Biology 230

Human Anatomy

Anatomy

- The art of separating the parts of an organism in order to ascertain their position, relations, & structure

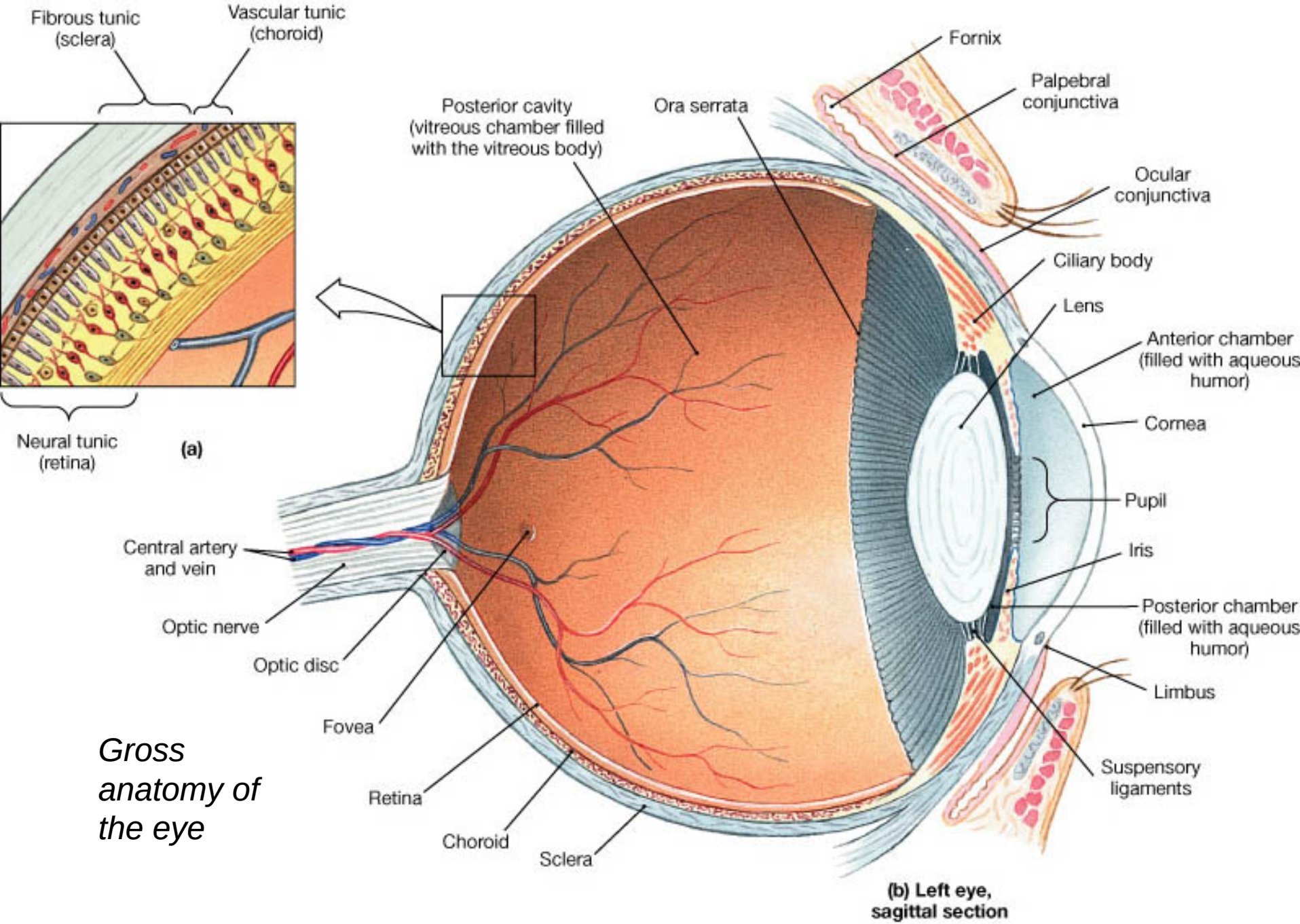
- Cutting something up to see what's inside
  - structure

Types of anatomy

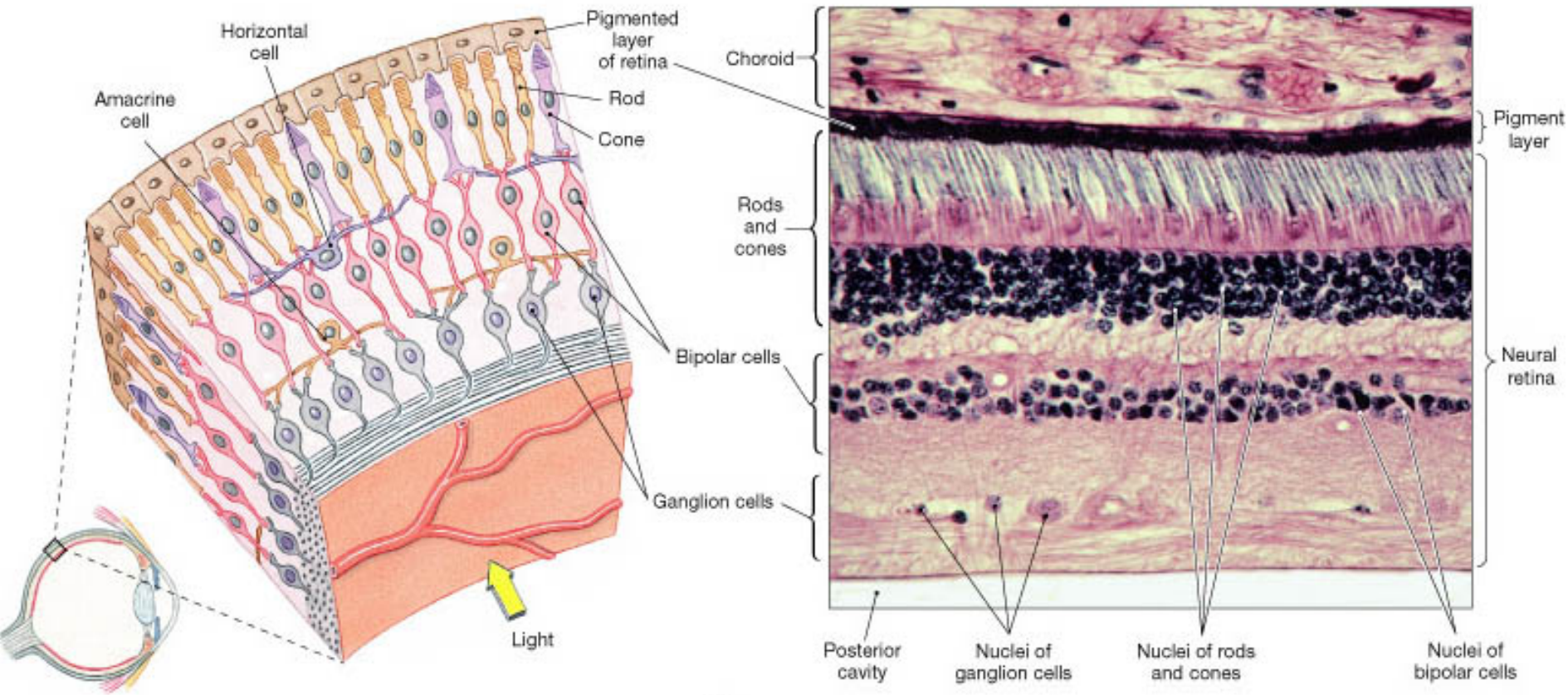
- Microscopic anatomy
  - Cytology-internal structure of cells
  - Histology-study of tissues (groups of cells)
- Gross anatomy
  - Surface anatomy
  - Regional anatomy
  - Systemic anatomy

Gross anatomy

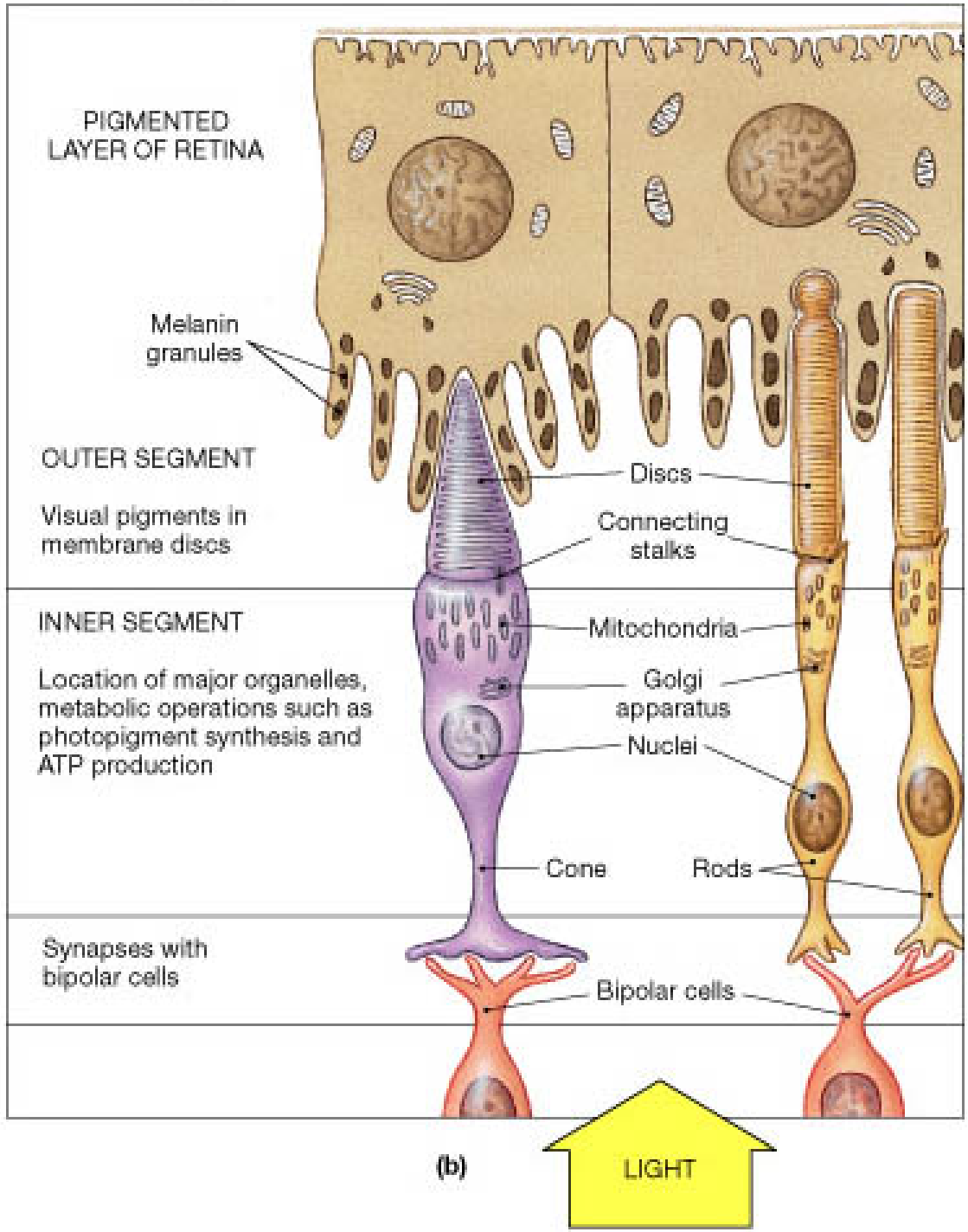
- **Surface anatomy**-anatomy that we can see at the surface of the body (everyday life)
- **Regional anatomy**-complete anatomy (internal) of a specific region of the body (learning every blood vessel, muscle, bones, etc. in the arm)-medical school
- **Systemic anatomy**-the body is divided into 11 organ systems-(our class)



Gross anatomy of the eye



Histology of the eye



Cytology of the eye

Physiology

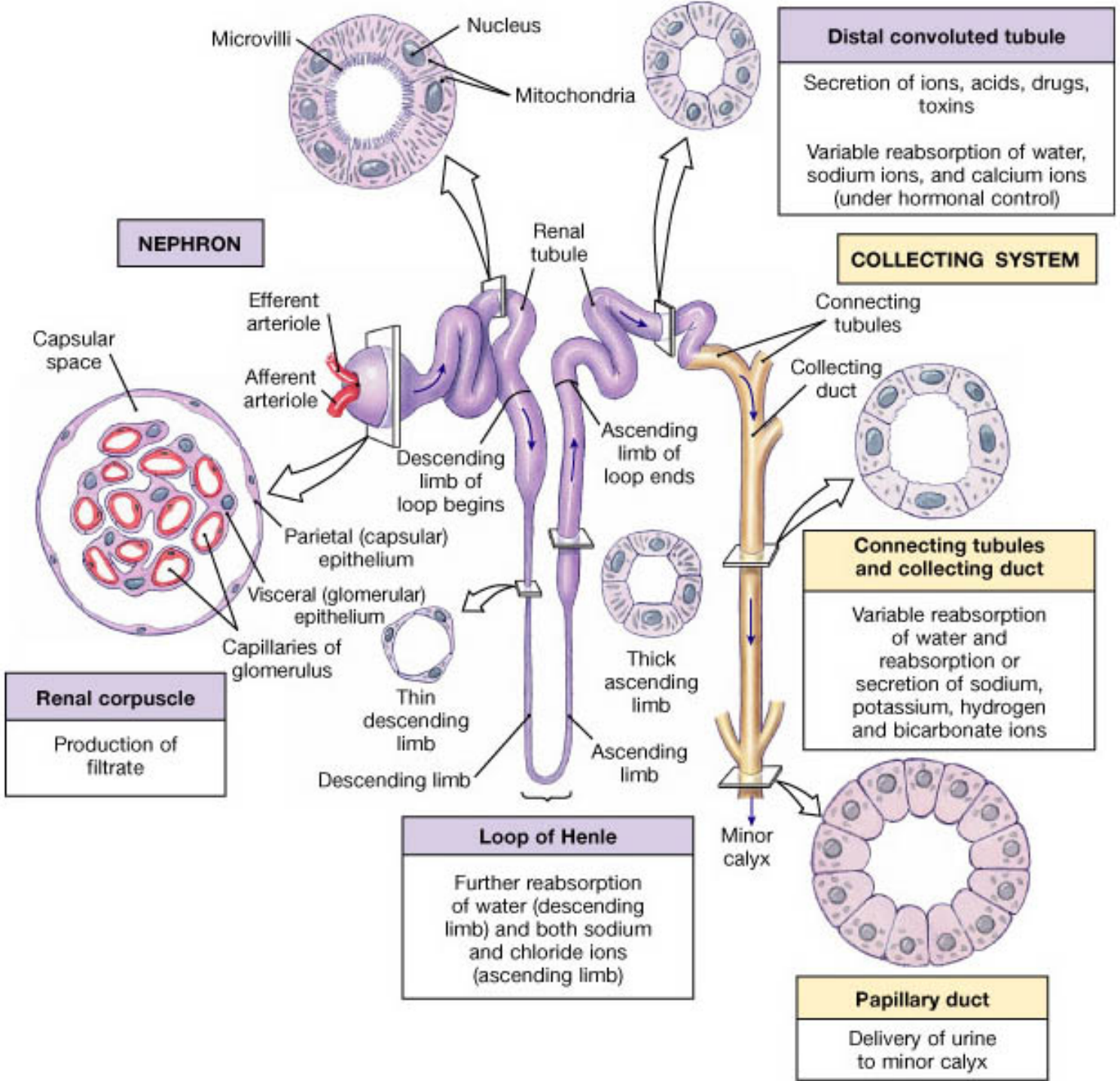
- A branch of biology that deals with the functions & activities of life or of living matter (as organs, tissues, or cells) & of the physical & chemical phenomena involved

