **The Philippine Native Swine**

- Indigenous animals belong to a large undefined population of individuals without any uniform traits usually ascribed to a breed.
- The local pig or Philippine Native pig belongs to this category, as they are small and lack the anatomical symmetry of standard breeds.
- General characteristics: Small and late maturing, mostly solid black or black and white have small ears, sway back and with weak pasterns.

Other Scientific Name	
Luzon Warty pig	<i>Sus philippinensis</i>
Palawan Bearded pig	<i>Sus barbatus</i>

## Purebreeds

### 1. Landrace

#### Origin:

- First Landrace swine was developed in Denmark for the production of high quality bacon.

#### Characteristics:

- The Landrace breed is white in color, although black skin spots or freckles are rather common.
- It is known as the longest breed of swine ( 16 to 17 ribs).
- This breed is known for its prolificacy and mothering ability under Philippine condition.

#### Disadvantage:

- Weak legs and pasterns especially on the hind leg. Some strains of Landrace have narrow body and long legs depending on the country of origin.

### 2. Yorkshire/Large White

#### Origin:

- English bacon breed which had its origin in Yorkshire and neighboring countries in Northern England. It was developed by selection and crossing with Leicester hog which was a white hog.
- The present Large White was developed in England.

#### Characteristics:

- Yorkshire should be entirely white in color.
- Yorkshire sows are noted as good mothers (Mother Breed).
- They not only farrow or raise large litters, but are great milkers.
- The pigs are excellent foragers and compare favorably with those of any other breed in economy of gains. =

#### Disadvantage:

- Some individuals in this herd are relatively short and with big belly and they tend to develop carcasses with excess back fat.

### 3. Duroc

#### Origin:

- The Duroc breed of hogs had its origin in the eastern United States and in the Corn Belt.
- It would seem presumptuous today to attempt to identify the foundation stock of the breed, which was originally called the Duroc-Jersey.

#### Characteristics:

- Duroc has solid colors, ranging from very light golden to very dark red that approaches the color of mahogany.
- The head is small in proportion to the body and the jowl is medium in size. The length of its legs is proportional to the depth and length of its body.

#### Performance:

- Duroc is considered a superior breed in terms of growth rate and feed efficiency. It has a good muscle quality and is probably the most resistant to stress.

#### Disadvantage:

- Some individuals have a strong tendency to have a well arched back which is undesirable because this animal does not stay long in the breeding herd.
- Unsound front and hind legs that may lead to stiff gilt or lameness are also encountered in some animals.

### 4. Pietrain

#### Origin:

- Pietrain, Belgium, the village from which the breed takes its name, was the birthplace of the breed.

#### Characteristics:

- This breed may be appropriately called the "muscle" pigs because it is well known for its outstanding muscle development in the ham, loin and shoulder.
- The backfat is very thin. The motherly ability is well within acceptable level.

#### Disadvantage:

- Because of the relatively well-muscled ham, the number one problem of this breed is usually weakness of the hind legs which do not develop as fast as the ham muscle.
- This breed is also known for being a slow grower and being highly susceptible to stress.

## **5. Hampshire**

#### Origin:

- Hampshire breed traces its origin to Southern England.
- But the first Hampshire Swine Record was organized in Boone country Kentucky, just across the Ohio River from Cincinnati.

#### Characteristics:

- The most striking characteristic of the Hampshire is the white belt around the shoulder and body including the foreleg.

#### Performance:

- Feed efficiency, length and ham-loin percent of this breed is excellent.

#### Disadvantage:

- Low liter size at birth and at weaning, poor mothering ability and late maturing. Being black is also an objection because it is associated with thick backfat is also an objection because it is associated with thick backfat and with difficulty in dressing/cleaning during slaughtering.

## **6. Berkshire**

#### Origin

- South Central England, principally in the counties of Berkshire and Wiltshire.

#### Characteristics

- The distinct peculiarity of the Berkshire breed is the short and sometimes upturned nose.
- The color is black with six white points, four white feet, one point on the forehead; and another on the switch of the tail.

#### Disadvantage

- This breed has a small litter size at birth and at weaning, late maturing, thick backfat and the black skin.

## **7. Poland of China**

#### Origin

- South-western Ohio in the fertile area known as the Miami Valley. It is also known as the "Hot Type" of "big Type Poland China."

#### Characteristics

- Modern Poland China is black in color with six distinct white points, the four feet, poll of the head and switch of the tail.

## **8. List of other Purebreds**

- a. Spotted
- b. Limousine
- c. Chester white
- d. Hereford
- e. Taniworth
- f. Large black
- g. Chinese Taihu pigs
  - Funjiang
  - Meishan
  - Janxiang black
  - Erhualian

### **Meishan**

- From China, considered Taihu pigs, deriving their name from the Taihu Lake
- Slow growing and fat, but have a very good taste, resistant to some diseases
- The Meishan breed is known for its wrinkled face and skin.
- Meishan pigs are perhaps one of the most prolific breeds of pig in the world
  - Large litter size of 15-16 pigs.

### **Upgrades**

Upgrading: native pigs bred with foreign breeds

- **Diani** - upgrade of native pigs (Batangas) with Berkshire
- **Kaman** - upgrade of native pig (Batangas) with Duroc
- **Berkjala** - 5/8 Berkshire and 3/8 Jalajala pig (Rizal)
- **Miracle Pig** - ½ Large White ¼ Landrace ¼ Native

### **Hybrid pigs or synthetic breeds**

- Do not have distinguishing physical characteristics which differentiate them from other group of pigs.
- Most of them are white with good muscle development.
- Examples are: Babcock, Camborough, Cotswold, Hyopor, Seghers, Minnesota No.1, Nieuw Dalland

## **PRODUCTION SYSTEM**

### **A. Sow Herd Enterprise**

#### **Farrow to feeder operation**

- This type of operation starts with a pregnant gilt/sow to produce pigs weanlings, which are sold to other raisers who grows them until the marketable weight is achieved.

#### **Farrow to finish operation**

- The producer in this type of operation also starts with a pregnant gilt/sow to produce the breeders stocks, specifically junior boars and replacement gilts.

#### **B. Growing-Finishing Enterprise**

- The swine raiser in this type of operation starts with feeder/weanlings and carries them to slaughter, weight of about 80 to 90 kg.

#### **C. Board-for-Hire-Enterprise**

- The producer in this type of operation starts with a young boar, which he grows and trains to breeder age.
- The boar is used to breed the gilts/sows in the community for a fee.

## **MANAGEMENT OF THE BOAR**

### **Boar**

- It is one of the most important animals in a pig enterprise.
- A boar will generally produce 15 to 20 times as many offspring per year as do breeding female in the herd.
- A period of at least 1 to 2 months before the breeding season begins is enough time for the boar to get adjusted to the new environmental

### **Characteristics of a good boar:**

- At least 6 pairs of rudimentary teats (**NOT FUNCTIONAL**), not inverted
- 2 big equally-sized testicles (**NOT 2 PAIRS**)
- Strong legs
- Strong slightly arched back
- Toes not uneven (**NO SMALL INSIDE TOE**)

## **Characteristics of average ejaculate**

### **Characteristics:**

Volume, ml.	150-200*
Sperm concentration, million/ml.	200-300
Total sperm per ejaculate, billion	30-60
Total sperm per week, billion	120-150
Motile sperm,%	70
Morphologically normal sperm,%	80
Color	Creamy white

### **Test Mating**

- Test mating provides an opportunity to observe the new boars sexual behavior and his ability to serve the gilt normally.

### **Feeding Boars**

- Feed boars 2.3 to 3.0 kg of ration with 13 to 14% crude protein.
- In the tropics, voluntary water consumption may be as high as 4 to 5 liters of water per kg of air-dry feed.

### **Housing and Environment**

- The pen measurement is 0.6 m x 2.1-m with a height of 1.1 meters. If the boar pen doubles as the service area, allow between 5 to 7 square meters of floor area.
- Use of individual pens or stalls eliminates fighting, riding, and competition for feed.

### **Reproductive Phenomena**

- A boar should start serving at 8 months of age.
- Some boar reaches sexual maturity as early as 100 to 147 days of age.

### **Breeding Frequency**

GreenEMPIRE PH ([www.facebook.com/greenempireph](http://www.facebook.com/greenempireph))

### **Recommended service for boars**

	Junior Boar (8 mos. - 1 year)	Senior Boar (more than 1 year)
Service per:		
Day	1	2
Week	5	7
Month	20	30

### **Boar to Sow Ratio**

- **1 young boar: 20 breeding females** in the herd to take over the breeding work in case one or two of the herd boars become incapacitated for one reason or another.

In a multiple farrowing program, the recommended number of boars needed for a given sow population is as follows:

- a. Two services per sow per heat period.
- 15 sows or less - One boar if boar is at least 15 months old
- 15 – 25 sows - Two boars
- b. One service per heat period
- 20 sows or less - One boar if young boar
- 30 sows or less - One boar if boar is at least 15 months.

## **CARE AND MAINTENANCE OF SOWS AND GILTS**

### **Prior to Pregnancy**

- Under good management, sows have tremendous capability to produce 2.3 liters per year or over 20 pigs annually.

### **Raising and Selecting Replacement Gilts**

- A steady supply of replacement gilts is required to replace sows, which die or are culled because of poor performance.

- Plan to replace 40 to 55 percent of your herd annually, if your herd age is five litters or less.

#### **\*Breed Choice**

- The crossbreed female is preferred for commercial production.
- They have the added advantage of hybrid vigor.

#### **MANAGEMENT OF THE DEVELOPING GILTS**

- Raise potentials gilt replacement in all female group in dry, well – ventilated pens that provide 0.56 to 0.74 m<sup>2</sup> of floor space per animal.

#### **Pre – Service Management of Replacement Gilt**

##### **A. Flushing**

- Increasing the daily feed intake of gilts by 0.5 kg to 1.0 kg for 10 to 14 days before service should increase the number of eggs ovulated if they were limit fed at 2 kg per day before flushing.
- A better practice is to self – feed the gilts with a 14% protein gestation ration throughout the pre-service period.

##### **B. Recommendations at First Breeding**

- Breed gilt at eight months and at 110-120 kg.
- Gilts should have their first litter at one – year age.
- It is further recommended that gilt be bred on the second heat cycles when the animal is standing heat.

#### **MANAGEMENT AT BREEDING TIME**

##### **Developing a Breeding Schedule**

- Determine adequate boar power by considering the number of services required per week, not the number of sows and boar.

- Each sow should be served twice. Boars that serve twice in a day with a day rest between breeding, an allowance should be made for one boar a sow during the week.

#### **Mating System**

Mating system vary as to amount of labor involved, ease of obtaining accurate breeding records and facility requirements.

##### **1. Artificial Insemination**

##### **2. Hand Mating**

- This is the preferred mating system.
- The operator checks for heat and takes the female in heat to the boar.

##### **Its advantages are:**

- a. The operator knows for certain that the females were bred
- b. Accurate breeding dates can be recorded
- c. The operator can accurately check for return to heat
- d. Boar use is regulated
- e. Anestrus problems can be determined earlier
- f. A more accurate sire breeding performance can be calculated
- g. Fewer boars are required for the same number of females

*Note: The main disadvantages are that more labor and closer observation are required.*

##### **3. Pen-mating – a boar runs with a group of females.**

1. Although less labor intensive more boar can handle 8 to 10 females in a 21-day breeding period.
2. A young boar (8 to 12 months) can effectively service from four to six sows in the same period.

*Note: The main disadvantage of pen-mating is that record of breeding dates, boar services rate and female return to heat dates are often unknown expect when the headsman observes a mating.*

### **Heat Detection**

Proper and accurate heat detection is important for a successful mating system.

#### **A. Physical Signs**

- ✓ Vulva maybe swollen and red
- ✓ Clear viscous vaginal discharges
- ✓ Restless and grunting
- ✓ Mounting behavior
- ✓ Frequent attempts to urinate with little or not discharges

#### **B. Techniques**

**Haunch–Pressure Test:** The operator should approach the sow from behind and rub her sides and thigh.

**Riding-the back-test:** This technique is applied by riding or merely pressing the back of the animal.

**Semen-on-the-snout test:** This test is particularly important in artificial insemination although it can be applied in natural breeding.

**Teaser boar:** Allowing a boar but preferably one that has been vasectomized to mount the sow.

**Sound Test:** Use of chomping sounds of the boar.

The **estrous cycle** ranges from 17 to 24 days, with an **average of 21 days**. Estrous cycle is continuously manifested by the individual unless interrupted by pregnancy.

Estrous = cycle

Estrus = phase in the estrous cycle when a female is sexually receptive, "in heat"

### **MANAGEMENT DURING THE GESTATION**

- The **normal gestation length of the swine is 114 days** with a range of 109 to 119 days. Or simply put, **3 months, 3 weeks & 3 days.**

#### **Housing and Environment**

- Be careful when mixing gilts with mature sows and keep group size at no more than five or six per pen.
- Avoid any stress – producing situation, especially during the first three weeks after breeding.
- When gestating stalls are used, partially slatted floors behind the sow are recommended to ensure a dry area for the sow and to reduce cleaning time.
- The edges of the stalls should be rounded to avoid damage to feet or teats.
- In a penning situation, allow about  $1.85 \text{ m}^2$  per bred sow or gilt.
- Stall measurement of about  $0.5 \times 2.13 \text{ m}$  are recommended.

#### **Feeding Level**

- Normally, 1.8 to 2.3 kg of balanced 14 percent crude protein ration will meet the daily nutrient requirements and free of heavy parasite infestation.

#### **Feeding in the Sow in the Late Pregnancy**

- The growth of the developing embryos increases rapidly in the final third of pregnancy.
- Also at this time, the transfer of nutrients from the dam to the fetus increases gradually and retention in the uterus and mammary glands develop accordingly.

The greater demand for feed in the last trimester of pregnancy can be satisfied by **increasing the level of feeding to at least 15 percent level of 2.0 kg for primigestation and light**

**multigestation sows, and 10% for the fully grown or heavy multigestation sows.**

### **Weight during Gestation**

- Weight gain during gestation will represent about 23-27 kg for mature sows and bout 30-41 kg for gilts and young sows.
- The weight loss at farrowing (litter weight and fluids) is about 22 to 27 kg.
- After the fourth litter, there should be little if any net weight gain.
- A sow body weight should be about 163 kg after weaning for each successive reproductive cycle.

### **MANAGEMENT DURING THE FARROWING**

\*Farrowing period and the first weeks of lactation are critical in swine production.

### **Basic Farrowing System**

- Continues farrowing: Sows to farrow are seen through a facility in a continues flow with no break for total room sanitation.
- All in, All Out Batch Farrowing System: Groups of sows due to farrow during the week are brought into individual rooms over a short time period.

### **Pre Farrowing Operations**

- Preparing the Farrowing Quarters: Thoroughly clean the whole farrowing room or area.
- Wash Sow: Before placing the sow in the farrowing unit, thoroughly wash her with a mild soap solution and rinse with warm water.

- Transferring Sows: To acquaint sows with their new surroundings, place them in the farrowing until 5 to 7 days before expected date of farrowing.
- Parasite Control: Deworm sows 10 to 14 days before transferring them to the farrowing stalls.
- Feeding the sow Prior to Farrowing: Constipation of the sow at farrowing is a condition which needs to be kept under control. Constipation can be avoided or corrected by feeding the sow a bulky or laxative diet one week before she is due to farrow.

### **Farrowing**

#### A. Signs of Farrowing

- ✓ She is restless, nervous and often bites the wall or stall partition
- ✓ She starts build a nest
- ✓ There is distinct swelling of the mammary apparatus
- ✓ There us slackening of the abdominal wall.
- ✓ Milk let – down: The presence of milk when the teats are stripped indicates that the sow will farrow within 24 hours.

#### B. Supervised Farrowing

The Need for an Attendant: The care and attention given to the piglets from the time they are farrowed until they weaned are very important. An attendant should be presented to assists the newly born pigs and the sow if necessary.

##### Reasons:

- Reduced stillborn pigs
- Minimize crushing
- Prevent starvation
- Prevent predators
- Avoid cannibalism
- Minimize dystocia (difficulty in giving birth)

### **Causes of Difficulty on Birth**

- Lack of uterine intertia – 37%
- Fetal Impression – 35.5%
- Obstruction of the Birth Canal - 13.0%
- Deviation of the Uterus – 9.5%
- Hysteria – 3%
- Oversized fetus – 4%

### **MANAGEMENT AFTER FARROWING**

#### **Average Daily Gain**

$$\text{ADG} = \frac{\text{Final weight} - \text{initial weight}}{\text{Number of feeding days}}$$

#### **Feed Efficiency (Feed Conversion Ratio)**

$$\text{FE} = \frac{\text{amount of feed consumed}}{\text{Gain in weight}}$$

\*Lower FE, better performance

#### **Health Care**

- Inspect the sow's mammary apparatus for congestion, inflammation, laceration and other forms of injuries. If these are presented watch out for MMA Syndrome.
- Metritis (Inflammation or Infection of the Uterus).
- Mesatitis (Inflammation of the Udder)
- Agalactica (Inadequate Supply of Milk).

Immediately after weaning the multiparous sows should be vaccinated against hog cholera at least twice a year.

#### **Feeding During Lactation**

- Usually it takes about 7 days from farrowing for milk production and feed requirements of the piglets to justify liberal feeding of the sow.

- Recommended level- 4.5-5kg of air dry feed/head/day for lactating sows and gilts.
- To avoid this problem on overfeeding or underfeeding, the feeding level for lactating sows should be based on the number of pigs in the litter rather than on a per sow basis.
- A sow with 12 suckling pigs should receive 2.0 kg feed for maintenance plus 1.0 kg for every three piglets in the litter or a total of 6.0 kg per day.

#### **Care and Management of the Baby Pig from Birth to Weaning.**

- Birth weight is important because heavier pigs at birth tend to be heavier at weaning and even growing.

#### **Keeping Newly Born Piglets Warm and Comfortable to Keep Them Alive**

- An estimate showed that 15% of the baby's pig body's heat is lost to the floor by conduction
- Roughly 10% through the normal evaporation of water from the respiratory tract and skin.
- Of the various sources of heat, it is believed that **the straw that the straw bedding is still the most effective means of providing the baby pigs with comfortable environment.** It permits the piglets to alter their environment in order to meet the needs of the moment.
- Correct environmental temperature is most critical during the first 6 days of post natal life when the thermal insulation of the pig is at its lowest.
- The capacity of the pig to regulate body temperature starts to improve gradually only on the 7<sup>th</sup> day onwards up to the 20<sup>th</sup> day when full important to provide the baby pigs supplemental heat to prevent serious losses from chilling.
- The presence of artificial heat source in the farrowing unit also helps prevent losses from crushing because it attracts the baby pigs baby pigs prefer a temperature ranging from 30-31

°C for the first week at birth, 29°C to 30°C after the first week until the 6<sup>th</sup> week and declines as the pig grows older (26 to 30°C for 50 kg pigs and 17 to 22°C for a 100 kg pig).

### Cutting of Umbilical Cord

- The umbilical cord is very vital organ for the growth and development of the fetus during the pregnancy but becomes an unnecessary appendage and crucial area for the entrance of infection after the pig is born.
- Tie the umbilicus about 1 to 2 inches from the base with a sterile thread

### Cutting the Needle Teeth

- Pigs are born with 4 pairs of sharp teeth (two on each jaws) called "black" teeth because of their darker color compared with the incisors. Some authors refers to them as "needle" or "wolf" teeth because, they should be cut immediately after birth because they do more harm than good to the producers.

### Prevention of Tail Biting

- **Tail biting** is major problem in many commercial swine farms in the country.
- Tail biting can be triggered off by an injury to the tail and it requires only one pig in a group to start biting and the other quickly follow suit.
- Other reports indicated that it could be due to the excess humidity, trapped stale air, and sudden changes in the weather, shortage of protein and excess energy in the diets.

Other dietetic factors include:

- A.) Shortage of Fiber
- B.) Excessively high or excessively low calcium
- C.) Deficiency of salt in the diet

- Parasite infection is another, which has been incriminated as the cause of tail biting. A pig with worms tends to switch its tail sharply and angrily.

### Feeding the Suckling Pigs with Colostrum

**Colostrum** is exceedingly rich in these protective molecules and it is imperative that each newborn piglet consumes colostrum within hours of birth in order to receive adequate immunity against infective organism. The gut of the piglets can absorb these large molecules intact only for short period after birth the absorption takes place within an hour of suckling, initially complete after 6 hours and by 16 hours after birth it is no longer possible.

### Identifying the Piglets

#### 1. Earnotching

- This is one of the most/ common method used in identifying individual pigs in the litter.
- A notch on the ear is permanent but unsightly and difficult to read when obliterated through injuries.
- It compromises of cutting a V shaped notch/es on specific places along the borders of the ear by means of a earnotchers or scissors.

#### 2. Tattooing

- It consists of piercing outlines of desired numbers or figures on the skin inside ear and the incorporating a black vegetable pigment into their punctures.
- The use of the tattoo method in identifying swine is not popular as earnotching although it is good as far as permanency of the mark is concerned.
- Tattooing is often performed on older pigs, using a tattoo-earmaking outfit to which the desired set of numbers is fitted.

### **3. Ear Tagging**

- Tags or labels are made up of light metal or strong plastic with the number stamped on them. Tags are fixed generally to the ear with a special tagging forceps.
- There are two types of tags:
  1. Self-piercing types
  2. Non – piercing types

### **Prevention of Baby Pig Anemia**

- Baby pig anemia is an old and well known disease problem to the progressive producers.
- This disease is brought about by a deficiency iron due to inefficient placental and mammary transfer of iron to the piglets.

### **Signs of Iron Deficiency Anemia**

#### **Clinical Signs**

- ✓ Poor Growth
- ✓ Rough hair coat
- ✓ Inactive and depressed
- ✓ Diarrhea
- ✓ Pallor (Paleness of gums, eyelids, lips and skin)
- ✓ Anoxia (deficiency of oxygen reaching the tissue of the body)

#### **Subclinical signs**

- ✓ Hypochronic microcytic anemia
- ✓ Enlargement heart and spleen
- ✓ Enlarge fatty liver
- ✓ Ascites (accumulation of serious fluid in the abdomen)
- ✓ Clumping of erythroblastic cells in bone marrow
- ✓ Pale internal organs
- ✓ Thin, white runny blood

### **Creep Feeding the Baby Pigs**

- Begin feeding the creep feed when the nursing pigs are about one week of age to make sure that they will be consuming sufficient amounts of the dry feed before milk production starts to decline.
- It is also help a great deal in preparing the piglet for the diet on which it would have to live on after weaning.

### **Rearing the Orphan Pigs**

- Orphan pigs are brought about by a number of factors like death of the sow after farrowing udder disturbances, lactation failure and too many pigs in a litter.
- There are various possibilities of rearing orphan pigs. Some of these are fostering, artificial feeding and rotational feeding.

### **Castration**

- The removal of the primary sex organ of the male is done when the pigs are about two weeks from birth or earlier.
- When castrating pigs, age, health condition and susceptibility to stressful condition of the animal must be consider.

### **WEANING THE PIGLETS**

- Weaning practices had changed gradually from the traditional weaning to early weaning and finally to artificial rearing with the ultimate objective of increasing the number of pigs weaned per sow per year.

#### **1. Traditional weaning (TW)**

- In traditional weaning the pigs are weaned at 8 to 10 weeks of age which has been the usual practice in the past. With a gestation period of 114 days and a dry period of 26 days on the average, a sow under the system will have only 1.7 to 1.9 farrowing per year.

## **2. Conventional Weaning (CW)**

- In conventional weaning the pigs are usually weaned at 5 or 6 to 7 weeks of age.

## **3. Early weaning (EW)**

- Early weaning as prescribed by the progressive commercial swine operators, entails weaning at 3 to 4 weeks of age.

## **4. Very early weaning (VEW)**

- Included under the very early weaning (VEW) category is artificial rearing (1 to 2 days weaning) and weaning from a few days (3 to 7 days) from birth to 2 weeks.

## **CARE AND MANAGEMENT OF GROWING FINISHING PIGS**

### **Growing finishing stage**

- The period from weaning to a slaughter weight of about 80 to 100 kilograms.

### **Scour Control (Diarrhea)**

- The most common cause of mortality and weight setbacks in weaning pigs
- The infectious agents causing the disease complex usually multiply in unsanitary facilities although they may also appear in relatively clean farms.

### **Gastro-Intestinal Parasite Control**

- Deworming of growing-finishing pigs 1 or 2 weeks after weaning is generally recommended as part of a sound health program.
- A second treatment ½-1 to 2 months after the first treatment is necessary because it takes approximately about a month for the large roundworm to complete its entire life cycle so that the larvae not killed by the first treatment is vulnerable as adults.

### **External Parasite Control**

- The major parasites causing the problem are the mange mites such as the *Scnoptes scabiel* and the *Demodex phylloides*.
  - ✓ ***S. Scabiel***, the most common mite, burrow into the upper two-thirds of the dermis.
  - ✓ ***Demodex phylloides*** infestation seldom occurs in swine. The mites live in the hair follicles and cause a pimple like lesion.

### **Vaccination**

Hog cholera is nearly 100 percent fatal to pigs of all ages, and its virulence resistance to antibiotics and other drugs for treatment, and highly contagious nature make it difficult to control.

- Growing-finishing pigs are best-vaccinated 2 weeks after weaning or 1 week after deworming, if deworming precedes vaccination.
- If pasturing is practiced, keep the pigs indoors until about 2 weeks when full immunity must have been attained.
- When using live-virus vaccines, observe extra care because improper handling may lead to serious hazards.

### **Feeding**

- It has been observed that when the shift in the feed is done abruptly, the pigs especially the young ones develop diarrhea so that to avoid the problem it is important to shift them gradually from one diet to another.

### **Feeding Systems**

- **Ad libitum feeding.** Giving feeds without restriction and always available at any time.
- **Restricted feeding.** Controlled amount of feed given to the animals.

- Combination of ad libitum and restricted feeding.** Fed ad lib until they reach the weight of 50 kg and fed restricted until they are marketed. Maximizing the advantage of the growth curve.

Ration and Crude Protein Requirement:

Type of Ration	Crude Protein Requirement (NRC, 1998)
Creep	22 – 23%
Pre-starter	19 – 20%
Starter	17 – 18%
Grower	15 - 16%
Finisher	13 – 14%
Gestating	13 – 14%
Lactating	15 – 16%
Boar	16%

## VIII. GOAT and SHEEP PRODUCTION

Goat Scientific name: *Capra hircus*

- Known as "biological herbicide" due to its browsing ability (browser).
- Diet: 40% grasses and 60% forbs (shrubs and herbs)
- Capable of nibbling bark of trees
- Mobile lips
- Walk long distance in search for food
- Selective in term of feed preference(eats young shoot first)

Sheep Scientific name: *Ovis aries*

- Biological lawnmover (essentially grazers)
- Flocking instinct- pecking order
- Less selective of feed offered than goats

### Basic differences between goat and sheep:

	Goat	Sheep
Scientific name	<i>Capra hircus</i>	<i>Ovis aries</i>
Chromosome number	60	54
Sounds made	Maaa	Baaa
Tail posture/carriage	Upward	Downward
Feeding behavior	Partly browser	Purely grazer
Social behavior	Individualistic	Flocking instinct
Long hair growth	Beard	Mane
Skin covering	Mostly hair	Mostly wool
Presence of horns	Naturally horned	Naturally polled
Presence of scent glands in males	Base of horn; Beneath tail	Between hooves
Growth behavior of horn	Narrower; upright; less curved	Curl in loops at sides of head

Goat production is one of the ideal farm enterprises if properly managed in the farm.

In study conducted by a government agency, it was observed that goats are multi-purpose ruminants producing 58.4% milk, 35.6% meat, 4.3% hide and 1.7% fiber.

### SHEEP BREEDS

**Barbados Black Belly** – originated in Barbados Island with African Ancestry; adapted to wide range of environment; high

reproductive efficiency; hair type: sweet mutton; black colors covers under parts completely extending up the neck and down the insides of the legs.

**Priangan**- originated in Indonesia; primarily for ram fighting and meat; thin-tailed; often lacks external ears

**Shropshire**- originated in England; wool-type; believed to be as one of the ancestors of the Philippine sheep

**Suffolk**- originated in England; wool-type; meat, dark colored feces and legs

**Merino**- originated in Spain; finest wool producer; the other ancestor of Philippine sheep

## GOAT BREEDS

There are many breeds of goat worldwide but the available breeds in the Philippines are as follows.

