LECTURE NOTES

For

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Preface

There is a shortage in Ethiopia of teaching / learning material in the area of anatomy and physicalogy for nurses. The Carter Center EPHTI appreciating the problem and promoted the development of this lecture note that could help both the teachers and students.

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TGB: Tyro globulin

TRH: Tyro tropin Releasing Hormone

TSH: Thyroid Stimulating Hormone

UV: Ultra Violet

CHAPTER ONE

INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY

Learning Objective

At the end of this chapter, the students should be able to:

- Define Anatomy and Physiology
- Explain Homeostasis
- Describe levels of structural organization of the human body
- Discuss directional terms, anatomical position, planes and sections used in Anatomy.
- Differentiate body cavities

Selected Key terms

The following terms are defined in the glossary:

Anatomical position	Body regions
Anatomy	Directional terms
Appendicular skeleton	Homeostasis
Axial skeleton	Physiology
Body cavities	Quadrants
Body plane	

Hence, Anatomy and physiology are studied together to give students a full appreciation and understanding of human body.

Homeostasis

When structure and function are coordinated the body achieves a relative stability of its internal environment called *homeostasis* / staying the same. Although the external environmental changes constantly, the internal environment of a healthy body remains the same with in normal limits.

Under normal conditions, homeostasis is maintained by

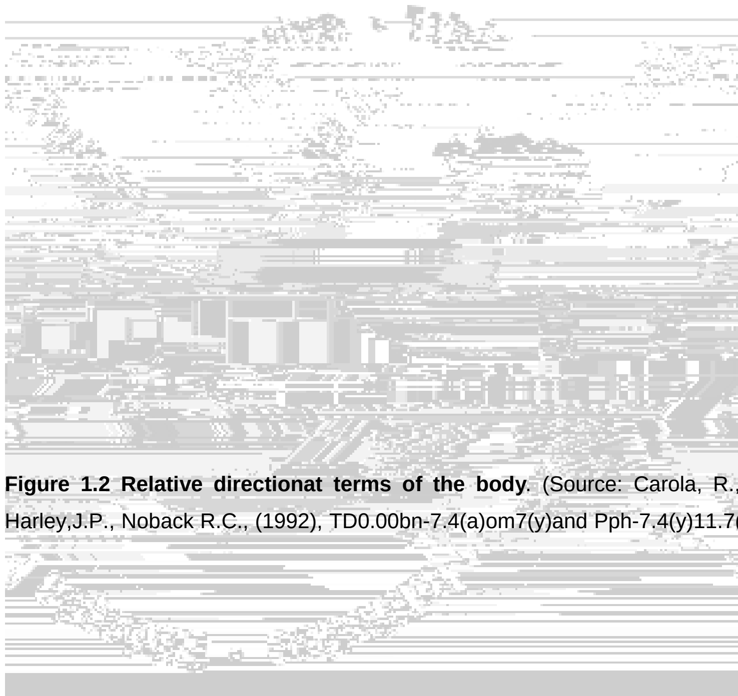


Figure 1.2 Relative directionat terms of the body. (Source: Carola, R., Harley,J.P., Noback R.C., (1992), TD0.00bn-7.4(a)om7(y)and Pph-7.4(y)11.7(,)-234(yolog)-6.4(y)142(c)77.5(TMc Gra-6.4(yw

1.5 Body Cavities

The cavities of the body house the internal organs, which commonly referred to as the viscera. The two main body

Review Questions

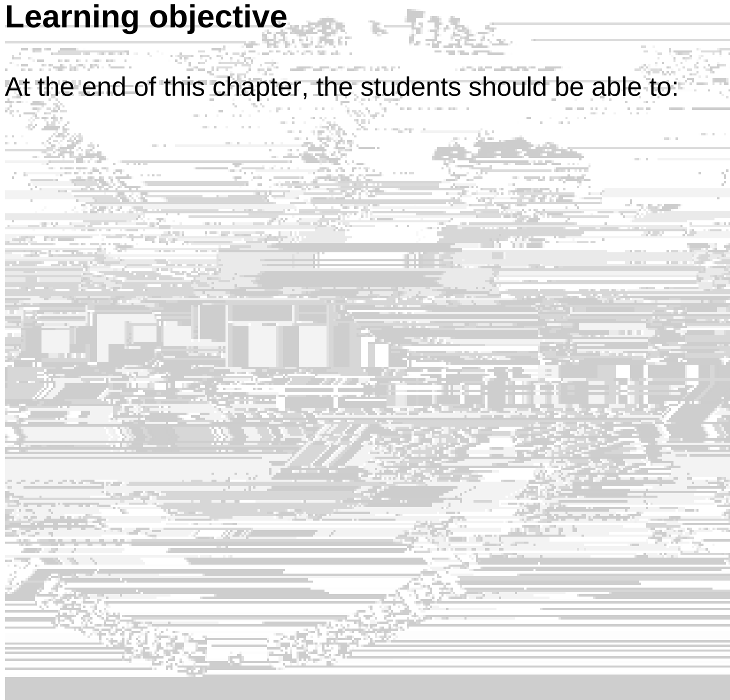
1. The anatomical term opposite to lateral is: -
   a) Proximal b) Distal

CHAPTER TWO

CELL

Learning objective

At the end of this chapter, the students should be able to:



2.1 Cell

Cell is the basic living structural and functional unit of the body.

Cytology: - It is a branch of science concerned with a study of cells

2.1.1 Plasma Membrane

Passive movement: includes

i. *Simple diffusion*, the random movements of molecules from area of high concentration to the area of low concentration. Example air in alveoli of lung

b. *Facilitated diffusion,* larger molecules, which are not soluble in lipid need protein channel to pass through the plasma membrane. No direct energy needed. Example: - Amino acid passes through the cell membrane.

c. *Osmosis,*

because they are soluble in water. The majority of organic substances however are found as colloids. Colloids are particles that remain suspended in the surrounding medium.