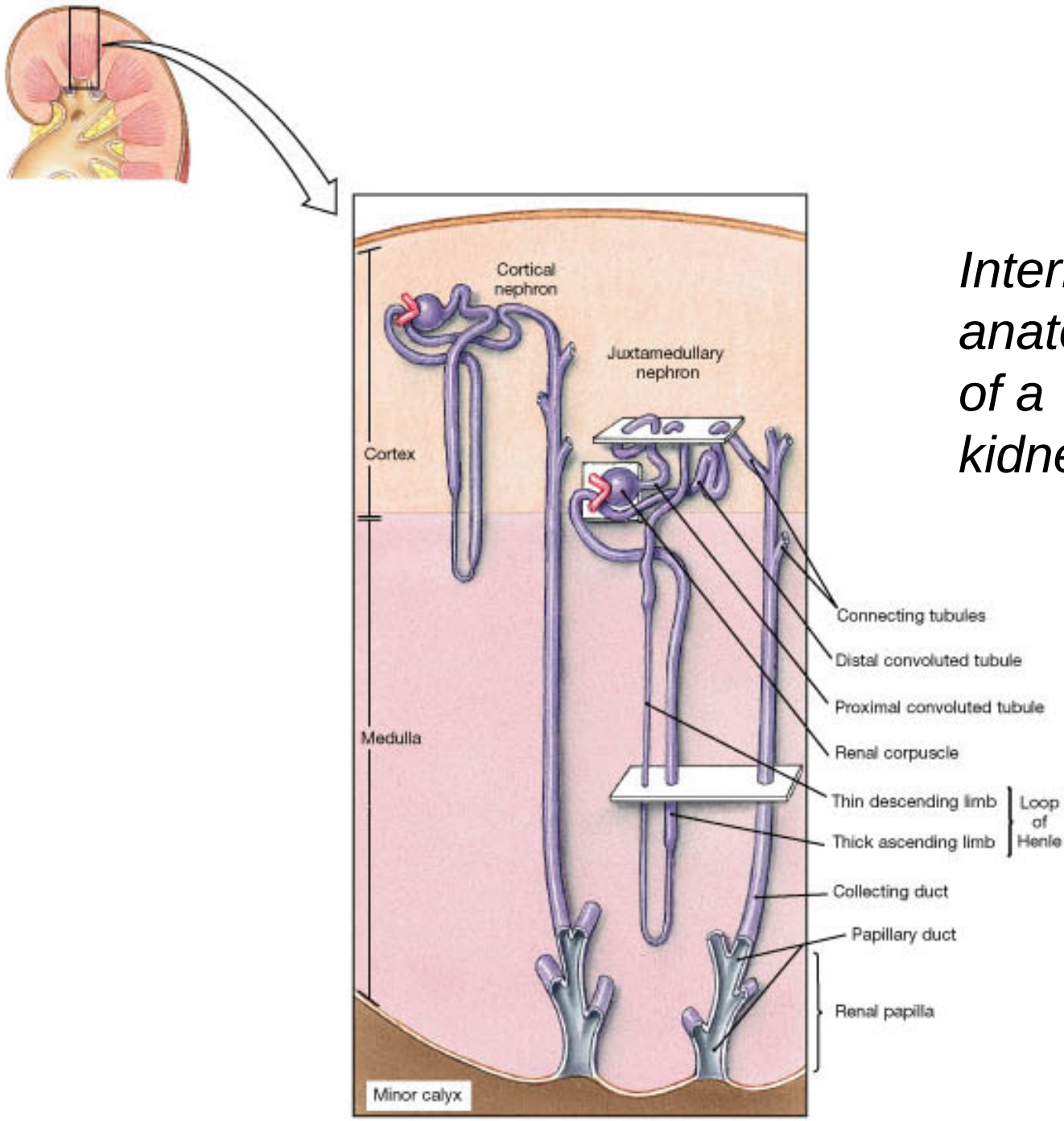
- How does a cell/organ work?
  - function

Structure follows function

- The anatomy (shape/position/structure) of an structure is designed to fulfill it's function (physiology)

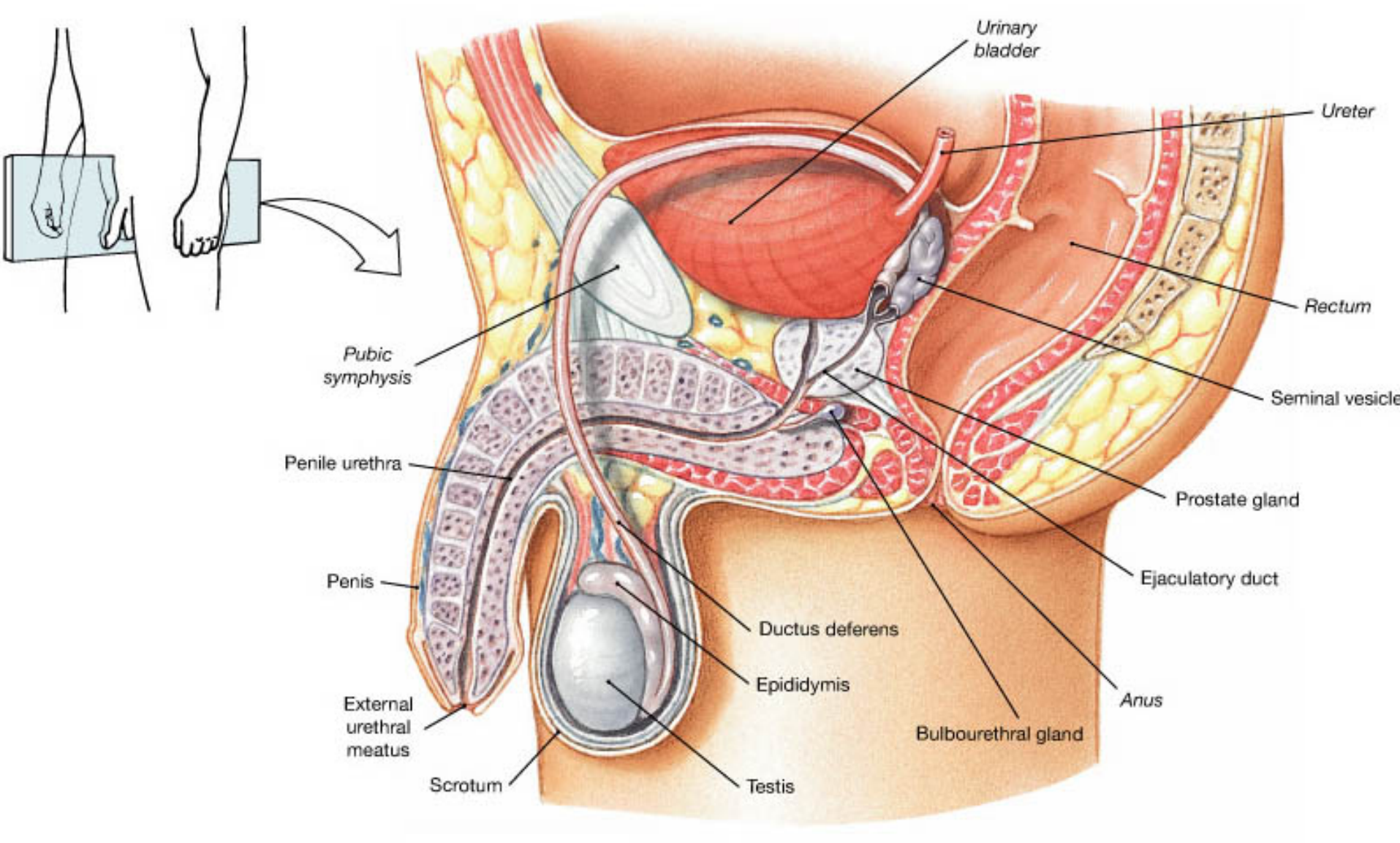
- The anatomy of the ribs protect the organs in the chest cavity. Strong bone protecting soft tissue.
- The branching of blood vessel allows the cardiovascular system to deliver blood to all cells of the body


Microvilli
Nucleus
Mitochondria
Distal convoluted tubule
Secretion of ions, acids, drugs, toxins
Variable reabsorption of water, sodium ions, and calcium ions (under hormonal control)
NEPHRON
Renal tubule
COLLECTING SYSTEM
Efferent arteriole
Afferent arteriole
Capsular space
Connecting tubules
Collecting duct
Descending limb of loop begins
Ascending limb of loop ends
Parietal (capsular) epithelium
Visceral (glomerular) epithelium
Capillaries of glomerulus
Thick ascending limb
Thin descending limb
Descending limb
Ascending limb
Minor calyx
Connecting tubules and collecting duct
Variable reabsorption of water and reabsorption or secretion of sodium, potassium, hydrogen and bicarbonate ions
Renal corpuscle
Production of filtrate
Loop of Henle
Further reabsorption of water (descending limb) and both sodium and chloride ions (ascending limb)
Papillary duct
Delivery of urine to minor calyx



(a) Cortical and juxtamedullary nephrons

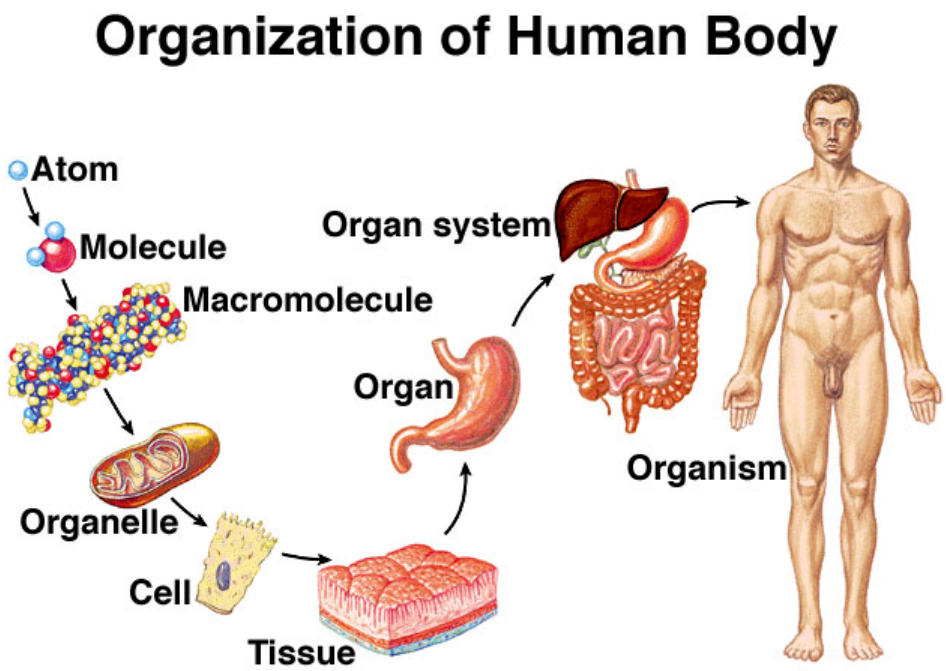
Internal anatomy of a kidney


Urinary bladder
Ureter
Rectum
Pubic symphysis
Seminal vesicle
Penile urethra
Prostate gland
Ejaculatory duct
Penis
Ductus deferens
Epididymis
Anus
External urethral meatus
Bulbourethral gland
Scrotum
Testis

Levels of Organization

least complex most complex

Chemical level>cellular level>Tissue level>Organ level>Organ system level>Organism level



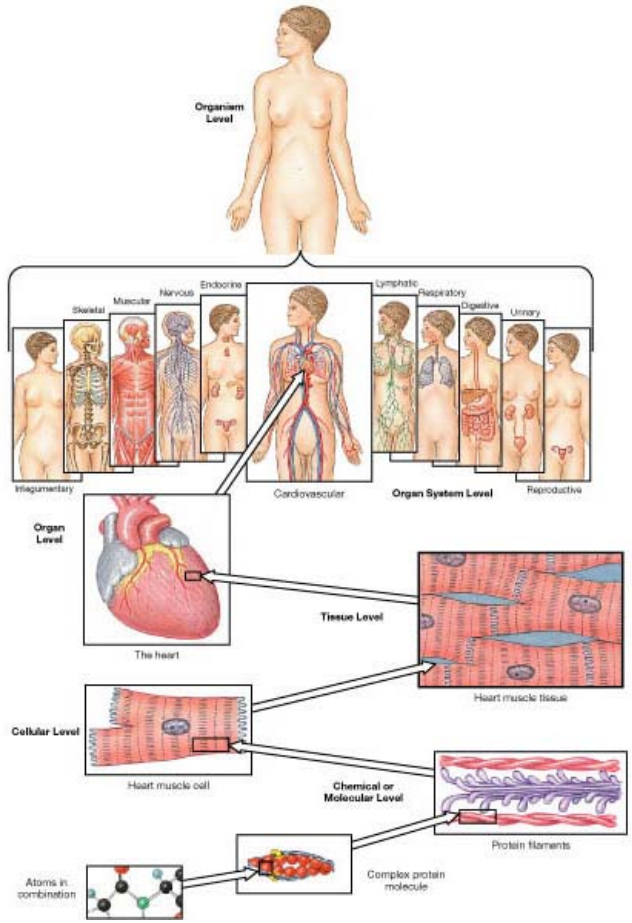


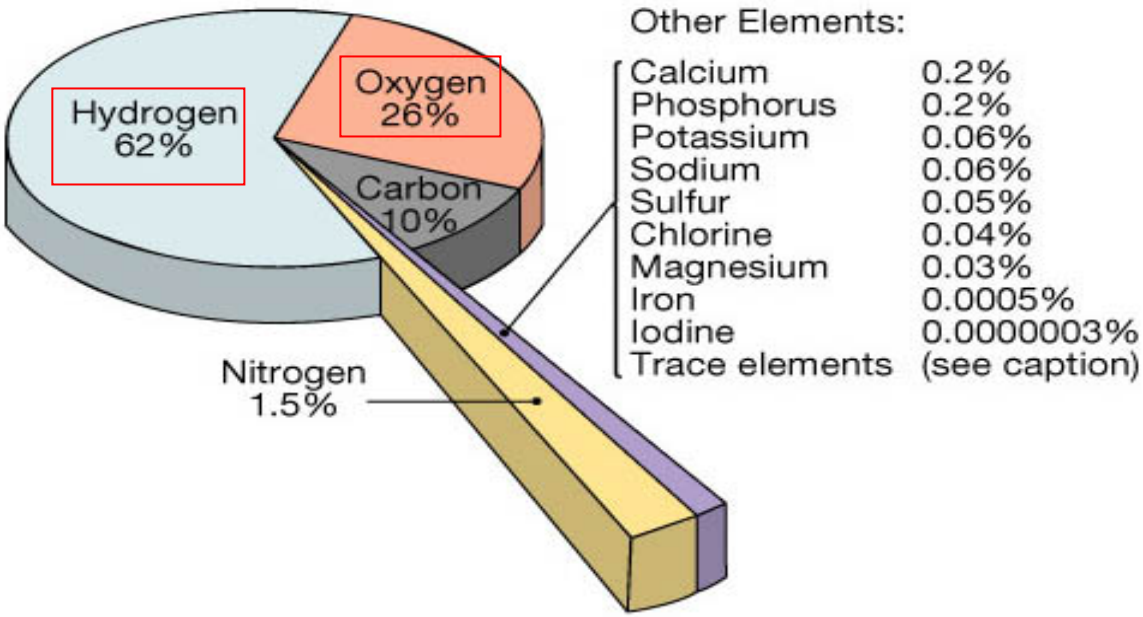
Fig 1.4

- **Chemicals**-elements & molecules
- **Cells**-the subunits of an organism
- **Tissues**-collection of similar types of cells
- **Organs**-collection of tissues (not all the same type) –has a specific function
- **Organ systems**-many organs working together to carry out bodily functions
- **Organism**-a individual living being