### A. Dual Purpose

**Anglo-Nubian**- basically a tropical breed successfully adopted grow in the Western countries, distinguishing features are drooping pendulous ears and a Roman nose.

**Boer Goats**- are intended to be raised for meat and they grow more rapidly than other goat breeds. They have a light-colored body and a distinction red head.

### B. Dairy Breeds

**Saanen**- originated in Switzerland, pure white to off-white in color and has the highest milk production.

**Toggenburg**- from Switzerland, smaller than the Nubian and Saanen, distinguishing feature are markings on the face, legs and tails; erect ears like the Saanen.

**Alpine**- also a European breed; color range from off-white to red to black.

**La Mancha** – from Spain/Oregon; very distinctive ear types “gopher ears”, “elf ear”

## C. Stock Selection

### A. Does

- Selection could be based on the number of offspring's weaned per year/doe, animal mortality, length of production life and incidence of major defects.

### B. Bucks

- In the selection of breeder buck, consider the blood composition, constitution and vigor, breeding quality and aggressiveness.
- It is recommended to have a minimum of two purebred or crossbreed bucks of different breeds.
- Generally, buck male ratio is 1:35.

## Management

- It is usual to see an offspring at the side of the mother even when rearing a kid of its own.
- Their pack character is so very evident, with the oldest buck or doe on the highest part of the sleeping area.
- They also have maintained their mountainous character.
- Goats prefer an elevated area of resting. The arrangement and feature of the housing, including management practices, must then be adapted according to these characteristics.
- Goats can be expected to live up to 13 to 15 years, with an average economic lifespan of 6 to 8 years.
- In the Philippines, does come in-heat year round with an average kidding interval of about 8 to 9 months.

## Housing

- All goats are afraid of rain and wetness, as these make them prone to pneumonia.
- Goats also prefer to sleep in elevated areas, therefore elevated sleeping platform, like a stair-type arrangement, and must be provided.
- Flooring should be included and elevated at least about 15° to facilitate cleaning and drainage.
- Separate pens should be provided for lactating does, kids, growers, and bucks.
- The buck pen should be placed in such a way that it will always be visible to the breeding does yet far enough to avoid transfer of the typical goat smell in case of lactating does when milk is to be sold.

## Type of housing

- Shed type
  - Free movement in or out
  - Feeding / watering trough, mineral feeders, grain bunks
- Pen-barn type
  - Stall barns (individual confinement)
  - Confined housing (group pens for same sizes of animals)
  - Provision for feed and water shall be placed and protected from spoilage and will not mess up the pen.

## Minimum floor space requirement *in intensive production*

Animal	Weight kg	Floor space (m <sup>2</sup> /animal)		
		Solid floor	Slatted	Open yard
Doe/Ewe	35	0.8	0.7	2
Doe/Ewe	50	1.1	0.9	2.5
Doe/Ewe	75	1.4	1.1	3
Kid/Lamb		0.4-0.5	0.3-0.4	-
Buck/Ram		3	2.5	-

## SPACE REQUIREMENTS FOR GOAT

	Floor Area (sq. Meter)	Feeding Space (linear em.)
Does, bucks and adults	0.50-1.50	15.24-25.40
Growing	0.50-0.75	10.16-15.24
Kids	0.20-0.50	7.62-12.70

## Minimum space requirement:

### a. Floor

Animal	Weight (kg)	Floor space (m <sup>2</sup> /animal)	
		Pregnant	Lactating
Doe/Ewe	50-70	1.3	2
Doe/Ewe	>70	1.6	2.3

### B. Exercise lot or loafing area:

- 3 m<sup>2</sup>/animal
- A loafing area, fenced beside the goat house must be provided complete with feeding racks and water troughs. This

must be continuous with the goat house to allow them to loaf when preferred.

#### Functional requirement

- **Pens (for pen-barn type housing)**
  - Height of pen wall and gate: not <1.2m
- **Pen facilities:**
  - Feeding trough and hay racks
  - Watering trough: 300mm space per 15 -25 head  
1 bowl or nipple per 50 head

#### Computation for the total floor space area

- Basis:
  - Number of breeding females;
  - Reproductive parameters; and
  - Minimum floor space requirement.
- Reproductive parameters:
  - Conception rate (80%)
  - Kidding interval (8 mos.)
  - Ave. Kidding size (1.5)
  - Disposal age (at 1 yr age)
  - Annual replacement rate (20%)
  - Livability rate (to 1 yr age)
- **Cogon** and **nipa** roofing materials are preferable in hot and humid areas.
- **Ventilation** is of utmost importance. Majority of pneumonia causes can be traced to excessively warm and humid interior and sudden changes in temperature.
  - Allow a 0.5 to 1 ft., clearance between floor to wall and wall to beam to create an adequate air circulation and to lower draft.
  - It is desirable to maintain interior temperature of 28° to 30°C.

- It has been established that above 30°C, ruminants are inhibited from eating.

- **Lighting** may also be provided in the barns during the night. Goats consume up to 30% of the day's intake during the night when light is provided.

#### Fencing

- Nine-eye hog wire is the cheapest and most effective fencing available locally.
- Post must be staked every 2 meters. Goats are fond of pounding their feet and scraping their bodies on fences so it must be sturdily built.
- Barbwire fencing requires a minimum of four strands so it becomes more costly besides making goats prone to wounds.

## BREEDING AND MANAGEMENT PRACTICES

#### Breeding characteristics:

	Bos taurus	Capra hircus	Ovis aries
Age at puberty (months)	8	5-6	7-8
Age at 1 <sup>st</sup> breeding (months)	15	8-10	12
Estrus cycle (days)	18-24	18-24	15-19
Estrus duration (hours)	18	24-72	24-72
Post-partum estrus (days)	40-60	60	17
Gestation period (days)	283	150	150

#### A. REPRODUCTIVE PHENOMENA

**Sexual Maturity**- Goat become sexually mature at the age of five to six months if they are well managed and well fed.

**Estrous Cycle**- Once sexual maturity is reached, goats are regularly cycling, and that is if they are managed properly, Regular cycling

means the goat becomes in-heat or receptive for breeding every 18 to 24 days with an average of 21 days.

**Estrous Duration**- estrous or heat period usually ends after 18 hours from the onset.

**SIGNS OF ESTROUS**-the most common are the following:

- a. Allowing themselves to be mounted
- b. Mounting other animals
- c. Mucous discharge from vulva; swollen vulva
- d. Frequent urination, nervousness and lack of appetite

**Gestation Period**- once the doe is successfully bred during heat period, she is expected to deliver after five months.

**Age at First Breeding**- although female goats become sexually mature at five to six months, they are not supposed to be bred until they reach 8 to 12 months while breeder buck is allowed to breed at 10 to 12 months of age.

**Male to Female Ratio**- on the average, 25 females are allowed to be bred with a single one-year-old buck.

#### B. CARE BREEDER BUCK

- Potential male breeders are immediately separated from the herd after weaning at 3 to 4 months.
- Select the animals when they are eight to ten months.

#### C. CARE OF DRY AND PREGNANT DOES

- If the doe is being milked, dry (stop milking) at least 1 and ½ to 2 months before kidding date.
- This will give her enough reserve for the next lactation. Put all dry does in one compartment.

- One week before kidding, place her in separate kidding pen. This can be predicted by swelling and discharge from the vulva, engorgement and waxing of the teats and constant lying down of the doe.
- Avoid any form of noise in the kidding area. Sometimes it is necessary to help the pregnant doe during the kidding, especially to native does bred with pure bucks because the kids are bigger.
- Dystocia, or difficult delivery, is common in these cases. Be sure that the presentation is right before attempting to pull out the kid. In anterior presentation, both front legs and head are presented and in posterior presentation, both hind limbs come out at the same time.
- Oversized kids should be pulled out with an even, continuous pressure. In difficult cases it is best to see a practicing veterinarian.

#### D. CARE OF THE LACTATING DOE AND NEWBORN KIDS

- Immediately after delivery, wipe the kid's mouth, nose and eyes with a clean, dry cloth and message the thoracic area to initiate breathing. Normally, this is done by mother, but sometimes the mother is too weak to do it. Be sure no mucous is clogging the nostrils.
- The kids must be able to suck within one hour. They may be weak to be propped up. For very weak kids, feeding colostrums through stomach tube or feeding bottle usually produces dramatic results.
- First-time mothers sometimes are reluctant to suckle their young due to udder pain caused by over-engorgement of milk. Restraining does for the first sucking will usually relieve udder pain. If colostrums in the udder is not fully consumed by kid, stopping (manually milking out excess) will be necessary to prevent mastitis.

- The placenta must come out within 24 hours from expulsion of the fetus.
- Tie the umbilical cord with a sterile string and apply disinfectant (tincture of iodine) on the cut portion.
- Allow the kids to suckle for the first 4 to 5 days. If the doe is to be milked, separate the kids from the mother and start feeding using a baby bottle (8 oz. Size).
- Refer to feeding guide for dosage. If the doe is not to be milked, the doe can be taken out of the pen for feeding and returned to the kid three times a day and the whole night.
- This method will ensure greater livability to the kid by not exposing it to the elements, and proper feeding of the doe. Does weaned early (4 to 5 days) usually return to heat after 1 to 2 months.
- When the doe comes into heat, introduce it to the buck, not vice versa.
- Two services a day for two days is optimum. If the doe does not conceive, heat may return in 8 to 12 days.
- Higher conception is accomplished in secondary heat. If breeding is successful, milk production drops after one month and the right side of the abdomen starts to fill up.

### **Milking**

- Goats, like cattle, usually adapt to a routine. Milking periods must be established and strictly adhered to.
- If milking is done twice, say 6 a.m. And 6 p.m. The process should not be delayed or advanced.
- If possible, the same personnel should be assigned. Goats can withhold their milk, so unnecessary changes in the routine should be avoided.

Milk quickly and continuously. Milk letdown can be initiated by washing the udder with lukewarm water and wiping with a clean

towel. All milking utensils especially the milkers hands, must be thoroughly clean.

Feed concentrates during milking. This serves as incentives to goats for them to enjoy and look forward to.

- Contrary to popular beliefs, properly drawn and processed goat milk has no offending smell.
- During milking, the buck should not near the doe so as not to transfer the typical goat smell to the milk.

### **E. CARE OF WEANLING AND GROWING KIDS**

- Place all weaned kids in a separate pen, if possible, according to size.
- If male kids are to be raised for meat, castrate as early as possible, preferably within the first month.
- If females are to be raised for milking, check for excess teats and have them removed.
- Horn buds usually appear within the first to third month. Dehorn when buds reach size of a fingernail.
- Separate males from females at the age of four months. Goats sometimes reach puberty at this age.
- Start breeding females at 8 to 10 months. Bucks can start at the same age.

### **F. BREEDING**

The following are some reproductive characteristics of goats:

Age of Puberty	4 to 8 months
Cycle of type	Polyestrus
Cycle of Length	18 to 21 days
Duration of heat	2-3 days (secondary heat 8-12 days after)
Gestation Period	150 ± 5 days

Best breeding time: Daily during estrus

- Does reach puberty from 4 to 18 months. Best breeding age will be 10 to 12 months, depending on the desired weight.
- Limiting yearling buck services to 25 doe services/year. Older bucks can cover up to 35 doe services per year.
- Buck to Doe ratio is normally 1:35.

The following are signs of heat or estrus:

1. Mucus discharge from the vulva, causing matting of tail hair.
2. Uneasiness, constant urination, lack of appetite and bleating
3. Seeks out or stays near the buck and lets herself be mounted.

- The preferred method will be to upgrade local native or grade does with pure bucks.
- A maximum infusion of 75% foreign blood must be served to retain the natural resistance of the native.

#### Dystocia

- It is very common in crossing natives with large pure-breeds due to the invariability large size of the unborn kids.
- Crossbreed birth weights of up to four kilos for multiple births and up to six kilos for single births have been observed while native birth weights reach only 2 and 4 kilos for multiple and single births, respectively.
- Cross-breeding large native does with a minimum weight of 25 kilos or more those that have given birth will also be of help in saving kids but this should be done only when necessary.

#### Anestrus

- Failure to come in heat
- It is a common problem most particularly with high-producing does.

- Several hormones, prostaglandin, progesterone sponges and implants and pregnant mare serum (PMS) have been used with varying rates of success.
- Routine administration of oxytocin right after kidding and before weaning (5 days) aids in faster expulsion of the placenta, uterine fluids in the rapid regression of the uterus.
- Routine vitamin A, D & E supplementation to breeding herds also contribute to reproductive well-being.

#### Goat Artificial Insemination

- Remarkable strides have been made in the field of goat artificial insemination, a method of breeding which enables goat raisers to utilize far-away proven bucks for impregnating their in-heat does.
- In the Philippines this has been successfully done at national Rural Life Center (NLRC) in Dasmariñas, Cavite where the kid goat, A. 1 was born.
- The method is also being tried in Iloilo, which receives shipments of frozen goat semen from the NLRC.

#### G. OTHER ROUTINE MANAGEMENT PRACTICES

##### Hoof Trimming

- Goat's hooves under confinement are usually overgrown. Trimming required.
- A rose pruner and a small curved knife are adequate tools.
- Untrimmed hooves will cause lameness and make it prone to foot rot. Bucks refuse to mount when having sore feet.

##### Dehorning

- Especially in milking, dehorning is essential.
- A dehorned animal is more docile than a horned one. It will also eliminate unnecessary wounds due to fighting.

- Dehorn when horn buds appear (2 to 4 months) using hot iron cautery.
- A ½ inch GI pipe is an effective and cheap material for cauterizing.
- Chemical cautery is not preferred because kids tend to lick one another and may therefore lead to cauterized or burned tongues.

#### **Castration**

- Castration of unwanted male goats is preferred within the first month of age.
- Castrated males grow faster than uncastrated males and are free of the goat male odor.

#### **Tattooing, Ear Notching and Other Forms of Identification**

- In order to keep track of individual animals, a positive identification is needed. No recording is possible without this.
- Ear notching is more common because of permanence and easy identification. Refrain from using plastic tags.
- Tattooing causes no deformities but requires special tools that may be costly.

#### **Recording**

- For a good breeding herd program, a proper and well-kept recording system is necessary. The record must reflect all the essential data of individual animals.

## **FEED RESOURCES AND FEEDING MANAGEMENT**

### **A. Feeding under confinement and Grazing System**

- A combined method of feeding management under the confinement and grazing system can be adopted.
- This is practiced in Bukidnon province where rainfall pattern is almost distributed throughout the year.
- Purely Cut-and-Carry-System shall be introduced during rainy season. However, during sunny days if grazing pasture is available, animals are allowed to graze in the morning up to 10:00 am and then feed in confinement for the rest of the day.
- However, when a combined grazing and confinement method is adopted, two (2) hectares can support 50 head/year.
- It is recommended that grazing pasture be divided into 9 paddocks for convenience in grazing management.

### **B. Tethering System**

**Tethering** is the traditional way of rearing goat in the backyard with two or more households.

- However, during rainy days and night time, the animals are kept inside the house. Normally, the animals consume lesser amount of feed based on dry matter requirement per head/day.
- Tethered animals need concentrate supplementation and as much as possible, planted grasses for cut-and-carry be available to provide the desired nutritional requirement of the animals.

### **C. Forage Conservation**

In order to provide enough feed supply in the whole year round, especially during summer, forage conservation like Hay or Silage Making shall be incorporated in the feeding program.

## Feed Requirements

AGE	FEED	AMOUNT PER
Birth – 3days	Colostrum	Ad Libitum (3 to 5x feeding)
4days– 2weeks	Whole milk (goat or cow milk) Vitamin-Mineral Water	0.5-1li/kid divided into 3x feeding Ad Libitum Ad Libitum
2weeks–16weeks	Whole milk/milk Replacer Grass-Legume hay or quality fresh forages Vitamin-mineral Mix Water Starter (22% C.p.)	0.5-1li/kid divided into 2x feeding Ad Libitum Ad Libitum Ad Libitum Ad Libitum Increasing amount w/o causing digestive upset
4 months kidding	Forage Vitamin-Mineral mix Water concentrates (16-18% C.p.) <sup>2</sup>	Ad Libitum Ad Libitum 0.2-0.7 kg/hd.m
Dry,pregnant,bucks	Forage Vitamin-mineral mix Water concentrates (16-18% C.p.) <sup>3</sup>	Ad Libitum Ad Libitum Ad Libitum
Lactating	Forage Vitamin-Mineral mix Water concentrates ( 16-18% C.p.) <sup>3</sup>	Ad Libitum Ad Libitum 0.3-0.5 kg/li. Of milk Produced

## HEALTH MANAGEMENT

### A. Health Management Practices

#### Sanitation

- Have pens cleaned daily and washed at least three times a week.
- Disinfect at least twice a month.

#### Deworming

- Parasites rank second in causing heavy mortality. From experience, tapeworms are the most debilitating worm problem in all ages of goats.
- Protozoa-like coccidia and amoeba are also common problems especially in young kids.
- Have your goats checked regularly for specific worm load and deworm regularly depending on worm load and seasonal occurrences. Know what kind of internal parasite is affecting your herd before attempting to use a deworming product, or else it will be a waste of money and effort.

#### External Parasites

- Lice and ticks are common problems.
- When these are observed, apply acaricide or chemical against lice and ticks, in powder or dust form. This can be done by mixing the powder-form chemicals with 7 to 140 parts of starch or flour and apply as dusting powder. Refrain from using the liquid or spray form.

## B. Common Infection diseases of Goat

### Bacterial Pneumonia

#### Mode of transmission

-Direct contact from infected or contaminated udder; navel infection, genital or intra uterine infection of dam, contaminated environment

#### Symptoms

-Fever, inability to suckle, nasal discharge, coughing and respiratory distress.  
-Gradual emaciation may terminate as pneumonia-enteritis combination. Death is common.

#### Prevention

-Proper nursing, in clean, dry environment necessary. Early cases respond to antibiotic treatment.

### Infectious Arthritis

#### Mode of Transmission

-Direct, through mouth, skin, open wounds or via umbilicus.

#### Symptoms

-Swollen knees, lameness, pain if pressure is applied on affected joint. Fever may be present. Joints involved are hock, knee, elbow and stifle. Animals prefers recumbency, appetite affected with gradual deterioration.

#### Prevention

-Minimize infection by treating wounds (castration & navel) dressing, hygiene management especially in areas of confinement. Treatment includes wide spectrum antibiotics and sulfa drugs.

### Mastitis

#### Mode of Transmission

-Direct or indirect

#### Symptoms

-Hot, painful and swollen udder. May be come red due to inflammation later changing to dark reddish-blue indicating necrosis of udder tissue. Milk may be bloodstained, may contain flakes or clots. Fever, loss of appetite, depression and dehydration; gait or movement of doe is affected.

#### Prevention

**Treatment:** Intramammary infusion of antibiotics. Early and repeated treatment needed to prevent complications such as gangrene and toxemia.

**Prevention:** Proper treatment of injured teats with antiseptic; disinfecting udders for milking and proper milking technique. Monitor by surveillance to detect early cases for immediate isolation and treatment.

### HMD

#### Mode of Transmission

#### Symptoms

-Direct and indirect contact with naturally infected animals, carriers, implements other infected materials.

-Blister fluid, saliva and other bodily discharges highly infected.

-Fever vesicles, erosion in between hooves, coronary band junction between skin and hoof, teats and udders oral mucosa and tongue.

-Raw ulceration follow rupture of vesicles, stingy or foamy salivation, smacking of the lips, difficulty in feed

	ingestion; staggering gait and lameness. Abortion in pregnant animals.	
Prevention	<ul style="list-style-type: none"> <li>-Immediate notification of the authorities. Designation of quarantine areas with virudical agents (commercial disinfectant or lye caustic soda)</li> <li>-Animals should be kept on dry ground and lesions treated with mild antiseptic (5% formalin)</li> <li>-Mass immunization and effective restriction in movement of animals and carriers is necessary.</li> </ul>	
<b>Brucellosis</b> Mode of Transmission	-Ingestion of contaminated feed and water. Aborted fetus, fatal membrane, placenta, urine and uterine discharge are main sources of infection. Infected males may transfer disease through natural/artificial breeding.	
Symptoms	<ul style="list-style-type: none"> <li>-Infertility, abortion, retained placenta, persistent vaginal discharge. In males, swollen and painful testicles with subsequent infertility sterility.</li> </ul>	
Prevention	<ul style="list-style-type: none"> <li>-Blood tests and removal of infected animals.</li> <li>-Vaccination may be tired.</li> <li>-Antibiotic medication is found to be impractical.</li> </ul>	
		<b>Hemorrhagic Septicemia</b> Mode of Transmission
		Symptoms
		Prevention
		<b>Blackleg</b> Mode of Transmission
		Symptoms
		Prevention
		-Infection initiated by trauma of the body and oral mucosa. Cases in larger ruminants maybe source of infection in the area.
		-Sudden death in acute cases.
		-Less acute: depression fever, rapid respiration and suspended ruminatism
		-Typically, not painful swelling in thigh and leg muscles. Crackling sensation on palpitation of swelling due to gas in tissues.
		-Lameness in affected limb.
		-Vaccination
		-Cremation of carcasses
		- Early isolation and treatment with massive doses of antibiotics

## **Tetanus**

### Mode of transmission

-Direct infection due to introduction of organism in wounds. Castration, old ulcerating wounds, dehorning complications. Not contagious to other animals.

### Symptoms

-Early stages characterize by rigidity and stiffness of muscles, stiltly gait.  
-Late stages: with tetanic convulsions, prolapse of third eyelid, stiff tail, head and neck thrown back; hyper-excitability.

### Prevention

-Bloat and other nervous signs. Treat wound with oxidizing antiseptic (hydrogen peroxide) until completely healed; use clean instrument castration, dehorning.

## **Parasitic Gastroenteritis**

### Mode of transmission

-Commonly transmitted through direct infection with parasitic larval stages through herbages, less commonly through skin penetration and intrauterine infection in some species.

### Symptoms

-Poor body condition: anemia, diarrhea, potbelly and weakness

### Prevention

-Regular deworming with effective anthelmintics (tetramisole, parbendazole, thiabendazole, pyrantel)  
-Pasture rotation and improve feeding practices.

## **Parasitic Pneumonia**

### Mode of transmission

### Symptoms

### Prevention

-Infection with the parasite in the larval stage though herbage.

-As in parasitic gastro-enteritis for general signs.

-Specific symptom include persistent husky, coughing, respiratory distress

-Regular deworming with tetramisole albendazole or exfendazole.

-General prevention as parasitic gastro-enteritis.

## **Tapeworm Infection**

### Mode of transmission

### Symptoms

### Prevention

-Through ingestion of plant mites which are intermediate hosts.

-Some as other internal parasitism, passage of tapeworm segments in the feces.

-Regular deworming

## **Liverfluke Infestation**

### Mode of transmission

### Symptoms

### Prevention

-Direct infection through ingestion of parasitic stage in grasses. Presence of this stage related to avail ability of snail host.

-Common in low-lying communities with water logged areas, rivers, streams and stagnant pools.

-Similar to parasitic gastroenteritis

-Regular deworming with flukecides, control of snail hosts; pasture improvements, keep animals away from known infected sources of herbage. Dewormiking at proper intervals (3-4

<b>Lice Infestation</b>	times a year) is the only practical approach.	acarides such as Malathion, Trichlorfon, Fentnion.
Mode of transmission	-Consult veterinarians for proper drug, dosage and intervals.	-Diazinon, Crotoxyphos or coumaphos. Interval of treatment should be 7-10 days with 2-3 applications to destroy mites that have hatched after each treatment.
<b>Symptoms</b>	-Direct contact with infested animals or indirectly through environment of facilities.	- Non-contagious.
	-Constant scratching and rubbing to relieve itching and irritation. Scurfy coat (dandruff) and encrustation of exudates with scabby deposit. Loss of hair, raw skin and bruises in severe infestation. Animals become unthrifty, poor thriving, weak and anemic.	-Swollen left flank which is resonant when tapped. Signs of colic such as uneasiness, difficult respiration, bloating and absence of rumen movements.
<b>Prevention</b>	-Use insecticide (Asuntol, Ciodrin, Diazinon, Neguvon, Supona, Nankor, etc.). In dust form solution, repeat treatment in 10-14 days to kill all nymphs which hatch out. Also spray pens and lifter. Isolate treated from untreated animals.	-Feed straw or fibrous diets before turning loose on lush pasture. Puncture rumen with large needle.
<b>Mange</b>	-Direct and indirect contact with infected animals.	-Oils and fats (mineral oil, vegetable oil or to prevent foaming tallow) are satisfactory in the rumen. Commercial antibloat preparations are Avlinox, Tympanol, and Bloatguard.
Mode of transmission	-marked itchiness and irritation with animals constantly rubbing or licking affected areas. Maybe patchy or generalized, skin becomes hairless, thickened or scabby.	
<b>Symptoms</b>	-Periodic examination to detect early cases. Regular spraying with effective	
<b>Prevention</b>		
<b>Bloat</b>	Mode of transmission	
	Symptoms	
	Prevention	
<b>Acute Indigestion or Grain Overload</b>	Mode of transmission	
	Symptoms	
	Prevention	

Treatment generally unsatisfactory. Early cases may respond to high antibiotic levels given orally to reduce population of acid-forming bacteria, (acidosis) indigestion may be treated with anti-acids like baking soda (sodium bicarbonate), magnesium carbonate or magnesium hydroxide given orally in warm water (1 gm/kg body weight) to neutralize rumen acidity. Systematic acidosis requires intravenous injection of acid neutralizers like 5% sodium bicarbonate repeatedly given.

## IX. BEEF CATTLE PRODUCTION AND MANAGEMENT

### Overview of the Beef Cattle Industry

- The beef cattle industry is one of the least developed among the livestock and poultry industries in the country.
- For the past 11 years, cattle inventory has only increased at a rate of 4.3 percent per year.
- Per capita annual consumption of beef in 1999 was 2.70 kg.

### Inventory

- Slow growth in inventory from 1.68 M in 1990 to 2.48 M in 2000 (4.31% average growth rate)
- Backyard farms accounts for 92% of the total inventory; 8% are in commercial farms

- From 1990 to 2000, average annual growth rate of backyard farm was 5% while the commercial farms grew by less than 1%/year
- The top five producing regions are Ilocos, Southern Tagalog, Central Visayas, Northern Mindanao and Western Visayas.

### BEEF PRODUCTION SYSTEMS IN THE PHILIPPINES

#### 1. Ranching Or Extensive System

##### a. Cow-calf operation

**Aim:** to produce stockers and feeders.

- The initial and most fundamental step in the beef enterprise is the production of the calves and raising it to weaning age.

##### b. Purebred Program or Breeder Farm Operation

- **Aim:** to produce breeder stocks to be sold to other ranchers.
- Highly specialized form of beef production.

#### 2. Feedlot Fattening Operation

- **Objective:** to add weight to the animal and increase its value.

- Important to the livestock industry of the Philippines for three main reasons:

- 1) It provides the farmer with extra income
- 2) It gives him year-round work and allow the use of cheap, plentiful farm by products such as corn stovers, hay, silage, rice straw, copra meal, rice bran and sugarcane tops which might otherwise be wasted;
- 3) It helps meet the urgent demand for high-protein foods in the Filipino diet.

## **Backyard Cattle Raising**

**Backyard sector-** 92% of the total cattle population.

Backyard cattle raising is characterized by the following:

- a. 1 or 2 heads of either fattening or breeding cattle is raised on a farmer's spare time.
- b. Farmers usually tethers animal to graze around the home lot and then supplements this with farm wastes like rice straw or corn stover/stalks when back in pain.
- c. Others practice soiling and supplementing with ipil-ipil (*Leucaena leucocephala*), as a source of protein, and rice bran, corn bran, or cops meal at 1-2 kg/animal and,
- d. In Batangas, force feeding (supa or supak) of feed mixture is a common practice among backyard cattle raisers.

## **BEEF CATTLE BREDS, BREEDING AND REPRODUCTION**

### **Origins of Modern Cattle:**

Aurochs (*Bos primigenius primigenius*)

- India thought to be the homeland of primitive cattle which later expanded to Eurasia and North Africa.