2.1.3 Organelles

Organelles are specialized portion of the cell with a characteristic shape that assume specific role in growth, maintenance, repair and control.

a)

enzyme capable of breaking dowa
molecules. The lysosomal enzyme believed to be synthesized in the granular endoplasmic reticulum and Golgi complex.

g) *The cyto-skeleton*, the cytoplasm has a complex internal structure consisting of a series of exceedingly small microfilaments, microtubule & intermediate filaments together referred to as the cyto-skeleton.

h) *Centrosme,* a dense area of cytoplasm generally spherical and located near the nucleus it contain centrioles. It also contains DNA that controls their replication. Centrosmes are made of microtubules, which seam drnsiinking straw0 -1hey are Involved in the movement of chromosome during cell division.

i) *Cilia/flagella,* thread like appendages, whicn4(h a)5.9(r)63o9(dage6(at.000of -1 Tf6.TJ0 -1.718

Therefore considering the number of layers and cell shape we

e h c t a i p n e c l

g r o u p s

m i S

a) S i

a l f

d i f T f h u u s

l u n g , i

*a) Connective tissue proper, c*onnective tissue proper has a more or less fluid intercellular martial and fibroblast. The various forms of connective tissue proper are:

- Loose (areolar) connectives tissue, which are widely and ligaments. Dense connective tissues provide support & protection and connect muscle to bone.

- Elastic connective tissue: Posses freely branching elastic fibers. They stretch and snap back in to original shape. They are components of wall of arteries, trachea, bronchial tubes & lungs. It also forms vocal cord. Elastic connective tissue allows stretching, and provides support & suspension.
- Reticular connective tissue: Lattice of fine, interwoven threads that branch freely, forming connecting and supporting framework. It helps to form a delicate supporting storma for many organs including liver, spleen

Hyaline cartilage

d) Vascular tissue (Blood tissue)

It is a liquid connective tissue. It contains intercellular

4. Which of the following is involuntary and striated?
   a) Skeletal muscle tissue
   b) Cardiac muscle tissue

Stratum spinosum: next down to stratum granulosum. The cells in this stratum have a poly-hydral shape and they are in the proces2.5(e)-3m protein synthesis.

Receptors of deep pressure (pacinian corpuscles) are distributed through out the dermis.

Hypoderms: it is found beneath the dermis. It is a subcutaneous layer (under the skin). Hypodermis is composed of loose, fibrous connective tissue, which is richly supplied with lymphatic and blood vessels and nerves. Hypodermis is much thicker than dermis. With in it coils of

the scalp of women aged 16 to 24 years. Scalp hair grows 0.4 m.m per day (an average scalp cont

4.4 Nail

Nails, like hair are modifications of the epidermis. They are made of hard keratin. Nails are co

4.

5.1.2. Gross anatomy of a typical long bone

You can take **Tibia** (in the leg) one of the longest bones in the body.

In adults it have:

Diaphis, the tubular shaft, hallow cylindrs an with walls of compact bone tissue. The

Epiphyseal plate is a thick plate of hyaline cartilage, which provides the framework of synthesis of the cancellous bone tissue within metaphysis.

- The medullary cavity running through the length of the diaphysis contains *Yellow marrow.*
- The porous latticework of the spongy epiphyses is filled with *red bone marrow.* The red marrow also known as *myeloid tissue*

  Endosteum is the lining the medullary cavity of compact bone tissue and covering the trabeculae of spongy bone tissue.

  Periosteum: it is covering the outer surface of the bone. It is absent at joints and replaced by articular cartilage.

5.1.3 Bone (Osseous) Tissue

Compact bone tissue forms the outer sheet of a bone. It is very hard and dense. It appears to naked eye to be solid but not. Compact bone tissue contains cylinders of calcified bone known as *osteons (Haversion system).* Osteons are made up

Figure: 5.3 Compact bone tissues (Source: Elaine n. MARIEB, (2000), Essentials of human anatomy and physiology, Addison secrete un-mineralized ground substance, act as pump cell to move calcium and phosphate in and out of bone tissue.

c) *Osteocytes* ae the main cell of fully developed bo They have a cell body that occupies a lacuna. Osteocytes are derived from osteoblasts. They together with osteoclasts play an important role of homeostasis by helping to release calcium.

d) *Osteoclasts* are

cartilage it self do not convert

Figure: 5.4 Axial and Appendicular skeleton (Source: Carola,

Table 5.2 Divisions of The Adult Skeleton (206 Bones)

AXIAL SKELETON		APPENDICULAR SKELETON
Skull (29 bones)*		
Cranium	8	
Parietal (2)		
Temporal (2)		
Frontal (1)		
Ethmoid (1)		
Sphenoid (1)		
Occipital (1)		

Table 5.3 Description and function of Cranial Bones (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed, pp 170)

Bone	Description and function
Ethmoid (1)	Base of cranium, anterior to body of sphenoid. Made up of horizontal, cribriform plate, median perpendicular plate, paired

Sutures

Meaning to stitch, are immovable joint found between skull bones. There are four main sutures in the skull.

a) *Coronal suture*: between the frontal & the two-parital bone.

b) *Sagital suture*: between the two parietal bones.

c) *Lambdoidal suture*: between parietal & occiputal bone.

d) *Squamosal suture*: between parietal bone and temporal bone.

shaped and is the largest fontanel. It closes 18 to 24 months after birth.

b) *The posterior (occiputal) fontanel,* between parietal & occiputal bone. It is also diamond shaped but smaller than the anterior fontanel. It closes 2 months after birth.

c) *The Antrolatral (sphenoidal) fontanel,* they

Human Anatomy and Physiology 5 3333

Nasal (2)	Upper bridge of nose between frontal processes of maxillae. Small, oblong; attached to a nasal

Table 5.5 Description and function of bones of the vertebral column (26 bones**), (source:** Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2

The Thorax

Refers to the chest. Thorax is a bony cage formed by sternum (breast bone), costal cartilage, ribs and bodies of the thoracic vertebra.