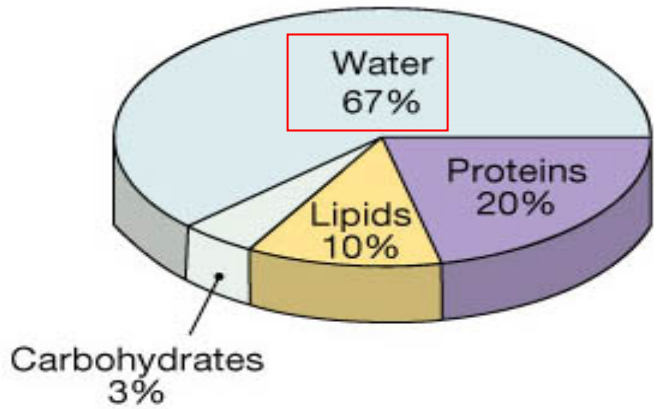
Chemical level

Fig 1.3

CHON-most abundant elements

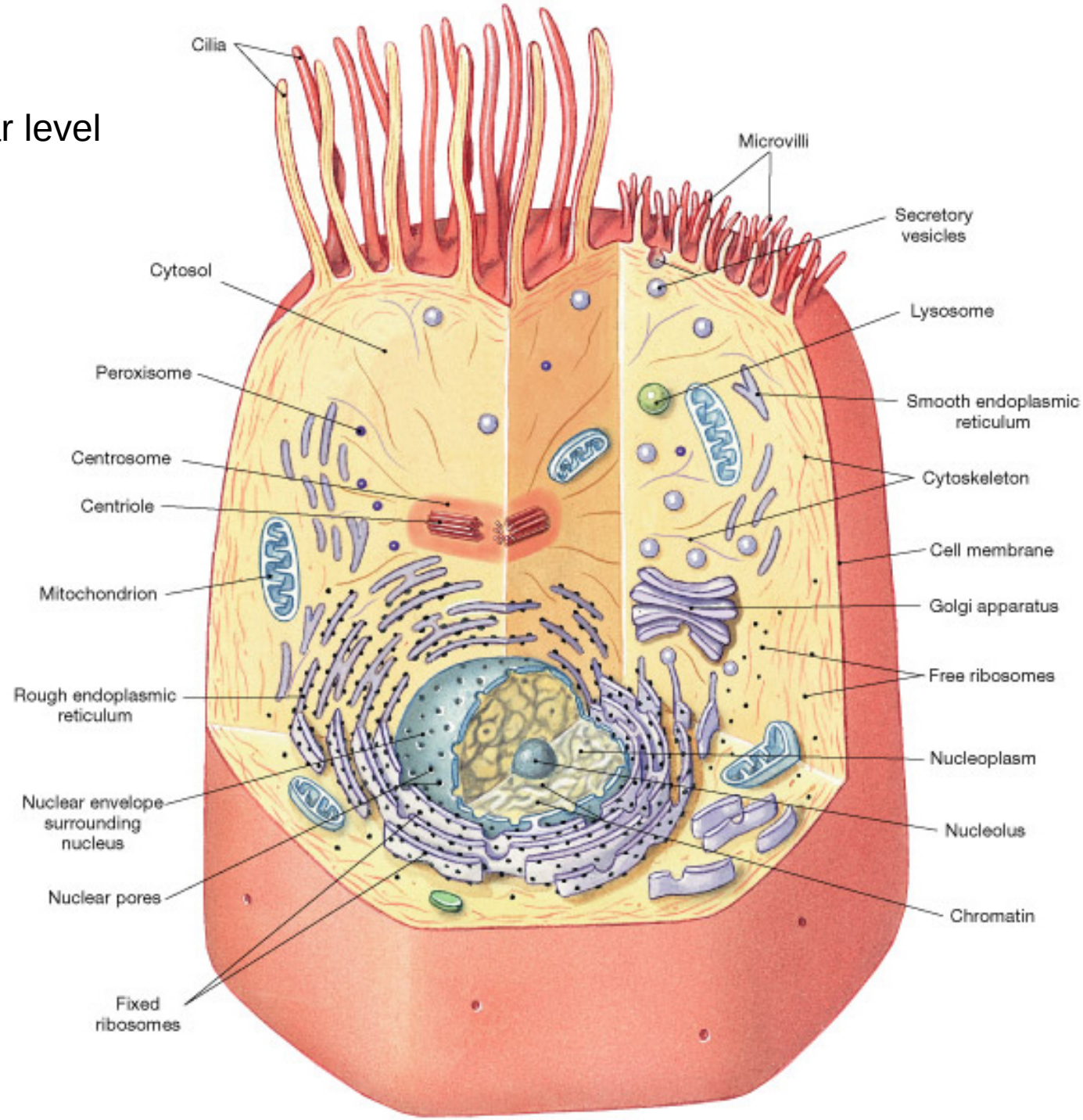


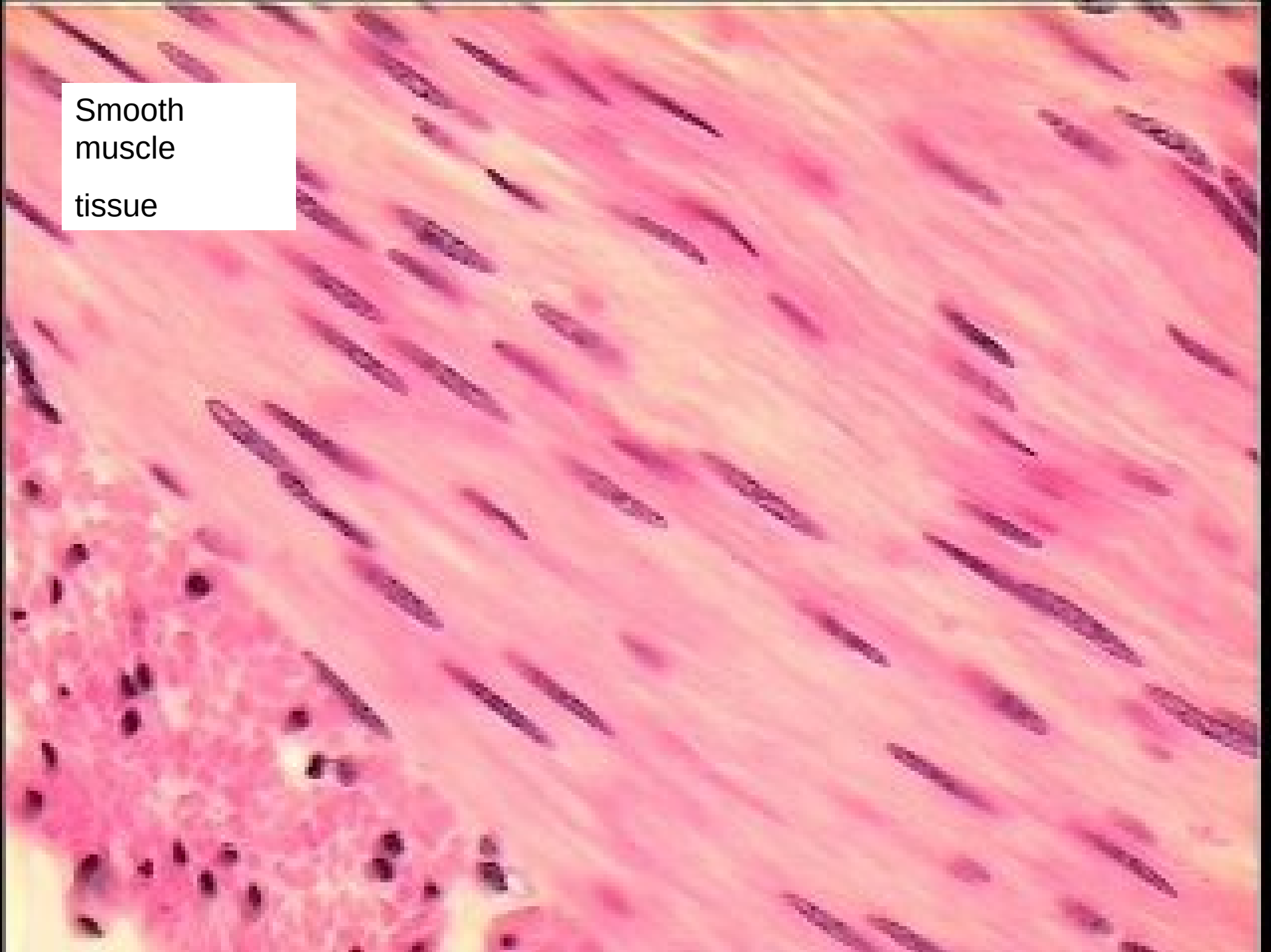
(a) Elemental composition of the human body

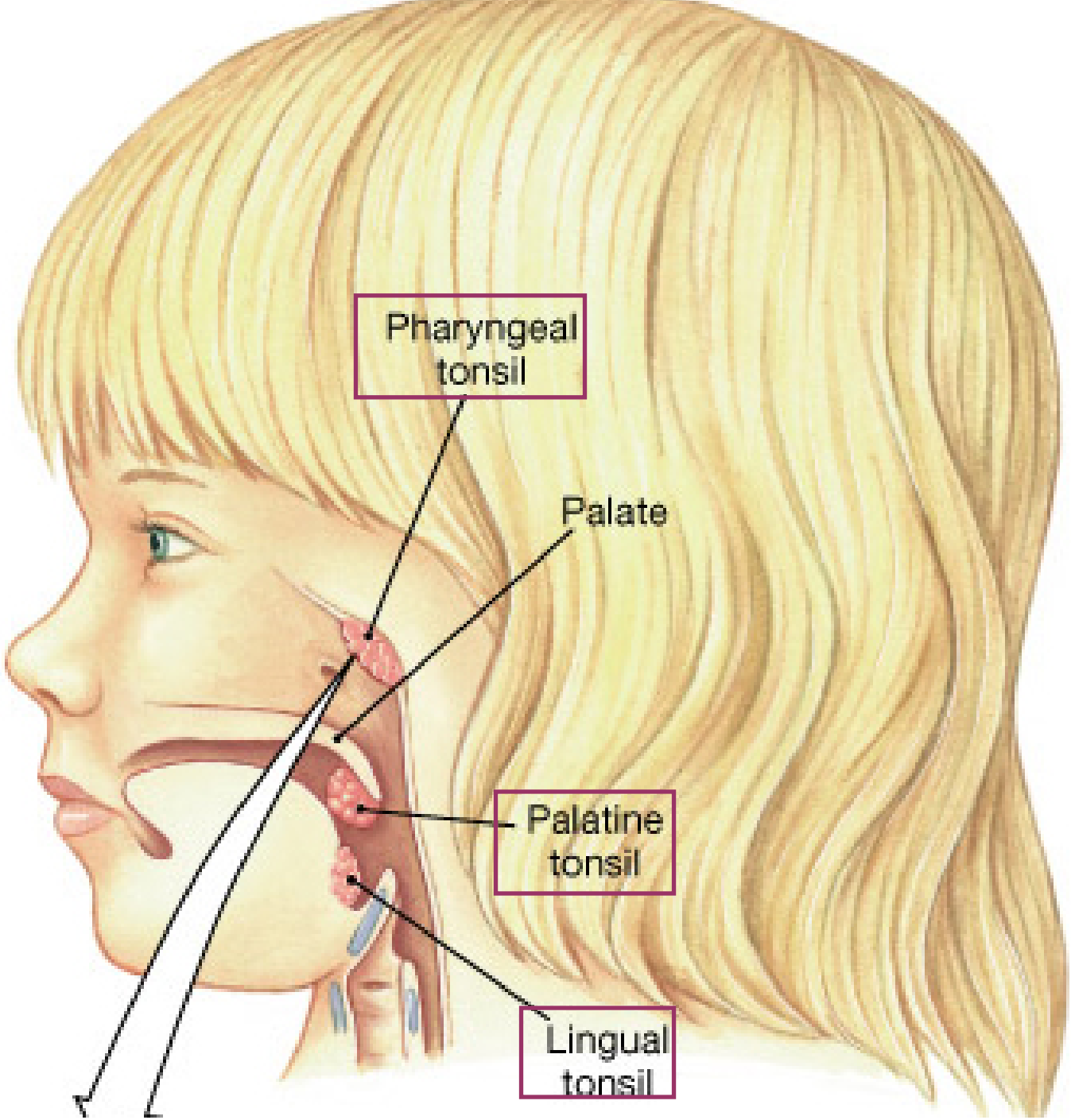


(b) Molecular composition of the human body

Cellular level




Smooth
muscle
tissue


Pharyngeal tonsil
Palate
Palatine tonsil
Lingual tonsil

Vital properties and process of living organisms

- Read page 6 in text-
- Responsiveness
- Growth & Differentiation
- Reproduction
- Movement
- Metabolism & Excretion

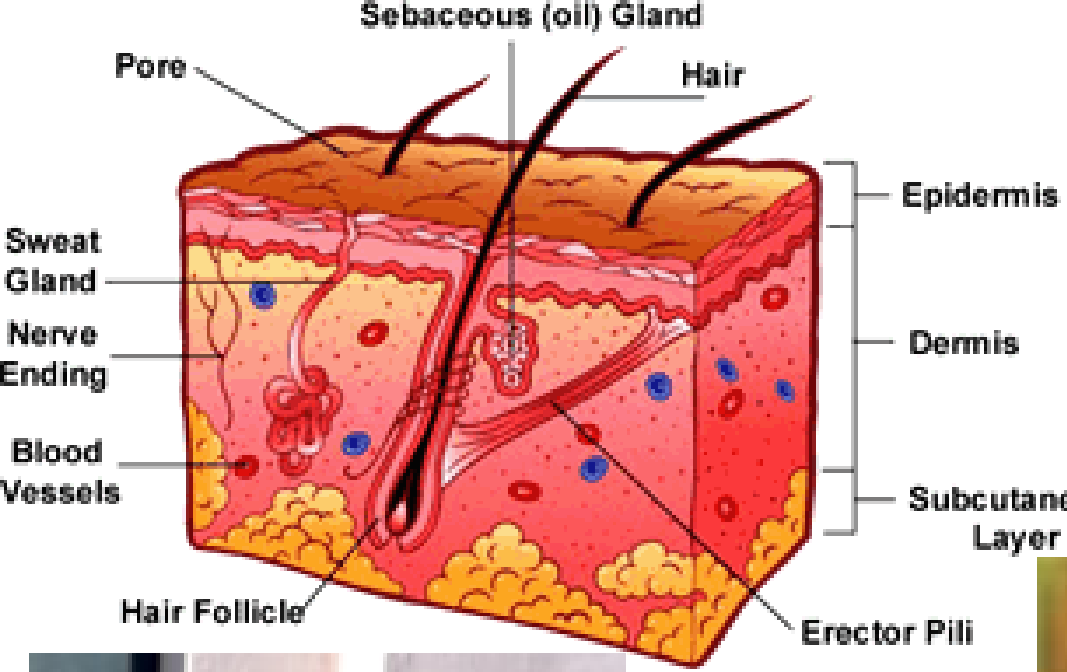
- Homeostasis

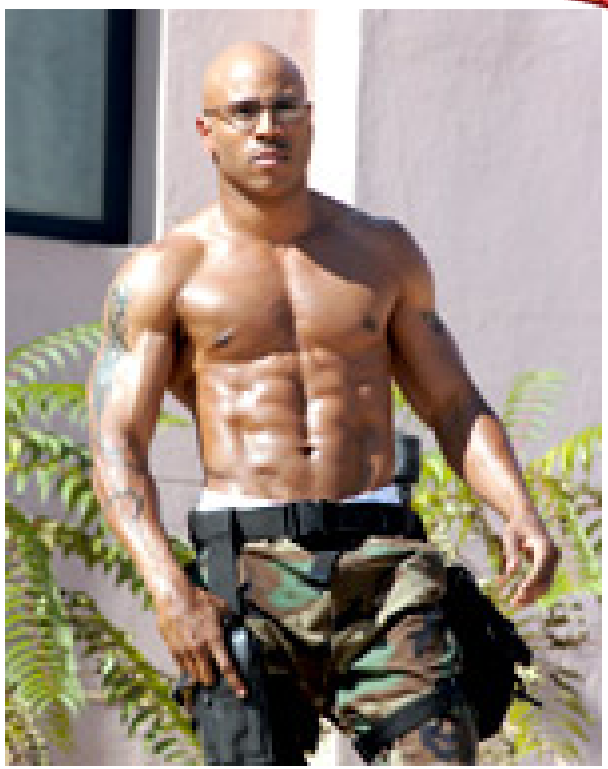
Systemic anatomy

- The body has 11 organ systems
- Each organ system has a number of organs within the system
- Each organ has a specific function
- The organs work together to give the organ system its function