Some species related to the Aurochs also underwent domestication

Yak (*Poephagus grunniens*)

- From mountains of Tibet
- Some regions of middle Asia
- South Siberia

Genus Bibos

- (B banteng) or Ban cattle
- (B frontalis) or gayal

- From India, Malay archipelago and Indochina, particularly Burma.

Probably first domesticated during the Stone Age, within 10,000 B.C. from the wild ox or *Bos primigenius*

Modern cattle family Bovine, genus Bos

#### **a. *Bos taurus***

- Of Europe origin such as Shorthorn or Jersey.
- Without humps and therefore of temperate origins.

#### **b. *Bos indicus***

- Of tropical origin such as the Brahman or Zebu of India or Afrikander of Africa.
- Hump cattle.
- Adapted to tropical conditions (has survived through centuries exposure to inadequate conditioned such as food supplies, insect pests, parasites/diseases and extreme weather conditions)

#### **c. Crosses of two, Sta. Gertrudis (5/8 Shorthorn, 3/8 Brahman) and Brangus (5/8 Brahman)**

Characteristics of Zebu breeds as compared to temperate breeds:

- Large hump over top of shoulder and neck
- Large pendulous ears
- Dewlap having large amounts of excess skin
- Highly developed sweat glands (perspire more freely)
- Oily secretion from the sebaceous glands

Zebu breeds	Country	Products
Brahman	US	Meat, Hardiness
Indu-Brazil	Brazil	Meat, Hardiness
Kankref	India	Draft, Meat, Milk
Krishna	India	Draft, Resistant to Tick Fever
Nellore	Brazil	Meat
Red sindhi	Pakistan	Milk
Sahiwal	India	Milk
Sta. Gertrudis	US	Beef Quality
Tharparkar	India	Milk, Draft

#### Temperate Breeds

Angus	Scotland	Meat
Chianina	Italy	Draft, Meat
Simmental	Switzerland	Milk, Butter, Cheese, Draft
Aryshire	Scotland	Milk, Butter, Cheese
Brown Swiss	Switzerland	Milk, Cheese
Guernesey	France	Mil, High Butterfat
Holstein-Freisian	Netherlands	High-producing Dairy Cow
Jersey	France	Milk, Butterfat

There are 278 identifiable breeds worldwide

- 33 as beef breeds
- 18 as draft breeds
- 39 as meat-draft
- 54 meat dairy
- 21 dairy-draft
- 61 meat – dairy – draft
- 51 dairy breeds

In the Philippines, the most impact was carried through the Brahman through the pioneering of efforts of **Mr. Antonio Nocom of Ansa Farms of Tiboli and Tantangan in South Cotabato and Lipa, Batangas, Sarangani Cattle owned by the Consunji's.**

**Christopher Columbus** and others brought cattle to the New World. They were valued mainly for milk, butter, hides and work.

At present the **Mathling Corporation of Lanao del Sur**, holds the distinction as the only Southeast Asian breeder of the beefalo. In fact, it holds the most number of beefalo. In fact, it holds the most number of beefalo semen outside of North America.

#### Beef Breeding

**Breeding** - the controlled propagation of cattle to improve qualities desirable to man.

#### Variations due to Genetics and Environment

Cattle traits are either qualities or quantitative.

**Quantitative traits** show discontinuous variations

- ✓ Coat color
- ✓ Homed or polled
- ✓ Certain blood characteristic
  - Blood types
  - Presence or absence of particular enzymes

Generally, inheritances of quantitative traits are simple in accordance with the Laws of heredity. Environment plays a very minor role.

**Quantitative traits** show continuous variations between the extremes. The mean types among the characteristics are most frequent to change. These are:

- ✓ Growth rate
- ✓ Liveweight
- ✓ Body measurements and maturity
- ✓ Milk yield
- ✓ Milk composition

It is possible to establish the fraction of total variation in the population that is caused by the additive effects of the genes. This fraction is known as **heritability**.

#### Heritability

- 1.00** - show that variations observed in the population of the traits is determined by genetics.
- 0.00** - variations observed in the population of the traits is entirely due to environment
- 0.50** - variation is equally due to genetic and environment.

## Breeding Systems

- Are defined as several types of mating to combine desirable qualitative and quantitative characteristics through mating systems which are planned or non-random.
- A. **Random mating (or unplanned)** – this means each possible mating in a population has the same probability or occurrence.
- B. **Inbreeding** – mating of closely related individuals within a breed.

#### Effects of Inbreeding.

- 1. Marked decrease in fertility

- 2. Reduces vigor
- 3. Decrease in growth rate of offspring.
- 4. Reduces viability of the offspring

- B1. **Close breeding** – matings of close relatives e.g., father – daughter, son – mother, brother, sister
  - B2. **Line breeding** – breeding of not so close relatives, ex, cousins. This is a form mild inbreeding designed to concentrate the genes of a certain ancestor of the genetic constitution of the progeny.
  - B3. **Strain breeding** – a very mild form of inbreeding which leads to increase homozygosity within the strain in the long term.
- C. **Crossbreeding** – meeting of individuals from two or more established purebreds.
- To increase heterozygosity
  - To take advantage of hybrid vigor or heterosis.

**Hybrid vigor** - the average quality of the first generation exceeding the average of the two parental breeds.

**Heterosis** - is displayed mainly in the fitness traits, fertility and viability.

#### Types of Crossbreeding:

- C1. **Systematic crossbreeding** – two or more breeds are involved in a breeding program lasting several years. This way, a crossbred which may eventually stabilized into a breed, e.g., Brangus (Brahman x Angus). Charbray (Charolsis x Brahman) may occur

C2. **Upgrading** - the mating of purebred sires to nondescript or native female and their offspring generation after generation.

- I. 18 months old- 1:12-15
- II. 2 yrs old – 1:20-25
- III. 3 yrs old – 1:40-50

## Reproduction

### Reproduction phenomenon

**Sexual Maturity (bulls/heifer)**: 6-8 months

**Estrus Cycle**: 18-24 days (Ave: 21 days)

**Estrus duration**: Exotic/ European breeds- 14-18 hrs.

Indigenous/Zebu- 10-12 hrs.

**Ovulation**: 10-14 hrs after end of estrus

**Parturition**: Ave. 283 days

**Bull Ejaculate**: 2- 12ml of 500 or more sperm cells/ml

Sperm cells survive the oviduct up to a maximum of 48 hrs.

### Signs of Estrus

- a. Mount others
- b. Reddening and swelling of the vulva
- c. Mucous discharge
- d. Isolates herself
- e. Seem sickly and has no appetite
- f. Frequent urination, restlessness and sometime bellowing or mooing and
- g. Standing still when mounted (the only reliable or true sign of estrus; estrus is defined as the period of sexual receptivity of the female to the male).

### Breeding Methods

1. **Natural Method**- conventional use of bull to impregnate a heifer or cow

- A. **Handmating** – a bull in good condition can serve 3-4 times/week or one service every other day:

### B. **Pasture mating** (2-3 months old)

- I. 2-3 yrs old bull – 10-15 cows
- II. 9 yrs old bull – 20-25 cows

### 2. **Artificial insemination**

- Process of including fertilization in female without the benefit of sexual contact between male and female animals

#### AI Guideline:

*"Females observed in estrus in the morning, are inseminated late afternoon of the same day. Those observed in the afternoon, are inseminated not later than noon time the next day."*

### Some Indicators of Good Breeding or Reproductive Management

- a. **Conception rate (Pregnancy)** – percent of breeding females that conceived versus the total exposed females.

$$CR = \frac{\text{Cows pregnant at end of breeding season}}{\text{Cows exposed during breeding season}} \times 100$$

- b. **% (90 or 120 day) non returns**

▪ Percent of breeding females confined pregnant at 90 or 120 days, by pregnancy diagnosis, versus the total exposed females. This is similar to conception rate.

- c. **Calving Rate** – percent of breeding females that give birth versus the total exposed females.

d. **Calving Interval** – the average length of time (in days) between successive calving.

- Can be calculated for each cow or the entire herd
- One year is ideal. Eighteen (18) months is common.

e. **First heat after parturition** – the occurrence of estrus after giving birth to a young. First heat is related to calving interval.

## BEEF CATTLE NUTRITION

### Common Feeds for Ruminants

#### Forages

- Is the natural cheapest feeds for ruminants and includes not only grasses but also legumes.

#### By-products roughages

- Most of these are highly fibrous (rice, straw, corn cobs, sugar cane tops), low in CP and TDN and have poor digestibility.

#### Concentrate

- Unlike in developed countries, little amount of grain is fed ruminants locally. Copra meal, rice bran, wheat pollard are commonly used by-product concentrates, contain from 20% as in case of molasses to 21% in copra meal.

#### Use of urea in ruminant ration

- Urea has long used as partial protein source ruminants in other countries.

The following guidelines are recommended for safe use of urea.

Add fertilizer grade urea at not more than:

- A) 1% of the ration (Dm basis)

- B) 2.3% of the concentrate mixture, (air-dry basis) or
- C) 25.30% of the total dietary protein

## HERD MANAGEMENT

- **Goal:** to produce a crop of high quality, heavyweight calves.

#### Herd division

- Herd division ensures the appropriate nutrition of various age groups of the herd.
- Prevent premature breeding which seriously affect the growth of young bulls and heifers and prevent high rate of abortion resulting from butting and fighting of animals.

Animals may be divided into the following herds:

- a. **Pregnant herd** – composed of pregnant females. Cows are grouped with the breeding herd during the breeding season.
- b. **Breeding herd** – consists of dry cows and heifers ready for breeding. After the breeding season, pregnant animals are transferred to the pregnant herd.
- c. **Heifer herd** – composed of heifers not yet ready for breeding. Heifer calves are included in this herd after weaning.
- d. **Steers, Feeders or fattening herd** – consists of growing cattle and those to be fattened for the market.
- e. **Bull herd** – consists of mature males kept mainly for servicing the breeder cows.

## MANAGEMENT OF BREEDING FEMALES

### a. Lactating and pregnant cows

- Pregnant cows are separated from the herd to prevent injury and possible abortion due to riding, butting and fighting with other animals.

#### Signs of pregnancy:

- i. Cessation of estrus or heat
- ii. Enlargement of the abdomen and udder
- iii. Palpation 60-90 days after breeding (more reliable pregnancy test).

\***Palpation** is the manual examination of the reproductive tract by way of the rectum and colon to verify pregnancy in cattle.

### b. Open cows and replacement heifers

- Should be given the right amount of feed daily to ensure that they are in the right physiological status.

## MANAGEMENT OF CALVES, GROWERS AND FATTENERS

- a. **Calves** - should suckle colostrum milk from their mother within three hours after calving.
- b. **Grower** - are usually maintained at the pasture with very little attention. They are given salt and mineral supplement.
- c. **Fatteners** - require a shorter period to reach slaughter weight. They are generally bigger, mature, or nearing maturity. However, one and a half to two year-old animals weighing 200-300 kg are preferred. They may be fattened either in feedlot, on pasture, or both areas.

## HOUSING AND OTHER FACILITIES

### Min. Feeding space requirement

Enterprise	Class of animal	Feeding space linear mm/hd.
1. Feedlot		750
2. Ranch		
3. Dairy cattle	Calves (3 – 6 mos.)	450
	Calves (7 – 12 mos.)	500
	Yearling, heifer, milking & dry cows;	750
	Cows in maternity stalls	

### Minimum floor space requirement

Enterprise		Floor space, m <sup>2</sup> /hd
1. Feedlot	Shed area	4
	Loafing area	5
2. Holding	Up to 270 kg	1.3
Pen	270 – 540 kg	1.6
	Over 540 kg	1.9
3. Dairy	Calves (up to 3 mos.)	1
Cattle	Calves 3 – 6 mos.	2
	Calves 7 – 12 mos.	3
	Yearlings	4
	Heifer/Steer	5
	Milking & dry cows	6
	Cows in maternity stalls	10

## GENERAL MANAGEMENT PRACTICES

**Cattle identification-** This practice is necessary for management purposes and to denote ownership.

**Branding with hot iron** is the most common method of identifying cattle. The owner brand is placed on the animals left foreleg.

**Putting ear tags or ear notches** are other effective methods of identifying cattle.

### Dehorning

- A. Dehorning cattle requires advantages;
- B. They occupy less space in transit or shipment
- C. They are more uniform in appearance

**Castration- the slit and the cap methods** are both effective ways of surgically removing testicles. Bloodless castration can also be done with Burdizzo pinchers or emasculator.

\***Castration** tends to decrease the rate of live weight gain by 15% - 20%

### Selection and Culling

Breeding stock with poor performance should be culled for slaughter. These are as follows:

- 1. A cow that calves every one and a half to two years.
- 2. A cow that produces a little amount of milk and raises a small calf despite good feeding and management.
- 3. Small, weak, and unhealthy animals which are susceptible to diseases and may become the source of infection of the herd if not removed on time.

- 4. Heifers that do not come in heat in spite of proper age, good size, healthy condition, vigor and strength.
- 5. Heifers that fail to meet the standard set for the breeding herd
- 6. Bull ad cows which have undesirable hereditary defects such as inverted teats, hernia, dwarfism, bull dog, cryptorchidism (failure of one or both teats in descend normally), and the like.

### Some Important Diseases in Cattle:

- 1. Foot and Mouth Disease (FMD) – Aphovirus types A, O, C Phil
- 2. Hemorrhagic septicemia – Pasteurella multocida
- 3. Anthrax – Bacillus anthracis
- 4. Blackleg (malignant) – Clostridium chauveilsepticum
- 5. Tetanus – Clostridium tetani

## X. DAIRY PRODUCTION

### Milk and Milk products

#### Milk

- Nature's most perfect food
- With its assortment of protein, fat, lactose (milk sugar), minerals, vitamins, enzymes, and water

#### Nutritional Importance of Milk

- Contains all the essential amino acids needed by humans.
- The protein of milk is composed of casein, lactalbumin, globulin, and serum albumin.
- **Casein** is the most abundant protein consistent of milk. It has many uses in addition to providing protein in the diet.

- **Lactalbumin** is part of the enzyme system that synthesizes lactose in the mammary gland. It is part of the enzymes into milk as a by-product and becomes part of milk protein.
- **Protein globulins** of milk are structural parts of antibodies.

### **Colostrum**

- The first milk a female produces after the young is born.
- It contains many antibodies that give the newborn protection from harmful microorganisms that invade the body and causes illness.
- Other constituents of milk include lactose, minerals such as Ca and P (both of which are important in bone growth and other body functions), and vitamins.
- Milk is, however, low in Fe, therefore young animals consuming nothing but milk may develop anemia.
- Milk contains several important vitamins such as a vitamin A, which help keep the intestinal tract and skin in proper repair, the vitamin B complex, and vitamins D and E. Vitamin D is added to most marketed milk.
- Milk is low in vitamin C, which prevents scurvy (a disease characterized by bleeding, spongy gums and loose teeth);

### **The Philippine Dairy Situation, Year 2000**

RDA (Required Dietary Allowance) for Milk for Filipinos = 30 kg LME (liquid milk equivalent) per capita per year

MILK CONSUMPTION PER FILIPINO = 16 kg per year \*

\* From 803 g mean one day per capita food consumption, milk and milk products account for 44 g (5.48%); ranks 5<sup>th</sup> cereals and cereal products, fish, meat, and poultry, vegetable and fruits.

$$44 \times 365 \text{ days} = 16,060 \text{ g}$$

TOTAL MILK REQUIRED BY 75 MILLION FILIPINOS =  $30 \text{ kg} \times 75\text{M} = 2250\text{Mkg}$   
LOCAL PRODUCTION = 10.21 million kg

Livestock Population, year 2000 data.

Class	Population	Dams	% of Total Milk Produced
Cattle	2.49 M	3,350	78
Carabao	3.06 M	4,720	21
Goat	3.23 M	510	1

Imported = 1904.25 million kg (US\$402.12M)

- 91% of imports were cream and milk, mainly in powder form.
- 5% were butter and butterfat, 3% curd, 1% cheese

Source of Importation

Australia 44.5%	New Zealand, 20.7%
Netherlands, 8.3%	USA, 7.4%

Exportation:

51.1M kg (US\$14.04M), basically exports of milk and cream products and dairy spreads.

### **Government Efforts to Develop the Philippine Dairy Industry**

#### **Dairy Development Act of 1995 (R.A. 7884)**

- Signed into law by President Fidel V. Ramos on 20 February 1995 and became effective on 12 March 1995.
- The Act integrates all government dairy development programs into the National Dairy Authority or NDA.

### DTRI (Dairy Training and Research Institute)

- Organized in 1962 from the Dairy Husbandry Division of the then Department of Animal Science UPLBCA, is mandated to conduct research and training in dairy production and technology.

### Breeds Of Dairy Cattle

**Dairy cattle** – The conventional dairy breeds of cattle were developed mainly from the taurine species.

#### Factors in choosing cattle for milk production:

- Breed popular in the community
- High salvage value of the animal

\*Holstein and the *Bos indicus* breed Sahiwal, known as Australian Friesian Sahiwal (AFS) developed in Australia, are being promoted by the government.

In the selection of dairy cows, dairy operators look for **properly attached udder and strong feet**. These characteristics are **best indicators** that a cow will remain a high producer for a long time.

## DAIRY CATTLE REPRODUCTION

**Milk production** - dependent on reproduction since the production of milk is a secondary sex characteristic.

- Most dairymen agree that a -month calving interval is ideal to maximize production and profit.

- A normal cow can be described as one that becomes pregnant on the first or second service and produces a live healthy calf every 12 to 13 months.

### Physiology of Reproduction

#### A. Bull's Reproductive Physiology

\*Volume of semen/ejaculate varies from 2 to 15 ml, with average = 5 to 6 ml.

- Sperm concentration ranges from 1 to 3 B sperm per ml, with an average of about 2B per ml.
- Percent motile cells ranges from 0 to 85 %, with an average of 70%.
- Based on these figures, an average ejaculate contains about 7B motile cells (5 ml semen X 2 B/ml X 70%)
- In natural service, maximum fertility rates should be obtained by bulls whose semen characteristics meet or exceed these average values and contain no more than 15% abnormal sperm (head or tail abnormalities).
- In natural service a bull service 50 to 100 cows per year. In AI it is not unusual for a bull to service 10, 000 to 20, 000 cows per year.

#### Artificial Insemination

- Semen is normally collected by the *use of an artificial vagina*.
- Volume is recorded and the ejaculate for concentration (spermatozoa per ml) motility, and morphology.
- The semen is diluted with an egg yolk-citrate extender or milk-base extender, and if the semen is to be frozen, glycerol.
- Dilution rates are calculated to yield a final motile spermatozoa per insemination of 10 to 12 million.

- An average ejaculate of 5 ml semen that contains 1.25 B live cells per ml after freezing contains enough spermatozoa for 500 to 600 inseminations.
- The semen is packaged in ampules or straws, frozen and stored (usually in liquid nitrogen storage tanks) at a temperature of -300 to -320°F (-128 to -196°C).
- As long as the semen is maintained at this temperature, it remains viable for 10 to 15 years or more.

## B. Cow's Reproductive Physiology

Ova are produced in the follicle of the ovary, released from the follicle (ovulation), picked up the infundibulum of the oviduct, move into the oviduct, fertilized in the oviduct, *moved into the uterine horn 4 to 6 days after fertilization*, and *implanted in the uterus 30 to 33 days after fertilization*. The embryo is carried in the uterus while developing into a full term calf, and the calf is discharged through the cervix, vagina and vulva.

The process of ova production and release begins at puberty (usually 6 to 10 months of age) and continues on a **21-day cycle** basis until pregnancy. The cycle is normally reestablished within **40 to 50 days after calving** and continues until pregnancy occurs again.

# XI. CARABAO PRODUCTION & MANAGEMENT

## INTRODUCTION

- ✓ The carabao or water buffalo remains important in the Philippine agriculture because:
  - It is an integral part of crop production system

- It provides major source of draft power in almost all farming operations
- ✓ About 99 % belongs to small hold farmers and 1% commercial
- In 2010:
- Total pop'n = 3.3M
  - Dairy population – 34,858
  - Milk prod'n = 1.67M liters
  - Meat prod'n = 64,728MT kg
  - Draft = 2.5M heads

## Buffalo Production Systems

- ✓ Based on the number of animals raised in the farm, the carabao production system can be classified as:
  - **Smallholder or backyard system**
    - 99.8% (2.99M)= backyard
  - **Commercial system**
    - 0.2% (14K) = commercial
- ✓ Top 3 regions:  
**Eastern Visayas, Western Visayas & Cagayan Valley**

## LAWS CONCERNING THE CARABAO

- **RA 7307, Philippine Carabao Act of 1992** by Pres. Cory Aquino
  - Conserve, promote & propagate the carabao as source of draft, meat, milk and hide
  - Availability of quality stocks,
  - Benefit from technology transfer activities on the care and mgt of carabao and the processing of meat and milk
  - Encourage backyard dairy development in rural areas

- **RA 8485, Animal Welfare Act (1997)** by President Fidel Ramos
  - To protect and promote the welfare of all animals by supervising and, regulating the establishment and operations of all facilities utilized for breeding, maintaining, treating or training all animals
  - This law superseded the EO 626 or the carabao slaughter ban
- **Carabao Slaughter Ban (EO 626)**
  - EO No. 8 of 1954 prohibiting the slaughter of carabao regardless of age, sex, and physical condition purposely to conserve work animals
  - Superseded by other EO's identifying a specific term period for slaughter and age limit.
  - EO 626 of 1980 locally known as 7-11, allows the slaughter of male buffalo 7 years old and above and female carabaos 11 yrs. Old and above

How was it lifted?

- Thru RA-8485 of 1998 Sec. 6 "Animal Welfare Act" in 1997

## **Types and Breeds of Water Buffalo**

### **Swamp type - Bubalus bubalis, 2n = 48**

Breeds : Philippine carabao

Cambodian

Chinese buffaloes

- Light gray to gray, white bands below the jaw and across the chest and legs
- Sickle-shaped horns
- 1.5 -2 kg of milk/day

### **River type - Bubalus bubalis, 2n = 50**

Breeds: Indian Murrah

Bulgarian Murrah

Brazilian Murrah

- Black or dark gray in color
- With tightly curled or drooping straight horn
- Dairy type buffalo can produce 8-10 liters of milk daily

## **Breeding**

- The carabao can be bred throughout the year. Mating season usually takes place during the wet season
- Estrous cycle - 21 days
- Weight at breeding - 250 to 300 kg
- Breeding age - 2.5 to 3 yrs.
- Estrus period (sexual receptivity) - 18 hours
- Ovulation - 15 hours after estrus

## **Signs of heat**

- The female stands still when mounted by a bull or another female (standing heat). This is the best sign of estrus
- Swelling of the vulva and reddening of the vaginal epithelium
- Mucus discharges of varying viscosity from the vagina, it is clear and watery at first and becomes turbid and sticky towards the end of estrus
- Mounting other animals in the herd
- Animal becomes restless and lacks appetite

Note: Not all these signs may be manifested by a carabao in estrus

## **Occurrence of Estrus**

Time	Number	Percent,%
12 mn-7 am	1053	58.2
7am-12 noon	238	13.2
12 noon-6 pm	84	4.6
6 pm-12 mn	434	23.9
<b>Total</b>	<b>1809</b>	<b>100</b>

#### When to breed or inseminate

- Breeding can be done by natural mating or artificial insemination
- **Best time to inseminate is towards the end of estrus**, in the latter 2/3rds of standing estrus, or within few hours after estrus
- As a rule of thumb, apply a.m. – p.m. Rule which is inseminate in the morning and repeat in the afternoon or inseminate in the afternoon and repeat in the morning

#### Reproductive Parameters

1. Calving interval is the period between two successive calvings (**410 d or 13.6 mo**)
  - Calving interval may range from 18 to 24 months (optimum is 14-16 months)
2. It is the number of days from calving to conception date or service period/days open (**90 d or 3 mo**)
3. Lactation Period (**305 d or 10 mo**)
4. Gestation Period (**315 d or 10.5 mo**)
  - Average gestation period is 315 days (range 295 to 339 days)
  - Age at first calving is about 3 to 4 years old
5. Dry Period- It is the number of days from drying off to the next calving(**105 d or 3.5 mo**)

#### Breeding or Mating

- Natural mating (60% pregnancy rate)
- Artificial insemination(25% pregnancy rate)

#### Breeding Management

- Heat is checked every 18-24 days, then 39- 45 days
- Conduct pregnancy diagnosis (PD) at 50-60 days
- Confirmatory PD at 80-90 days
- Cows bred at least 30-60 days after calving, induced estrus if possible

#### Crossbreeding Program

Murrah Buffalo (2n=50) x Phil. Carabao (2n=48)

Result: Phil-Murrah Crossbred (F<sub>1</sub>) (2n= 49)

#### Benefits from crossbreeding

##### Increase in milk production

- From 1-1.5 liters to 4-6 liters per day

##### Increase in growth rate

- From 250-500 g to 800 to 1,200 g per day
- Meat quality is as good as beef

##### Maintain draftability of crossbred

- Due to heavier bodyweight, it can carry or pull heavier loads
- It can plow as efficient as the PC

#### Act of Giving Birth or Parturition

##### Normal Duration:

Labor stage - 2-6 hours

Expulsion of fetus - 0.5 – 3 hours

Expulsion of placenta - 0.5 – 8 hours

- If the placenta will not be expelled after 8-12 hours, then it called retained placenta and time to call the veterinarian

#### Signs of parturition

- a. Presence of milk in the mammary gland
- b. Swollen teats
- c. Presence of thick mucus

- d. Water bag appears first
- e. For normal delivery, the forelegs appear first, followed by head resting on the forefeet
- f. Expulsion of the fetus
- g. Calf is fully groomed and need to suckle the colostrum immediately (within 1 hr. After birth)

## CARE AND MANAGEMENT OF BUFFALOES

### **Caracalves**

- Proper care and management of calves should start during gestation.

#### Immediately after birth:

- a. Remove fetal membranes from calf's mouth and nostrils.
- b. When difficulty in breathing is observed due to some fluids that have to be drained from the respiratory tract, hold the calf upside down by the hind legs to aid removal of the fluids.

#### Within a few minutes after birth:

- a. Cut navel cord with sterilized scissors or blade at about 2-3 inches from the base.
- b. The cord should be properly tied with sterilized thread before it is cut about 1 inch below the knot.
- c. Dip cord into a solution of tincture of iodine.

### Weaning

- a. **Backyard operations:** calves are allowed to go with their dams from birth to a weaning age of 8 to 12 months. Weaning can be done as early as 4 to 5 months of age.
- b. **Commercial dairy operations:** calves are usually weaned 3 to 5 days after birth and are trained to drink mixed milk from a pail.

### Feeding of Calves

- a. Feed caracalf starter (18-20% CP; 75% TDN) beginning at two weeks of age. Start feeding forage like freshly cut grasses. Provide fresh and clean waters at all times.

#### Pointers in calf feeding

- b. Protect the calf against infectious diseases thru passive immunity from colostrum
  - Right amount – 1.5 to 2L/feeding
  - Right frequency of feeding – 2 to 3 times/d
  - Right temperature – 38 °C
- c. Promote early rumen development
  - Milk is expensive
  - Mix feed (concentrate) and hay are cheaper and can hasten rumen development

### **Growing-Fattening**

- Weaned caracalves, 8 to 12 months old, may either be sold as feeder or may be fed with low-cost rations to gain 0.50 to 0.75 kg per day for sell as yearling or fatteners after 3 months.
- Yearling crossbred bulls, which are not being used for breeding purposes, are good materials for fattening.
- Other animals, which are culled for one reason or another, may be used for fattening. These may be fed with high-energy ration and finished as soon as possible for slaughter.
- Growing calves may be raised on pasture alone as long as nutritious forage is available.
- Mineral blocks and water should be made available at all times.
- Good fattening results have been attained from carabaos with age ranging from 2 ½ to 3 years old.
- For crossbreds, fattening may be started much earlier considering the fact that these animals grow much faster and attain mature weight faster than native carabaos.

- Likewise, the number of crossbreds increase thus, more animals become available for fattening purposes.

