Animal Organ Systems (Student Version)

Submitted by Callie Parr and used in cooperation with the University of Illinois at Urbana-Champaign.

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Animal Organ Systems

Anatomy and Physiology
All living things are made up of ________.

Cells are the most basic structure of life.

Cells need ____________, food/energy, and ________________ to survive.
Natural Hierarchy

- ____________ are the most basic and simple.
- Cells that are all alike work together to form ____________ which perform tasks.
- Tissues that are alike work together to form ____________ which complete jobs.
- Organs work together in ________________ to carry out processes.
- Organ systems work together to support the life of an ________________.
How do we study animals?

- We look at the _____________ of them – the outer physical structures.
- We look ______________ of dead animals – the internal physical structures.
- We look at the tissues under a ______________ – microscopic structures.
- We study the _____________ reactions between cells, tissues, and organs.
Anatomy

The study of the _________, shape, and ______________ of an animal – its ____________ both internal and external.

- **Gross anatomy** is the study of the structures – internal and external – that we can _________________.
- ______________________ anatomy is the structures that can only be seen under magnification.
Physiology

- The study of the __________ of the cells, tissues, and organs of the animal.

- **Biochemistry**
- How cells, tissues and organs work __________ to complete a task...digestion.
Why study anatomy and physiology?

- Efficient production of livestock requires understanding the anatomy and physiology related to ________________.
  - Production is muscle gain, milk or egg production, and hair or wool production.

- Raising animals requires an understanding of the requirements needed for ________________.
  - Animal wellbeing is caring for animals so that their basic needs are met and they do not suffer.
Mammals vs Non-mammals

- Most of our livestock are _______________.
  - i.e. – vertebrate that has hair, gives birth to live young, produces milk, & maintains constant body temperature.
    - Cattle, horses, pigs, goats & sheep, etc.
  - Exceptions are ________________________________.
    - Poultry – birds – ducks, chickens, turkeys, etc.
    - Aquacrops – fish, shrimp, etc.
Organ Systems

- Skeletal
- Nervous
- Respiratory

- Excretory
- Endocrine
- Reproductive
Skeletal

- **Bones**
  - ____% water, 26% minerals (Ca & P), ____% protein, ____% fat
  - Core is soft and spongy – called ______
    - Marrow makes new red blood cells for body.

- **Cartilage**
  - Soft, tough tissue found between bones that ______________ joints

- **Ligaments**
  - Long ______________ tissue that holds joints together
Skeletal

- Gives structure and __________
- Protects internal __________
- Makes __________/movement possible
Skeletal - Joints

- **Synovial Joints**
  - Pivot
  - Ball and Socket

- **Fibrous Joint**
  - Suture

- **Cartilage Joint**
  - Hinge

- **Symphysis**
Skeletal - Skull

Skull is made up of several fused bones

Frontal View

Temporal
Parietal
Occipital
Zygomatic Arch
Sphenoid
Maxilla
Incisive

Side View

Temporal
Frontal
Nasal
Occipital
Zygomatic Arch
Sphenoid
Maxilla
Mandible
Skeletal - Spine

- The spine is made up of many vertebrae and cartilage disks
- 5 types of vertebrae
  - Cervical – ____________
  - ____________ – body
  - Lumbar – lower ____________
  - ____________ – around hip
  - Coccygeal - ____________
DOG

- skull
- cervical spine
- thoracic spine
- lumbar spine
- pelvis
- hip joint
- femur
- patella
- stifle joint
- tibia
- fibula
- rib
- scapula
- shoulder joint
- humerus
- elbow joint
- radius
- ulna
- carpus (wrist)
- metacarpus
- phalanges (toes)
- tarsus (hock)
- os calcis
- metatarsus
- tail
Muscular

- **Muscles**
  - ___________ cells that are design to __________ and relax in pairs
  - Voluntary – under the organisms __________ control – triceps
  - Involuntary – automatically move to __________ body functions – heart and ____________