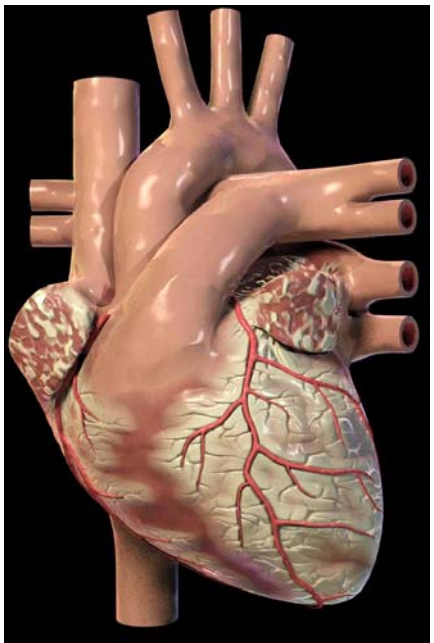
Functions of the 11 organ systems

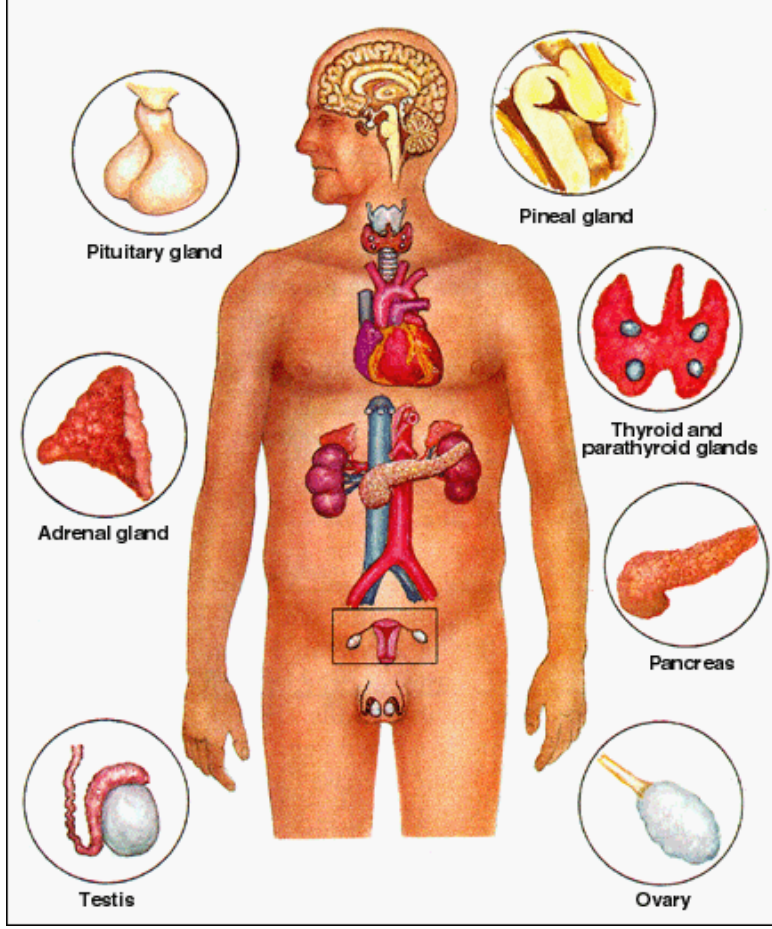
- **Integumentary**-protection from the environment, helps control body temperature, energy storage
- **Skeletal**-support, protection of soft tissues, mineral storage, blood cell formation
- **Muscular**-locomotion, support posture, heat production------skeletal muscle


Sebaceous (oil) Gland
Pore
Hair
Epidermis
Sweat Gland
Nerve Ending
Dermis
Blood Vessels
Subcutaneous Layer
Hair Follicle
Erector Pili

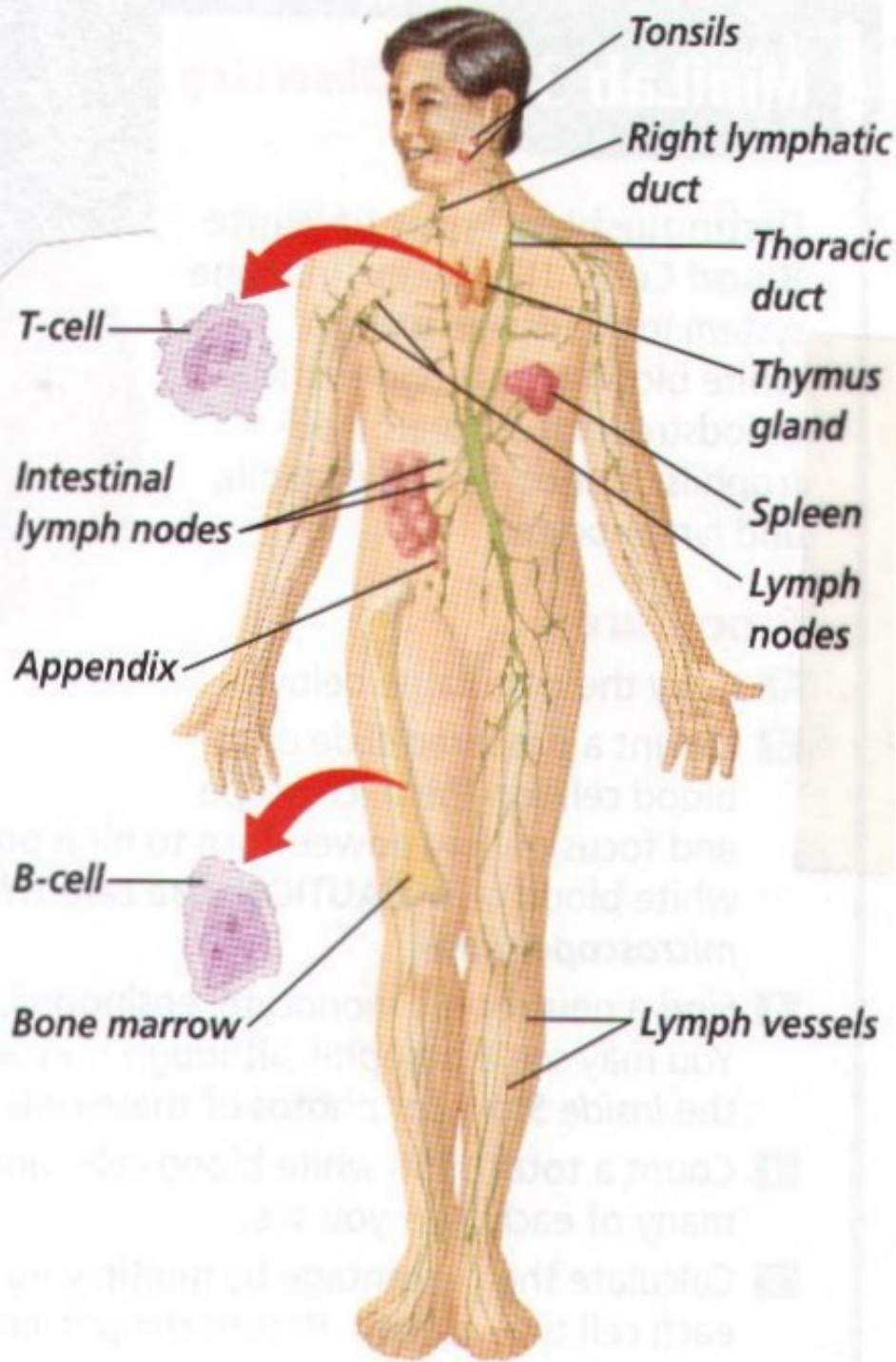


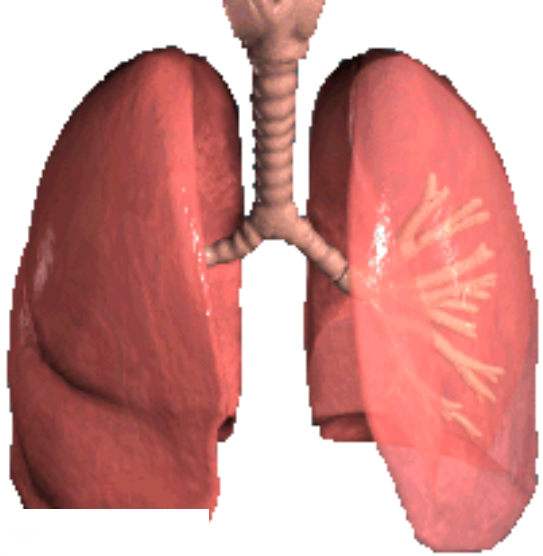
- **Nervous**-directing immediate responses to stimuli by coordinating the actions of other organs
- **Endocrine**-directing long-term changes in the activities of other organ systems by release of hormones
- **Cardiovascular**-internal transport of cells and dissolved materials, including nutrients, wastes, & gases

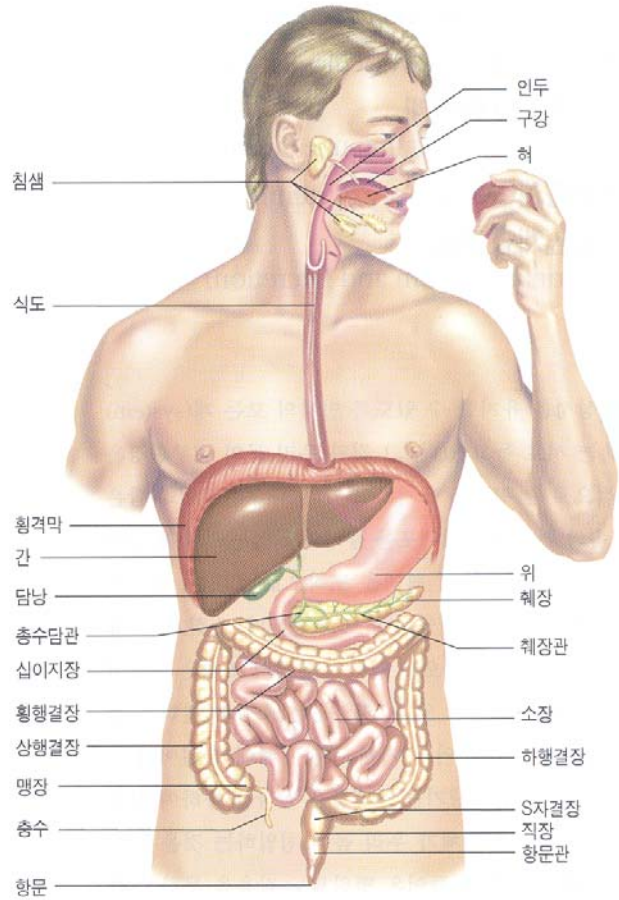



Pituitary gland
Pineal gland
Thyroid and parathyroid glands
Adrenal gland
Pancreas
Testis
Ovary

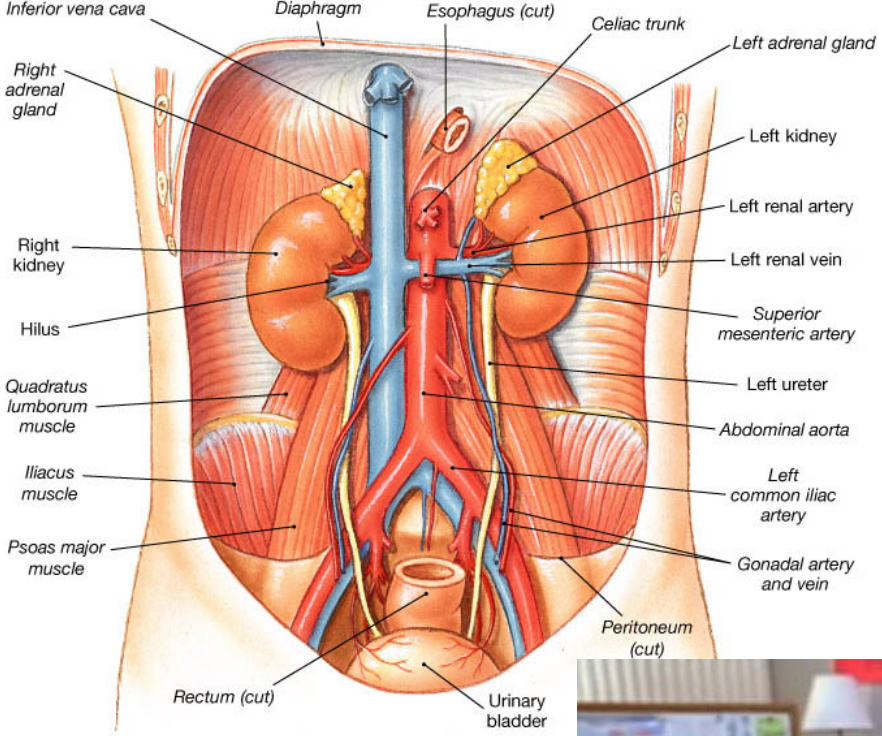
- **Lymphatic**-defense against infection & disease
- **Respiratory**-delivery of air to where gas exchange can occur between the air & circulating blood
- **Digestive**-processing of food & absorption of organic nutrients, minerals, vitamins, & water


Tonsils
Right lymphatic duct
Thoracic duct
T-cell
Thymus gland
Intestinal lymph nodes
Spleen
Lymph nodes
Appendix
B-cell
Bone marrow
Lymph vessels




인두
구강
허
침샘
식도
횡격막
간
담낭
총수담관
십이지장
횡행결장
상행결장
맹장
충수
항문
위
췌장
췌장관
소장
하행결장
S자결장
직장
항문관

- **Urinary**-elimination of excess water, salts, & waste products; controls pH of body fluids
- **Reproductive**-production of sex cells & hormones



(a) Anterior view

Anatomical terminology

- Standardized anatomical language used to describe the body

- Anatomical position-standardized body position used to describe location of structures and movements of the body