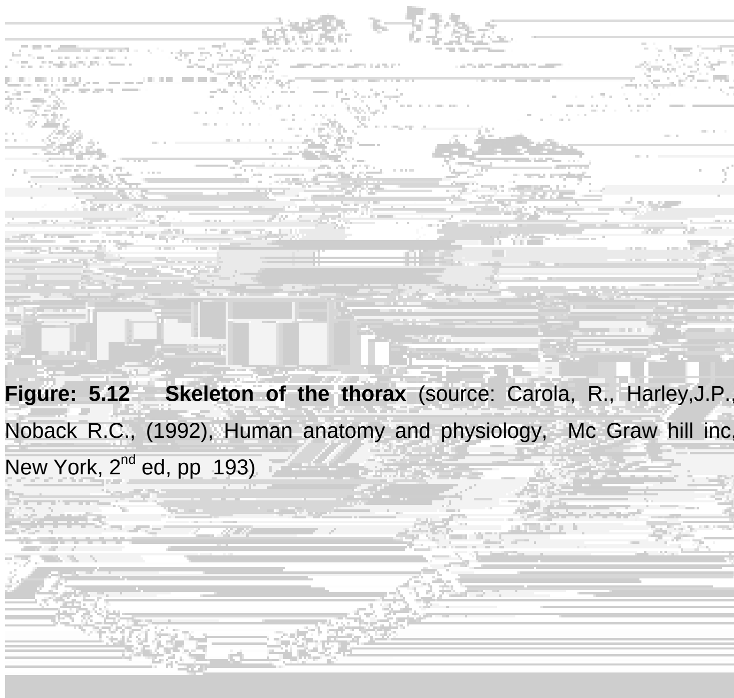


Figure: 5.12 Skeleton of the thorax (source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed, pp 193)

Table 5.6: Description and function of bones of the upper extremity (source: Carola, R., Harley,J.P., Noback R.C.,

Figure 5.20 [illegible] San Francisco, 6th Ed)

Figure: 5.21 Bones and arches of the foot (source: Memmler, Ruth Lundeen, Barbara Jansen Cohen and Dena Lin Wood (1996), The Human Body in Health and Disease, 8th ed, pp 103)

Arches of the foot

The sole of your foot is arched for the same reason that your spine is curved. Besides its function of absorbing shock it prevents nerves and blood vessels in the sole of the foot from being crushed.

There are three arches in the foot, two longitudinal (medial & lateral) and one transverse

5.7 Articulations

Bones being structural framework, muscles give it power. But movable joints provide the mechanism that allows the body to move.

. . . Continued

Muscle structure

A. Connective Tissue Component

A skeletal muscle is an organ composed mainly of striated muscle cells and conne-1.ve tissue. Ea-h skeletal muscle has two parts; the conshe c4(s)(ec.1(e tis(-h)h4(sh2(a5o)-0.th3(;at exte6(ato formtal)6.6( )]TJ0 -1.718 t e 6 (o - 1 . 5 2 n 4 t)] T J / T T 2 1 3 D 3 2 9 3 2 0 8 6 - T D 0 . 5 0

B. Microscopic structures6

The muscle bundles6are composed of many elongated muscle cells called muscle fibres. Each6**musclefibre** is a6cylindrical6 cell containing several6nuclei located immediately beneath the cell membrane (**sarcolemma**). The6cytoplasm of each6 muscle fibre (**sarcoplasm**) is filled with myofibrils. Each6 myofibril is a thread-like structure that extends from one end of the muscle fibre to the other. Myofibrils consist of two major kinds of protein fibres:6**actins** or6thin **myofilaments**, and **myosin** or thick6**myofilaments**.

The actins and myosin myofilaments form highly ordered units called **sarcomers**, which are joined end-to-end to form the6 myofibrils (see Figure 6-1). Sarcomere is a structural6and functional6unit of muscle tiss

a network of protein fibres, which6form the6**Z-lines** when6the6 sarcomere is viewed from side. The6Z-lines form an6 attachment

the6actin and myosin myofilaments in a sarcomere gives the6 myofibril because

myofilaments overlap. The

I-band) and dark (**A-band**) areas of the6 0 TD-0.6168 -1.7245 TD0.0008 T

The sarcolemma of a muscle fibre forms blind-ended sacs or **T-tubules** which penetrate the cell and lie in the spaces between the myofibrils. The T-tubules contain interstitial fluid and do not open into the interior of the muscle fibre. Within the sarcoplasm of the muscle fibre there is an extensive network of branching and anastomosing channels, which forms the sarcoplasmic reticulum (this structure is a modified endoplasmic reticulum.m4 7manam of th9(sarpcol)8asml

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with the actin receptor sites and pull the actins myofilaments toward the centre (H-zone) of each sarcomere. The bond between the myosin crossbridges and actin breaks down under the influence of enzymes and the crossbridges are then free to rejoin with other actin receptor sites. The actin filaments do not shorten but slide past the myosin filaments overlapping them so that the Z lines are drawn toward each other, shortening the sarcomere. As each sarcomere shortens the whole muscle fibre contracts.