- **Tendons**
  - Long, thin, ___________ tissues that attach muscles to ____________.
  - Muscles pull against ______ when they contract which causes ______________.
Muscular

- Primary function is ________________.
  - External & internal
- Also protect delicate ________________
- Muscles make up about __________ our livestock animals’ ________________.
- Composed mostly of ________________.
Muscular

Three types of muscles

- _________ – meat – bicep – voluntary
- _________ – heart – involuntary
- _________ – digestive system - involuntary
Skeletal

Cardiac

Smooth
A=Rhomboides capitis
B=Splenius
C=Levator scapulae ventralis
D=Supraspinatus
E=Infraspinatus
F=Teres major
G=Serratus dorsalis
H=Longissimus dorsi
I=Multifidae spinae
J=Clavotrapezius
K=Clavobrachialis
L=Acromiodeltoid
M=Spinodeltoid
N=Acromiotrapezius
O=Spinotrapezius
P=Spinalis dorsalis
Q=Latissimus dorsi
R=Rhomboides
Nervous

- Uses ________ impulses to send messages from brain throughout body.
- Controls ________, learning, ________
- _______ Nervous System and _________ Nervous System
Nervous

Brain
- _______ tissues that ______________ all aspects of animal function

Spinal Cord
- Main “_______” for nerve impulses to travel from ________ to rest of __________

Nerves
- Branch out and reach rest of body

Sensory organs
- ____________
- Olfactory
- ____________
- Taste
- ____________
Nervous - Brain

Bain

- _________ – controls voluntary movement and __________
  - Kicking, _______, vocals, _____________, etc
- _____________ – coordination of animal’s __________
  - Walking

Brain Stem – most of the functions to _______________
  - Body temp, _____________, digestion, _____________
## Nervous – Cranial Nerves

<table>
<thead>
<tr>
<th>Number</th>
<th>Nerve</th>
<th>Sensory Funct</th>
<th>Motor Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Olfactory</td>
<td>Smell</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Optic</td>
<td>Vision</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Oculomotor</td>
<td>Position of eye</td>
<td>Move eye, constrict pupil, focus</td>
</tr>
<tr>
<td>4</td>
<td>Trochlear</td>
<td>Position of eye</td>
<td>Move eye</td>
</tr>
<tr>
<td>5</td>
<td>Trigeminal</td>
<td>Sense in face &amp; teeth</td>
<td>Chewing</td>
</tr>
<tr>
<td>6</td>
<td>Abducens</td>
<td>Position of eye</td>
<td>Move eye</td>
</tr>
<tr>
<td>7</td>
<td>Facial</td>
<td>Taste buds</td>
<td>Blinking, facial expression</td>
</tr>
<tr>
<td>8</td>
<td>Auditory</td>
<td>Hearing &amp; balance</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Glossopharyngeal</td>
<td>Taste buds</td>
<td>Swallowing</td>
</tr>
<tr>
<td>10</td>
<td>Vagus</td>
<td>Sensory of internal organs</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Spinal accessory</td>
<td>Muscles of shoulder</td>
<td>Move neck and shoulders</td>
</tr>
<tr>
<td>12</td>
<td>Hypoglossal</td>
<td>Muscles of tongue</td>
<td>Move tongue</td>
</tr>
</tbody>
</table>
Nervous – Cranial Nerves

I. Olfactory
II. Optic Nerve
III. Oculomotor Nerve
IV. Trochlear Nerve
V. Trigeminal Nerve
VI. Abducent Nerve
VII. Facial Nerve
VIII. Vestibulocochlear Nerve
IX. Glossopharyngeal Nerve
X. Vagus Nerve
XI. Accessory Nerve
XII. Hypoglossal Nerve
Lobes of the Brain