Fig 1.8

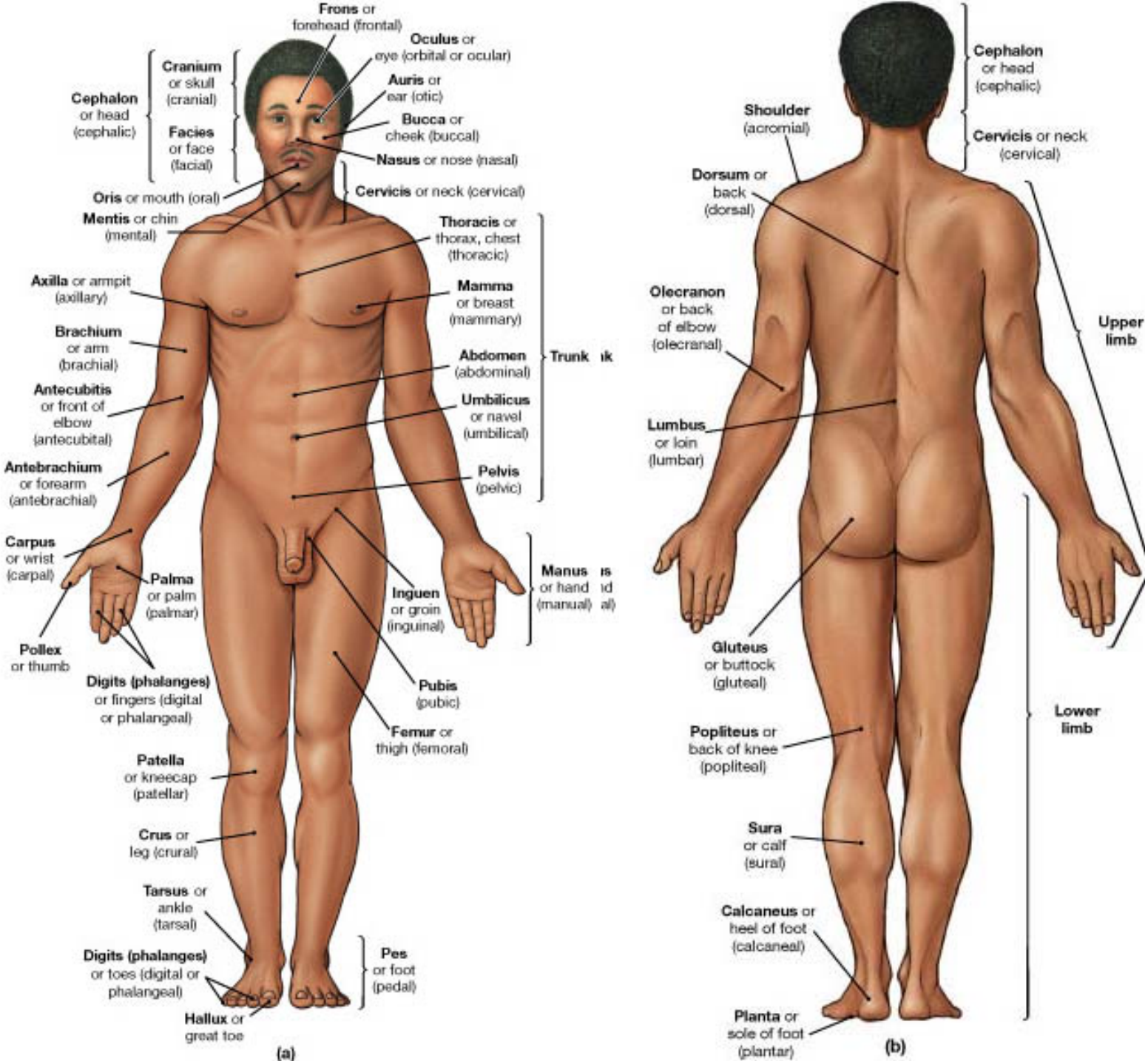
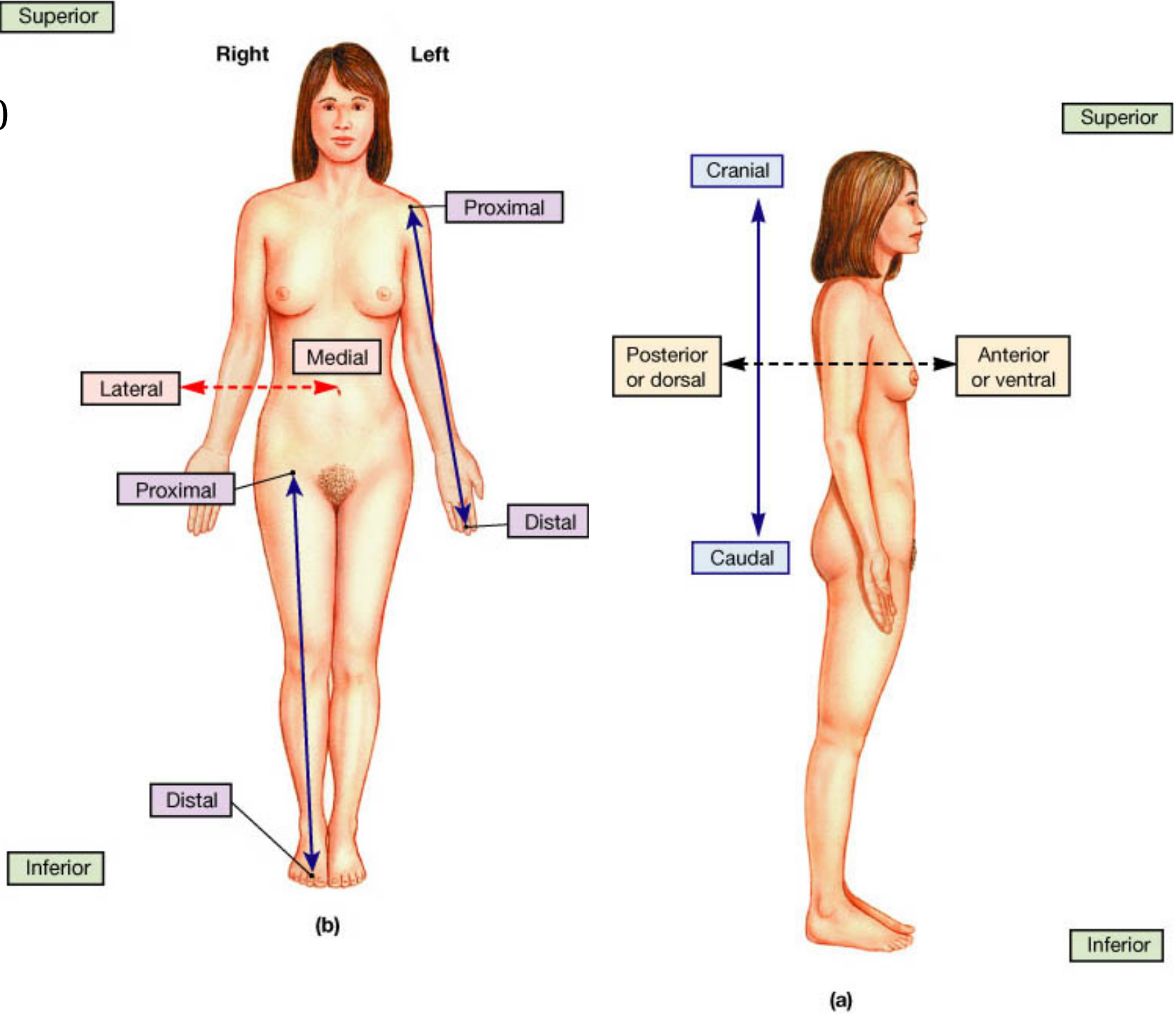

Frons or forehead (frontal)
Oculus or eye (orbital or ocular)
Auris or ear (otic)
Bucca or cheek (buccal)
Nasus or nose (nasal)
Cephalon or head (cephalic)
Cranium or skull (cranial)
Facies or face (facial)
Oris or mouth (oral)
Mentis or chin (mental)
Cervicis or neck (cervical)
Thoracis or thorax, chest (thoracic)
Axilla or armpit (axillary)
Mamma or breast (mammary)
Brachium or arm (brachial)
Abdomen (abdominal)
Trunk
Antecubitis or front of elbow (antecubital)
Umbilicus or navel (umbilical)
Antebrachium or forearm (antebrachial)
Pelvis (pelvic)
Carpus or wrist (carpal)
Palma or palm (palmar)
Manus or hand (manual)
Inguen or groin (inguinal)
Pollex or thumb
Digits (phalanges) or fingers (digital or phalangeal)
Pubis (pubic)
Femur or thigh (femoral)
Patella or kneecap (patellar)
Crus or leg (crural)
Tarsus or ankle (tarsal)
Digits (phalanges) or toes (digital or phalangeal)
Pes or foot (pedal)
Hallux or great toe
(a)
Cephalon or head (cephalic)
Cervicis or neck (cervical)
Shoulder (acromial)
Dorsum or back (dorsal)
Olecranon or back of elbow (olecranal)
Upper limb
Lumbus or loin (lumbar)
Gluteus or buttock (gluteal)
Lower limb
Popliteus or back of knee (popliteal)
Sura or calf (sural)
Calcaneus or heel of foot (calcaneal)
Planta or sole of foot (plantar)
(b)

Fig 1.10


Superior
Right
Left
Proximal
Medial
Lateral
Proximal
Distal
Distal
Inferior
(b)
Superior
Cranial
Posterior or dorsal
Anterior or ventral
Caudal
Inferior
(a)

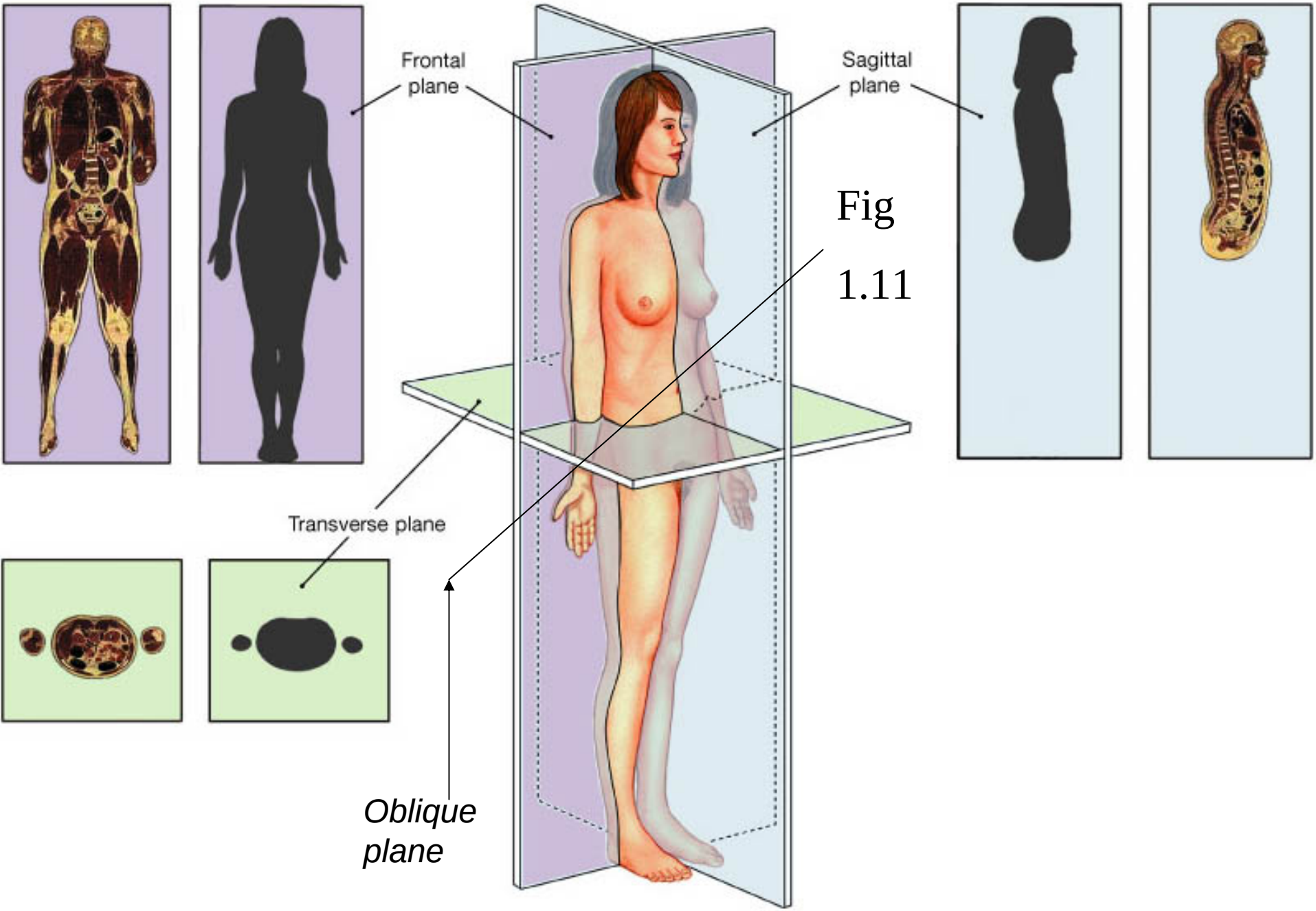

Frontal plane
Sagittal plane
Transverse plane
Oblique plane

Fig 1.11

Protect internal organs

Give organs space to change size & shape (expansion/contraction of the heart)