Relaxation of the muscle fibres occurs when the calcium ions are actively reabsorbed by the sarcoplasmic reticulum thus

primarily on aerobic respiration for ATP synthesis. Although some glucose is used as an energy source, fatty acids are a more important energy source during sustained exercise as well as during resting condi17.1s. On the other hand, during intense exercise such as riding a bicycle up a steep hill, anaerobic respiration provides enough ATP to support intense muscle

Glucose

Fatty acids

Anaerobic respiration

respiration

Aerobic

2 ATP + Lactic acid

CO_2 + H_2O

38 ATP +

Figure 6-2. Anaerobic and aerobic respiration

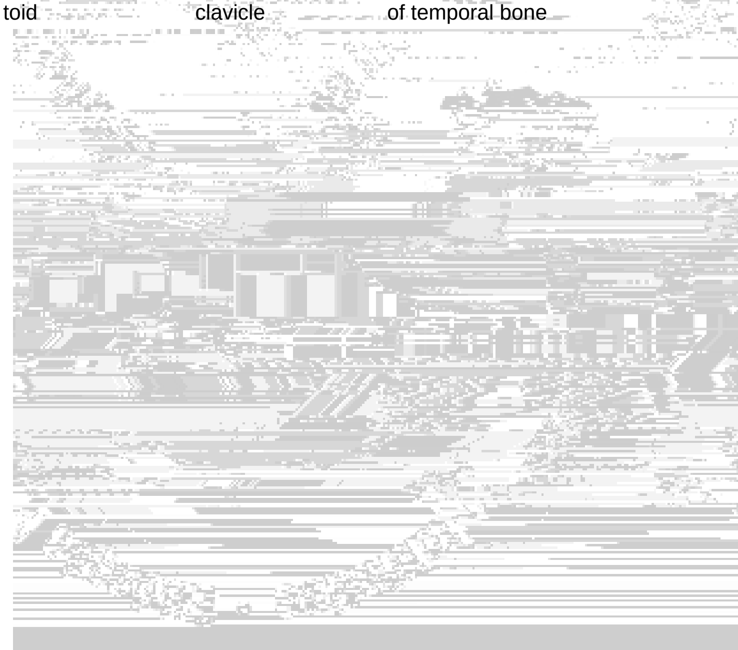
Contractions for approximately 1 to 2 minutes. Anaerobic respiration is ultimately limited by depletion of glucose and a build up of lactic acid within the muscle fibre. Lactic acid can consequence, ATP levels are too low to sustain crossbridge movement and the contractions become weaker and weaker. For most of us, however, complete muscle fatigue is rarely the reason we stop exercising. Instead, we stop because of psychological fatigue, the feeling that the muscles have tired. A burst of activity in a tired athlete as a result of encouragement from spectators is an example of how

hold the muscle so that the fo

Principal skeletal muscles

Although there are over 700 individual skeletal muscles in the human body, an appreciation and understanding of skeletal muscl-1.724s can be accomplished by concentrating on the large

Muscles of mastication Temporalis	Temporal region on side of the skull	Mandible	Closes jaw
Massetor	Zygomatich arch	Mandible	Closes jaw
Muscles that move the head rapezius	Occipital bone and vertebrae	Scapula and Clavicle	Extends head and neck
Sternocleidomastoid	Sternum & clavicle	Mastoid process of temporal bone	



- Discuss the anatomical and functional characteristics of

Cerebral cortex Pons

one part of the body to another, but they do it in different ways. The nervous system transmits information very rapidly by nerve impulses conducted from one body area to another. The endocrine system transmits information more slowly by chemicals secreted by ductless glands into blood steam and circulated from glands to other parts of the body. The nervous system serves as the chief coordinating agency. Conditions both within and outside the body are constantly changing; the purpose of the nervous system is to respond to these internal .6(lsfe)5.4(lgg)5.3(ennch(d)]TJge)]TJs (kd

nd

Division of the Nervous System The nervous system as a whole consists of two principal di

A. Hypothalamus

B. Thalamus

IV. Cerebrum

Cerebellum

Structure. Look at Figure 7-5 to find the location, appearance, and size of the cerebellum. The cerebellum is

end of the cord no longer reaches the lower part of the spinal canal. This disparity in growth conti

1. Conduction of sensory impulses upward through ascending tracts to the brain
2. Conduction of motor impulses from the brain down

Table 7-1

Nerves

A nerve is a bundle of nerve cell fibers located outside the CNS. Bundles of nerve cell fibers within the CNS are tracts.

beginning at the front and proceeding back (Figure 7-10). The first 9 pairs and the 12th pair supply structures in the head.

General Functions of the cranial nerves

From the functional point of view, we may think of the kinds of messages the cranial nerves handle as belonging to one of four categories:

1. Special sensory impulses, such as for smell, taste, vision, and hearing
2. General sensory impulses, such as those for pain, touch, temperature, deep muscle sense, pressure, and vibrations
3. Somatic motor impulses resulting in voluntary control of skeletal muscles
4. Viscera motor impulses producing involuntary control of glands and involuntary muscles (cardiac and smooth

   nervous system, parasympathetic division.

The Autonomic Nervous System

nerve fiber extends all the way from the spinal cord to the skeletal muscle with no inte.0002.42 singcsyna0002.pse.

2. The parasympathetic pathways begin in the ***craniosacral*** areas, with fibers arising from cell bodies of the midbrain, medulla, and lower (sacral8 part of the spinal cord. From these centers the first set of fibers extends to autonomic ganglia that are usually located near or within the walls of the effector organs. The pathways then continue along a second set of neurons that stimulate the involuntary tissues. These neurons release the neuro transmitter acetylcholine, leading to the description of this system as ***cholinergic*** (activated by acetylcholine).

6. Dilation of the bronchial tubes to allow more oxygen to enter
7. Increase in metabolism.

The sympathetic system also acts as a brake on those systems not directly involved in the response to stress, such as the urinary and digestive systems. If you try to eat while you are angry, you may note that your saliva is thick and so small in amount that you can swallow only with difficulty. Under these circumstances, when food does reach the stomach, it seems to stay there longer than usual.