## **MANAGEMENT OF BULL**

- Male calves intended for breeding must be selected from high producing parents;
- The aim is raise the animal to become gentle and docile/tame.
- At 8-10 months old, male calves should be separated from female or non-pregnant animals;
- At 2 years, feed to gain 300 g/d to be physically fit;
- At 2.5 years, the bull is capable of breeding
- Subject to breeding soundness evaluation (BSE) for mounting behavior, tameness, and sexual urges or libido

## **Feeding of buffalo**

- The amount of feed a ruminant eats is limited by the time it takes for the feed to break down in the rumen
- Presence of multiple compartment stomach:
  - a. Rumen or paunch
  - b. Reticulum or honeycomb
  - c. Omasum or manyplies
  - d. Abomasum or true stomach
- In the rumen: end product of digestion
  - a. Protein – microbial protein, NPN
  - b. Carbohydrate – vfas (acetic, propionic, butyric acids)
  - c. Fats – fatty acids and glycerol then to propionic acid

## **Carabull/Caracow Ratio**

- Bull to cow ratio largely depends on the mating system adopted. Ideally, a carabull can be assigned to 20 females during in the breeding season.

- The age and the physical condition of the bull are important factor in determining its female load.
- With hand mating, a young bull of about 2.5 to 3.5 years old should sire only 20 females per season. This may be increased to 30 to 40 caraheifers or caracow when bulls reach the age from 3 ½ to 4 ½ years and older, respectively.

## **Feeds for Ruminants:**

- Ruminants need both quantity (energy) and quality (protein) in their diets to grow well
- Ruminants need to eat at least 15% of their bodyweight in fresh forage each day or about 3% of bodyweight in dry matter

Example: Assume: 300 kg carabao & 25% DM of grass

$$300 \text{ kg carabao} \times 0.03 = 9 \text{ kg dry matter intake}$$

$$9 \text{ kg DM}/0.25 = 28 \text{ kg fresh feed intake}$$

## **DESIRED OUTPUT TO PROFIT**

1. Dairy production
  - To produce 8-10 kg milk/day for 300 day lactation (2,400-3,000 L/lactation)
2. Cow-calf operation
  - To produce a calf every 1 ½ years with higher survival rate
3. Feedlot Growing – Fattening
  - To attain 1 kg ADG or more
  - To market fattened animal after 4- 6 months of feeding

## **FEEDING SYSTEMS**

### **1. All-roughage system**

- Forage in the form of pasture grasses soilage, silage, hay, etc.

- Crop residues such as rice straw, corn stover, sugarcane tops, etc.
- Cut-and-curry system or grazing/tethering.

## **2. Roughage-concentrate system**

- Roughage-concentrate ratio (70:30)
- Addition of concentrate feeds in the ration e.g. Grains (corn), oil meals (copra meal), root crops (cassava), milling and factory by-products (rice bran)
- Use in backyard, and feedlot fattening operations.

## **3. Feeding management**

- Chopped napier grass (45 days) – ad libitum, year-round
- Flushing can be done by giving up to 5 kg per day per animal during the first 3 months post-calving depending on daily milk production (300 g to 500 g/L milk produced)
- Concentrate feed is given during milking
- Use brewer's spent grain – occasionally
- Water provided at all times – using drip system

## **HOUSING FOR FEEDLOT FATTENING**

- In an open confinement
  - Mature feeders = 4 to 4.7 sq. M.
  - Yearling = 2.8 to 3.7 sq. M.
- Pen for calves
  - Measures 1m x 1.5m
  - Elevated, about 1 foot high
  - Provided with hay bedding
  - Provided with waterer and pail for the concentrate
- Housing for mature carabaos
  - Each animal is allocated 6 to 8 sq. M. Of floor space
  - With feeding trough, waterer and shower

## **ANIMAL HEALTH MANAGEMENT**

- Deworming program
  - Calves
    - At 1 week of age
    - At 1 month of age
    - At 3 months of age
    - Then, every 4-6 months
  - Mature animals
    - Every 4-6 months
- Dewormers
  - Albendazole, 1ml/10kg BW
  - Triclabendazole, 1ml/10 kg BW
- Vaccination program (FMD & Hemosep)
  - At 3 months of age (initial shot)
  - At 4 months of age (booster shot)
  - Then, every 6 months
- Tuberculosis test
  - Once a year
- California mastitis test (CMT) for milking animals
  - Once a month
- Bloat or tympany – is a distension of the abdomen due to gas trapped in the rumen
  - Frothy bloat (primary rumen tympany) –caused by overeating legumes
  - Remedy: To puncture on left paralumbar fossa or hunger hollow using a trocar to release the gas

## **Animal Identification**

- Under backyard type of operations, branding is the most commonly used. It is a permanent method of identification.

## **Training of the Carabao**

- The natural docility of tameness of the carabao contributes to its early learning ability.
- Training should start as early as 2 to 3 years old.

## Animal Science

1. This classification of animal includes all even-toed ungulates, usually with two hoofed digits on each limb.
  - a. Phylum chordate
  - b. Subphylum Vertebrata
  - c. Class Mammalia
  - d. Order Artiodactyla
2. Which of the following species is an omnivore?
  - a. Bos indicus
  - b. Oryctolagus cuniculus
  - c. Sus scrofa
  - d. Capra hircus
3. It refers to the general shape, form and purpose for which an animal is being raised
  - a. Type
  - b. Strain
  - c. Breed
  - d. Variety
4. An established group of fowls by breeding and possess distinctive traits
  - a. Type
  - b. Strain
  - c. Breed
  - d. Variety
5. Ovulation is spontaneous in all domestic species except for this animal which is considered reflex ovulators:
  - a. Bitch
  - b. Queen
  - c. Cow
  - d. Sow
6. An after birth is delivered soon after birth but it may accompany the fetus or precede it. The other term for afterbirth is:
  - a. Yolk sac
7. Estrogen is the female hormone secreted by the ovarian follicle, it is involved in the following functions except:
  - b. Extra-embryonic membranes
  - c. Trophoblast
  - d. Epitheliocchorial
8. This structure is considered as site of exchange between blood and the interstitial fluid that surrounds all cells
  - a. Lymph vessels
  - b. Alveoli
  - c. Glomerulus
  - d. Capillaries
9. Testosterone is the hormone secreted by the male animal. The following are the functions of this hormone except:
  - a. Development of body features associated with the male
  - b. Development and maintenance of libido
  - c. Development of Leydig cells
  - d. Responsible for the secretory activity of the accessory organs
10. The purebred known to be the "longest breed" among pure breed.
  - a. Large white
  - b. Duroc
  - c. Landrace
  - d. Pietrain
11. The earliest number of months that swine attain sexual maturity.
  - a. 2
  - b. 3
  - c. 4
  - d. 5
12. The weight at 8 months that the gilt can be culled.

- a. <100kg  
b. <120kg  
c. <110kg  
d. <90kg
13. The average heat period of gilts and sows  
a. 2-5 days  
b. 1-3 days  
c. 7-10 days  
d. 1-2 days
14. This swine is known to be the "red power" among purebred hogs  
a. Pietrain  
b. Hampshire  
c. Landrace  
d. Duroc
15. This corresponds to the knee of animals  
a. carpals  
b. humerus  
c. tarsals  
d. femur
16. This hormone is responsible for the characteristic buck odor  
a. carpic hormone  
b. codric hormone  
c. castric hormone  
d. centric hormone
17. This is the fluid portion of uncoagulated blood  
a. serum  
b. globulin  
c. plasma  
d. hemoglobin
18. This is a lymphoid organ that acts as graveyard for old or senile red blood cells  
a. liver  
b. spleen  
c. lungs  
d. thymus
19. This is a musculomembranous partition that separates the thoracic from the abdominal cavity  
a. pleurae  
b. diaphragm  
c. peritoneum  
d. mesentery
20. The function of all genes are the following except  
a. Control the function of other(structural) genes  
b. Copy or replicate itself  
c. Store and transmit genetic information  
d. Undergo mutation
21. Interbreeding depression in most reproductive trait in farm animals is caused by  
a. Outcrossing  
b. Parent offspring mating  
c. Species hybridization  
d. Upgrading
22. The American Brahman breed is an example of  
a. Bos indicus (Zebu) cattle  
b. Bos indicus humpless cattle  
c. Bos Taurus humped cattle  
d. Bos Taurus humpless cattle
23. In the formula  $P$  (phenotype) =  $G$  (genetics) +  $E$  (environment), the following are the types of gene action that may be exploited by crossbreeding except  
a. Additive gene effects  
b. Dominance  
c. Epistasis  
d. Overdominance
24. The following are examples of non-Mendelian inheritance except  
a. Autosomal linkage  
b. Complete dominance  
c. Cytoplasmic inheritance

- d. Pleiotropy
25. The scientific name of European wild boar believed to be the principal descendant of our domesticated pig today
- S. Scrofa*
  - S. indicus*
  - S. philippensis*
  - S. domesticus*
26. It refers to a group of animals that has specific traits or characteristics in common and mating within the breed produces progeny that maintains the same set of characteristics
- Species
  - Strain
  - Breed
  - Hybrid
27. It is a breeding technology where the semen is deposited to the sow's genitalia in time conducive to fertilization through artificial means.
- Embryo transfer
  - Artificial insemination
  - Super ovulation
  - A and c
28. A breed of pig noted for his longest body, square, round ham and believed to have extra pair of ribs compared to other breeds.
- Large white
  - yorkshire
  - Landrace
  - Both a and b
29. The most efficient method of selection that considers two or more traits
- Pedigree
  - Index
  - Tandem
  - Eyeball
30. Ruminants are animals that has
- a. Four chambers of their stomach
- b. Three chambers of their stomach
- c. Two chambers of their stomach
- d. One chamber of their stomach
31. The scientific name of goat is
- Capra hircus*
  - Capra hircus*
  - Capra hercus*
  - Carpa hercus*
32. The cattle that is European in origin
- Bos taurus*
  - Bos indicus*
  - Bos bulalis*
  - Bos aries*
33. The percentage of the nutrient value in feed that is excreted with the manure on the soil.
- 60%
  - 70%
  - 80%
  - 90%
34. Weight shrinkage of ruminants during transport and marketing is
- 5-10%
  - 10-15%
  - 15-20%
  - 20-30%
35. The true stomach of the ruminant animal
- Abomasum
  - Omasum
  - Reticulum
  - Rumen
36. All of these animals are monogastric except
- Bos indicus*
  - Sus scrofa*
  - Meleagris gallopavo*

d. Equus caballo

37. In animals, the term "entire" refers to

- a. Uncastrated male animal
- b. Castrated male animal
- c. Female animal which has given birth
- d. Female animal which has not yet given birth

38. One of these diseases is viral and affects almost all livestock and has adversely affected our chances of being able to export our animal products.

- a. Bird flu
- b. Foot and Mouth Disease
- c. Anthrax
- d. Mad Cow Disease

39. A group of birds developed in the same broad geographical area

- a. Type
- b. Strain
- c. Breed
- d. Class

40. In chicken, these are red, pendulous growth of flesh at either side of the base of the beak and upper throat

- a. Comb
- b. Snood
- c. Caruncles
- d. Wattles

41. Synarthrodial joints are united by the fibrous tissue or cartilage. The joint between a tooth and its socket is an example of what type of immovable joint?

- a. Gomphosis
- b. Sutures
- c. Synchondroses
- d. Syndesmoses

42. It is considered as the pacemaker of the heart because the action potential that spontaneously developed is propagated around the

heart to stimulate action potentials in all myocardial cells and produce contraction.

- a. Diastolic node
- b. Sinoatrial node
- c. Atrioventricular node
- d. Purkinje fibers

43. Horse is an important domesticated animal, the leg and the shawl corresponds to what bones of the horse?

- a. Metatarsals and Phalanges
- b. Tibia and fibula
- c. Radius and ulna
- d. Metacarpals and phalanges

44. It is a cup-like leaflet structure of the heart that allows only blood flows from the ventricle into the artery and not in the opposite direction.

- a. Auricular valve
- b. Atrioventricular valve
- c. Sino-atrial valve
- d. Semilunar valve

45. Erythropoietin is a hormone which regulates erythrocyte production in normal animal; this hormone secrete by what organ of the body?

- a. Liver
- b. Stomach
- c. Bone
- d. Kidney

46. This is done by riding the back or pressing the loin or back of the gilt or sow

- a. Haunch pressure test
- b. Semen-on-snout test
- c. Riding the back test
- d. Teaser method

47. This swine is known to be the "mother breed" among pure bred hogs

- a. Large white
- b. Duroc
- c. Land race
- d. Pietrain

48. This is done by applying pressure on the rump with both hands

- a. Teaser method
- b. Semen-on-snout method
- c. Riding the back test
- d. Haunch pressure test

49. This is known to be the "muscle pigs" among the purebred hogs

- a. Hampshire
- b. Duroc
- c. Landrace
- d. Pietrain

50. The act of giving birth to a litter of pigs.

- a. Flushing
- b. Farrowing
- c. Crushing
- d. Gestating

51. These teeth are absent in horse and cattle

- a. canine teeth
- b. molar teeth
- c. milk teeth
- d. incisor

52. This is the site of gastric juice production in chicken

- a. crop
- b. gizzard
- c. proventriculus
- d. small intestine

53. This is the structural and functional units of the kidneys

- a. alveoli
- b. nephron
- c. glomerulus
- d. nephrite

54. Gall bladder is absent in this animal

- a. cattle
- b. horse
- c. dog
- d. cat

55. This is the site of fertilization in chicken

- a. fimbriae
- b. uterus
- c. infundibulum
- d. isthmus

56. \_\_\_\_\_ leads to random genetic drift because of chance variation or sampling effects/errors.

- a. Migration
- b. Non-random mating
- c. Selection
- d. Small population size

57. The magnitude of inbreeding depression in inbred populations depends on

- a. Degree or coefficient of inbreeding
- b. Dominance effect (d)
- c. Frequency of heterozygotes before breeding (2pg)
- d. All of th above

58. .The average gestation period in the sow is

- a. 114 days
- b. 148 days
- c. 283 days
- d. 316 days

59. Duroc is a breed of

- a. Beef cattle
- b. Dairy cattle
- c. Goat
- d. Swine

60. When a gene suppresses the expression of its allele, the former is called the dominant gene while the latter is referred to as the \_\_\_\_\_ gene.
- Homozygous
  - Recessive
  - Regulator
  - Structural
61. This is a common disease in swine also known as classical swine fever where a vaccination program is usually instituted in a pig farm
- Hog cholera
  - Parvo virus
  - Pseudo rabies
  - Leptospirosis
62. A gilt is ready for breeding when she has the following except,
- 8 months old
  - 100-120 kg LW
  - Sufficient libido
  - Cycled twice
63. A type of feeder that provides the following pigs with the unlimited amount of feed to sustain their optimum rate of growth
- Eat all you can through
  - Self-feeder
  - Auto-feeder
  - B and c
64. A breed of pig characterized with a deep red or rusty color or cherry red color developed in USA and known as "red power" since males belonging to this breed are noted for their aggressiveness.
- Pietrain
  - Duroc
  - Hampshire
  - Largeblack
65. This is the term given to a sow from farrowing until weaning.
66. Ad libitum means
- Limited feeding
  - Unlimited feeding
  - Restricted feeding
  - Unrestricted feeding
67. Humped cattle usually found in tropical countries
- Bos taurus*
  - Bos indicus*
  - Bos bulalis*
  - Bos aries*
68. The surgical operation during which the primary sex organs are removed.
- Artificial insemination
  - Slaughtering
  - Vasectomy
  - Castration
69. The milk produced in the first few days after parturition.
- Colostrum
  - Filled milk
  - Fresh milk
  - Mastitis
70. The reddish yellow mass which forms in a ruptured follicle in the ovary of mammals.
- Ovarian cyst
  - Corpus luteum
  - Graafian follicle
  - Follicular mass
71. Duck known as the "Pateros Duck" known and mainly raised for "balut" production
- Philippine duck

- b. Tsaiya
- c. Khaki Campbell
- d. Philippine Mallard

72. A subdivision of a breed on traits like feather color and type of comb

- a. Type
- b. Strain
- c. Breed
- d. Variety

73. Site of gastric juice production in chicken

- a. Doudenum
- b. Gizzard
- c. Proventriculus
- d. Cecum

74. Which among the following breeds is not an egg-type chicken?

- a. Babcock
- b. Cornish
- c. Shaver
- d. Hisex

75. The turkey is scientifically known as

- a. Anas platyrhynchos
- b. Coturnix coturnix japonica
- c. Gallus gallus domesticus
- d. Meleagris gallopavo

76. Digestion of roughages in ruminant happens in the rumen.

However in young ruminants, what is the structure that cause milk to bypass the rumen and reticulum and pass through the omasum directly to the abomasum?

- a. Esophageal sphincter
- b. Ruminoreticular groove
- c. Esophageal groove
- d. Ruminal pillar

77. The peripheral nervous system provides a mean of communication from the environment where stimuli are received by receptor

organs to the central nervous system and to proper organs in the body, muscles and glands. The spinal nerves are part of the peripheral nervous system, what do you call the braid-like arrangements of the nerve that supplies the appendages?

- a. Tracts
- b. Plexuses
- c. Commisure
- d. Ganglia

78. Reflex centers are located throughout the central nervous system and are involved with the integration with the integration of more complex reflexes. When the animal sneeze and cough, the reflex center involved in these reactions is the:

- a. Cerebrum
- b. Hypothalamus
- c. Cerebellum
- d. Medulla oblongata

79. The parasympathetic nervous system is called the craniosacral system because the nerve fibers arise from the cranial nerves and sacral portion of the spinal cord.

- a. Excites gastrointestinal motility
- b. Contracts pupil of the eye
- c. Dilate blood vessels
- d. Accelerates heartbeat

80. Neurotransmitters are endogenous chemicals which relay, amplify, and modulate signals between a neuron and another cell. The following are examples of neurotransmitters except:

- a. Glycerol
- b. Acetylcholine
- c. Gamma-aminobutyric acid
- d. Norepinephrine

81. The most essential and the cheapest of all nutrients

- a. Proteins
- b. Water
- c. Minerals

d. Energy

82. This swine is known to be the "Belted white" among purebred hogs

- a. Large white
- b. Duroc
- c. Landrace
- d. Hampshire

83. This is the best period to breed the gilts

- a. 6 months
- b. 7 months
- c. 10 months
- d. 8 months

84. The percentage of crude protein for a brood sow ration

- a. 14
- b. 15
- c. 18
- d. 13

85. The percentage of crude protein, Ca, and P respectively for a lactating sow

- a. 14, 0.5 and 0.6
- b. 18, 0.7 and 0.5
- c. 15, 0.6 and 0.4
- d. 16, 0.2 and 0.3

86. This is an animal where both testicles failed to descend to the scrotal sac

- a. cryptorchid
- b. duorchid
- c. monorchid
- d. anestrus

87. The outer layer of the extra-embryonic membranes which is in contact with the maternal uterine tissues

- a. allantois
- b. amnion
- c. chorion

d. placenta

88. Which of these cells produce the hormone testosterone?

- a. spermatogonia
- b. Leydig cells
- c. spermatocyte
- d. sertoli cells

89. Which of the following accessory sex glands in male is absent in tom?

- a. geminal vesicles
- b. Cowper's gland
- c. prostate gland
- d. bulbourethral glands

90. Part of the oviduct in chicken which is responsible for the secretion of albumen

- a. uterus
- b. magnum
- c. isthmus
- d. fimbriae

91. \_\_\_\_\_ determines the sex of the individual.

- a. Autosomes
- b. Mating system
- c. Selection
- d. Sex chromosomes

92. \_\_\_\_\_ is the notation used to refer to the heterogametic sex chromosomes of a hen.

- a. XX
- b. XY
- c. ZZ
- d. ZW

93. \_\_\_\_\_ is the heterogametic sex in horses.

- a. Male
- b. Female
- c. Either male or female
- d. Both male and female

94. Milk production in cows and egg production in quails are examples of economically important traits which are known as
- Maternal effects
  - Sex-influenced
  - Sex-limited
  - Sex-linked
95. \_\_\_\_\_ is when genes that are more closely linked tend to be inherited together more often than those that are located further apart in the same chromosome.
- Autosomal linkage
  - Pleiotropy
  - Non-nuclear inheritance
  - Sex linkage
96. This practice is given to replacement gilts from 7-10 days before breeding to promote ovulation rate.
- Reconditioning
  - Flushing
  - Deworming
  - Feeding
97. The ideal temperature in the brooder area for newly born piglets.
- 30-32°C
  - 38-40°C
  - 33-35°C
  - 26°C
98. A practice in solid feeding sucklings where feeds are place in an area out of reach by dam.
- Creep
  - Solid
  - Wet
  - Dry
99. This practice is done to piglets at birth to prevent them from inflicting wound on the udder of their dam and litter mates.
- Needle teeth cutting
  - Wolf teeth cutting
- c. Black teeth cutting  
d. All
100. The system of identifying pigs commonly practice in any pig farm
- Ear notching
  - Ear tagging
  - Tattooing
  - None
101. Increasing the amount of feed fed to an animal for a short period of time usually just prior to breeding
- Ration formulation
  - Unlimited feeding
  - Flushing
  - Feed increase
102. Process of heating the milk at 63°C for 30 mins to destroy any harmful organisms while causing minimal changes in the composition, flavor and nutritive value of the milk.
- Sterilization
  - Sanitation
  - Boiling
  - Pasteurization
103. The land with herbage or forage for grazing animals.
- Pasture land
  - Farm land
  - Idle land
  - Grazing land
104. The feed containing more than 18% crude fiber when dry.
- Concentrate
  - Grass
  - Roughage
  - Legume
105. Fresh forage cuts feed animals tethered or kept in sheds.
- Roughage
  - Soilage

- c. Silage  
d. Fresh roughage
106. Organ that serves as the "teeth" of fowls  
a. Beak  
b. Proventiculus  
c. Gullet  
d. Gizzard
107. Fowl typhoid is caused by  
a. *Salmonella gallinarum*  
b. *Mycoplasma gallisepticum*  
c. *Aspergillus fumigatus*  
d. *Eimeria* spp.
108. This structure is responsible for producing the inner and outer shell membranes of the egg  
a. Isthmus  
b. Vagina  
c. Magnum  
d. Uterus
109. The process of removing the testes from young males to promote meat quality for market birds  
a. Spaying  
b. Castration  
c. Dubbing  
d. Caponizing
110. An organism which is egg-transmitted causing Chronic Respiratory Disease in poultry especially chicken and turkey  
a. *Pastuerella multicoda*  
b. *S. Pullorum*  
c. *Mycoplasma gallinarum*  
d. *Bacillus anthracis*
111. The following are considered functions of the bones except:  
a. Circulation of blood  
b. Site for blood formation  
c. For storing minerals  
d. Gives rigidity and form to the body
112. Which part of the chicken's oviduct where the egg stays longest?  
a. Uterus  
b. Vagina  
c. Isthmus  
d. Magnum
113. The mouth is the beginning of the digestive system , and it functions as follows except:  
a. For chemical digestion of food  
b. Initial breakdown of food  
c. Use for grasping mechanism  
d. Use as offensive and defensive weapon
114. Which of the following statements does not describe the differences and similarities of muscle cells of the body?  
a. All muscle cells are capable of undergoing hypertrophy  
b. Both skeletal and visceral muscles are striated  
c. All muscle cells are capable of contraction or shortening of cell  
d. Cardiac and visceral muscles are involuntary in action
115. During panting, there is an increase in ventilator rate but reduced tidal volume because the increase in air movement is primarily in the upper airways that are not sites of gas exchange. These airways are called:  
a. Physiologic dead space  
b. Atmospheric dead space  
c. Lung dead space  
d. Anatomic dead space
116. The length of cutting the umbilical cord of the new born piglet from the base  
a. 3-4 inches  
b. 3-5 inches  
c. 1.5-2.0 inches  
d. 4-5 inches

117. The percentage of crude protein, Ca, and P respectively for a lactating sow
- Not less than 18, 0.7 and 0.5
  - Not less than 22, 0.8 and 0.6
  - Not less than 20, 0.8 and 0.6
  - Not less than 18, 0.6 and 0.8
118. The type of roofing recommended for swine buildings
- Monitor
  - Semi-monitor
  - Gable
  - Gothic
119. The elevation or grade of the concrete floor for a 4-meter long pen
- <10
  - <8
  - <14
  - <12
120. The measurements of the door clearance of pens and the width of the door itself for breeding and growing-finishing animals
- 60 and 45 respectively
  - 62 and 50 respectively
  - 64 and 55 respectively
  - 66 and 60 respectively
121. What hormone is responsible for broodiness in chicken?
- prolactin
  - progesterone
  - estrogen
  - oxytocin
122. This hormone is responsible for the development of sperm cells in the seminiferous tubules
- luteinizing hormone
  - testosterone
  - follicle stimulating hormone
  - adrenocorticotropic hormone
123. This hormone stimulates glycogen breakdown and glycogenesis in the liver
- insulin
  - glucagon
  - epinephrine
  - estradiol
124. This is the neuroepithelial portion of the nervous tunic of the eye
- retina
  - pupil
  - iris
  - choroid
125. The auditory ossicles are found in the
- external ear
  - inner ear
  - middle ear
  - auricula
126. The following reproductive biotechnologies may be used to manipulate the reproductive process in cattle, carabao, horses and goats except
- In vitro fertilization
  - Embryo transfer
  - Oocyte culture
  - None of the above
127. Value of heritability which suggests that all the phenotypic variation among the individual in the population is due to additive and non-additive gene effects.
- 1
  - 0
  - +1
  - +2
128. Which of the following breed of livestock or poultry was not developed by Filipino animal breeders at the UP College of Agriculture in the 1920s?