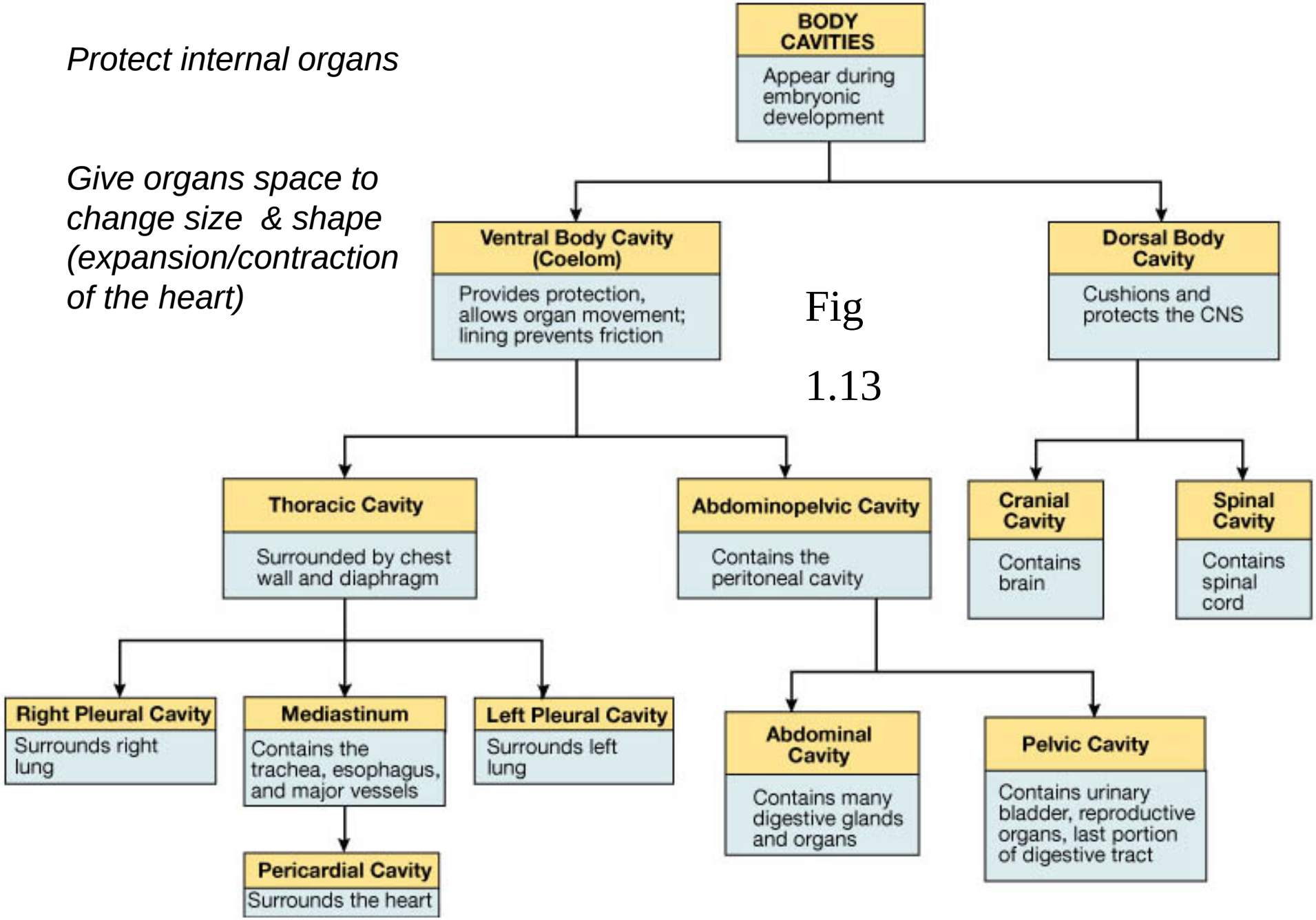
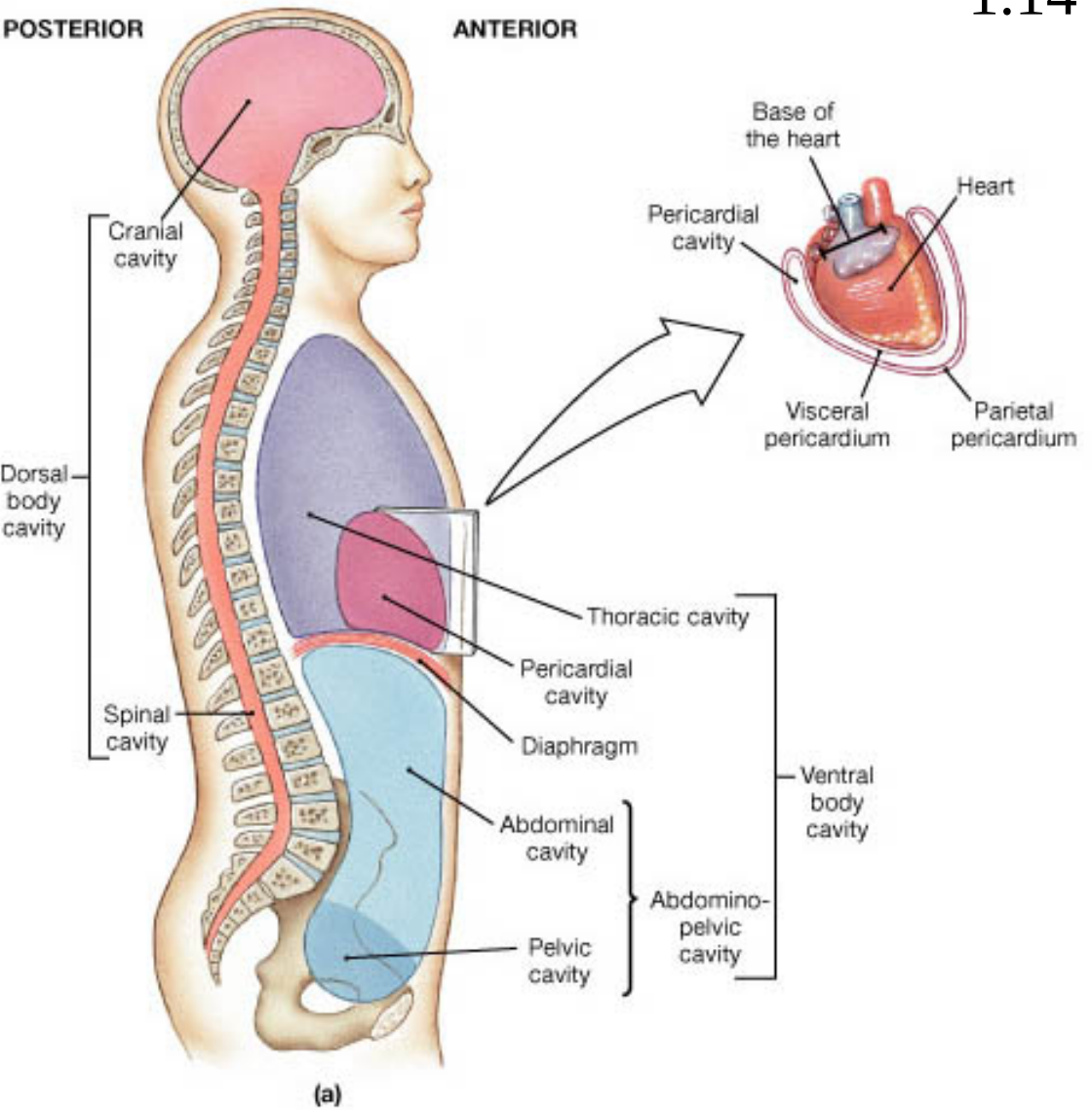
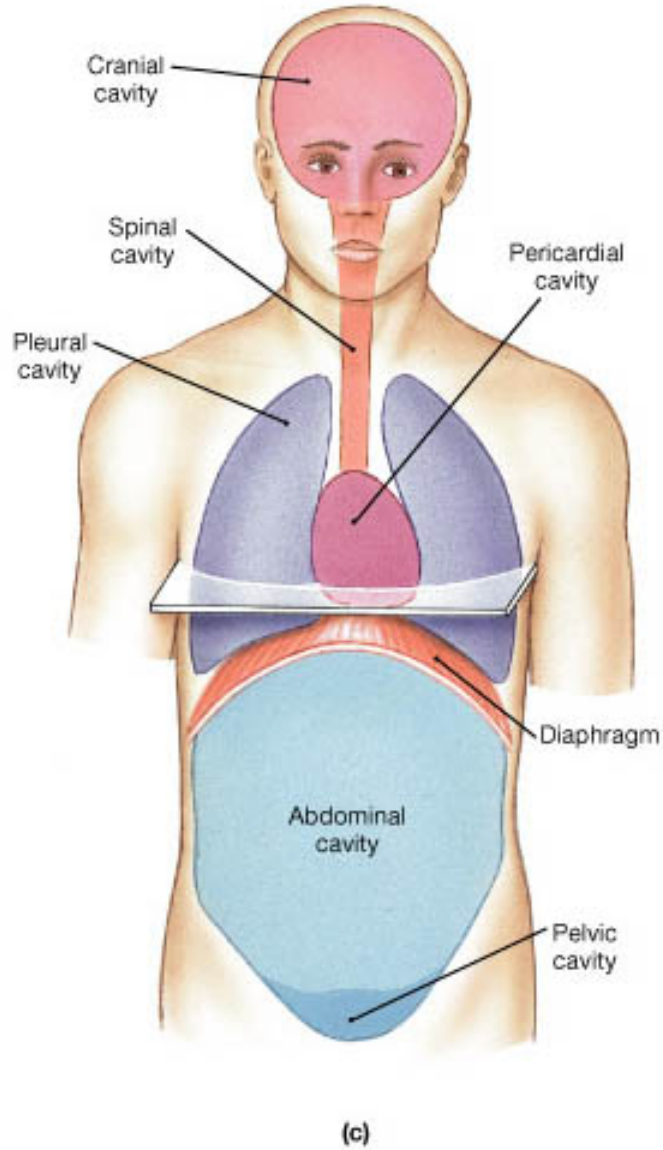


Fig 1.13

Fig 1.14


POSTERIOR
ANTERIOR
Cranial cavity
Dorsal body cavity
Spinal cavity
Thoracic cavity
Pericardial cavity
Diaphragm
Abdominal cavity
Pelvic cavity
Abdomino-pelvic cavity
Ventral body cavity
Base of the heart
Heart
Pericardial cavity
Visceral pericardium
Parietal pericardium
(a)


Cranial cavity
Spinal cavity
Pericardial cavity
Pleural cavity
Diaphragm
Abdominal cavity
Pelvic cavity
(c)

Serous membranes

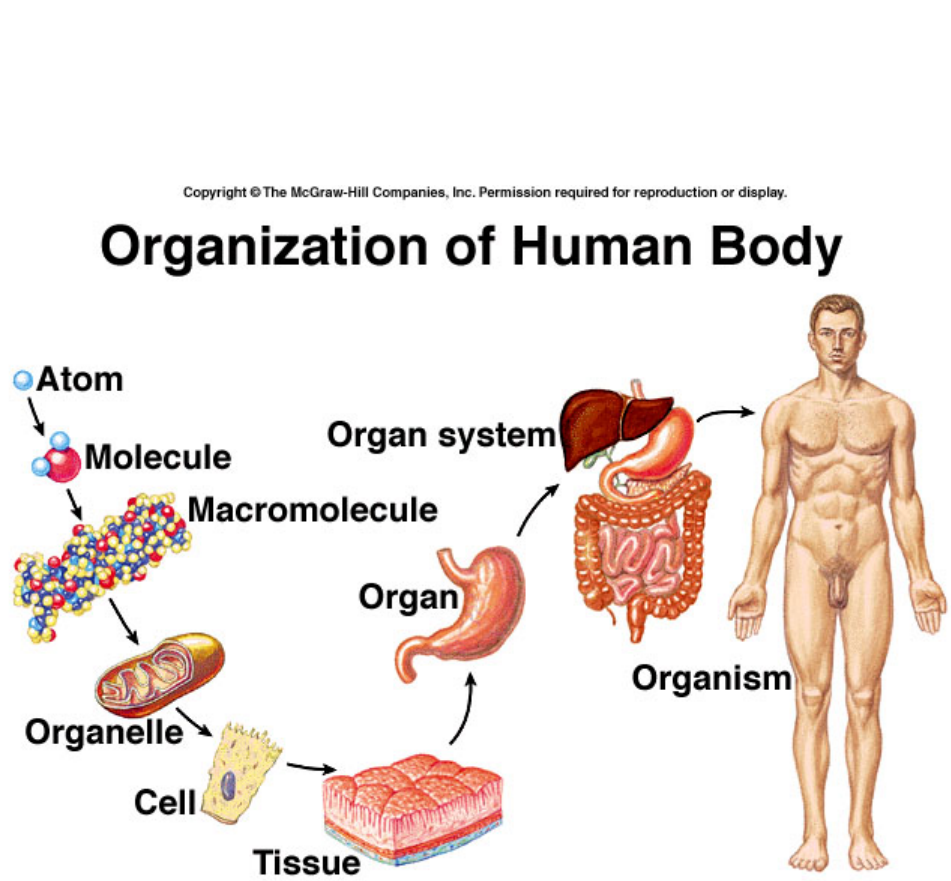
- Membranes lining ventral body cavities
- Secrete watery solution to protect walls of cavities and surfaces of internal organs

- Pleural membranes -pleural cavities
- Peritoneum membranes -abdominal cavity
- Pericardial membranes -pericardial cavity

Levels of Organization

least complex most complex

Chemical level>cellular level>Tissue level>**Organ level**>Organ system level>Organism level



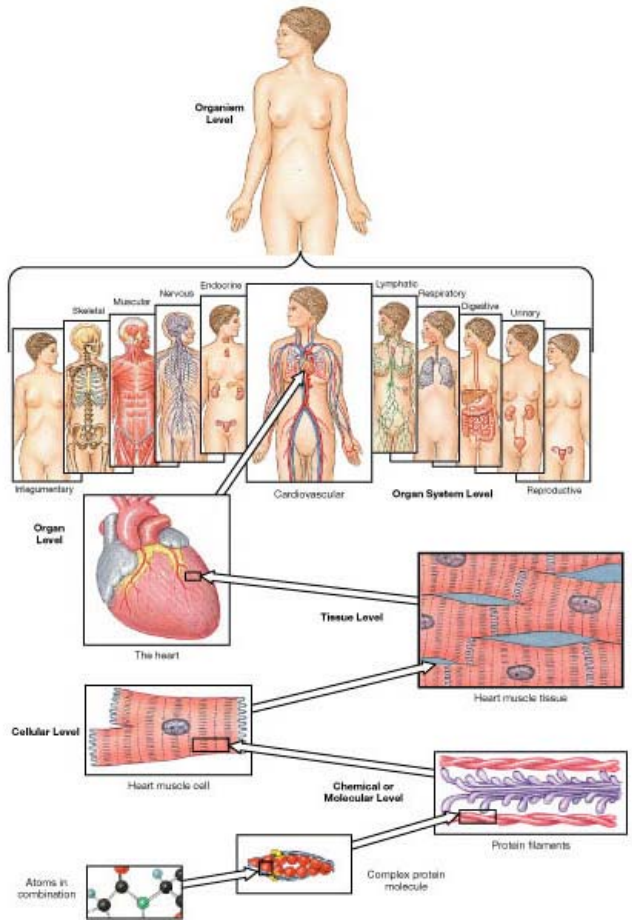
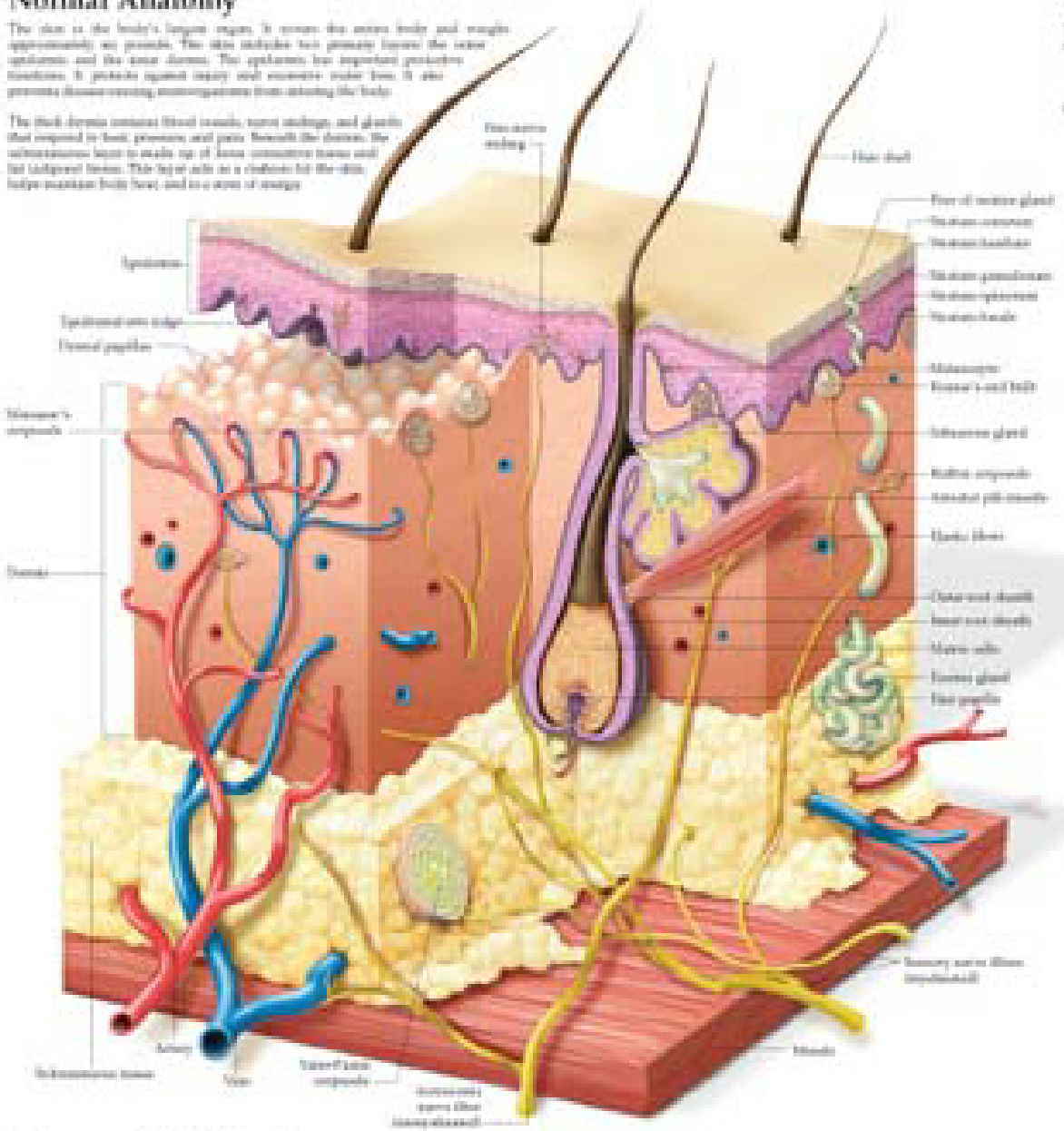