The parasympathetic part of the autonomic nervous system nonnal1y acts as a balance for 7. (i a quantity3e)5.fluidity3ierasymn(pathe)chodyh th 0 TD0088 168Tc

Table 7-2 Effects of the sympathetic and Parasympathetic Systems on Selected Organs

Sense Organs

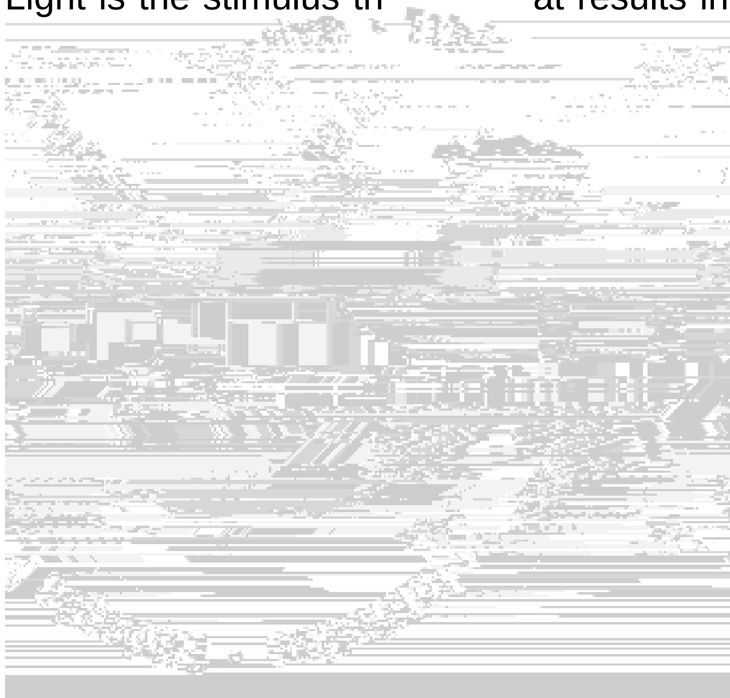
Classification of sense organs

transparent but appears blue, brown, gray, or green because it lies over the iris, the clie rd part o5.35(f)26(rthe ceye. A mucou5.35()-2.78)]TJ10-1.7124 TD

light is necessary to stimulate the cones. In other words, rods are the receptors for night vision and cones for daytime vision. There are three kinds of cones; each is sensitive to a different colour: red, green, or blue. Scattered throughout the central portion of the retina, these three types of cones all.tteref uthes blindness. Cataracts can be removed surgically and replaced with

Visu

Light is the stimulus th at results in vision8.4671 0 TD-4.0009



were generated by light stimuli in the rods and cones of the

External ear

The external ear has two parts: the auricle or pinna and the external auditory canal. The auricle is the appendage on the side of the head surrounding the openoup external auditory 5(pcan)5.6(a)-0.4(l. The)6(can)5.6(a)-0.4(l)6.9(itself is)6(a curve a)5.6(bout 2)5.6(.)2.7

much like a "tube within a tube." This is a membranous labyrinth, and it is filled with a thicker fluid called endolymph.

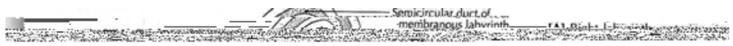


Figure 7-16 The Inner ear (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed,)

Although the olfactory receptors are extremely sensitive (that is, stimulated by even very slight interpreted as specific odors. The pathways taken by olfactory nerve iypulses and the area where these impulses are interpreted are closely associated with areas of the brain

Review Questions

The Endocrine Glands and Their Hormones

The endocrine system consists of the glands that secrete

Metabolic Effects

Protein metabolism: GH increases protein synthesis and nitrogen retention by enhancing the incorporation of amino acids into prot09 . The prot09 anabolic action results from 1) accelerated entry of amino acids into cells and 2) increased

2. Prolactin (PRL)

Control of Secretion

Prolactin (PRL) is a peptide hormone composed of 199 amino acids. Its secretion by the lactotrophs of the adenohypoiphysis is tonically suppressed by dopam

adenohypophysis. Elevated plasma levels of free thyroid hormones (T3 and T4) inhibit thyrotropin secretion. Stress also inhibits TSH secretion.

Actions

Biosynthesis of Thyroid Hormones

1. Iodide uptake: Ingested iodine is readily absorbed from the GI tract in the reduced iodide state. Iodide ions are actively transported from the blood into the thyroid follicles by an energy-requiring "trapping" mechanism often called the iodide pump. The normal thyroid: serum ratio of iodide is 25:1. The uptake of iodide is enhanced by TSH and may be blocked by anions such as perchlorate and thiocyanate.
2. Oxidation to iodine: On entering the colloid, iodide is rapidly oxidized to iodine in the presence of peroxidase enzymes. Thiouracil appears to inhibit peroxidase activity.
3. 1.273707 t5 Tc thsiodin42.6(n42:4(s)5.Fre The moleculch a)5ride i76.6(c

until a stimulus for secretion arrives. On stimulation by TSH,portions of the TGB(colloid) are engulfed by microvilli that extend from the apical surface of the follicular cells. Droplets of the engulfed colloid fuse with lysosomes, and proteolytic enzymes release T3 and T4 from the TGB. The lipophilic hormones (T3 and T4) readily diffuse to nearby capillaries and enter the bloodstream.

Thyroid-stimulating hormone, acting through cyclic AMP, PBI and increasing the percentage of free, active hormones. High levels of estrogen, such as those occurring in pregnancy or during oral contraceptive th

however, the renal actions of PTH lead to a net decrease in plasma phosphate levels.