- **Frontal**
  - __________, emotions, problem solving

- **________________**
  - Touch, temperature, pressure, pain

- **Occipital**
  - __________ and memory

- ______________
  - Vision
Functions of the Parts of an Eye

- The ________, made out of a fairly dense, jelly-like material provides protection for the eye.
- The ________________, a watery liquid, helps keep the cornea in a rounded shape, similar to that of a lens.
- The _____________ controls the amount of light that enters the eye.
- The ____________ controls the bending of light rays to a focused image on the retina.
Functions of the Parts of the Eye

- The __________ muscles control the thickness of the lens.
  - the power of the lens is directly related to its thickness
- The __________ is the light-sensitive inner lining of the eye.
- The __________ humor is a jelly-like substance that helps the eye keeps its round shape
- The __________ is the point where light enters the eye.
Nervous – Touch

- Hair
- Free Nerve Endings (pain)
- Hair Follicle Receptor (hair displacement)
- Pacinian Corpuscle (deep pressure, touch)
Circulatory

- **Heart**
  - Technically a ______________
  - Pumps blood with ___ chambers and ___ valves

- **Arteries**
  - Carry __________ rich blood from __________ and heart to __________

- **Veins**
  - Carry blood __________ from tissues to lungs and heart.
Circulatory – Heart - exterior

- Cranial Vena Cava
- Right Pulmonary Artery
- Right Pulmonary Veins
- Right Atrium
- Right Coronary Artery
- Right Coronary Vein
- Right Ventricle
- Caudal Vena Cava
- Aorta
- Left Pulmonary Artery
- Left Pulmonary Veins
- Left Atrium
- Left Coronary Artery
- Left Coronary Vein
- Left Ventricle
Circulatory – Heart - interior
Circulation – the flow of blood
Circulatory – Arteries and Veins

Aorta

Vena Cava
Circulatory

Blood
- white blood cells
  - Neutrophil
  - Lymphocyte
  - Eosinophil
- red blood cells
- Platelets

Plasma
- ______ part of blood – 55% of volume
- Carries O2 and carbohydrates (__________)
- Makes blood clot
Circulatory - Blood
Circulatory – Stained blood smears

- Basophil
- Erythrocytes
- Eosinophil
- Neutrophil
- Thrombocyte
- Monocyte
- Lymphocyte
Circulatory

- Also includes the Lymph Glands
  - Secrete ________________ fighting materials
- Moves materials throughout the body
Respiratory

- Nasal and ___________ Passages
  - External opening of the body and passageways
- Pharynx & _____________
  - ___________ connects the esophagus and trachea
  - Larynx is the “__________”
- Trachea
  - ___________ that connects nasal passages with ________________
Respiratory

- **Bronchus**
  - Tube that branch off of the ___________ and carries air to lungs

- **Bronchioles**
  - Smaller tubes that branch off of ____________

- _______________
  - Small sacks where gas exchange occurs

- **Lungs**
  - “__________” that expand and contract to bring in fresh air and expel old air
Respiratory

- Function is to bring _______ into the body and expel ______________.
- Exchange of gasses happens inside the lungs in the _________________.
- Lungs expand and contract due to the movement of the _________________.


Excretory

- Also referred to as the _______ System.
- Kidneys
  - Remove ____________ materials from blood
  - ____________ filter out wastes (urine)
    - Found in the Medulla and Cortex of kidney
- Bladder
  - Holds urine
- ______________
  - Connect bladder to urethra
- Urethra
  - Empties _______ to the exterior of the animal
Digestive

- ________ and varied system
- Breaks down ______ into usable energy
- Removes ____________ food from body
Digestion

- ____________ – 1 stomach – can’t digest cellulose (fiber) – pigs and humans
- ____________ – 4 stomachs – polygastric – digest cellulose, produce own B vitamins and proteins – cows and sheep
- ______________ - have 1 stomach, but have enlarged cecum that digests cellulose – horses and rabbits
Digestion - Monogastric

Mouth

- ___________ – gathering food – teeth, lips, tongue
- ______________ – Chewing – break food into smaller pieces for swallowing – teeth and saliva
Digestion - Teeth
Dentation