Fig 1.4

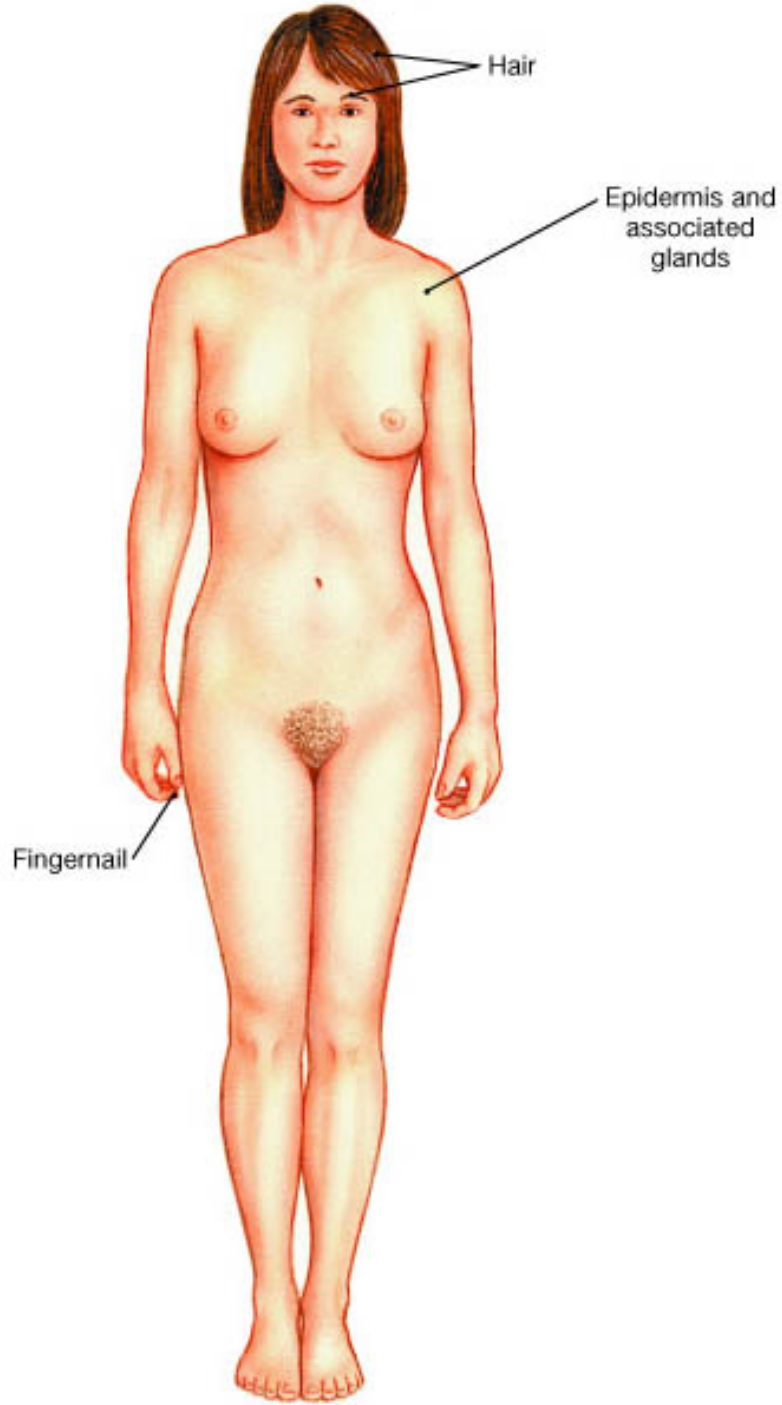
THE SKIN

The Integumentary System



Fig

1.6



THE SKELETAL SYSTEM

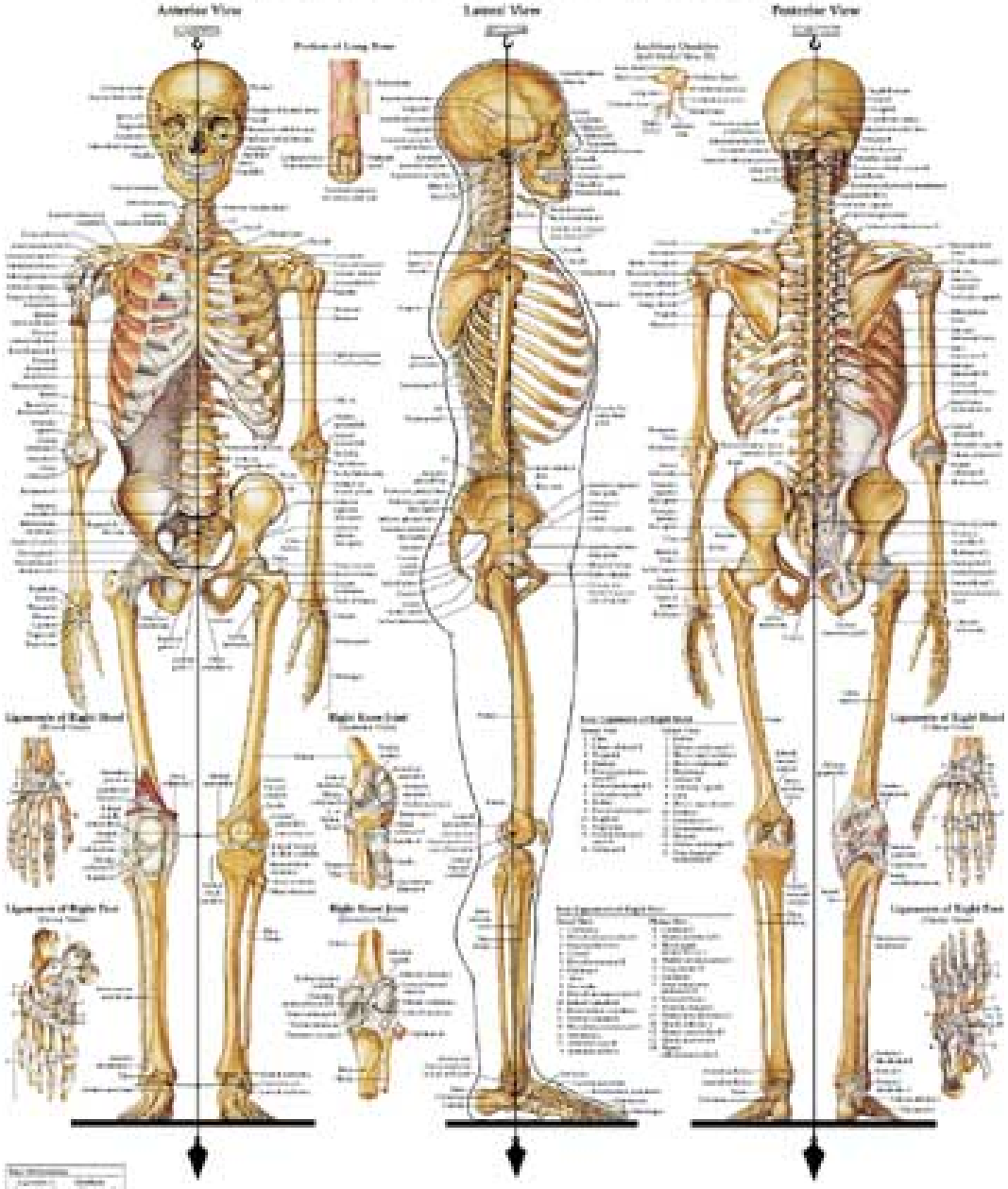
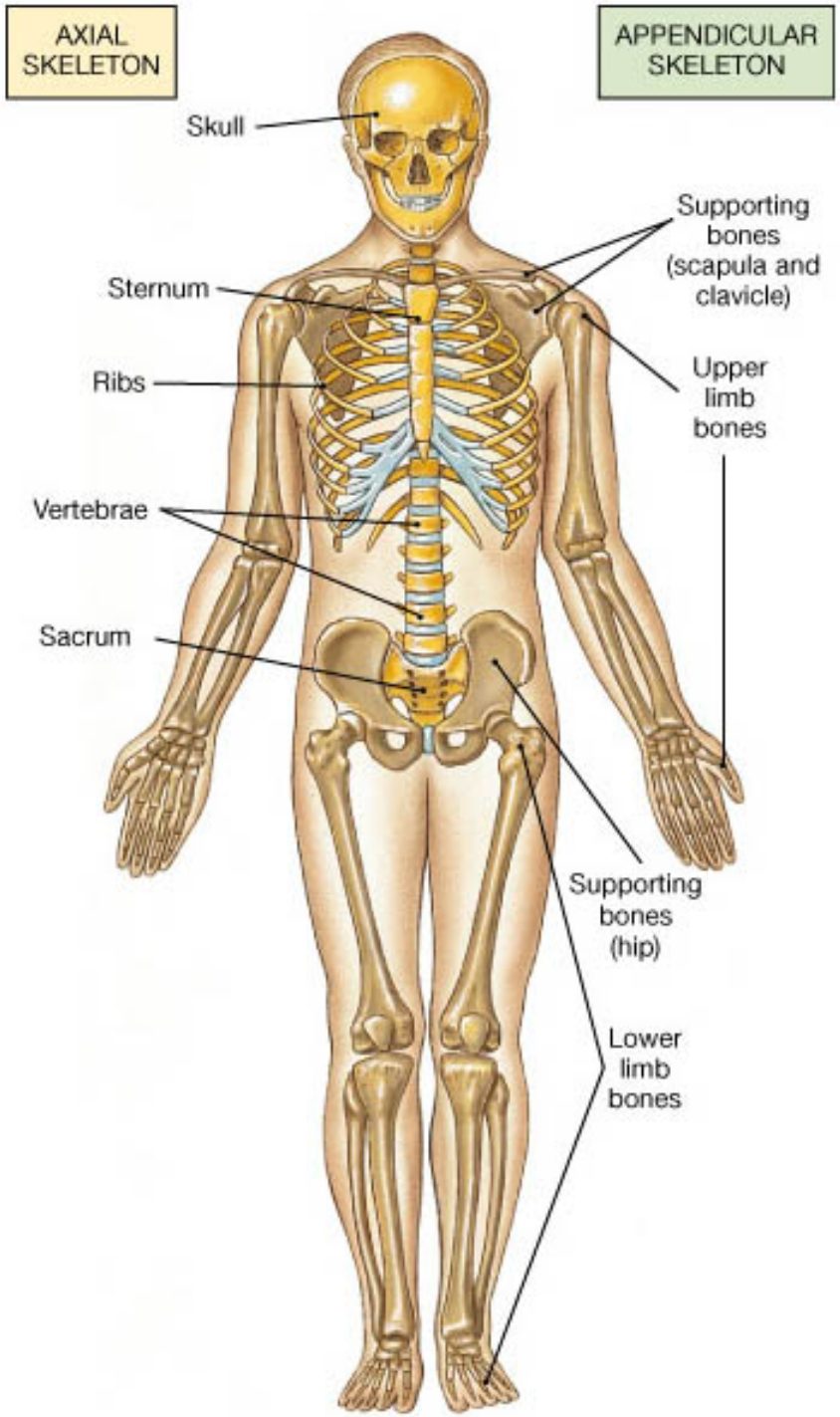
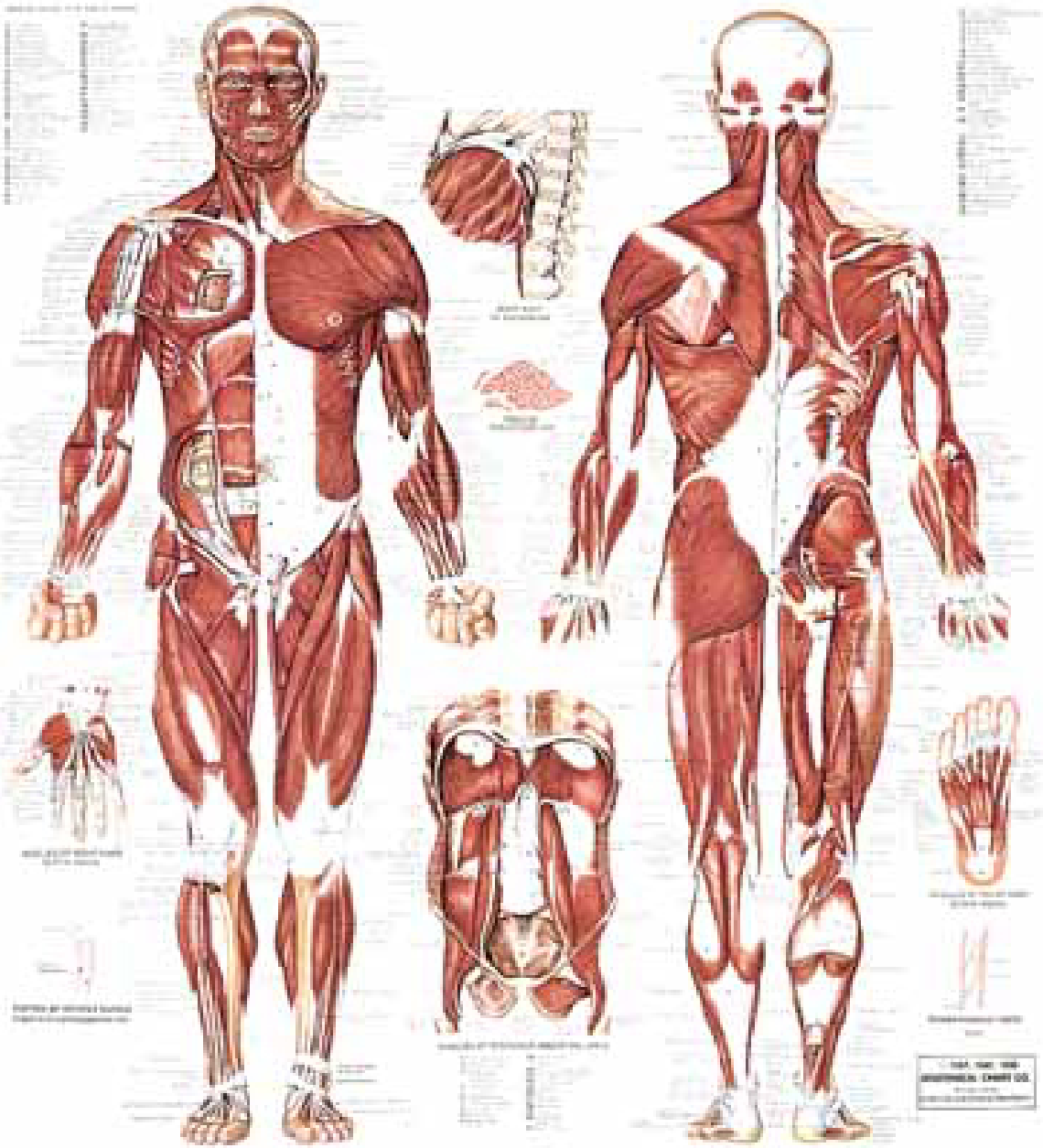