- Kidneys: PTH promotes renal tubular reabsorption of

Insulin-secreting beta cells are the most numerous, making up to 75% of the islet cell population. The A cells containing glucagons comprise approximately 20% of islet cell mass, whereas the somatostatin–containing D cells accou8nt for 3% to 5% of pancreati7 u2ouslet celsn. The s tme

adipose tissue. Glucagon also enhances hepatic ketogenesis by facilitating conversion of fatty acids to ketone bodies.

- Protein metabolism: Glucagon exerts a catabolic action on hepatic proteins and inhibits thaAnatooroti adids5.4(snato)hrati

3. Pancreatic Somatostatin

Unlike glucagons and insulin, pancreatic somatostatin does not directly regulate intermediary metabolism. Rather, it slows digestionoand absorption of nutrients by exerting several

•

concentrations of sodium and potassium are involved in the control of aldosterone secretion. Hyperkalemia (elevated

nuclei o

The most important function of [illegible] a plasma protein called fibrinogen into solid threads of fibrin, which form the clot.

Blood Clotting

Blood clotting, or coagulation, is a protective device that prevents blood loss when a bl

donor's red blood cells may rupture and release their antibodies to agglutinate red cells8(y)-6.1(d the)-6.1(y)3.7(can)-6(there)-6.1(f)3(or)-7.6(e)-6.1( )]

Figure 9-3. Heart and great vessels (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed,)

Four Chambers

2. The **right ventricle** pumps the venous blood received from

that supply blood to the muscle of the heart are called the **right** and **left coronary arteries** (Figure 9-5). These arteriesF0.-2ch-5.28

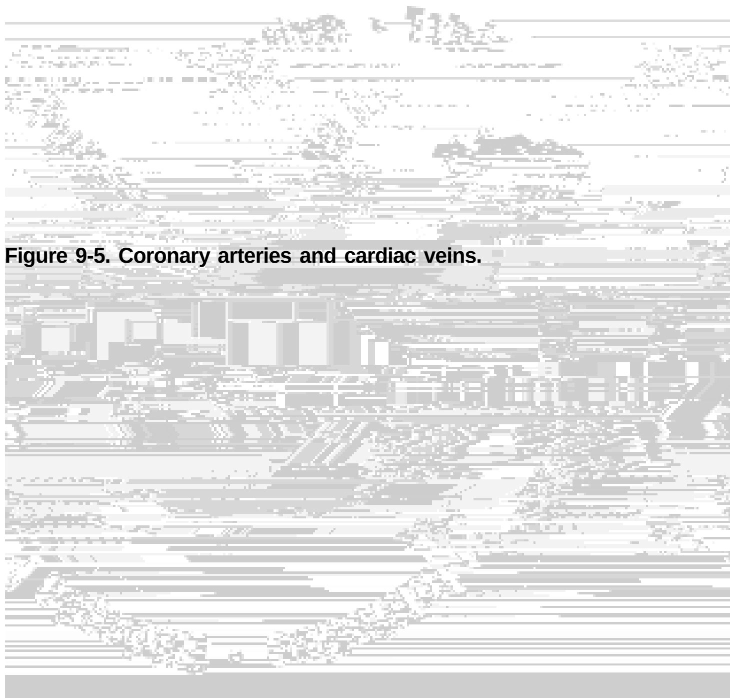


Figure 9-5. Coronary arteries and cardiac veins.

volume–and the number of beats of the heart per minute–the

arteries that extend between the ribs, sending branches to the muscles and other structures of the chest wall.

Branches of the Abdominal Aorta

As in the case of the thoracic aorta, there are unpaired branches extending forward and paired arteries extending toward the side. The unpaired vessels are large arteries that supply the abdominal viscera. The most important of these visceral branches are listed below:

1. The celiac trunk is a short artery about 1.25 cm long that subdivides into three branches: the [illegible]

3. The renal arteries, the largest in this group, carry blood to

 (innominate) veins are formed, one on each side, by the union

Figure 9-10. Principal veins (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed,)

Figure 9-11. Hepatic portal circulation (Source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed,)

vena cava, they deliver it by way of the hepatic portal vein to the liver. The largest tributary of the portal vein is the superior mesenteric vein it is joined by the spleenic vein just under the liver. Other tributaries of the portal circulation are the gastric, pancreatic, and inferior mesenteric veins.

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Blood Pressure

Since the pressure inside the blood vessels varies with the condition of the heart, the blood, and the vessels, as well as with n.ocorepersoncorere3(re)-d3(re)-tpre p

a. **Right lymphatic duct** drains upper right part of the body and empties in to right subclavian vein

b. **Thoracic duct**

Review Questions

1. How does the color of blood vary with the amount of oxygenation?

2. Name the three main purposes of blood.
3. Name the two prime components of lood.
4. Name four main ingredients of blood plasma. What are their Purposes?

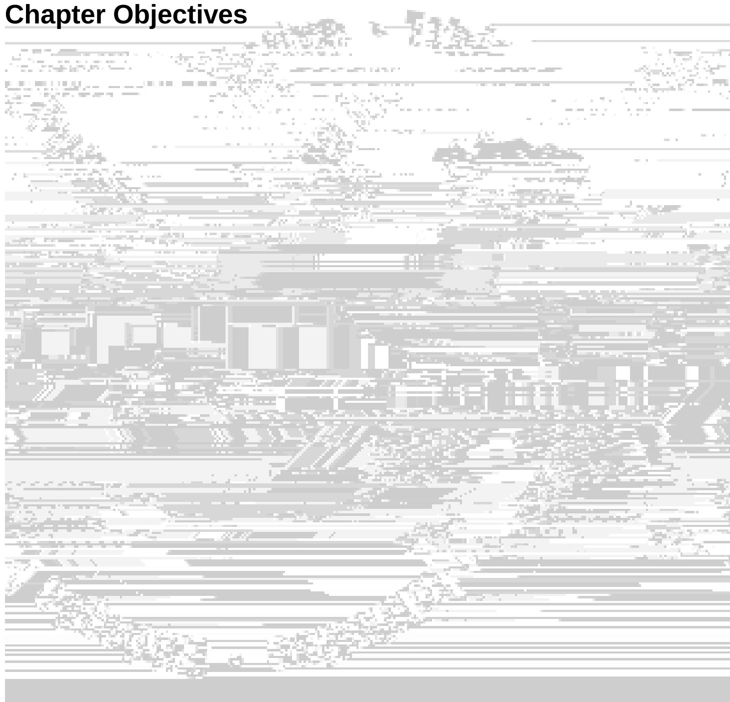
5. What is the main function of erythrocytes? Leukocytes? Platelets?