- a. Berkjala pigs  
b. Los Baños Cantonese chickens  
c. Pekin ducks  
d. Philamin cattle
129. The goal in breeding is to increase  
a. Frequency of the homozygous dominant genotypes  
b. Frequency of the homozygous recessive genotypes  
c. Frequency of the heterotypes  
d. A and B only
130. The Hardy Weinberg Law states that \_\_\_\_\_ frequencies remain constant from generation to generation provided that the population is large, mating is random, and that there is no migration, mutation, and selection.  
a. Gene and genotypic  
b. Gene and phenotypic  
c. Genotypic and Phenotypic  
d. Genetic
131. It is a fraction of semen that plugs the cervix during natural mating to prevent semen from back flowing.  
a. Gel-fraction  
b. Pre-sperm fraction  
c. Sperm-rich fraction  
d. Semen
132. This is common disease in sucklings where the droppings become watery.  
a. Coughing  
b. Diarrhea  
c. Scouring  
d. B and c
133. It is the common type of roofing adopted in backyard hog raising for sow level less than 5.  
a. Single span  
b. Double span  
c. Monitor
134. d. Semi-monitor  
This is the term given to pigs 60kg and up  
a. Finisher  
b. Fattener  
c. Slaughter hogs  
d. All
135. A term given to male pigs castrated before secondary sex characters developed.  
a. Barrow  
b. Stag  
c. Wether  
d. Gelding
136. Buffalo with chevron at the ventral side of the neck.  
a. Dairy buffalo  
b. Riverine buffalo  
c. Swamp buffalo  
d. Murrah buffalo
137. Mating of two individual animal that are related to each other.  
a. Breeding  
b. Cross breeding  
c. Upgrading  
d. Inbreeding
138. A phenomenon wherein the offspring will perform better than their parents.  
a. Heterosis  
b. Outbreeding  
c. Mutation  
d. Libido
139. Another term for stocking rate is  
a. Growth rate  
b. Carrying capacity  
c. Initial rate  
d. Stock yard
140. The two most popular native vegetation in the Philippines

- a. Cogon and paragrass  
b. Paragrass and stargrass  
c. Cogon and bagokbok  
d. Bagokbok and paragrass
141. The removal of a part of the comb of day-old chicks  
a. Clipping  
b. Dubbing  
c. Spaying  
d. Debeaking
142. A feed conversion ratio of 2.9 means that  
a. The animal ate 1 kg feed to produce 1.9kg of gain  
b. The total feed intake of the broiler is 1.9kg  
c. The broiler ate 1.9kg feed to produce 1kg of gain  
d. The broiler is 1.9kg
143. Magnolia chicken is actually from the breed  
a. Lohmann  
b. Ross  
c. Arbor Acre  
d. Phil-Malay
144. The development of chicks from unfertilized eggs is termed  
a. Fecundity  
b. Hatchability  
c. Oogenesis  
d. Parthenogenesis
145. This reproductive organ is otherwise known as the shell gland.  
In colored eggs, the pigment is added in this section  
a. Magnum  
b. Vagina  
c. Uterus  
d. Infundibulum
146. The cardiovascular system is composed of the blood vessels together with the heart, the following are the functions of this system except:  
a. Transports hormone  
b. Carries oxygen to the lungs from the different tissues  
c. Helps maintain water equilibrium in the body  
d. Assist in overcoming disease
147. Which statement is not true about animals whose testis/testes failed to descend into the scrotum?  
a. Both cryptorchid and monorchid could be used as breeders  
b. A cryptochid is likely to be sterile  
c. A monorchid is fertile  
d. Both cryptorchid and monorchid produce testosterone
148. The most important factor associated with seasonal breeding in domestic animals is:  
a. The age of the animals  
b. Nutritional status of the animals  
c. The species characteristics  
d. Photoperiod
149. The starch-digesting enzyme amylase is present in the saliva of some domestic animals. In which animal does the enzyme most abundantly?  
a. Cat  
b. Pig  
c. Horse  
d. Dog
150. Which hormone is responsible for the rupture of fully grown follicles in the ovary?  
a. Progesterone  
b. Luteinizing hormone  
c. Estrogen  
d. Follicle stimulating hormone
151. This is the height were the automatic waterer for suckling pigs is placed  
a. 5-8cm from the floor  
b. 8-10cm from the floor  
c. 12-14cm from the floor  
d. 15-20cm from the floor

152. This is the height where the automatic waterer for weanling pigs is placed
- 10-12cm from the floor
  - 14-16cm from the floor
  - 18-20cm from the floor
  - 22-24cm from the floor
153. This is the height where the automatic waterer for grower pigs is placed
- 10-12cm from the floor
  - 14-16cm from the floor
  - 18-20cm from the floor
  - 22-24cm from the floor
154. This is the height where the automatic waterer for grower pigs is placed
- 16-17cm from the floor
  - 18-19cm from the floor
  - 20-21cm from the floor
  - 22-25cm from the floor
155. The recommended quarantine period for swine
- Not less than 20 days
  - Not less than 40 days
  - Not less than 30 days
  - Not less than 50 days
156. This is a protective mechanism of animals against profound cooling
- hibernation
  - panting
  - estivation
  - chilling
157. This refers to the range of environmental temperature within which the animal does not have to adapt to the environment
- critical temperature
  - comfort zone
  - body temperature
158. Which of the following is not a way of removing moisture or water from the animal's body?
- panting
  - respiration
  - sweating
  - none of the above
159. The average body temperature of goat is
- 37.6 °C
  - 39.1 °C
  - 38.3 °C
  - 40.1 °C
160. This refers to a rise in body temperature that develops during pathological conditions
- fever
  - hyperthermia
  - hypothermia
  - heat stroke
161. The following reproductive biotechnology increases the reproduction rate in the bull, buck, boar or ram.
- Multiple ovulation and Embryo transfer (MOET)
  - Artificial insemination (AI)
  - In vitro fertilization (IVF)
  - Cryopreservation
162. In Mendel's Law of Segregation, the following are stated except
- Genes determine characters
  - Genes occur in pairs
  - Only one of the gene pair is transmitted by a particular gamete
  - Segregation and recombination is random
163. In a segment of DNA, adenine is an example of
- Amino acid
  - Nucleotide

- c. Purine  
d. Pyrimidine
164. \_\_\_\_\_ is the term for gametogenesis in the cow  
a. Fertilization  
b. Heterosis  
c. Oogenesis  
d. Spermatogenesis
165. \_\_\_\_\_ is a segment of the DNA which determines the base sequence of nucleotide in the mRNA that makes up the code for a certain biological function.  
a. Chromosome  
b. Gamete  
c. Gene  
d. Genotype
166. This process in piglet processing is done to prevent/minimize possible tail biting during growing-finishing stage  
a. Cleaning  
b. Needle teeth cutting  
c. Ear notching  
d. tail docking
167. A term applied to sow from weaning until subsequent breeding.  
a. Gestating sow  
b. Dry sow  
c. Lactating sow  
d. Both b and c
168. A system of breeding recommended in the production of slaughter pigs to take advantage of heterosis  
a. Pure breeding  
b. Inbreeding  
c. Upgrading  
d. Crossbreeding
169. A term given to the removal of male testes through surgical means.  
a. Spaying  
b. Caponization  
c. Castration  
d. Vasectomy
170. A term given to piglets after their separation from the dam.  
a. Weanlings  
b. Growers  
c. Finishers  
d. Growing-finishing hogs
171. Arachis pintoii is an example of  
a. Grass  
b. Ornamental  
c. Silage  
d. Legume
172. Measurement of feed consumption by an animal in the pasture  
a. Animal unit  
b. Kilogram  
c. Grams per body weight  
d. Dry matter
173. Thickness x weight x length is  
a. No. of lumber  
b. No. of board feet  
c. No. of post  
d. No. of kilometers
174. Fencing cost is the summation cost of  
a. Labor, nails and wire  
b. Labor and wire  
c. Labor, post and wire  
d. Labor, post, wire and nails
175. A dual type breed of chicken  
a. Cochinchina  
b. Frizzle  
c. Bantam

- d. Cantonese
176. This pigment which is derived from the feed produces the yellow color of the skin and shanks in chicken
- Hemoglobin
  - Xanthophylls
  - Chlorophylls
  - Methionine
177. A collective term for all domestic birds rendering economic services to man and can refer also to dressed carcasses of fowls
- Poultry
  - Broilers
  - Chicken
  - Avian
178. The urine is white to cream colored and much of it consists of a thick, pasty mucoid material that contains
- Hydrochloric acid
  - Gastric acid
  - Ascorbic acid
  - Uric acid
179. The adult male parent turkey is called
- Drake
  - Cock
  - Rooster
  - Tom
180. It refers to the provision of care especially heat and lighting to chicks beginning from the time of hatching until they no longer need it
- Vaccination
  - Brooding
  - Breeding
  - Rearing
181. The Muscovy duck is known scientifically as
- Anas platyrhynchos
  - Cairina moschata
- c. *Anser anser*  
d. *Coturnix coturnix japonica*
182. One of the most popular breed of geese for meat production and is known to be the largest
- Chinese
  - Buff
  - Toulouse
  - Pilgrim
183. Period where embryonic development takes place outside the body of the hen
- Gestation
  - Incubation
  - Hatching
  - B and C only
184. The act of egg laying
- Ovulation
  - Oviposition
  - Deposition
  - Incubation
185. There are three processes involved in urine formation, which of the following is not included?
- Deselective tubular secretion
  - Glomerular filtration
  - Selective tubular reabsorption
  - Selective tubular absorption
186. Spermatids are the cells resulting from the second meiotic division in the seminiferous tubules. What is the term for series of functional and structural changes undergone by a spermatid to become a spermatozoa?
- Mitosis
  - Spermiogenesis
  - Acrosome reaction
  - Spermatogenesis

187. In ruminants dietary carbohydrates are fermented in the rumen to become volatile fatty acids. What VFA is the major source of glucose and glycogen in the ruminant?
- Butyric acid
  - Acetic acid
  - Propionic acid
  - Lactic acid
188. Ventilation is the process by which air is moved in and out of the lungs. The volume of air that moved during each breath is known as
- Respiratory volume
  - Residual volume
  - Inspiratory reserve volume
  - Tidal volume
189. Only the exocrine secretions of the pancreas are involved in the digestive process. Which of the following secretions are involved in the neutralization of the chime from the stomach?
- Amylase
  - Lipase
  - Protease
  - Bicarbonates
190. The S-shape structure in the penis is called the sigmoid flexure. Erection causes extension of this structure. Sigmoid flexure is located pre-scrotally in what male animal?
- Ram
  - Stallion
  - Boar
  - Bull
191. The exposure of animal to extreme environmental heat will initiate a response from its body. Which is not a physiologic response of the animal's body?
- There will be an increase in evaporation loss like sweating and panting
  - There will be vasodilation
  - There will be vasoconstriction
  - All of the above
192. What type of breeding is applied when a native doe is mated with an Anglo-Nubian buck?
- Backcrossing
  - Line breeding
  - Upgrading
  - Inbreeding
193. Water is the most abundant constituent of the body fluids compromising 60% of the total body weight. The following statements best described the functions of water except:
- Transport granular products
  - It functions as a lubricant
  - Helps regulate body temperature
  - All of the above
194. The type of gene action which involve non-allelic interaction of genes with complementary or inhibitory effects.
- Complete dominance
  - Crossing
  - Epistasis
  - Overdominance
195. This is the height were the automatic waterer for grower pigs is placed
- 16-17cm from the floor
  - 18-19cm from the floor
  - 20-21cm from the floor
  - 22-25cm from the floor
196. The recommended quarantine period for swine
- Not less than 20 days
  - Not less than 40 days
  - Not less than 30 days
  - Not less than 50 days
197. The superiority of the crossbred offspring over the average of the purebred parents

- a. Close breeding  
b. Hybrid vigor  
c. Inbred  
d. Line breeding
198. This breed has a major defect on its hind legs particularly the pastern  
a. Duroc  
b. Landrace  
c. Largwe white  
d. Pietrain
199. Cherry red is the most common color of this breed  
a. Duroc  
b. Landrace  
c. Large white  
d. Pietrain
200. An example of hybrid swine present in the country  
a. Duroc  
b. Landrace  
c. Large white  
d. Nieuw Dalland
201. The ears of its kind are medium and pointing upward  
a. Duroc  
b. Landrace  
c. Large white  
d. Nieuw Dalland
202. Thin swine has a very thin backfat thickness among the breeds  
a. Pietrain  
b. Hampshire  
c. Landrace  
d. Duroc
203. This breed has a greater tendency to put on fat  
a. Duroc  
b. Landrace
- c. Large white  
d. Pietrain
204. This breed is black with white band around the heart girth including the front legs  
a. Duroc  
b. Landrace  
c. Hampshire  
d. Yorkshire
205. This breed is black colored with six white points, at the forehead, the forelegs and switch  
a. Berkshire  
b. Duroc  
c. Hampshire  
d. Yorkshire
206. This is the yellow body formed from the ruptured graafian follicle  
a. corpus hemorrhagicum  
b. corpus luteum  
c. corpus albicans  
d. corpus anthrum
207. Phase of estrous cycle where the corpus luteum is developed and progesterone is secreted  
a. proestrus  
b. estrus  
c. metestrus  
d. none of the above
208. The length of estrus period of cattle  
a. 30 hours  
b. 21 hours  
c. 18 hours  
d. 24 hours
209. This is the muscle which retracts the testicles against the body to protect it from excessive cold  
a. bulbocavernous muscle

- b. retractor  
c. cremaster  
d. urethral muscle
210. This refers to animal tissues which are suitable for food  
a. meat  
b. lean  
c. fat  
d. muscle
211. Which is not considered as a red meat?  
a. beef  
b. mutton  
c. pork  
d. none of the above
212. This refers to the meat of rabbit  
a. mutton  
b. star meat  
c. lapan  
d. venison
213. This refers to the meat of cattle slaughtered before one year of age  
a. venison  
b. beef  
c. veal  
d. mutton
214. Which of the following muscles yield the less tender meat?  
a. leg muscle  
b. rib  
c. back muscle  
d. rump
215. Which of the following is not affected by water or moisture content in the meat?  
a. texture  
b. juiciness  
c. color
- d. none
216. \_\_\_\_\_ is the process of the union of the sperm and the egg to form a zygote which develops as a new individual.  
a. Fertilization  
b. Gametogenesis  
c. Meiosis  
d. Mitosis
217. \_\_\_\_\_ is a process by which the germinal cells divide to produce haploid cells each carrying only one-half of the genetic complement of the individual.  
a. Fertilization  
b. Gametogenesis  
c. Meiosis  
d. Mitosis
218. \_\_\_\_\_ is the process of producing the reproductive cells.  
a. Fertilization  
b. Gametogenesis  
c. Meiosis  
d. Mitosis
219. \_\_\_\_\_ is a spontaneous change in the biochemical structure of the gene resulting in an entirely different phenotypic effect.  
a. Migration  
b. Mutation  
c. Random genetic drift  
d. Selection
220. \_\_\_\_\_ is the process in which individuals from one population transfer to another population.  
a. Migration  
b. Mutation  
c. Random genetic drift  
d. Selection

221. \_\_\_\_\_ measures the proportion of the total phenotypic variance that are attributable to the additive effects of genes that influence the trait.
- Heritability
  - Repeatability
  - Dominance
  - Epistasis
222. \_\_\_\_\_ is a result of crossbreeding characterized by a large improvement in the average performance of the F1 progeny over that of the parents.
- Heterosis
  - Random genetic drift
  - Panmixia
  - Linkage
223. \_\_\_\_\_ is when individuals of the sample phenotype (positive) or different phenotype (negative) are mated.
- Assortative
  - Outbreeding
  - Non-random mating
  - Panmixia
224. \_\_\_\_\_ is the capability of a phenotype and a corresponding genotype to survive and reproduce in a given environment.
- Epistasis
  - Fitness
  - Genotype X Environment interaction
  - Panmixia
225. \_\_\_\_\_ causes differential fitness among phenotypes.
- Migration
  - Mutation
  - Random genetic drift
  - Selection
226. A feed ingredient derived from sugar cane milling used to enhance the palatability of the formulated ration.
- Molasses
  - Oil
  - Fish meal
  - All
227. It is a structure necessary to collect semen from the boar where he may mount during semen collection.
- Dummy
  - Dry sow
  - In heat sow
  - All
228. A corn-milling by product utilized in feed formulation.
- Tiki-tiki
  - GYC
  - Corn bran
  - B and c
229. A provision placed at the entrance of the building where all entering person should step on to prevent introduction of possible disease causing organisms into the farm.
- Wheel bath
  - Dipping bath
  - Foot bath
  - Foot spa
230. The following are the purposes in doing castration, except
- It prevents boar taint in meat
  - It promotes fast rate of growth
  - It allows mixing of both sexes during growing-finishing stage
  - None
231. This is done to prevent nutritional anemia among sucklings.
- Injection iron preparation
  - Providing clean soil
  - Supplying iron paste

- d. All
232. This practice is regularly done weekly to prevent proliferation of harmful microorganisms that maybe present in the piggery as part of internal biosecurity.
- Disinfection
  - Cleaning
  - Scrubbing
  - A and b
233. A major plant protein source used in swine feeding.
- Soyameal
  - Copra meal
  - Ipil-ipil leaf meal
  - None
234. A system of breeding recommended in improving the genotype of our native pigs.
- Upgrading
  - Pure breeding
  - Inbreeding
  - Crossbreeding
235. A type of flooring usually preferred for larger pigs.
- Dirt
  - Slat
  - Concrete
  - All
236. A young turkey is called
- Poult
  - Chick
  - Cygnat
  - Gosling
237. A disease characterized by swollen face in poultry
- Fowl Pox
  - CRD
  - Gumboro
  - Infectious Coryza
238. An effective disease prevention and control program should include the following EXCEPT
- Biosecurity
  - Use of disinfectants
  - Use of insecticides
  - Vaccination
239. Secretion of the gizzard which coats the lining membrane and forms the grinding pads
- Gastric juice
  - Koilin
  - Hydrochloric acid
  - Amylase
240. Group of eggs laid by a hen for a successive number of days or on a certain time pattern
- Clutch
  - Collection
  - Fertile eggs
  - Nest
241. Which among the following is a meat breed of duck
- Indian runner
  - New Hampshire
  - Berkshire
  - Muscovy
242. Male of the duck family
- Rooster
  - Cockerel
  - Drake
  - Gander
243. A layer strain of chicken
- Peterson
  - Starbro
  - H and N
  - Pilch

244. An egg takes \_\_\_\_\_ hours to be formed from ovulation to oviposition
- 28
  - 25.5
  - 30
  - 29
245. Incubation period for chicken egg
- 18 days
  - 21 days
  - 24 days
  - 42 days
246. Which type of intraallelic gene action is applied when a black coat (dominant) color Angus cattle is crossed with a red coat (recessive) color, resulting to a heterozygous black color offspring?
- Incomplete dominance
  - Epistasis
  - Complete dominance
  - Overdominance
247. Broiler chicken originated from crossing these two breeds of chicken
- Brahmas and Cochin
  - Cornish and Rhode Island Red
  - Cornish and White Rock
  - White Rock and Rhode Island Red
248. The egg production of layers which is 90% was consistent throughout their laying period layers, this shows the:
- Heterosis
  - Repeated throughout its life
  - Transfer to offspring
  - Repeatability estimate
249. The average superiority of the crossbreds or offspring compared to the average of their parents is called \_\_\_\_\_.  
a. Repeatable estimate
- b. Heterosis  
c. Heritability estimate  
d. None of the above
250. If the heritability estimate is 20%, this means that 80% of the trait expression is
- Transfer to offspring
  - Inherited
  - Repeated throughout its life
  - The improved environmental factors
251. In the selection of breed, this trait is the aptitude to tolerate the environmental conditions without drop in egg production
- Product quality
  - Low feed consumption
  - Hardiness high productivity
  - None of these
252. The manner by which the genetic information is transmitted from parents to offspring is through
- Autosomes
  - Germinal
  - Somatic
  - Gonadal
253. Crossing the first generation with a male belonging to each parent breeds alternatively is
- Crossbreeding
  - Criss-cross
  - Back cross
  - Inbreeding
254. If a Holstein Friesian is mated with a Red Sindhi, the resulting offspring is a/an
- Crossbred
  - Upgraded
  - Inbred
  - None of the above

255. The method of crossing wherein the first generation crosses are mated with their parents:
- Cross breeding
  - Criss-cross
  - Back cross
  - Upgrade
256. This breed has a characteristic 50% black and 50% white colored body with good mothering ability
- Berkshire
  - Hampshire
  - Spotted Poland
  - Yorkshire
257. This breed is well known for the "thick backfat"
- Pietrain
  - Poland China
  - Spotted Poland
  - Yorkshire
258. The hybridization process of mating or crossing of two different species of animals
- Intraspecific
  - Interspecific
  - Crisscrossing
  - Two way crossing
259. The hybridization process of mating the animals belonging to different breeds or strain.
- Crossbreeding
  - Inbreeding
  - Pure breeding
  - Upgrading
260. This intensifies or fixes hereditary qualities and brings about homozygosity to the hogs.
- Close breeding
  - Cross breeding
  - Line breeding
  - Triple crossing
261. The mating of closely related individuals such as brother to sister, sire to daughter and son to dam.
- Close breeding
  - Cross breeding
  - Line breeding
  - Triple crossing
262. The mating of animals in a lesser degree than close breeding like between cousins, half-brother to half-sister, grandparents to grandchildren or vice versa.
- Close breeding
  - Cross breeding
  - Line breeding
  - Triple crossing
263. The successive crossing of progeny to common ancestor
- Backcrossing
  - Criss crossing
  - Triple Crossing
  - Two way Crossing
264. Gilt should be bred to farrow the first litter at
- About 1 year old
  - About 2 year old
  - About 3 year old
  - About 4 year old
265. The lifetime reproductive performance of the sow is affected during
- First Farrowing
  - Second Farrowing
  - Third Farrowing
  - Fourth Farrowing
266. This refer to the application of genetics and physiology of reproduction to animal improvement or "procreation"
- Grading
  - Breeding

- c. Marking  
d. Farrowing
267. This is a protein that greatly influences the tenderness of the muscle after cooking  
a. collagen  
b. reticulin  
c. elastin  
d. myosin
268. These substances in meat are responsible for the so-called "gamey" flavor of meat of wild animals  
a. nitrogenous extractives  
b. fats  
c. sarcoplasmic proteins  
d. carbohydrates
269. Which is not an advantage of fasting animals prior to slaughter?  
a. save feeds  
b. low shrinkage  
c. ease of cleaning entrails  
d. short shelf-life
270. The water requirement for slaughtering a head of cattle or carabao  
a. 30 gallons  
b. 15 gallons  
c. 60 gallons  
d. 35 gallons
271. This refers to the process of making the animal unconscious prior to slaughter  
a. Sticking  
b. Scalding  
c. Stunning  
d. Evisceration
272. The process of wrapping the beef carcass with cheesecloth soaked in lukewarm water
- a. chilling  
b. scalding  
c. shrouding  
d. evisceration
273. This refers to the cutting of carcasses into standard wholesale and retail cuts  
a. fabrication  
b. meat evaluation  
c. grading  
d. meat chopping
274. Which is not included as a wholesale cut of the front quarter of a beef carcass?  
a. ribs  
b. loin  
c. plate  
d. brisket
275. Which of the following wholesale cuts of beef contains the sternum?  
a. chuck  
b. ribs  
c. brisket  
d. loin
276. This refers to 'the process of making a stable milk emulsion  
a. pasteurization  
b. cream separator  
c. homogenization  
d. curding
277. This cut contains part of the 13th rib and the abdominal muscle  
a. flank  
b. shoulder  
c. loin  
d. belly
278. Incubation period for chicken egg

- a. 18 days  
b. 21 days  
c. 28 days  
d. 24 days
279. Average incubation period for goose egg  
a. 18 days  
b. 33-35 days  
c. 28-32 days  
d. 42 days
280. Average incubation period for ostrich egg  
a. 42 days  
b. 33-35 days  
c. 28-32 days  
d. 27 days
281. Brooder pneumonia is caused by  
a. *Mycoplasma gallisepticum*  
b. *Salmonella gallinarum*  
c. *Aspergillus fumigatus*  
d. *Pastuerella multicoda*
282. Recommended length of light hours to stimulate egg production in layers  
a. 8-10  
b. 12-13  
c. 14-16  
d. 21
283. The keel bone is the  
a. Clavicle  
b. "wish bone"  
c. Pygostyle  
d. Sternum
284. A differentiated outpouching of the esophagus at the cervical and thoracic junction  
a. Cecum  
b. Proventriculus
- c. Crop  
d. Gizzard
285. The mouthpart of duck and geese  
a. Bean  
b. Bill  
c. Snout  
d. Muzzle
286. Young domestic *Struthio camelus* in the downy stage  
a. Chick  
b. Poult  
c. Duckling  
d. Keet
287. Internal quality that serves as the most common criterion for total egg acceptability  
a. Taste  
b. Yolk color  
c. Foaming  
d. Nutritional value
288. A progeny of crossing between different species  
a. Mutant  
b. Hybrid Vigor  
c. Hybrid  
d. Cross
289. Segregated early weaning of piglets allows the advantage of  
a. Faster growth rate  
b. Lowest feed cost  
c. Reduced risk of piglet infection and mortality  
d. Increased reproductive rate of sows
290. Which of the following animal traits has the most important influence on animal selection an environmental impact which is highly considered by animal breeders at present?  
a. Mothering ability  
b. Litter size  
c. Growth rate

- d. Feed conversion efficiency
291. A sow bred on March 26 can be expected to farrow on what specific date listed below?
- July 29
  - July 18
  - July 11
  - July 22
292. The economic trait in pigs that can be associated to feed efficiency
- Growth rate
  - Cross bred
  - Litter size
  - Back fat thickness
293. Growth does not only involve increase in size and weight but also changes in the organs. The first to reach full development in the pig's body:
- reproductive organs
  - skeletal system
  - lean muscle
  - adipose tissue
294. Cooked pork contains about 23% protein. How many grams of cooked pork is needed to satisfy 50% of the 35g daily protein allowance a person could consume?
- 65g
  - 99g
  - 56g
  - 76g
295. The following factors that influence puberty except
- Breed
  - Adding new pen mates
  - Stimulation by a boar
  - New animal handlers
296. Mothering ability of a sow is measured by the number of fatteners sold per sow
- piglets weaned per sow per year
  - piglets reared per sow per year
  - piglets born alive per sow per year
297. In the process of upgrading, heterosis is expected to be highest in
- F1 50:50
  - F2 75:25
  - F3 87.5:12.5
  - All equal
298. The mating of animals having diverse genotypes or genetic composition.
- Hybridization
  - Outbreeding
  - Pure breeding
  - Inbreeding
299. The mating back of thee crossbred progeny to the parent stock using them alternately
- Inbreeding
  - Crisscrossing
  - Grading
  - Backcrossing
300. This is done by applying pressure on the rump with both hands.
- Riding-the-back-test
  - Haunch pressure test
  - Semen-on-Snout-Test
  - Teaser Method
301. This is done by riding the back or pressing the loin or back of the animal.
- Riding-the-back-test
  - Haunch pressure test
  - Semen-on-Snout-Test
  - Teaser Method

302. This is done by placing sample of fresh semen on the snout of the female by either plain hand or from a squeeze bottle.
- Riding-the-back-test
  - Haunch pressure test
  - Semen-on-Snout-Test
  - Teaser Method
303. This is done by placing boar beside the gilt or sows pigpen.
- Riding-the-back-test
  - Haunch pressure test
  - Semen-on-Snout-Test
  - Teaser Method
304. Increasing the nutrient intake prior to breeding and during ovulation to increase the productivity of the sow or gilt.
- Flushing
  - Gestating
  - Breeding
  - Farrowing
305. The time or period between breeding and farrowing.
- Lactation
  - Gestation
  - Ovulation
  - Parturition
306. The act of giving birth to a litter of pigs.
- Lactating
  - Barrowing
  - Gestating
  - Farrowing
307. The time from farrowing until weaning.
- Lactation
  - Gestation
  - Parturition
  - Ovulation
308. The process in which certain individuals are preferred to produce in the next generation.
- Ovulation
  - Lactation
  - Selection
  - Gestation
309. Which is not included as primal cuts of pork?
- loin
  - shoulder
  - ham
  - brisket
310. The predominant carbohydrate in milk
- galactose
  - maltose
  - lactose
  - fructose
311. Milk is not rich in this mineral
- iron
  - calcium
  - zinc
  - fructose
312. Strain of broiler used in the contract growing scheme of Tyson's agribusiness ventures
- Cobb
  - Anak
  - Magnolia
  - Peterson
313. Commercial broiler strains available in the market except
- Pilch
  - H and N
  - Hybro
  - Starcross
314. Arbor acre is locally known as
- Lohmann
  - Magnolia
  - Ross

- d. Hubbard
315. The common type of house intended for broiler contract growing is
- litter floor
  - range
  - slat floor
  - battery cages
316. In brooding chicks, old newspapers are used as bedding to
- serve as litter to absorb moisture of manure
  - teach birds to recognize pictures
  - improve the walking stance of chicks for better growth
  - conserve heat for brooding as insulator
317. In raising 200 broilers in the litter floor, how many feeding trough of one meter length, both sides can be used are required? The feeding space is 4cm/bird
- 3
  - 5
  - 4
  - 6
318. \_\_\_\_\_ is the difference of the mean phenotypic value between the offspring of the selected parents and the whole of the parental generation before selection.
- Selection differential
  - Response to selection
  - Selection intensity
  - Genetic standard deviation
319. \_\_\_\_\_ is when certain genotypes perform well under certain environments than other genotypes.
- Epistasis
  - Fitness
  - Genotype X Environment interaction
  - Panmixia
320. \_\_\_\_\_ is a form of non-random mating except
- Assortative mating
- b. Disassortative
- c. Inbreeding
- d. Panmixia
321. The following are examples of outbreeding except
- Crossing of inbred lines
  - Full sib mating
  - Interspecific hybridization
  - Upgrading
322. According to the Hardy-Weinberg Law, the following are factors that affect gene and genotypic frequency in a breeding population except
- Migration
  - Mutation
  - Selection
  - Verification
323. The following is a consequence of inbreeding except
- Exposure of undesirable recessive gene combinations
  - Hybrid vigor
  - Inbreeding depression
  - A and C only
324. The scientific name of chicken is
- Anas platyrhynchos
  - Coturnix coturnix japonica
  - Gallus gallus domesticus
  - Meleagris gallopavo
325. \_\_\_\_\_ is a technique wherein a young embryo is collected from a donor female parent and then implanted into the uterus of a recipient.
- Multiple ovulation and Embryo transfer (MOET)
  - Artificial insemination (AI)
  - In vitro fertilization (IVF)
  - Cryopreservation
326. In general, traits that are associated with reproduction (e.g., fertility and litter size) have \_\_\_\_\_ heritabilities