- By looking at the _________ of an animal, it is apparent what type of _________ they eat.
- An herbivore has _________ designed to clip grass and _________ designed to grind grass and grains.
- A _________ has incisors and premolars designed to _______________ and molars designed to shred.
- Omnivores combine the _________ teeth and the __________________________ teeth because they eat both meat and plants.
Digestion - Monogastric

- ___________ – transport tube to stomach – muscular contractions move food down
Digestion - Monogastric

Stomach

- conditions – pH of ____, churning and contracting to ___________
  food
- ingredients – food, ________, ______________
Digestion - Monogastric

Small intestine

- major site of nutrient absorption
- Functions – _________ absorb nutrients that have been broken down – minerals, ________, amino acids, ________, simple ________
Glands – __________ secretes bile used for ______ breakdown; ______ secretes enzymes for __________ and carbohydrate breakdown (pepsin and amylase)
Digestion - Monogastric

- Large intestine – colon
  - accumulates ____________
  - absorbs ____________

- Rectum and Anus
Digestion - Monogastric

- Esophagus
- Cecum
- Large intestine
- Small intestine
- Rectum
- Anus
Digestion - Ruminant

- **Mouth**
  - Prehension – cow tongue is very long
  - Mastication – graze ________, and don’t chew much 1st time

- **Esophagus** – liquids to the ________ and solids to the ________

- **Reticulum** – __________
  - __________ – very large compartment
Digestion - Ruminant

__________ – when rumen is full, the animal forces contents back up to re-chew

- **Rumination**
  - re-mastication of _________________
  - Bolus – ball of _________________
  - Adds saliva to food and grinds to smaller particles

- **Esophagus** – re-swallow food
Digestion - Ruminant

Rumen

- ____________ vat
- __________ gal
- contains microbes that break down the cellulose
- pH of ___________ for microbes
- releases ___________ – belch
- creates ___________ and _________ from amino acids
- also contains ___________ that absorb nutrients released by ___________
Digestion - Ruminant

- ___________ – filter for large particles – grinds them down
- ___________ – like the monogastric stomach – acidic and enzymatic
- Small intestine – same as monogastric
- Large intestine – same as monogastric
- Rectum and anus
Digestion – Pseudo-Ruminant

- Mouth
  - prehension
  - Mastication

- Esophagus

- Stomach
  - same as monogastric
  - too _________ in horses and inactive – doesn’t break down ______________
  - require frequent smaller meals
Digestion – Pseudo-Ruminant

- Small intestine – absorption of nutrients – same as __________________
  - **Still has not digested the cellulose – large amount

- _______________
  - enlarged area between small and large intestine
  - contains ______________ that break down cellulose like rumen
Digestion – Pseudo-Ruminant

- ____________ – absorbs nutrients released by cecum
- Small colon – absorbs ____________ and collects waste
- Rectum and Anus
Endocrine

- Ductless glands in the body
- __________, pituitary, pancreas, __________, thyroid, adrenal
- Secrete hormones that chemically __________ certain functions of the body
- Play a large role in ________________, digestion, growth, etc.
- Most hormones are derivatives of ____________ (corticoids)
Endocrine System
# Endocrine System