6. What are the names usually given to the four main blood groups? What determines the dit group. n67

CHAPTER TEN

RESPIRATORY SYSTEM

Chapter Objectives



The sinuses are small cavities lined with mucous membrane in the bones of the skull. The sinuses communicate with the nasal cavities, and they are highly susceptible to infection.

larynx. You can feel the larynx move upward toward the epiglottis during this process by placing the fingertips of your fingers on your larynx as you swallow.

The larynx is lined with ciliated mucous membrane. The cilia trap dust and other particles, moving them upward to the pharynx to be expelled by coughing, sneezing, or blowing the nose.

The Trachea (Windpipe)

The trachea is a tube that extends from the lower edge of the larynx to the upper part of the chest above the heart. It has a

depends primarily on the respiratory control centers located in the medulla and pons of the brain stem. Nervec2.7.Rvlmsfroe the

H u m a n A n a

and the outer layer has longitudinal fibers. The alternate contractions of these muscles create the wavelike movement that propels food through the digestive tract and mixes it with digestive juices. This movement is called ***peristalsis***

from buds that are present at birth. The first permanent tooth to appear is the important 6-year molar. This permanent tooth comes in before the baby incisors are lost. Because decay

1. The parotid glands, the largest of the group, are located below and in front arotid ear.
2. The submandibular, or sumaxillary, glands are located nearotid body arotid lower jaw

3. The sublingual glands are underotid tongue.

Allotidse glands empty by means aroducts intootid oral cavity.

The Pharynx and Esophagus

The pharynx is commonly referred to asotid throat. The oral part of the pharynx is visible when you look into an open mouth and depressotid tongue. The palatind tonsilsomay be seen at eitheroside. The pharynx also extends upward tootie nasal cavity and downward tootie level arotid larynx. The soft palate is tissud that formsotid back of tid roaroarotid oral cavity. From itohangs a soft, fleshy, V -shaped mass called tid uvula.

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into esophagus, a muscular tube about 25cm (10 inches) long

The Small Intestine

The small intestine is the longest part of the digestive tract. It is known as the small intestine because, although it is longer than the large intestine, it is smaller in diameter, with an average width of about 2.5 cm (1 additionk each epithelial cell has small projecting folds of the cell membrane known as microvilli. These create a remarkable increase in the total surface area available in the small intestine for the absorption of nutrients.

The Large Intestine

Any material that cannot be digested as it passes through the dig0936 Tstive tract must be enated from the body. In additionk

d(re)524(c(ly(into the(bloe)524ds.)]TJ/T42 1 TfT*D0 Tc0 Tw( )TjT*D-0.0001 Tc030915 Tw[Digese)52

along the alimentary canal, and finally eliminates the digestive wastes from the body. Chewing or mastication, swallowing or deglutition, peristalsis, and defecation are the main processes of mechanical digestion. **Chemical digestion** breaks down large, nonabsorbable food molecules–molecules that are able to pass through the intestinal mucosa into blood and lymph. Chemical digestion consists of nume catalyzed by enzymes in saliva, gastric juice, pancreatic juice, and intestinal juice.

The urinary system is also called the excretory system of the

12.1.3 Blood circulation:

Blood is supplied to the kidneys by renal artery and drainage is by renal vein.

nephron and their function. (source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed, pp 855)

Structure **Major functions** G

All the functions are directly or indirectly related to the formation of urine. The series of events leads to:

- To the elimination of wastes
- Regulation of total body water balance.
- Control of the chemical composition of the blood and other body fluid
- Control of acid base balance

The processes in urine formation are: -

12.2 Accessory Excretory structures

Urine is formed in the kidney, but accessory structures are required to transfer, store and eventually eliminate urine from the body. These structures are the two ureters, urinary bladder and urethra.

12.2.1 Ureters

like the kidneys and ureters. It is

in length in male. In females it opens between vagina and clitoris. In male it pass through prostate,mbranous portion (pelvic diaphragm muscle), spongy portion (that pass through

12.3.1 Urination

Urination is emptying of the bladder; it is the process of conscious and unconscious nerve control. Steps of urination are:

Conscious desire to urinate

Pelvic diaphram muscle relax

Study Questions

1. The apex of each renal pyramid end in the
   - a) Cortical region
   - b) Papilla
   - c) Juxta medullary region
   - d) Capsule
   - e) Tubule
2. The inner most layer ofion the ureters is the
   - a) Mucosa
   - b) Muscularis
   - c) Adventitia
   - d) Longitudinal layer
   - e) Circular layer
3. The kidney function in all ofithe following ***except***
   - a) Acid – base balance
   - b) An endocrine organ
   - c) By removing metabolic waste
   - d) By removing excess carbon dioxide
   - e) By maintaining osmotic concen
4. An increased volume ofiurine formation would follow:-
   - a) Inhibition ofitubular sodium re-absorption
   - b) A fall in plasma osmolarity
   - c) A fall in plasma volume
   - d) a and b
   - e) a, b and c
5. Urine passéithroughithe ureters by:
   - a) Gravity
   - b) Hydrostatic pressure
   - c) Filtration
   - d) Peristalsis
   - e) a, b and d

The composition of body fluids is an important factor in

Functions:

- Necessary for cell metabolism & contribute to body structure.
- Facilitate movement of water between the body

Study Questions

1. Whihe followhi are the most shi

sma & inter(s)38.(tistal fluids)]TJ04 -1.2456 TD-0.0031 Tc-0.0219 Tw[) gma & intercellular fluids

mara intost5(u)0118()6.8ar e tfluids Movement8of waa & from one bod 30 Tartmost4Went8tolar in( )

The function of reproductive system is replication. Reproduction by means of sexual intercourse produces new human beings and hereditary traits to be passed from both

14.1s1 Male internal reproductive organs

Male internal reproductive organs include the tastes, series of ducts and accessory glands.