- compared to those that are associated with production and product quality traits (e.g. growth rate and back fat thickness).
- a. Higher
  - b. Lower
  - c. The same
  - d. Unknown
327. The scientific name of goats is
- a. *Bubalus bubalis*
  - b. *Capra hircus*
  - c. *Equus caballus*
  - d. *Ovis aries*
328. This is the upgrade developed between a Jala-jala native pig in Laguna and Berkshire
- a. Diani
  - b. Kaman
  - c. Berla
  - d. Berkjala
329. The following are the type of drinkers adopted in raising pigs, except
- a. Nipple
  - b. Bite
  - c. Water dispenser
  - d. Bowl
330. The following are the advantages derived through AI, except
- a. One ejaculate serves 8-10 sows
  - b. It extends the usefulness of a good proven dam.
  - c. It prevents injury among boar and sow during service
  - d. It allows the breeding of boar and sow of different sizes.
331. A non-surgical method of castration applied in pigs
- a. Single slit
  - b. Burdizzo
  - c. Improvac
  - d. Elastrator
332. A term for a male pig used for breeding
- a. Junior boar
  - b. Stag
  - c. Senior boar
  - d. A and c
333. A method of feeding ideal for pregnant sows during the first 2 months of pregnancy to prevent her from becoming too fat.
- a. Restricted
  - b. Controlled
  - c. Full
  - d. A and b
334. It is the only method used in identifying pigs for international trade employing the use of numbered plastic or metal materials.
- a. Ear notching
  - b. Ear tagging
  - c. Tattooing
  - d. All
335. A system of raising pigs where all classes of pigs are housed in one building.
- a. Life cycle system
  - b. Monitor
  - c. Conventional
  - d. none
336. If a dry sow was inseminated in April 29, what is her expected date of farrowing?
- a. Aug 25
  - b. July 21
  - c. Aug 21
  - d. July 25
337. If the said sow is to be treated against mange 14 DBF, when shall it be done?
- a. July 7
  - b. Aug 17
  - c. Aug 7
  - d. July 17

338. If the sucklings should be creep feed 5 DAF, when should it start?  
a. Aug 26  
b. July 28  
c. Aug 28  
d. July 26
339. If we adopt the farmers conventional weaning practice of 35 days, what is the expected date of weaning the litter?  
a. Sept 23  
b. Sept 20  
c. Sept 28  
d. Sept 25
340. If the males in the litter will be castrated on the 26<sup>th</sup> day of August, what is their age at castration time?  
a. 7d  
b. 14d  
c. 5d  
d. 1wk
341. If the litter will be fattened for 4 months from the date of farrowing, when will these hogs be marketed?  
a. Dec 30  
b. Dec 29  
c. Dec 19  
d. Dec 25
342. Avian pest is also known as  
a. Fowl Pox  
b. Lymphoid Leukosis  
c. New Castle Disease  
d. Aspergillosis
343. Given the following FCR values, which value shows the most efficient feed conversion?  
a. 2.5  
b. 1.6  
c. 3.0
344. Cairina moschata eggs take how many days to hatch?  
a. 21  
b. 42  
c. 33-35  
d. 27
345. Broiler starter ration should contain \_\_\_\_\_ protein?  
a. 19%  
b. 15%  
c. 25%  
d. 17%
346. How many functional ovaries does a normal sexually mature hen possess?  
a. 1  
b. 2  
c. 3  
d. 0
347. Vaccine usually administered to day-old chicks at the hatchery  
a. NCD vaccine  
b. Bursal Disease vaccine  
c. Marek's Disease vaccine  
d. Brooder Pneumonia vaccine
348. Average incubation period for turkey eggs  
a. 21 days  
b. 28 days  
c. 27 days  
d. 42 days
349. Albumen is deposited around the yolk when the egg reaches this section of the avian reproductive tract  
a. Magnum  
b. Fimbria  
c. Vagina  
d. Cloaca
350. Surgically castrated male poultry

- a. Stag  
b. Barrow  
c. Capon  
d. Gelding  
e. Steer
351. The most popular white-egg layer which constitutes about 66% of market share worldwide  
a. Hy-line  
b. Hubbard  
c. Bovans  
d. Shaver
352. The hen house average of 500 layers that laid 400 eggs  
a. 1.25%  
b. 80%  
c. 20%  
d. 35%
353. When piglets have the tendency to have thick carcass fat they tend to:  
a. Have high lean percentage  
b. Reach market weight fast  
c. Have a high feed conversion ratio  
d. Resist heat stress effectively
354. The physical attributes of a gilt that can describe its potential for mothering ability are:  
a. Shape and size of vulva  
b. Legs and back  
c. Mammary system and body length  
d. Development of ham, loin and shoulder
355. Small piglets are prone to this condition:  
a. Anorexia because of smaller surface to body ratio  
b. Hyperthermia  
c. Hypothermia  
d. Hypoxia
356. False heat occurs in gilts after transport when they are above this age:  
a. 125 days old  
b. 200 days old  
c. 175 days old  
d. 150 days old
357. Excessive restriction before and after the first few days of farrowing can cause excessive sow excitement. Often, this is due to:  
a. Malnutrition resulting to an increase in piglet's death by crushing  
b. Excitement  
c. Stress  
d. Hunger
358. A good parent stock should produce an offspring that has an average daily gain of more than this weight:  
a. 750 grams  
b. 700 grams  
c. 550 grams  
d. 650 grams
359. When there is delayed parturition, the piglet will suffer from lack of oxygen. This condition is termed as:  
a. Toxemia  
b. Anorexia  
c. Hypoxia  
d. Anemia
360. A sow was served by artificial insemination. At what stage can it be assumed pregnant?  
a. Mammary system enlarge and milk is secreted  
b. Markedly gained weight  
c. Absence of estrus after 2<sup>nd</sup> heat control or day 42 after mating  
d. Missed heat period after 3 weeks

361. What happens if there is frequent changing on the position of the sow?
- It will decrease feed intake
  - There is exhaustion of energy
  - It can result to crushing
  - It will increase feed intake
362. Shelf life of a processed boar semen for artificial insemination can be prolonged by storing at this temperature at approximately 40 hours after onset of estrus.
- 20 °C
  - 2-8 °C
  - 10-14 °C
  - 16-17 °C
363. A group of proteins that are polymers.
- Amino acids
  - Energy
  - Vitamins
  - Minerals
364. They are composed of sugar and starches and are the primary source of energy for the pigs.
- Amino acids
  - Energy
  - Vitamins
  - Minerals
365. The indispensable amino acid
- Cystine
  - Alanine
  - Tyrosine
  - Lysine
366. The dispensable amino acid
- Aspartic
  - Arginine
  - Leucine
  - Histidine
367. This serves also as major source of energy for pigs.
- Minerals
  - Fats
  - Fiber
  - Ash
368. It has low energy nutrient content which is less digestible to pigs.
- Minerals
  - Fats
  - Fiber
  - Ash
369. They are classified into complex organic compounds needed in pigs health and normal body processes
- Minerals
  - Fats
  - Fiber
  - Vitamins
370. They are extremely important to proper animal development
- Minerals
  - Fats
  - Water
  - Fiber
371. The most essential and cheapest of all nutrients.
- Minerals
  - Fats
  - Water
  - Fiber
372. The most accepted way of testing the pig for leptospirosis and brucellosis.
- Riding-the-back-test
  - Haunch pressure test
  - Semen-on-Snout-Test
  - Blood Test
373. The brood sow ration contains CP Equivalent to

- a. 14%  
b. 15%  
c. 16%  
d. 17%
374. The crude protein content parent stock  
a. 12-14% CP  
b. 17-18% CP  
c. 16-17% CP  
d. 18-21% CP
375. Gumboro disease is also known as  
a. Avian Pest  
b. Infectious Bursal disease  
c. Fowl Pox  
d. Marek's disease
376. The limiting constraints why broilers cannot be extensively raised in rural areas  
a. diseases and parasites  
b. labor requirement  
c. feeds  
d. marketing and distribution
377. The disease commonly observed in brooding with moist or wet litter causing brooder pneumonia or  
a. coccidiosis  
b. avian pasteurellosis  
c. aspergillosis  
d. mycoplasmosis
378. The average bodyweight of modern broilers now is about \_\_\_\_  
35-37 days  
a. 2.0 kg  
b. 1.7 kg  
c. 1.4 kg  
d. 1.0 kg
379. When the FCE of broiler is 19 it means  
a. broiler will have to eat 1 kg feed to produce 1.9 kg bodyweight  
b. feeding 1.9 kg feed to produce one kg of broiler  
c. the total feed intake of one broiler is kg  
d. bodyweight of 1.9 kg will be achieved by feeding only 1 kilo
380. Broilers can be raised any time of the year for about per year if the duration of one cycle is 38 days, cleaning of 3 days, selling of 14 days and chick order of 7 days  
a. 5 batches  
b. 9 batches  
c. 7 batches  
d. 3 batches
381. The highest cost expenses aside from feeds in broiler production  
a. labor cost  
b. chick cost  
c. depreciation  
d. light, heat and water
382. The world-wide numbers of breeds of fowls  
a. more than 300  
b. more than 200  
c. more than 100  
d. more than 400
383. Population of small number of birds isolated within the breed that is responsible with specific characteristics  
a. breed  
b. cross  
c. strain  
d. in-breed
384. The chromosome number of the carabao is  
a.  $2n=38$   
b.  $2n=48$   
c.  $2n=54$

- d.  $2n=78$
385. The total number of carabaos owned mostly by smallholder farmers in the Philippines is approximately
- 30,000
  - 300,000
  - 3 million
  - 30 million
386. The reproductive rate (i.e. expected number of young produced per year) in pigs is
- 0.5
  - 1 to 3
  - 10 to 25
  - 50 to 300
387. Splanchnic circulation is a part of systemic circulation that supplies blood to the
- Heart
  - Kidney
  - Liver
  - Digestive tract
388. Sexual receptivity which coincides with estrus in animals that exhibit estrous cycle is due to large amount of \_\_\_\_\_.
- Testosterone
  - Progesterone
  - Estrogen
  - Relaxin
389. Hypertrophy and hyperplasia of the thyroid gland cells are compensatory mechanisms to counteract the deficiency of which mineral?
- Iodine
  - Phosphorus
  - Calcium
  - Iron
390. Gigantism results from the hypersecretion of which hormone before the closure of the epiphyseal-diaphyseal plate of the long bones.
- Prolactin
  - Luteinizing hormone (LH)
  - Follicle stimulating hormone (FSH)
  - Somatotrophic hormone (STH)
391. Destruction of the beta cells of the \_\_\_\_\_ will lead into a disease condition known as diabetes mellitus.
- Liver
  - Kidney
  - Pancreas
  - Adrenals
392. A kind of blood cell (cellular element) which is non-nucleated and contains a red pigment called hemoglobin
- Erythrocyte
  - Lymphocyte
  - Thrombocyte
  - Monocyte
393. The artery at the base of the tail of an animal where the pulse is detected is called
- Femoral artery
  - Coccygeal artery
  - Saphenous artery
  - Pulmonary artery
394. All these are viral diseases except
- Fowl pox
  - Fowl cholera
  - Marek's disease
  - New Castle Disease
395. Hitcher B strain vaccine is administered to boost immunity against
- Fowl Cholera
  - Marek's Disease

- c. Fowl Pox  
d. Avian Pest
396. Test done to check the quality/fertility of eggs prior to incubation  
a. Culling  
b. Candling  
c. Kindling  
d. Kandling
397. This hormone is responsible to broodiness in poultry  
a. Progesterone  
b. Oxytocin  
c. Prolactin  
d. Endorphin
398. Which is the so-called "wish bone" of chicken?  
a. Radius  
b. Clavicle and coracoid  
c. Ulna  
d. Sternum
399. One of the oldest breeds of chicken developed in Italy in 1900  
a. Leghorn  
b. Cornish  
c. Wyandotte  
d. Cornish
400. Reproductive organ in female poultry that produces the shell  
a. Isthmus  
b. Uterus  
c. Magnum  
d. Vagina
401. The science that deals with the study of the development of an organism from a zygote to a fetus  
a. Anatomy  
b. Embryology  
c. Histology  
d. Comparative Anatomy
402. A branch of anatomy that deals with the study of joints  
a. Mycology  
b. Osteology  
c. Arthrology  
d. Neurology
403. It refers to the lips of animals that belong to Order Anseriformes  
a. Snout  
b. Muzzle  
c. Beak  
d. Bill
404. It refers to the excess skin on the ventral side of the neck of Bos indicus  
a. Knobs  
b. Crop  
c. Dewlap  
d. Withers
405. Medicine given intramuscularly to cattle are introduced in the  
a. Brisket and dewlap  
b. Rump and neck  
c. Loin and back  
d. Flank and udder
406. The part in the external anatomy of the Sus scrofa where the tibia, fibula and metatarsus join  
a. Thigh  
b. Pastern  
c. Leg  
d. Hock
407. The excess skin hanging from the lower jaw of turkey  
a. Bean  
b. Snood  
c. Comb  
d. Caruncles

408. Vertebra in the neck region
- Cervical
  - Thoracic
  - Lumbar
  - Coccygeal
409. Normal breathing is referred to as
- Eupnea
  - Dyspnea
  - Polypnea
  - Hypernea
410. Hormone secreted by the anterior pituitary gland in response to an abnormally high circulating Ca
- Calcitonin
  - Aldosterone
  - Mineralocorticoids
  - Vasopressin
411. Undersecretion of thyroid hormones due to a defect in the thyroid gland or lack of iodine will result to \_\_\_\_\_ in young animals
- Cretinism
  - Myxedema
  - Muscle cramps and tetany
  - Addison's Disease
412. Animal whose testicles fail to descend into the scrotum are called
- Impotent
  - Free martin
  - Infertile
  - Cryptorchid
413. In bulls, luteinizing hormone functions to stimulate
- Spermatocytogenesis
  - Spermatogenesis
  - Testosterone secretion
  - Spermiogenesis
414. The minimum required sperm count per inseminate is 3 billion. A 300 L ejaculate with a concentration of 200 million sperm cells per ml can produce how many inseminate?
- 23 doses
  - 18 doses
  - 15 doses
  - 20 doses
415. A sow failed to give birth on the expected date and appears to give no sign of impending parturition. What is the immediate action to take?
- Check sow for pseudo pregnancy
  - Check breeding record for possible error on the date of breeding
  - Prepare for caesarian operation of the sow
  - Administer exogenous hormone to induce parturition
416. Early introduction of solid diet to sucking piglets is primarily intended to:
- Prevent loss of body condition of the sow
  - Augment feed intake of piglets
  - Allow early weaning to increase reproduction rate of the sow
  - Ensure heavy piglets at weaning
417. Normally, a lactating sow is given 2 kg feeds for maintenance plus 0.3 kg per piglet and  $\pm$  0.5 kg based on body condition. A sow late in lactation was in poor condition for raising 13 piglets. To recover, the ration of the sow must be:
- 6.4 kg/day
  - 2.8 kg/day
  - 8.0 kg/day
  - 5.9 kg/day
418. A sow on its first parity gave birth to only 6 piglets. The best decision to undertake is:
- Try new method of mating the sow
  - Cull the sow for having poor reproductive performance

- c. Retain the sow up to 3<sup>rd</sup> parity  
d. Review performance of the AI technician
419. In case pre-weaning piglets suffer scouring, the immediate course of action must be:  
a. Administer antibiotics to the sow  
b. Withdraw solid feed given to piglets  
c. Administer antibiotics to the piglets  
d. Withdraw feed of the sow
420. *Trichuris suis* is a whipworm of pig and the adult worm could be located in the:  
a. Stomach  
b. Liver  
c. Small intestine  
d. Cecum
421. A sow apparently having difficulty in farrowing. The appropriate assistance to the sow to undertake is:  
a. Allow the sow to stand  
b. Administer oxytocin to enhance contraction of the uterus  
c. Leave the sow alone  
d. Check for obstruction in the birth canal
422. Which of the following endoparasites is transmitted prenatally?  
a. *Diocophyema renale*  
b. Pig threadworm  
c. *Trichuris suis*  
d. *Ascaris suis*
423. Which of the following is not considered as a zoonotic disease?  
a. Rabies  
b. Tuberculosis  
c. Infectious Bursal Disease by virus  
d. Anthrax
424. Which of the following swine diseases exclusively affects only pigs?  
a. Tetanus  
b. Foot and mouth disease
- c. Pseudorabies  
d. Hog Cholera
425. Pullorum Disease is also called Bacillary White Diarrhea in poultry. This is chiefly transmitted directly through the egg but also by direct or indirect contact. This disease is best prevented by  
a. Routine testing of breeding stock  
b. Use of antibiotics  
c. Vaccination  
d. All of the above
426. This disinfectant is often used to cover dead carcasses that are buried.  
a. Formalin  
b. Phenol  
c. Calcium oxide  
d. Chlorine
427. This is common antidote given to animal that have suffered allergic reactions to a vaccine  
a. Acetylcholine  
b. Sugar  
c. Glycine  
d. Epinephrine
428. This nutritional deficiency cause rickets in young and osteomalacia in adults  
a. Vitamin K deficiency  
b. Vitamin A deficiency  
c. Vitamin D deficiency  
d. Vitamin E deficiency
429. Surra is a protozoan disease of horse and ruminants which is commonly transmitted by biting flies. It causes intermittent fever and anemia, and the causative agent for this disease is.  
a. *Trypanosoma brucei*  
b. *Trypanosoma evansi*  
c. *Trypanosoma cruzi*

- d. *Trypanosoma equiperdum*
430. The digestible energy required in brood sow ration  
a. 3100  
b. 3200  
c. 3300  
d. 3400
431. The amount of calcium required in brood sow ration  
a. 0.70  
b. 0.75  
c. 0.80  
d. 0.85
432. The amount of phosphorus required in brood sow ration  
a. 0.35  
b. 0.40  
c. 0.45  
d. 0.50
433. The digestible energy required in pregnant gilt.  
a. 6200  
b. 6400  
c. 6600  
d. 6800
434. The minimum rest in days of the farrowing pens between farrowing  
a. 7  
b. 14  
c. 21  
d. 28
435. The gestation period of sow is  
a. 90 days  
b. 100 days  
c. 107 days  
d. 114 days
436. The longest gestation period of normal pigs farrowed recorded  
a. 126 days
- b. 136 days  
c. 146 days  
d. 156 days
437. The number of hours when the milk is present in the sow that is about to farrow.  
a. 24 hours  
b. 48 hours  
c. 72 hours  
d. 96 hours
438. The lactating ration contains CP equivalent to  
a. 14%  
b. 15%  
c. 16%  
d. 17%
439. The digestible energy required in lactating ration  
a. 0.60  
b. 0.65  
c. 0.70  
d. 0.75
440. The amount of calcium required in lactating ration  
a. 0.60  
b. 0.65  
c. 0.70  
d. 0.75
441. The amount of phosphorus required in lactating ration  
a. 0.35  
b. 0.40  
c. 0.45  
d. 0.50
442. Feeding of newly farrowed sow will resume when  
a. On the second day  
b. On the third day  
c. On the fourth day  
d. On the fifth day

443. The optimum feed allowance given to the sow for piglet requirement during lactation period.
- 0.50 kg per piglet
  - 0.75 kg per piglet
  - 1.00 kg per piglet
  - 1.25 kg per piglet
444. The cutting of umbilical cord from the base in newly born piglet
- 0.60 to 0.65 inches
  - 0.70 to 0.75 inches
  - 1.50 to 2.00 inches
  - 2.5 to 3.00 inches
445. The good creep ration contains CP equivalent to
- 16%
  - 18%
  - 20%
  - 22%
446. The digestible energy required in lactating ration
- 3000
  - 3500
  - 4000
  - 4500
447. The amount of calcium required in lactating ration
- 0.60
  - 0.70
  - 0.80
  - 0.90
448. The amount of phosphorus required in lactating ration
- 0.60
  - 0.70
  - 0.80
  - 0.90
449. The usual recommended reduction of a sows feed before weaning
450. The recommended number of days for the gradual change of feeds in the feeding the pigs
- 2 to 3 days
  - 4 to 5 days
  - 6 to 7 days
  - 8 to 9 days
451. The recommended type of roofing in constructing piggery houses
- Semi-monitor
  - Monitor
  - Gable
  - Shed
452. Leghorn breed has plumage colors of
- white
  - silver
  - black
  - all of these
453. The progeny of two different breeds or strains belonging to single species
- cross
  - strain
  - hybrid
  - inbreed
454. The method of crossing wherein the first generation crosses are mated with their parents
- back cross
  - upgrade
  - criss-cross
  - cross breeding

455. Crossing the first generation with a male belonging to each of the parent breeds alternately
- criss-cross
  - upgrade
  - back cross
  - inbreeding
456. In the selection of breed, this trait is the aptitude to tolerate the environmental conditions without drop in egg production
- hardiness high productivity
  - product quality
  - low feed consumption
  - none of these
457. The breed of commercial hybrid layers with white eggs
- White Leghorn
  - New Hampshire
  - Barred Plymouth Rock
  - Rhode Island Red
458. Example of layer from the Institute of Animal Science (IAS) strain
- Warren
  - Hissex
  - Starcross
  - Golden comet
459. The red jungle fowl from east java, Burma, Thailand and Sumatra
- Gallus bankciva
  - Gallus varius
  - Gallus soneratti
  - Gallus lafayetti
460. Class of chicken based on purpose use of breeding
- economic
  - weight
  - standard
  - all of these
461. Annual egg production of native chicken
- 50-60 eggs
  - 200-240 eggs
  - 100-150 eggs
  - 260-280 eggs
462. Term applied to designated mature domestic cocks and hens
- poultry
  - chicken
  - fowl
  - chicks
463. \_\_\_\_\_ is a type of bone that contains air spaces or sinuses that communicate with the exterior.
- Pneumatic bone
  - Sesamoid bone
  - Flat bone
  - Long bone
464. \_\_\_\_\_ are the muscles attached to the bones of the skeleton, which are usually referred to us the flesh or meat of our animals.
- Cardiac muscles
  - Involuntary muscles
  - Smooth muscles
  - Skeletal muscles
465. Animals which feed on both plants and other animals are called
- Herbivores
  - Carnivores
  - Omnivores
  - None of the above
466. The most important contribution of animals to human welfare is
- Companionship
  - Clothing
  - Traction

- d. Food
467. The scientific name of horse is  
a. Equus caballos  
b. Bos Taurus  
c. Equus asinus  
d. Bos indicus
468. The basic functional unit of the nervous system is called  
a. Nephron  
b. Neuron  
c. Alveoli  
d. None of the above
469. Nerve cells do not come in direct contact with one another, instead there is a small gap of about 200 Angstrom units between them. This gap is called  
a. Synapse  
b. Perivitelline space  
c. Axonal end  
d. None of the above
470. \_\_\_\_\_ is defined as a substance or chemical mediator which is produced by an endocrine gland and carried by the blood to some distant parts of the body where it exerts its effects.  
a. Enzyme  
b. Toxin  
c. Hormone  
d. Vitamin
471. The atrio-ventricular (A-V) valves prevent the backflow of blood from the ventricle to the atrium during ventricular systole. The A-V valve present on the right side of the heart is called  
a. Pulmonary valve  
b. Tricuspid valve  
c. Aortic valve  
d. Bicuspid valve
472. A specialized structure at the right atrial wall of the heart and is referred to usually as the cardiac pacemaker  
a. Atrio-ventricular node  
b. Bundle of His  
c. Sino-Atrial node  
d. Purkinje network
473. The artery at the middle of the lower jaw where pulse in the horse is usually determined  
a. External maxillary artery  
b. Saphenous artery  
c. Femoral artery  
d. Coccygeal artery
474. This systemic circulation supplies blood to the heart itself.  
a. Coronary circulation  
b. Cerebral circulation  
c. Hepatic circulation  
d. Renal circulation
475. The cellular element that liberates thromboplastin which is important in blood clotting called  
a. Red blood cell  
b. White blood cell  
c. Platelet  
d. None of the above
476. Blood can carry oxygen to different parts of the body because of the conjugated protein present in the red blood cell. This conjugated protein which binds oxygen is called  
a. Myoglobin  
b. Hemoglobin  
c. Immunoglobulin  
d. Transferrin
477. \_\_\_\_\_ is the hormone responsible for milk ejection in a lactating mammary gland.  
a. Prolactin  
b. Calcitonin

- c. Oxytocin  
d. Epinephrine
478. This hormone helps in reducing urine volume by increasing reabsorption of water in the collecting ducts of the kidney.  
a. Vasopressin  
b. Adrenalin  
c. Oxytocin  
d. Prolactin
479. The structural and functional unit of the kidney is called  
a. Axon  
b. Nephron  
c. Calyx  
d. Neuron
480. \_\_\_\_\_ is the primary sex organ of the female animal. It is responsible for the production of the ovum and the female gonadal hormones  
a. Ovary  
b. Vagina  
c. Cervix  
d. Uterus
481. \_\_\_\_\_ is the site of implantation of the fertilized ovum in livestock  
a. Oviduct  
b. Horns of uterus  
c. Cervix  
d. Vagina
482. An animal whose testes remained inside the body cavity and failed to descend to the scrotum is called  
a. Capon  
b. Castrate  
c. Cryptorchid  
d. Eunuch
483. These are cells in the testis which are responsible for the production of the hormone testosterone  
a. Epithelial cells  
b. Leydig cells  
c. Sertoli cells  
d. None of the above
484. Hormone secreted by the uterus that causes the corpus luteum to regress  
a. Oxytocin  
b. Prostaglandin  
c. Prolactin  
d. Interferon tau
485. The period when milk production is maintained under the influence of prolactin is  
a. Mammogenesis  
b. Lactogenesis  
c. Galactopoiesis  
d. Milk let-down
486. Unpaired reproductive gland in male that secretes an alkaline substance responsible for the characteristic semen odor of Sus scrofa  
a. Seminal vesicle  
b. Prostate gland  
c. Cowper's gland  
d. Vesicular gland
487. Recommended and most economically advantageous time to breed sows after parturition  
a. 60-90 days after parturition  
b. 3-9 days after weaning  
c. 1<sup>st</sup> heat after parturition  
d. Anytime
488. Main site of microbial digestion in ruminants  
a. Omasum  
b. Reticulum  
c. Rumen  
d. Abomasum

489. The number of chromosomes in swine
- 30 pairs
  - 19 pairs
  - 27 pairs
490. Important conditions in a Hardy-Weinberg Equation include the following except
- Large population
  - Selection
  - No migration
  - Random mating
491. The ability to produce milk in dairy cattle is an example of
- Sex-limited trait
  - Sex-influenced trait
  - Sex-linked trait
  - No linkage
492. The presence of horn in sheep is an example of
- Sex-limited trait
  - Sex-influenced trait
  - Sex-linked trait
  - Autosomal linkage
493. The sex chromosomes of a stallion
- XX
  - XY
  - ZZ
  - ZW
494. Gregor Mendel, who established the first laws of heredity is an
- Australian monk
  - Austrian monk
  - Chinese Buddhist
  - Belgian priest
495. A description of the characteristics of an individual or the observable manifestation of the traits it possess
- Genotype
  - Phenotype
496. Genes that occupy the same loci but affect the same trait in a different manner
- Gene
  - Allele
  - Locus
  - Chromosome
497. Gene action resulting in the phenotype of the heterozygote being better than the average phenotypes of both purebred parents
- Additive gene action
  - Overdominance
  - Epistasis
  - Incomplete dominance
498. Mating of unrelated Large White and Large White boar
- Crossbreeding
  - Outcrossing
  - Outbreeding
  - Inbreeding
499. The best source of information that can determine the traits of an animal when slaughtered is
- Individual performance
  - Pedigree information
  - Sib performance
  - Performance of collateral relatives
500. Method of selection that is currently the most practical to use when several traits are considered at a time
- Independent culling level
  - Selection index
  - Sib selection
  - Upgrading
501. Mating of a native cow to a purebred bull for the purpose of improving the performance of the native breed