<table>
<thead>
<tr>
<th>Gland/organ</th>
<th>Hormone</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenal</td>
<td>Adreniline/epinephrine</td>
<td>Fight or flight abilities</td>
</tr>
<tr>
<td>Corpus Luteum</td>
<td>Progesterone</td>
<td>Maintain Pregnancy</td>
</tr>
<tr>
<td>Ovary</td>
<td>Estrogen</td>
<td>Sex drive/heat and feminine appearance</td>
</tr>
<tr>
<td>Testicle</td>
<td>Testosterone</td>
<td>Sex drive and masculine appearance</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Insulin/Glucagon</td>
<td>Regulates blood sugar levels</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Thyroxine</td>
<td>Controls metabolic rate</td>
</tr>
<tr>
<td>Pituitary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior</td>
<td>Growth Hormone</td>
<td>Stimulate growth of the body</td>
</tr>
<tr>
<td></td>
<td>FSH</td>
<td>Stimulate follicle formation/sperm production</td>
</tr>
<tr>
<td></td>
<td>LH</td>
<td>Stimulates Ovulation/CL formation</td>
</tr>
<tr>
<td>Posterior</td>
<td>Oxytocin</td>
<td>Smooth Muscle contraction</td>
</tr>
<tr>
<td>Hypothalamus</td>
<td>GnRH</td>
<td>Regulates and maintains reproductive cycles</td>
</tr>
</tbody>
</table>
Integumentary

- Skin, hair, hooves, horns, etc
- Keeps out ______________, regulates body ________, gives shape and color, protects internal organs
- System made almost entirely out of ________
- Animal skin is called the ____________________
  - Most animal hides made into leather
Reproductive System

- Most __________ system in animals
- Allows for reproduction of animals and the ________________ of the species
- Different structures between __________ and __________
- Most animals fundamentally have the same system, just varies in structure between species.
Male Reproductive Structures

- ___________ - produce sperm
- **testosterone** – hormone responsible for ________ and masculine appearance
- ___________ – Where the immature sperm are stored to mature
- ________________ – transportation tube that carries sperm from ____________ to the urethra
Male Repro (cont)

- **_________**: sac-like structure that contains and protects the testes
  - regulate temperature of the testes by ________________
  - testes must stay several degrees __________ than body temp.
Male Repro (cont)

- **Urethra** – large muscular tube that transports___________ and urine out the ___________
- **Semen** – contains __________, __________ to travel in, and ___________ solution
- ___________ – organ that extends into the female reproductive tract and deposits semen at the __________ – engorges with blood to cause an __________ necessary for __________
- **Sigmoid Flexure & Retractor Muscle** – are necessary to extend the ________ out of it’s protective __________ in bulls, rams, and boars
Male Repro (cont)

- _________ – Glands that produce fluid that protects and transports the sperm
- **Prostate Gland** – produces fluid that is mixed with the seminal fluid to _______
- **Cowper’s Gland** – produces fluid that precedes semen in the urethra to ______ and __________________ the tract
Reproductive Tract of Bull
Reproductive Tract of a Stallion
Reproductive Tract of a Stallion
Female Reproductive Structures

- **Ovary** – stores the eggs and produces ___________ and ___________ – hormones responsible for feminine appearance and estrus; eggs mature and are released one at a time - ________________.

- **Follicle** – as the eggs begin to mature, they become enlarged bodies on the ovary known as a follicle.
Follicles on Sow ovaries
Female Repro (cont)

- ___________ – also known as **Fallopian Tubes** in humans; tubes that carry the egg to the uterine horn; site of _______________. **Ectopic Pregnancy**

- ___________ – “catcher’s mitt”; as the egg is released, the infundibulum sweeps it off the _______________ and into the oviducts.
Female Repro (cont)

• __________ – y-shaped body that has ____ horns and cervix; it is very muscular and supports the fetus during pregnancy.

• __________ – litter bearing animals have _______ uterine horns and single bearing animals have _______ horns; horses and humans do not have uterine horns, just the main body of the uterus.

• ____________ – lining of the uterus that becomes engorged with blood to support the fetus.
Uterus Configurations
Female Repro (cont)

- lower outlet of the uterus that has cartilage rings; this is the structure that \textit{dilates} during birth.
- organ where copulation occurs and serves as the birth canal
- external (visible) portion of the female reproductive tract; made up of the \textit{Labia Majora} and the \textit{Labia Minora} (outer and inner folds)
- \textit{homologous} to the penis in the male
Reproductive tract of a Cow
Dorsal View
Reproductive Tract of a Sow