14.1s1s1 Tastes

Testes are paired male reproductive organs (gonads), which produce sperm. During fetal life, tests are formed just below the kidneys inside the abdomino-pelvic cavity. By third fetal month it stats is to descend and by the seventh month of fetal life it passes through the inguinal canal. The inguinal canal is a passageway leading to scrotum.

Human Anatomy and Physiology Semniferous

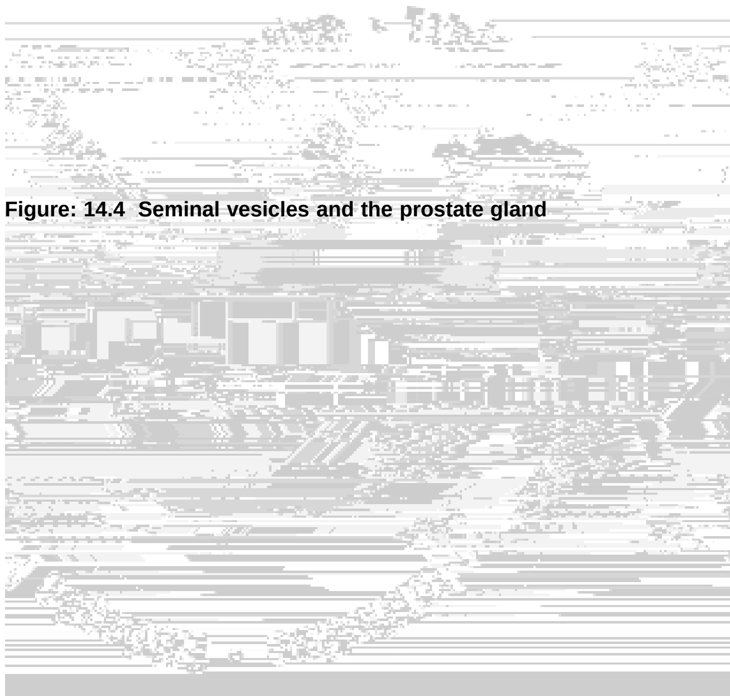

Figure: 14.4 Seminal vesicles and the prostate gland

The corpus spongiosum extends

mesovarium to the backside of each ***broad ligament***. A thickening border of the mesovarium called ***ovarian ligament*** extends from the ovary to the uterus. The ovary is suspended from the pelvic wall by the ***suspensory ligament***.

A layer of specialized epithelial cells called ***germinal layer***

Mound of fatty tissue covers symphysis pubis. It is covered with hair at puberty.

14.2.2.2 Labia majora

14.5 Gametogenesis

Gametogenesis is the process of formation of sex cells. It is said spermatogenesis in male & oogenesis in females. Both involve meiosis, a form of nuclear division.

B

Figure: 14.13 Gametogenesis; A- Spermatogenesis, B- Oogenesis (source: Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed, pp 929/30)

the released ova from the ovary to the uterus is prevented. And in males the surgical intervention for the purpose of contraception is called vasectomy. In this case both vas deferences are cut or ligated and after production the transmission of sperm from the testes prevented.

Temporary methods: condoms, tablets, Intra Utern Devices

4. In female, production of FSm is inhibited by
   a) Estrogen
   b) LH
   c) Progesterone
   d) Prolactine
   e)

5. Which of the following hormones is used as the basis for pregnancy testing?
   a) Estrogen
   b) LH
   c)G
   d) Prolactine
   e) Progesterone

Endocardium lining of the heart

Endocrine

Endothelium

Endosteumconnective tissue layer covering the inner hallow

of bone

Erythrocyte od celltive tissue-5.5449 -1.7246 TD-0.0021 Tc0 Tw[Enz)-11.1(y)15.1(me)]TJ/TT2 1 Tf3.76 w 0 TD0.

Epiglottis

swallowing

Epimysium sheath of fibrous nnective tissue thatoses

muscle

Epinephrine adrenaline; secretion of the adrenal medullaive tissue-5.7725 -1.7186 TD-0.001 Tc0 Tw

cavitiesve tissue3.3353 0 TD0 Tc( )Tj-3.3353 -1.7186 TD-0.0002 Tc[Esophagu)5.9(s)]TJ/TT2 1 Tf5.

Eponychyem thin flap of skin covering the proximal end of the nail

Extra cellular fluid all fluid existing out of a cell

Filtrate the primary filtered substance in the renal tubule

Fibrin blood protein that forms a blood clot

Follicle-Stimulating Hormone (FSH) Hormone produced by

Luteinizing

Mitosis indirect cell division involving complex changes in the nucleus

Mons pubis skin covered pad of fat over the symphysis pubis

aremembrane1(d)4utoms u7i

Tissue

References:

1. Carola, R., Harley,J.P., Noback R.C., (1992), Human anatomy and physiology, Mc Graw hill inc, New York, 2nd ed.

2. David T. Lindsay, 1996, Functional human anatomy, Mosbay, St. louis

3. De Loris Wenzel and David, (1996), T. Lindawy Study