- a. Backcrossing  
b. Purebreeding  
c. Line breeding  
d. Upgrading
502. Which of these could be considered both as antiseptic and disinfectant?  
a. Formalin  
b. Ethyl alcohol  
c. Cresol  
d. Hydrogen peroxide
503. The disease condition cause by lice in animals is known as  
a. Surra  
b. Pediculosis  
c. Mange  
d. Dermatitis
504. Which of the following dewormers is best used for roundworms?  
a. Triclabendazole  
b. Rafoxanide  
c. Levamisole  
d. Praziquantel
505. Infectious diseases are caused by microorganisms and could be classified as contagious or non-contagious. Which of the following diseases is considered as noncontagious infectious diseases?  
a. Tuberculosis  
b. Hog Cholera  
c. Tetanus  
d. Pseudorabies
506. Parturient milk fever paresis in cattle is treated by giving calcium gluconate, which is best given through this route:  
a. Orally  
b. Intramuscular  
c. Subcutaneous  
d. Intravenous
507. Foot and mouth disease is a contagious viral disease of ruminants and pigs which is characterized by fever, vesicles in the mouth and foot areas. The following are the recommended preventive measures for FMD except:  
a. Strict restriction on movement of animals and vehicles around the infected premises  
b. Vaccination  
c. Slaughter of all affected and in-contact susceptible animals  
d. None of the above
508. This hormonal disease is caused by the absence or lack of Antidiuretic Hormone (ADH)  
a. Pernicious anemia  
b. Diabetes insipidus  
c. Diabetes mellitus  
d. Goiter
509. A newly castrated piglet was found dead with extended stiff limbs, erect ears and also with stiff tail. The piglet is suffering from what disease?  
a. Pseudorabies  
b. Blackleg  
c. Parturient paresis  
d. Tetanus
510. A reactive defense of the body that results from increase in body temperature brought by the presence of microorganisms in the body of animal is termed  
a. Chill  
b. Hypothermia  
c. Fever  
d. Hyperthermia
511. The infective stage of *Fasciola gigantica* in ruminants is the:  
a. Cercaria  
b. Mertacecaria  
c. Miracidium

- d. Rediae
512. Coccidiosis is common in chicken. This can cause decreased growth rate to high disease is
- Protozoa
  - Roundworm
  - Flatworm
  - Bacteria
513. Fowl pox is a common disease of chicken which is characterized by proliferative lesions in the skin that progress to thick scabs and by lesions in the gastrointestinal tract and respiratory tract. Which of the following is not vaccinated against Fowl Pox?
- Breeders
  - Layers
  - Broilers
  - None of the above
514. Toxoid is the recommended preventive measure for Tetanus in pigs, ruminants and horses. Giving of toxoid will enhance what type of immunity?
- Artificial active immunity
  - Natural passive immunity
  - Natural active immunity
  - Artificial passive immunity
515. Avian pneumoencephalitis is a common poultry disease that is characterized by respiratory signs like coughing and sneezing coupled with nervous signs such as twisting of the neck, paralysis and drooping wings. This disease is caused by
- Paramyxovirus
  - B.Poxvirus
  - Birnavirus
  - Coronavirus
516. Which of the following animals is most sensitive to the neurotoxin produced by *Clostridium tetani*?
- Pig
- b. Chicken
- c. Horse
- d. Dog
517. The total number of animals carried per unit of pasture and it is measured in terms of animal unit is:
- General herd
  - Stocking rate
  - Grazing pressure
  - Stocking density
518. The recommended period for the actual use of vaccines after mixing with diluent
- 30 minutes
  - 40 minutes
  - 50 minutes
  - 60 minutes
519. The number of days after vacation that pigs should not be bathed
- 2 to 3 days
  - 4 to 5 days
  - 6 to 7 days
  - 8 to 9 days
520. The system of pig keeping wherein they are left free to find their own food
- Semi-Intensive
  - Intensive
  - Extensive
  - Semi-extensive
521. The system of pig keeping wherein they are supplied with high quality feeds, optimal utilization of housing facilities.
- Semi-Intensive
  - Intensive
  - Extensive
  - Semi-extensive

522. The system of pig keeping wherein they are supplied with high quality feeds, optimal utilization of housing facilities.
- Semi-Intensive
  - Intensive
  - Extensive
  - Semi-extensive
523. The farms that develop, produce and supply gilts and boars to other farms.
- Multiplication farm
  - Breeding farm
  - Fattening farm
  - Combination of Multiplication and Growing
524. The farms that aim to produce weaners for fattening pigs.
- Multiplication farm
  - Breeding farm
  - Fattening farm
  - Combination of Multiplication and Growing
525. A piggery farm that maintains purebred pigs or a specific line within a purebred.
- Breeder farm
  - Boar service farm
  - Nucleus farm
  - Subnucleus farm
526. A piggery farm that multiplies purebred and lines.
- Breeder Farm
  - Boar Service Farm
  - Nucleus Farm
  - Subnucleus Farm
527. A piggery farm that maintains grandparent stocks of the pig and produces parent stocks within the pure breeds.
- Breeder Farm
  - Boar Service Farm
  - Nucleus Farm
  - Subnucleus Farm
528. A piggery farm whose intentions is to give breeding services to other farms.
- Breeder Farm
  - Boar Service Farm
  - Nucleus Farm
  - Subnucleus Farm
529. A piggery farm whose intention is to produce finished pigs for slaughter
- Multiple Farm
  - Breeding Farm
  - Fattening Farm
  - Combination Multiplier and Growing
530. The allowable sperm defects on abnormal head shape in boars.
- 5%
  - 10%
  - 15%
  - 20%
531. The allowable sperm defects on abnormal chromosome in boars.
- 5%
  - 10%
  - 15%
  - 20%
532. The allowable sperm defects on cytoplasmic droplets in boars.
- 5%
  - 10%
  - 15%
  - 20%
533. The allowable sperm defects on coils tails in boars.
- 5%
  - 10%
  - 15%
  - 20%
534. A microscopy examination that measures the viability of the semen of boars.

- a. Sperm morphological test  
b. Semen density test  
c. Semen motility test  
d. Sperm evaluation test
535. Young domestic ostrich in the downy stage  
a. chick  
b. keet  
c. poult  
d. gosling
536. A male fowl one year old or over  
a. cob  
b. cock  
c. gobbler  
d. drake
537. Unsexed female fowl is known as  
a. capon  
b. poulard  
c. pullet  
d. poult
538. Race of domestic fowls which maintains distinctive characteristics of shape, growth, temperament and color of egg shells  
a. variety  
b. breed  
c. strain  
d. type
539. Poultry species having 39 pairs of chromosomes  
a. chicken  
b. guinea fowl  
c. quail  
d. all of these
540. Poultry species having 40 pairs of chromosomes  
a. duck  
b. turkey
541. The incubation period of muscovy duck  
a. 35 days  
b. 28 days  
c. 21 days  
d. 24 days
542. This is the incubation period of quails  
a. 16-18 days  
b. 26-28 days  
c. 30-34 days  
d. 22-24 days
543. The egg weight of geese is  
a. 58-60 grams  
b. 85-89 grams  
c. 70-80 grams  
d. 130-200 grams
544. The egg weight of guinea fowl is  
a. 40-48 grams  
b. 55-61 grams  
c. 13-15 grams  
d. 17-18 grams
545. The incubation period of mallard duck is  
a. 21 days  
b. 35 days  
c. 28 days  
d. 21 days
546. The incubation period of turkey  
a. 17 days  
b. 28 days  
c. 42 days  
d. 24 days
547. Example of toxic mineral found in paint in greater amount is  
a. lead

- b. cadmium  
c. arsenic  
d. mercury
548. The toxic mineral known as industrial pollutant  
a. arsenic  
b. cadmium  
c. lead  
d. mercury
549. The fat soluble vitamin needed in calcium and phosphorus metabolism  
a. Vit. A  
b. Vit. E  
c. Vit. D  
d. Vit. K
550. The vitamin necessary in all metabolism and anti-oxidation  
a. Vitamin K  
b. Vitamin E  
c. Vitamin C  
d. Vitamin D
551. Vitamin needed only by humans, monkey and guinea pigs  
a. Vitamin A  
b. Vitamin C  
c. Vitamin B  
d. Vitamin D
552. After palay milling, the level of rice barn in the palay is about  
a. 3%  
b. 20%  
c. 10%  
d. 17%
553. Storage of bran and rice polishing is difficult because of  
a. high oil content  
b. to fine to become dusty  
c. high silica of hull  
d. bulkiness of the stuff
554. In general, all grain products need this supplement  
a. calcium  
b. magnesium  
c. phosphorus  
d. salt
555. Wheat is scientifically known as  
a. Glycine max  
b. Arachis hypogea  
c. Triticum sativum  
d. Manihatutilisima
556. Cassava contains this substance that makes the taste bitter in some varieties,  
a. prusic acid  
b. tannin  
c. anti-trypsin factor  
d. mimosine
557. Kapok seeds cannot be fed monogastrics due to tannin.  
Kapok is known scientifically as  
a. Helianthus annus  
b. Ceiba pentandra  
c. Henea brasiliensis  
d. Arachis hypogea
558. The mineral needed in trace amount includes  
a. sodium  
b. copper  
c. calcium  
d. potassium
559. The mineral needed as macroelement in poultry  
a. iodine  
b. seleniurn  
c. iron  
d. phosphorus
560. Poultry eat a daily amount of feed that is equivalent to approximately

- a. 5%  
b. 15%  
c. 10%  
d. 3%
561. \_\_\_\_\_ is the hormone that stimulates ovulation of mature ovarian follicles.  
a. Luteinizing hormone  
b. Follicle stimulating hormone  
c. Progesterone  
d. Testosterone
562. A phase within the estrous cycle which is characterized by sexual receptivity of the female.  
a. Proestrus  
b. Estrus  
c. Metestrus  
d. Diestrus
563. This transient tissue results from the fusion of the fetal membranes to the endometrium of the uterus to permit physiologic exchange between fetus and mother during pregnancy.  
a. Placenta  
b. Cyst  
c. Conceptus  
d. Womb
564. \_\_\_\_\_ is the organ of prehension in the pig.  
a. Muzzle  
b. Bill  
c. Snout  
d. Snood
565. The part of the digestive tract which is the common passage for feed and air.  
a. Larynx  
b. Pharynx  
c. Trachea
- d. Esophagus
566. The main site of microbial fermentation of roughages in a ruminant stomach is  
a. Rumen  
b. Reticulum  
c. Omasum  
d. Abomasum
567. In the digestive system of the fowl, the true stomach is the \_\_\_\_\_  
a. Gizzard  
b. Proventriculus  
c. Crop  
d. Cecum
568. The part of the digestive system of the horse which enables it to live on grasses in spite of the fact that it is not a ruminant  
a. Small intestine  
b. Pancreas  
c. Cecum  
d. Adrenal gland
569. The hairs on the body of cattle converge to form hair streams and vortices known as \_\_\_\_\_  
a. Patch  
b. Hair pattern  
c. Cowlick  
d. Crypt
570. An oily and semi-liquid secretion of an animal's sebaceous gland, which protects the skin from harmful substances.  
a. Sebum  
b. Cerumen  
c. Cuticle  
d. Dandruff
571. Hair colors in horses is known by technical terms. The red color is called  
a. Chestnut

- b. Bay  
c. Aristocrat  
d. Amorsillo
572. It is the range of environment temperature where any regulation to maintain body temperature is only slight and it is of the physical variety.  
a. Summit metabolism  
b. Critical temperatures  
c. Zone of thermal comfort  
d. Maximal heat production
573. If the ambient temperature is higher than that of the body temperature, the body loses heat only by  
a. Radiation  
b. Conduction  
c. Convection  
d. Vaporization
574. When the ambient temperature is higher than that of the body temperature, the body loses heat only by  
a. Radiation  
b. Conduction  
c. Convection  
d. Vaporization
575. Specific part of the testis where formation of spermatozoa takes place  
a. Leydig cell  
b. Sertoli cell  
c. Seminiferous tubule  
d. Rete testis
576. \_\_\_\_\_ is the chemical means of thermoregulation  
a. Locating a shelter  
b. Changing freed body surface area  
c. Changing amount of thermal insulation  
d. Shivering
577. The desired genotypic effect of inbreeding is  
a. Inbreeding depression  
b. Hybird vigor  
c. Increase in homozygous gentotypes  
d. Increase in heterozygous gentotypes
578. The desired phenotypic effect of crossbreeding  
a. Hybird vigor  
b. Increase in homozygous gentotypes  
c. Increase in heterozygous gentotypes  
d. Improved performance of native animals
579. A technology which involves the transfer of the nucleus of pluripotent embryonic cells into an empty ovum then allowed to develop into a new individual  
a. Artificial insemination  
b. Multiple ovulation  
c. Embryo transfer  
d. Nuclear cloning
580. Hormones introduced to female too induce ovulation of more than the normal number of ovum produced per heat period  
a. Prostaglandin and progesterone  
b. Progestone and Prolactin  
c. Pregnant mare serum and follicle stimulating hormone  
d. Follicle stimulating hormone and luteinizing hormone
581. Technique used in collecting embryo from a donor cow  
a. Recto-vaginal technique  
b. Use of artificial vagina  
c. Non-surgical method  
d. Surgical method to a doe
582. Techniques used in introducing semen during artificial insemination  
a. Speculum method  
b. Recto-vaginal technique  
c. Use of dummy  
d. Use of a teaser
583. The first cloned sheep named after a popular female singer

- a. Jennifer  
b. Barbara  
c. Regine  
d. Dolly
584. Selection of breeding animals is based on available records. The record of performance of parents and grandparents of an individual being considered as parents for the next generation, used as bases for selection is called
- Individual record
  - Pedigree record
  - Progeny record
  - Collateral record
585. This breeding system involves the mating of animals belonging to two distinct breeds
- Purebreeding
  - Crossbreeding
  - Upgrading
  - Inbreeding
586. A breeding system which involves mating unrelated animals of the same breed
- Purebreeding
  - Crossbreeding
  - Upgrading
  - 3-way cross
587. A form of crossbreeding where F1 crossbreds are mated to a sire of a third breed
- Crossbreeding
  - Upgrading
  - Inbreeding
  - 3-way cross
588. Feed additive that serves mainly as a growth promotant
- Antibiotics
  - Probiotics
  - Hormones
  - Antihelmintics
589. Feedstuff that contain <18% crude fiber and >20% crude protein
- Energy concentrate
  - Protein supplement
  - Roughage
  - Feed additive
590. A plant processing by-product that serve as an excellent protein supplement
- Corn bran
  - Rice bran
  - Corn gluten meal
  - Tallow
591. An animal processing by-product that serves as excellent energy source
- Brewer's dried yeast
  - Corn germ feed
  - Corn gluten feed
  - Whey
592. Communities of plants used as feeds for ruminants by grazing or cutting
- Fodder
  - Forage
  - Grassland
  - Pasture
593. Feed additives in the diet of young pigs to decrease the stomach pH
- Acidifiers
  - Buffers
  - Pellet binders
  - Emulsifying agents
594. It refers to whole plant that is cut and dried to about 15% moisture
- Hay

- b. Silage  
c. Straw  
d. Green forage
595. Law also known as the "Livestock and Poultry Feeds Act" which governs manufacture, importation, labeling, advertising, distribution and sale of livestock and poultry feeds and feedstuff  
a. AO 35 S. 1975  
b. AO 40 S. 1976  
c. RA 1556 as amended by PD No. 7  
d. RA 3720 as amended by EO No. 175
596. Scientific name of kikuyu grass  
a. Pennisetum clandestinum  
b. Panicum maximum  
c. Paspalum atratum  
d. Penisetum purpureum
597. *Haemonus contortus* is a common roundworm that causes severe anemia in ruminants. This endoparasite is found in:  
a. Cecum  
b. Rumen  
c. Small intestine  
d. Abomasum
598. The distinguishing features of Philippine Carabao are the two diagonal stripes on its brisket. It is known as:  
a. Liners  
b. Chevron  
c. Chevron  
d. Stripes
599. In a cow-calf operation, the standard winning weight of Brahman and its crosses is:  
a. 200 kg  
b. 125 kg  
c. 150 kg  
d. 175 kg
600. In beef cattle breeding, the recommended bull to cow ratio under normal situation is:  
a. 1:50  
b. 1:20  
c. 1:30  
d. 1:40
601. Culling is an effective tool in removing the undesirable animals. The recommended rebreeding time before a cow must be culled is:  
a. 2 times  
b. 3 times  
c. 4 times  
d. 5 times
602. Under continuous breeding program in beef cattle reproduction, bull culling should be done using frequency:  
a. Yearly  
b. Every 2 years  
c. Every 4 years  
d. Every 5 years
603. Stocking rate is measured in terms of animal unit. What is the A.U. equivalent of a heifer?  
a. 0.5 A.U.  
b. 0.25 A.U.  
c. 0.75 A.U.  
d. 1.0 A.U.
604. To consider as good silage, the proper pH of the ensiling materials should be within this range:  
a. 4.2-4.5  
b. 3.2-3.5  
c. 5.2-5.5  
d. 3.0-4.0
605. A good silage should contain how many percent lactic acid?  
a. 5-9%  
b. 10-15%

- c. 1-5%  
d. 15-20%
606. For beef cattle shed or barn, what is the proper space requirement of yearling?  
a. 3-4 sqm  
b. 2-3 sqm  
c. 4-5 sqm  
d. 1-2 sqm
607. The extensive system of beef cattle/buffalo production is also popularly known as  
a. Ranching  
b. Cow-calf  
c. Feedlot fattening  
d. Backyard system
608. To measure carrying capacity of pasture, usually one animal unit is equivalent to how many kilograms?  
a. 300 kg  
b. 250 kg  
c. 275 kg  
d. 325 kg
609. In beef/buffalo production, one of the improved grasses used as forage in cattle feeding is  
a. Napier  
b. Centrosema  
c. Siratro  
d. Calopogonium
610. In buffalo production, what breed is a good example of swamp type?  
a. Draft type  
b. Philippine Carabao  
c. Bulgarian  
d. Nili-ravi
611. Paragrass is an improved forage, what is its scientific name?  
a. *Brachiaria mutica*
- b. *Brachiaria decumbens*  
c. *Brachiaria ruziziensis*  
d. *Panicum maximum*
612. Siratro is an improved legume, what is its scientific name?  
a. *Macroptilium atropurpureum*  
b. *Centrosema pubescens*  
c. *Arachis pintoi*  
d. *Desmanthus virgatus*
613. It is a tropical breed of cattle  
a. Brahman  
b. Chianina  
c. Charolais  
d. Hereford
614. Scientific name of ipil-ipil  
a. *Calliandra calothrysus*  
b. *Leucaena leucocephala*  
c. *Desmodium cinerea*  
d. *Desmanthus virgatus*
615. In the body of animals, this is the predominantly nutrient  
a. Fats  
b. Carbohydrates  
c. Proteins  
d. Minerals
616. Vitamin that is important in blood clotting mechanism since it is a co-factor in the synthesis of prothrombin by the liver  
a. Vitamin D  
b. Vitamin C  
c. Vitamin K  
d. Vitamin A
617. Animal with a poor sense of taste  
a. Cattle  
b. Chicken  
c. Horse  
d. Swine

618. Which of the following is an end product of starch digestion in ruminants?
- Glucose
  - Volatile fatty acids
  - Acetyl CoA
  - Lactose
619. Transport mechanism involved in amino acid absorption
- Facilitated diffusion
  - Osmosis
  - Active transport
  - Endocytosis
620. Absorption of this vitamin requires the presence of an intrinsic factor secreted by the mucosal cell of the stomach and the upper small intestine
- Vitamin B2
  - Vitamin B2
  - Vitamin B6
  - Vitamin B3
621. Synchronized contraction of the longitudinal and circular muscles of the gastrointestinal tract
- Eruption
  - Peristalsis
  - Deglutition
  - Rumination
622. Fat soluble vitamins are given names that describe their biological function. Vitamin A is
- Biological antioxidant
  - Antirachitic factor
  - Anti-infective vitamin
  - Coagulation factor
623. Minerals that serve as component of bones
- Ca, Mg, and P
  - I, Zn and S
  - Mn and Se
624. The term that refers to the meat coming from cattle if less than one year of age.
- Beef
  - Veal
  - Mutton
  - Lamb
625. The term refers to the act of slaughtering animals dead of some cause prior to the time of slaughter
- Fabrication
  - Emergency slaughter
  - Cold slaughter
  - Double slaughter
626. The process of heating food, usually a liquid for a definite temperature and time, and thereafter cooling it immediately
- Pasteurization
  - Homogenization
  - Clarification
  - Sterilization
627. Which is not considered red meat?
- Beef
  - Pork
  - Mutton
  - Veal
628. This refers to animal tissues which are suitable for food
- Meat
  - Fat
  - Lean
  - Muscle
629. The considered most variable components of meat because its proportion to the meat is greatly affected by several factors such as nutrition, age, etc. The most variable components of meat because its proportion to the meat is greatly affected by several factors such as nutrition, age, exercise and other physiological factors.

- a. Bone  
b. Lean  
c. Fats  
d. Blood
630. Usually the weaning weight of Brahman and its crosses is:  
a. 125 kg  
b. 150 kg  
c. 175 kg  
d. 200 kg
631. The average estrus cycle of Murrah Buffalo is:  
a. 21 days  
b. 25 days  
c. 30 days  
d. 45 days
632. This ensures the appropriate nutrition of the various age groups of the herd:  
a. Herd division  
b. Herd management  
c. Nutritional requirement  
d. None of the above
633. The most common and legal means of identifying beef cattle ownership is by this method:  
a. Hide branding  
b. Horn branding  
c. Earnotching  
d. Tattooing
634. It is the roughage dry matter requirement of a 400 kg mature cattle with a roughage to concentrate ratio of 80:20:  
a. 6.4 kg  
b. 8.4 kg  
c. 7.4 kg  
d. None of the above
635. The scientific name of Aurochs is:  
a. Bos Auros  
b. Bos longifrons  
c. Bos Taurus  
d. Bos premigenus
636. The 997,000 hectare Philippines pasture land can support this number of animal unit:  
a. 500,000 A.U  
b. 5,000 A.U  
c. 500 A.U  
d. None of the above
637. The commercial cow-calf operations of the country are located in this province:  
a. Pangasinan  
b. Masbate  
c. Bukidnon  
d. All of the above
638. The total agricultural lands devoted to crops of the country like the Riceland, cornland, coconut farming, etc. can support this number of animal unit:  
a. 10 M A.U  
b. 12 M A.U  
c. 11 M A.U  
d. None of the above
639. Herd division is merely grouping the cattle/buffalo according to this conditional  
a. Age  
b. Purpose  
c. Size  
d. All of the above
640. Nutrients are used in animals body for this purpose:  
a. Synthesis of muscles and bones  
b. Heat production, work and fat deposition  
c. Regulation of body processes  
d. All of the above

641. Lipids or fats and oils are dietary essential because of this function
- Without them water soluble vitamins cannot be used by animals
  - Animals need it for the formation of regulatory hormones
  - They supply concentrated amount of energy to the animal
  - All except A
642. Which statement depicts biologically essential mineral?
- Active part of body structure
  - Activator of enzymes
  - Causes specific symptom which can be cured by providing source of the mineral
  - All of the above
643. The new science of nutrigenomics deals with\_\_\_\_\_.
- Study of how different feeds may interact with specific genes to increase the risk of some diseases
  - Exploration of the relationship between genetic makeup of individual and nutrients in certain foods that may assist in the prevention of specific diseases
  - Development of feeds that can be matched to individual genotypes to benefit the health of individuals and enhance normal physiological processes.
  - All of the above
644. Nutrient is a feed constituent or group of feed constituents that aids in the support of life, such as
- Chemically synthesized vitamins
  - Chemically produced inorganic salts such as ZnO and MgSO<sub>4</sub>
  - Naturally occurring sugar, starch, cellulose and gums
  - All of the above
645. Which of the following minerals occur largely in the fluids and tissues to maintain osmotic pressure and acid-based equilibrium?
- Na, K, Cl
  - Na, P and Cl
646. Poultry eat a daily amount of feed that is equivalent to approximately
- 5%
  - 15%
  - 10%
  - 3%
647. The percent crude protein of quail starter should be percent of their bodyweight
- 23-27% CP
  - 10-14% CP
  - 18-22% CP
  - 20-22% CP
648. The site of bacterial fermentation of undigested food in poultry
- small intestine
  - cloaca
  - large intestine
  - ceca
649. This organ has thick glandular mucous membrane that secretes hydrochloric acid and pepsinogen
- gizzard
  - crop
  - proventriculus
  - cloaca
650. The CP content of grower mash
- 16%
  - 20%
  - 18%
  - 24%
651. Method of feeding grain to broiler parent stock
- place in hopper
  - place in round feeder
  - broadcast in litter

- d. place in automatic feeder
652. Most practical way to feed broiler
- ad libitum
  - restricted feeding
  - skip-a-day
  - phase feeding
653. A disease condition is observed when
- there are subclinical pathological processes
  - there is imbalance between infection pressure and resistance of animals
  - normal body function of tissues or organs are impaired
  - all of the above
654. This refers to the general susceptibility of animals to disease either required or genetically present at birth/development
- predisposition
  - constitution
  - condition
  - behavior
655. Diseases which are easily spread from one animal to another animal
- contagious diseases
  - acute diseases
  - zoonotic diseases
  - nutritional defects
656. Pathogens which can neither be classified as plants nor animals
- viruses
  - yeast
  - bacteria
  - fungi
657. Organisms that live at the expense of other live plants or animals
- parasite
  - microorganism
- c. saprophytes
- d. commensals
658. The process of anaerobic breakdown of carbohydrates used for the production of alcohol, vinegar and lactic acid
- fermentation
  - symbiosis
  - bio-synthesis
  - mineralization
659. The microorganism which can only be seen by an electron microscope
- yeast
  - viruses
  - fungi
  - bacteria
660. Pathogenic agents can damage the tissue by loss of resistance known as
- anemia
  - immunosuppression
  - necrosis
  - diarrhea
661. The science of the specific defense mechanisms of the body against pathological processes
- immunity
  - pathology
  - immunology
  - enzymology
662. This term refers to the maintenance of static or constant conditions in the internal environment of the animal.
- Homeostasis
  - Homeothermy
  - Homeokinesis
  - Homozygous
663. Which among the following is not a chemical mediator released by terminal neurons of the autonomic nervous system.

- a. Acetylcholine  
b. Epinephrine  
c. Norepinephrine  
d. Prolactin
664. \_\_\_\_\_ is the hormone which facilitates the transport of glucose from the blood into the cells of tissues  
a. Insulin  
b. Thyroxine  
c. Prolactin  
d. Calcitonin
665. This vitamin is important for blood clotting because it is used as a co-factor in the synthesis of prothrombin by the liver.  
a. Vitamin A  
b. Vitamin C  
c. Vitamin D  
d. Vitamin K
666. Which of the following is not present in the lymph fluid.  
a. Glucose  
b. Erythrocytes  
c. Lymphocytes  
d. Platelets
667. Passive expiration is exemplified by which activity?  
a. Coughing  
b. Talking loudly  
c. Laughing  
d. Quiet breathing
668. The only portion of the nephron which is impermeable to water  
a. Ascending limb of the loop of Henle  
b. Descending limb of the loop of Henle  
c. Proximal tubule  
d. Distal tubule
669. \_\_\_\_\_ refers to the union of sperm and ovum.
- a. Fertilization  
b. Syngamy  
c. Sperm migration  
d. Conjugation
670. The scientific name of quail is  
a. Gallus gallus  
b. Columba livia  
c. Anser domesticus  
d. Coturnix coturnix
671. Which of the following is not included in the animal industry of the country?  
a. Pig  
b. Cattle  
c. Chicken  
d. Camel
672. This animal subsists mainly on grasses and is raised mainly by smallholder farmers in the rural areas.  
a. Pig  
b. Carabao  
c. Chicken  
d. Duck
673. A kind of neuron which transmit nerve impulses from the effector organs to the spinal cord or brain.  
a. Sensory neuron  
b. Interneuron  
c. Motor neuron  
d. None of the above
674. Among the following animals, which is the one that can perceive many colors of the light spectrum.  
a. Cattle  
b. Sheep  
c. Goat  
d. Pig
675. This animal has a very poor sense of taste.

- a. Chicken
  - b. Cattle
  - c. Horse
  - d. Swine
676. A classification of bone which is greater in one direction than any other, and functions mainly as levers and aid in support, locomotion and prehension.
- a. Long bone
  - b. Short bone
  - c. Sesamoid bone
  - d. Pneumatic bone
677. This refers to the meat of rabbit
- a. Mutton
  - b. Lapan
  - c. Star meat
  - d. Venison
678. Meat is considered deficient in
- a. Iron
  - b. Manganese
  - c. Calcium
  - d. Protein
679. What is the recommended temperature for chilling meat?
- a. -15-0°C
  - b. 5-10°C
  - c. 2-4°C
  - d. 0°C
680. The following are the conditions that would warrant animals to be denied for slaughter except:
- a. The animal is pregnant
  - b. The animal is newly injected with antibiotic
  - c. The animal shows lameness
  - d. The animal is calm and well-rested
681. Which of the following statements is(are) true?
- a. Meat or carcasses contaminated with urine should automatically be condemned
  - b. The "boar taint" odor is not perceptible in meat when the boar is slaughtered of week after castration
  - c. The "boar taint" odor is manifested only upon sexual maturity of uncastrated male pig
  - d. All of the above statements are true
682. The term refers to meat coming from an illegal source
- a. Hot meat
  - b. Short meat
  - c. Green meat
  - d. Red meat
683. The meat of adult *Capra hircus*
- a. Beef
  - b. Pork
  - c. Mutton
  - d. Chevron
684. The term refers to the process of wrapping the carcass with cheese-cloth previously soaked in lukewarm water to absorb remaining blood, smoothen external fat and prevent excessive shrinkage and oxidation
- a. Evisceration
  - b. Shrouding
  - c. Plucking
  - d. Singeing
685. Which of the following muscles yield the least tender meat?
- a. Leg
  - b. Back
  - c. Rump
  - d. Head
686. Which of the following is not affected by water or moisture content in the meat?
- a. Texture
  - b. Color

- c. Juiciness  
d. Flavor
687. These substances in meat are responsible for the so-called "gamey" flavor or meat of which animals?  
 a. Nitrogenous extractives  
 b. Sarcoplasmic proteins  
 c. Carbohydrates  
 d. Proteins
688. Which of the following is an example of processed product from milk fat?  
 a. Cheese  
 b. Butter  
 c. Ice cream  
 d. Yoghurt
689. Which is not an advantage of fasting animals prior to slaughter?  
 a. Save feeds  
 b. Ease of cleaning entrails  
 c. Low shrinkage  
 d. Short shelf-life
690. The water requirement for slaughtering a head of cattle or carabao.  
 a. 30 gallons  
 b. 60 gallons  
 c. 15 gallons  
 d. 35 gallons
691. This refers to the process of making the animal unconscious prior to slaughter.  
 a. Stunning  
 b. Scalding  
 c. Evisceration  
 d. Bleeding
692. Which of the following is not true?  
 a. Fish meal has higher protein quality than soybean meal
- b. Skimmilk has higher protein quality than soybean meal  
 c. Animal protein sources  
 b. Have generally high protein quality than plant protein sources  
 a. None of the above
693. A diet is deficient in protein. How much fish meal (65% CP) is needed to correct the 2.0% crude protein deficiency?  
 a. 3.08%  
 b. 30.80%  
 c. 0.30%  
 d. 0.03%
694. A feed was analysed to contain 3% nitrogen. How much crude protein does the feed contains?  
 a. 18.75%  
 b. 19.50%  
 c. 20.00%  
 d. 21.00%
695. This toxic factor in ipil-ipil leaf meal causes alopecia.  
 a. Mimosine  
 b. Hydrocyanic acid  
 c. Anti-trypsin factor  
 d. Gossypol
696. An animal protein containing 80-85% CP but low in isoleucine. It is commonly used a bypass protein in ruminant  
 a. Blood meal  
 b. Fish meal  
 c. Feather meal  
 d. Squid meal
697. A macro mineral found in amino acids cysteine and methionine and in vitamins biotin and thiamine.  
 a. Sulfur  
 b. Magnesium  
 c. Phosphorus  
 d. None of the above

698. The ideal ratio of calcium and phosphorus in the diet for monogastric animals
- 1:1-2:1
  - 2:1-3:1
  - 1:2-2:3
  - None of the above
699. Vitamin K functions in the blood coagulation system such as\_\_\_\_\_.
- Synthesis of prothrombin and other plasma clotting factor
  - Degradation of prothrombin and other clotting factors
  - Prevents synthesis of prothrombin and other plasma clotting factors
  - Synthesis of prothrombin and other plasma clotting factors
700. The process of digestion is accomplished through this activity:
- Mastication and muscular contraction of the gastro-intestinal tract
  - Chemical processes such as action of HCL produced in the gastro-intestinal tract
  - Enzymatic action produced by bacteria located in the cecum
  - All of the above
701. Proper nutrition practice is essential in growing animals. This requires\_\_\_\_\_.
- Providing the essential chemical elements for life
  - Providing sources of substances/elements that function in vivo as antioxidant
  - Providing feed that provides fiber for the maintenance of gut mucosa
  - All of the above
702. Diet is a preparation with this following composition:
- Composed of individual feed selected to make balance ration
  - Also known as mixed feed
  - Also known as formula feed
703. Which fat soluble vitamins can be synthesized by the microflora of the digestive system of herbivores?
- K
  - A
  - D
  - E
704. The recommended inclusion rate of a feed enzyme is 2 kg per ton of diet. How much enzyme is needed for a 200 kg diet?
- 0.40 kg
  - 400 kg
  - 400,000 mg
  - All of the above
705. The most digestible polysaccharide is
- Hemicellulose
  - Cellulose
  - Galactose
  - Xylose
706. The disease of poultry known as avian pest
- Gumboro Disease
  - Fowl Pox
  - New Castle Disease
  - Lymphoid Lenkosis
707. The basic unit of inheritance is
- cell
  - genes
  - chromosomes
  - nucleus
708. The disease that can be prevented by vaccination through the wing-web method
- Avian Pest
  - Herpes virus of turkey
  - Fowl Pox
  - Infectious Bursal Disease

709. During vaccination, skim milk is sometimes added to
- supplement the feed as protein source
  - decrease the effect of vaccination
  - increase potency of vaccine
  - improve the drinking capacity of poultry
710. Bacterial disease of poultry caused by *Mycoplasma gallisepticum*
- Avian Leucosis
  - Chronic Respiratory Disease
  - Infectious Coryza
  - Fowl Cholera
711. Bacterial disease caused by *Salmonella gallinarum*
- Fowl Typhoid
  - Fowl Cholera
  - Pullorum
  - Fowl Pox
712. Aspergillosis, a disease caused by *Aspergillusfumigatus* and also known as Brooder Pneumonia is a
- viral disease
  - protozoan disease
  - bacterial disease
  - fungal disease
713. The disease characterized by swollen face of poultry
- Coryza
  - Chronic Respiratory Disease
  - Fowl pox
  - Avian Pest
714. Hitcher B1 strain of vaccine is
- Fowl Pox
  - Fowl Cholera
  - Avian Pest
  - Marek's Disease
715. The "wish bone" of chicken is actually the \_\_\_\_\_.  
a. Humerus
- b. Clavicle
- c. Radicle
- d. Ulna
716. The muscle which constitutes the thickness of the wall of the heart (myocardium), and its rhythmic contraction is responsible for blood circulation.
- Cardiac muscle
  - Skeletal muscle
  - Smooth muscle
  - None of the above
717. Short bones are somewhat cuboid, or approximately equal in all dimensions. There is no marrow cavity, but the interior is composed of spongy substance with marrow spaces. An example of short bone is
- Humerus
  - Radius
  - Carpus
  - Femur
718. The pars intermedia of reptiles and amphibians secretes a hormone that enables them to change skin color. This hormone is called
- Melanophore stimulating hormone (MSH)
  - Thyroid stimulating hormone (TSH)
  - Follicle stimulating hormone (FSH)
  - Luteinizing hormone (LH)
719. The hormone that increase the basal metabolic rate (BMR) of the body is
- Epinephrine
  - Thyroxine
  - Prolactin
  - Calcitonin
720. The production system for this livestock species is very intensive, commercially oriented, and depends heavily on commercially mixed feeds

- a. Goat  
b. Cattle  
c. Carabao  
d. Pig
721. This biological system is composed of the brain, spinal cord and the nerves.  
a. Cardiovascular system  
b. Endocrine system  
c. Nervous system  
d. Excretory system
722. The sensory receptor part of a neuron receives and converts several forms of energy into nerve impulse. One of these is called mechanical energy which is specific for  
a. Touch pressure  
b. Odor  
c. Taste  
d. Degree of warmth
723. One of the following hormones is not secreted by the anterior pituitary gland  
a. Growth hormone  
b. Luteinizing hormone  
c. Prolactin  
d. Oxytocin
724. This endocrine gland is located at the neck area just below the larynx. It secretes thyroxine and T3.  
a. Adrenal gland  
b. Pancreas  
c. Thyroid gland  
d. None of the above
725. The adrenal cortex has 3 types of cells making up the 3 zones of the cortex. The zone that secretes aldosterone is called  
a. Zona glomerulosa  
b. Zona reticularis  
c. Zona fasciculate
- d. None of the above
726. The secretion of aldosterone is not under the control of ACTH but by circulating factors such as  
a. Protein level  
b. Glucose level  
c. ECF volume  
d. PO<sub>2</sub> in the blood
727. This vitamin increases the efficiency of calcium and phosphorus absorption across the intestinal wall, making these minerals available for bone formation.  
a. Vitamin A  
b. Vitamin E  
c. Vitamin D  
d. Vitamin K
728. One of the important functions of this important functions of this biological system is to carry O<sub>2</sub> from the tissues to the lungs.  
a. Respiratory system  
b. Excretory system  
c. Cardiovascular system  
d. Endocrine system
729. In general, the smaller the body size of an animal species, the faster is its pulse rate. The average pulse rate of a mouse is  
a. 45 beats/min  
b. 72 beats/min  
c. 300 beats/min  
d. 600 beats/min
730. It refers to the interspersion of fat particles in lean meat.  
a. Meatiness  
b. Marbling  
c. Cutability  
d. Dressing percentage
731. The following are basic ingredients in curing meat except  
a. Salt  
b. Sugar

- c. Nitrate  
d. Spices
732. The average dressing percentage of cattle, using a carcass weight obtained 24 to 48 hours after chilling is  
a. 43%  
b. 48%  
c. 69%  
d. 65%
733. Which of the following is/are not step/s in slaughtering of hogs?  
a. Evisceration  
b. Flaying  
c. Scraping  
d. Splitting
734. The length of fasting slaughter animals depends on the size and type of stomach. The recommended fasting duration for swine is  
a. 12-24 hours  
b. 24-48 hours  
c. 1-3 days  
d. 60-120 hours
735. This refers to the cutting of carcasses into standard wholesale and retail cuts  
a. Fabrication  
b. Grading  
c. Splitting  
d. Chopping
736. A wholesale cut in pork carcass locally referred to as "kasim"  
a. Boston butt  
b. Picnic  
c. Ham  
d. Belly
737. In poultry, the heaviest retail cut is the  
a. Neck and back
- b. Wings  
c. Thighs  
d. Breast
738. Wholesale cuts with a higher proportion of cut that run in the same general direction are the more expensive cuts called the primal cuts. The primal cut of beef carcass is the  
a. Chuck  
b. Rib  
c. Loin  
d. Round
739. The primal cut of lamb carcass is the  
a. Shoulder  
b. Leg  
c. Breast  
d. Loin
740. The primal cut of pork carcass include  
a. Ham, loin and shoulder  
b. Ham, loin, belly and shoulder  
c. Pig's feet and tail  
d. Lean trimmings and neckbones
741. The use of a blow torch or open fire to rid the goat carcass of hair is called  
a. Skinning  
b. Singeing  
c. Scraping  
d. Sticking
742. The act of removing the internal organs from a carcass  
a. Fabrication  
b. Splitting  
c. Flaying  
d. Evisceration
743. Collective term for entrails such as heart, liver, kidney, tongue and brain  
a. Sweetbreads

- b. Chitterlings  
c. Offals  
d. Internal organs
744. Pork has the highest protein content among all livestock meats. The protein content of pork is  
a. 27.27%  
b. 21.25%  
c. 19.70%  
d. 20.20%
745. The normal fat color and consistency of chevon is  
a. Chalk white that appears brittle and dense  
b. Cream  
c. White and greasy  
d. Cream white to yellow, and firm and dry
746. Anything that is added to meat formulation to add bulk to processed meat products  
a. Free fat  
b. Seam fat  
c. Filler  
d. Binder
747. The oldest method of meat preservation  
a. Smoking  
b. Salting  
c. Drying  
d. Canning
748. It consists of fresh whole milk added to ground veal in a beef casing. It contains enough whole milk to give a moisture content of about 30%  
a. Kalberwurst  
b. Knackwurst  
c. Kobasica  
d. Krakow
749. Milk that contains finer globules of butterfat with 73.7% water  
a. Homogenized milk
- b. Evaporated milk  
c. Condensed milk  
d. Filled milk
750. Which of the following species produce egg with the most fat content?  
a. Chicken  
b. Duck  
c. Quail  
d. Tortoise
751. The sweetest monosaccharide is  
a. Fructose  
b. Glucose  
c. Galactose  
d. Xylose
752. Rice bran is a feed stuff that contains high amount of organic phosphorus called\_\_\_\_\_.  
a. Phytin phosphorus  
b. Phosphoric acid  
c. Phytate  
d. A & B
753. This feed is derived from processing of corn grain into ethanol  
a. Distiller's dried grain with soluble  
b. Yeast culture extract  
c. Corn germ meal  
d. Corn grits
754. Which of the following plant protein sources has the highest nutritive value?  
a. Soybean meal  
b. Corn gluten meal  
c. Peanut meal  
d. Ipil-ipil meal
755. The toxic compound found in cassava is  
a. Hydrocyanic acid  
b. Hydrochloric acid

- c. Volatile fatty acids  
d. Pyruvic acid
756. A micronutrient essential for the formation of enzymes related to oxygen transport and utilization.  
a. Fe  
b. Mn  
c. I  
d. Zn
757. Choline deficiency causes this condition in animals:  
a. Slipped tendons in chickens and turkey  
b. Goose stepping in swine  
c. Cracked hooves in swine  
d. Poor appetite
758. This vitamin contains cyanide group attached to cobalt atom  
a. B<sub>1</sub>  
b. B<sub>2</sub>  
c. B<sub>6</sub>  
d. B<sub>12</sub>
759. Feed additives are important component of animal rations because of this role:  
a. They provide extra nutrient for the animal  
b. Their use guarantee production in performance  
c. Some helps minimizing pollution of the environment from animal wastes  
d. None of the above
760. Lipids are made up of carbons, hydrogen and oxygen. They release more energy upon oxidation because of this characteristic.  
a. Oxygen comprises much smaller proportion of the molecule than its counterpart  
b. Oxygen comprises much greater proportion of the molecule than its counterpart  
c. There are three molecule of fatty acids  
d. The glycerol component also yield energy
761. Storage of bran and rice polishing is difficult because of this condition:  
a. High oil content  
b. High silica of hull  
c. Too fine to become dusty  
d. Bulkiness of the stuff
762. Kapok seed cannot be fed for monogastrics due to tannin. Kapok is known scientifically as:  
a. *Helianthus annus*  
b. *Henea brasiliensis*  
c. *Ceiba petandra*  
d. *Arachis hypogea*
763. A commercial strain of female egg-type chicken, 16 weeks of age is called  
a. Ready to lay pullet  
b. New layer  
c. Hen  
d. All of the above
764. Which of the following is correct regarding the incubation period of poultry species  
a. Chicken egg hatches at 21 days  
b. Quail egg hatches at 18 days  
c. Mallard duck egg hatches at 35 days  
d. All of the above
765. How much is the amount of feed consumed by a broiler with a body weight of 1.6 kg and feed conversion of 1.7?  
a. 2.72 kg  
b. 3.80 kg  
c. 3.0 kg  
d. None of the above
766. The vaccine usually administered in the hatchery at day-old  
a. fowl pox vaccine  
b. La sota vaccine  
c. bursal disease vaccine

- d. Marek's disease vaccine
767. These are bactericidal antibiotic that can kill bacteria except
- penicillin
  - neomycin
  - streptomycin
  - lincomycin
768. Ectoparasites that have no wings
- ticks
  - mite
  - fleas
  - house flies
769. Very small ectoparasites barely visible by the naked eyes
- mites
  - fleas
  - ticks
  - lice
770. Most endoparasites are roundworms and can be also called
- annelids
  - cestodes
  - nematodes
  - trematodes
771. Tapeworms are also known as
- trematodes
  - nematodes
  - cestodes
  - annelids
772. Excretion of pathogenic agents in this group is dangerous because detection is nearly impossible and the quantity of pathogenic may be high
- sick animals
  - recovered animals
  - animals in the incubation period
  - subclinical infections
773. Any disease is a stress which can have this effect
- a. immunosuppression  
b. increased metabolism  
c. decreased intestinal function  
d. all of these
774. Protozoans that move by making projections like amoeba are called
- sporozoa
  - flagellates
  - rhizopoda
  - ciliates
775. Viral diseases can be prevented only by vaccination because
- it is caused by viruses and no drugs exist against these diseases
  - drugs act on the enzymes by viruses use the enzyme of host
  - when a virus enters a cell, it loses its mantle of proteins
  - all of the above
776. The management problem resulting to mortalities due to lack of water and feed intake is
- starve outs
  - cannibalism
  - piling
  - wet litter
777. Too high mortality in growing birds can be due to
- disease & parasites
  - poor debeaking
  - high stocking density
  - all of these
778. All the venous blood from the systematic circulations are returned back to the heart via the
- Pulmonary vein
  - Pulmonary artery
  - Vena cava
  - Aorta

779. From the left atrium, the blood goes to the left ventricle through the
- Tricuspid valve
  - Bicuspid valve
  - Aortic valve
  - Pulmonary valve
780. Hepatic circulation is a part of systemic circulation that supplies blood to the
- Liver
  - Kidney
  - Brain
  - Pancreas
781. The mineral which acts as a co-factor in the process of blood clotting is
- Magnesium
  - Potassium
  - Calcium
  - Phosphorus
782. The amount air that moves into the lungs with each inspiration, or the amount that moves out with each expiration is called
- Inspiration reserve volume (IRV)
  - Expiratory reserve volume (ERV)
  - Tidal volume (TV)
  - Vital Capacity
783. The average gestation period (days) in swine is
- 114
  - 283
  - 340
  - 150
784. Implantation and placentation characterized by the formation of endometrial cups is specific for this species.
- Mare
  - Cow
785. Farrowing is a specific term for the act of parturition, or the act of giving birth in
- Cattle
  - Horse
  - Pig
  - Goat
786. This is considered the highest class or the aristocrat among the horse colors.
- Black
  - Red
  - Golden
  - Gray
787. A process of heat dissipation which involves direct contact of the animal with a part of its environment
- Conduction
  - Convection
  - Radiation
  - Vaporization
788. The normal rectal temperature range of chickens is
- 36-39°C
  - 38-40°C
  - 40-41°C
  - None of the above
789. The pig produces sweat as a means of losing heat. Its sweat glands are localized in the
- Flank
  - Snout
  - Neck
  - Ham
790. Polyestrous animals are those that come in heat all throughout the year. Among the following which is not a polyestrous?
- Cow

- b. Caracow  
c. Sow  
d. Bitch
791. Which among the following herbivores is not a ruminant?  
a. Cattle  
b. Pig  
c. Horse  
d. Goat
792. The young of this species is called a kid.  
a. Cattle  
b. Pig  
c. Horse  
d. Goat
793. Induced ovulator is an animal that does not ovulate unless there is copulation. Which among the following herbivores is not a ruminant?  
a. Rabbit  
b. Pig  
c. Sheep  
d. Cattle
794. The best sign of estrus in a normal cycling animal is  
a. Swelling of vulva  
b. Standing still when mounted  
c. Mucus discharge from vulva  
d. Restlessness
795. The best time to breed or inseminate is at the  
a. Start of estrus  
b. Towards end of estrus  
c. Mid estrus  
d. Before the start of estrus
796. The life-span of ejaculated mammalian spermatozoa in the female reproductive tract is about  
a. 24 hours  
b. 5 days
- c. 1 week  
d. 2 weeks
797. Pulmonary circulation is circulation of blood that takes place in the  
a. Lungs  
b. Liver  
c. Kidney  
d. Brain
798. Species that produce milk with the highest protein, fat and lactose content  
a. Cattle  
b. Carabao  
c. Goat  
d. Sheep

Answer Key of Review Questions in Animal Science

1	D	26	C	51	A	76	C	101	C	126	B	151	D	176	B
2	C	27	B	52	B	77	B	102	D	127	C	152	A	177	A
3	A	28	C	53	B	78	D	103	A	128	C	153	C	178	D
4	B	29	B	54	B	79	D	104	C	129	D	154	D	179	D
5	B	30	A	55	C	80	A	105	B	130	A	155	B	180	B
6	B	31	B	56	D	81	B	106	D	131	A	156	A	181	B
7	D	32	A	57	D	82	D	107	A	132	D	157	B	182	C
8	D	33	C	58	A	83	D	108	A	133	A	158	D	183	B
9	C	34	D	59	D	84	A	109	D	134	D	159	B	184	B
10	C	35	A	60	B	85	C	110	C	135	A	160	A	185	D
11	B	36	A	61	A	86	A	111	A	136	C	161	B	186	B
12	D	37	A	62	C	87	C	112	A	137	D	162	A	187	B
13	A	38	B	63	D	88	B	113	D	138	A	163	C	188	D
14	D	39	D	64	B	89	A	114	B	139	B	164	C	189	D
15	A	40	D	65	C	90	B	115	D	140	C	165	C	190	C
16	A	41	A	66	B	91	D	116	C	141	B	166	D	191	C
17	C	42	B	67	B	92	D	117	B	142	C	167	B	192	C
18	B	43	B	68	D	93	A	118	A	143	C	168	D	193	D
19	B	44	D	69	A	94	C	119	D	144	D	169	C	194	C
20	A	45	D	70	B	95	A	120	D	145	C	170	A	195	D
21	B	46	C	71	D	96	B	121	A	146	B	171	D	196	B
22	A	47	A	72	D	97	A	122	C	147	A	172	A	197	B
23	A	48	D	73	C	98	A	123	B	148	D	173	B	198	B
24	B	49	D	74	B	99	D	124	A	149	B	174	D	199	A
25	A	50	B	75	D	100	A	125	C	150	B	175	D	200	D

**Answer Key of Review Questions in Animal Science**

201	C	226	A	251	C	276	C	301	A	326	B	351	A	376	B
202	A	227	A	252	C	277	A	302	C	327	B	352	B	377	C
203	C	228	C	253	B	278	B	303	D	328	D	353	C	378	B
204	C	229	C	254	A	279	C	304	A	329	C	354	C	379	B
205	A	230	B	255	C	280	A	305	B	330	B	355	C	380	A
206	B	231	D	256	C	281	C	306	D	331	C	356	D	381	B
207	C	232	D	257	C	282	C	307	A	332	D	357	C	382	A
208	C	233	A	258	B	283	D	308	C	333	D	358	D	383	C
209	C	234	A	259	A	284	C	309	D	334	B	359	C	384	B
210	A	235	C	260	B	285	B	310	C	335	C	360	C	385	C
211	D	236	A	261	B	286	D	311	A	336	C	361	C	386	C
212	C	237	D	262	C	287	B	312	B	337	C	362	D	387	D
213	C	238	D	263	A	288	C	313	D	338	A	363	A	388	C
214	A	239	B	264	A	289	C	314	B	339	D	364	B	389	A
215	D	240	A	265	A	290	C	315	C	340	C	365	D	390	D
216	A	241	D	266	B	291	B	316	A	341	C	366	A	391	C
217	C	242	C	267	A	292	D	317	C	342	C	367	B	392	A
218	B	243	C	268	A	293	B	318	A	343	B	368	C	393	B
219	B	244	B	269	D	294	D	319	C	344	C	369	C	394	B
220	A	245	B	270	C	295	A	320	D	345	A	370	A	395	D
221	A	246	C	271	C	296	B	321	B	346	A	371	C	396	B
222	A	247	C	272	A	297	A	322	D	347	C	372	D	397	C
223	A	248	D	273	A	298	A	323	B	348	B	373	A	398	B
224	B	249	B	274	B	299	C	324	C	349	A	374	B	399	A
225	D	250	D	275	C	300	B	325	A	350	C	375	B	400	B

Answer Key of Review Questions in Animal Science

401	B	426	C	451	B	476	B	501	D	526	D	551	B	576	D
402	C	427	D	452	D	477	C	502	B	527	A	552	C	577	C
403	D	428	C	453	A	478	A	503	B	528	B	553	A	578	A
404	C	429	B	454	A	479	B	504	C	529	C	554	A	579	D
405	B	430	C	455	A	480	A	505	C	530	A	555	C	580	C
406	D	431	B	456	A	481	B	506	D	531	A	556	B	581	C
407	D	432	D	457	A	482	C	507	D	532	B	557	B	582	A
408	A	433	C	458	A	483	B	508	B	533	A	558	B	583	D
409	A	434	A	459	A	484	B	509	D	534	C	559	D	584	B
410	A	435	D	460	A	485	C	510	C	535	A	560	B	585	B
411	A	436	A	461	C	486	B	511	B	536	B	561	A	586	A
412	D	437	A	462	C	487	B	512	A	537	C	562	B	587	D
413	D	438	B	463	A	488	C	513	C	538	B	563	A	588	C
414	D	439	D	464	D	489	B	514	A	539	D	564	C	589	A
415	B	440	A	465	C	490	B	515	A	540	A	565	C	590	C
416	C	441	B	466	D	491	A	516	C	541	A	566	A	591	D
417	A	442	A	467	A	492	B	517	B	542	A	567	B	592	D
418	C	443	A	468	B	493	C	518	A	543	D	568	C	593	A
419	B	444	C	469	A	494	B	519	A	544	A	569	C	594	A
420	D	445	D	470	C	495	B	520	C	545	C	570	A	595	C
421	D	446	B	471	B	496	B	521	A	546	B	571	B	596	A
422	B	447	C	472	C	497	B	522	B	547	A	572	C	597	D
423	C	448	A	473	A	498	B	523	B	548	B	573	D	598	C
424	D	449	A	474	A	499	C	524	A	549	C	574	D	599	C
425	A	450	D	475	C	500	B	525	C	550	B	575	C	600	B

Answer Key of Review Questions in Animal Science

601	B	626	A	651	D	676	A	701	D	726	C	751	A	776	A
602	B	627	B	652	A	677	B	702	D	727	C	752	D	777	D
603	C	628	A	653	D	678	C	703	A	728	C	753	A	778	C
604	A	629	B	654	B	679	C	704	A	729	D	754	A	779	B
605	A	630	B	655	A	680	D	705	B	730	B	755	A	780	A
606	A	631	A	656	A	681	D	706	C	731	D	756	A	781	C
607	A	632	A	657	A	682	A	707	B	732	B	757	A	782	C
608	A	633	A	658	A	683	D	708	C	733	B	758	D	783	A
609	A	634	A	659	B	684	B	709	C	734	A	759	C	784	A
610	B	635	D	660	B	685	D	710	B	735	A	760	B	785	C
611	A	636	A	661	C	686	B	711	A	736	B	761	A	786	D
612	A	637	D	662	A	687	A	712	D	737	D	762	C	787	A
613	A	638	C	663	D	688	B	713	A	738	C	763	A	788	C
614	B	639	D	664	A	689	D	714	C	739	B	764	B	789	B
615	C	640	D	665	D	690	B	715	B	740	B	765	A	790	D
616	C	641	D	666	D	691	A	716	A	741	B	766	D	791	C
617	B	642	D	667	D	692	B	717	C	742	D	767	D	792	D
618	B	643	D	668	A	693	A	718	A	743	C	768	C	793	A
619	C	644	D	669	A	694	A	719	B	744	B	769	A	794	B
620	B	645	A	670	D	695	A	720	D	745	A	770	C	795	B
621	B	646	B	671	D	696	A	721	C	746	C	771	C	796	A
622	C	647	D	672	B	697	A	722	A	747	C	772	C	797	A
623	A	648	D	673	A	698	A	723	D	748	A	773	D	798	B
624	B	649	C	674	D	699	A	724	C	749	A	774	C		
625	C	650	A	675	A	700	D	725	A	750	B	775	D		