Fig 1.6

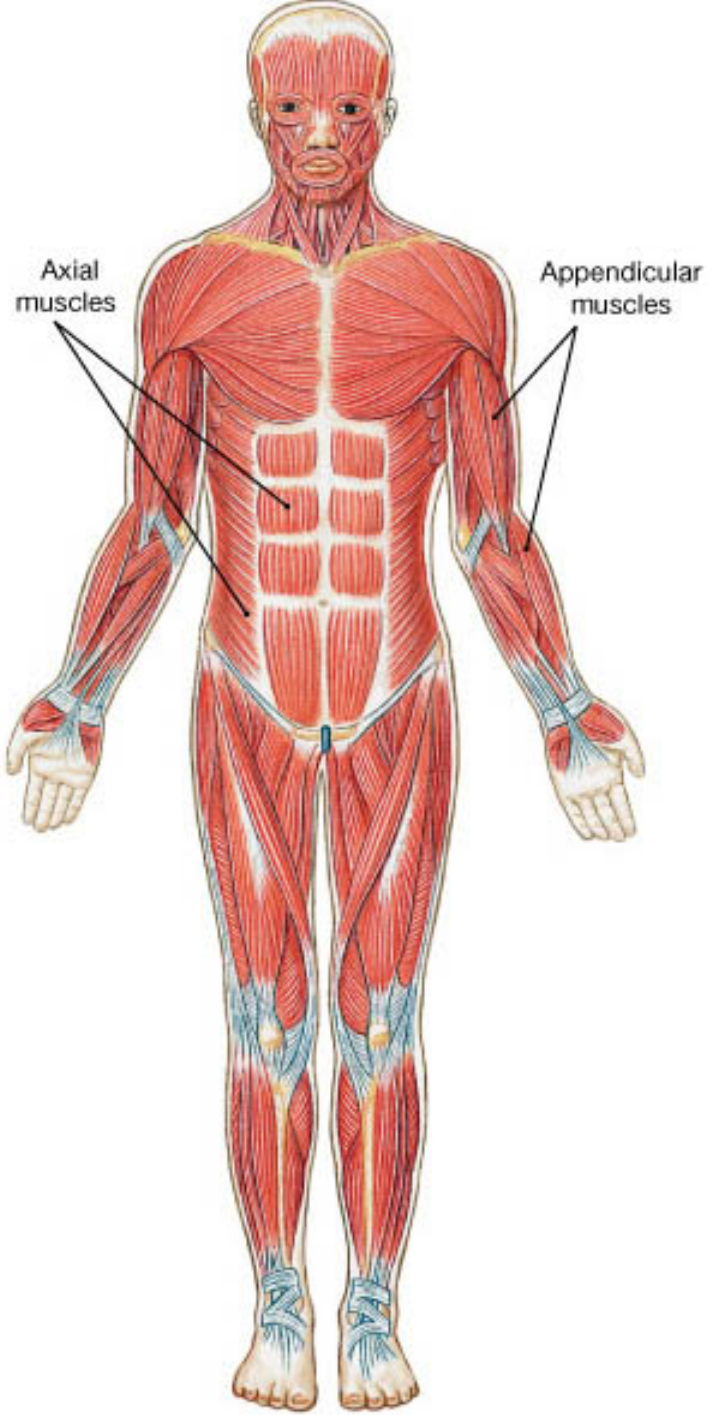

AXIAL SKELETON
APPENDICULAR SKELETON
Skull
Sternum
Ribs
Vertebrae
Sacrum
Supporting bones (scapula and clavicle)
Upper limb bones
Supporting bones (hip)
Lower limb bones

THE MUSCULAR SYSTEM



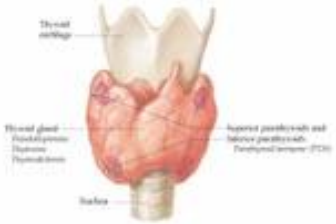
Fig

1.6



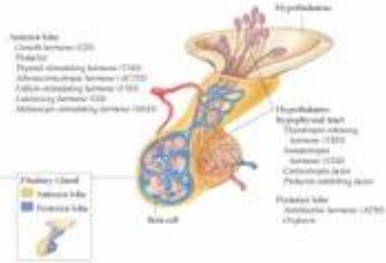
THE ENDOCRINE SYSTEM

Thyroid and Parathyroid Glands



Pineal Gland

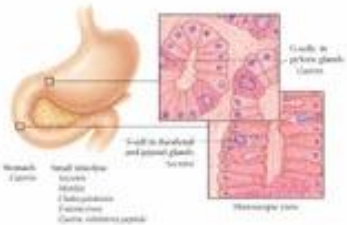
Pituitary Gland and Hypothalamus



Thymus Gland

Heart

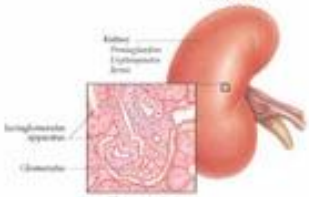
Stomach, Duodenum, and Jejunum

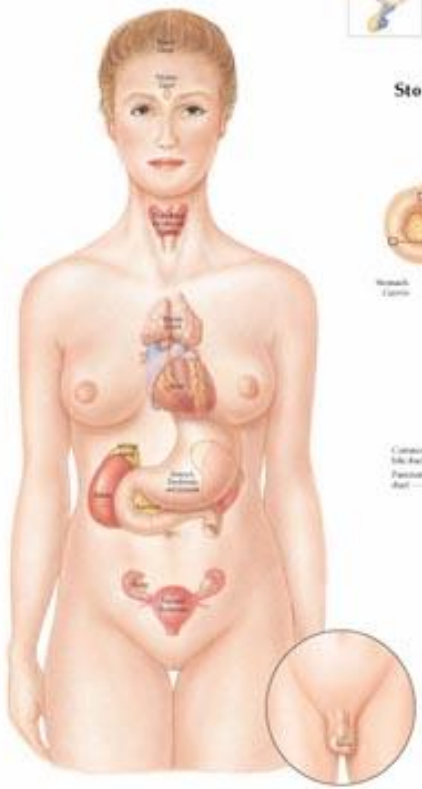


Adrenal Glands

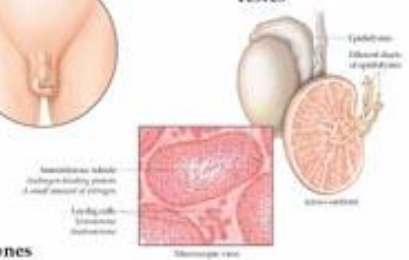
Pancreas

Kidney

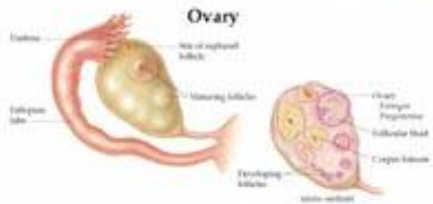




Testes



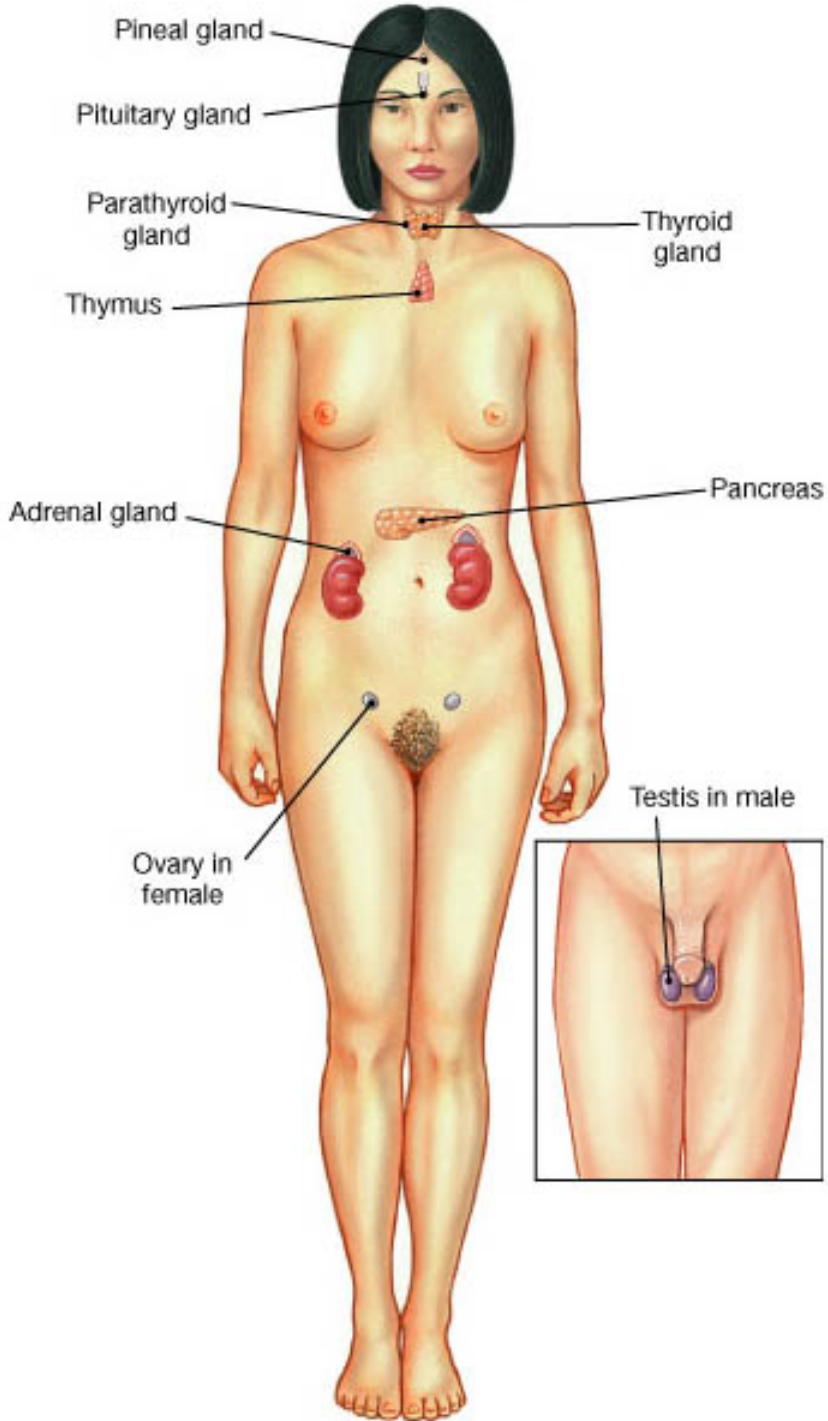
Ovary



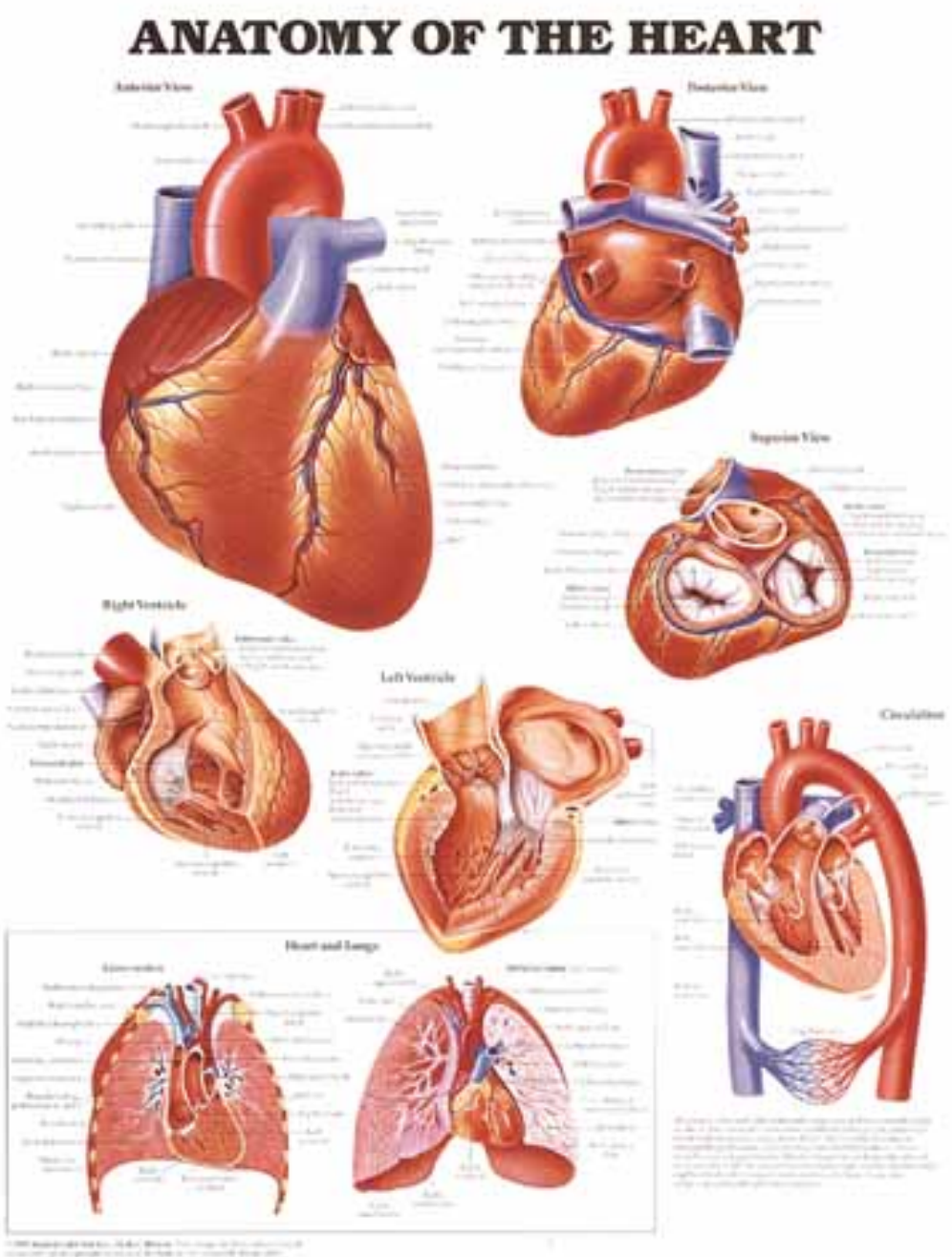
Placental Hormones

Fig

1.6

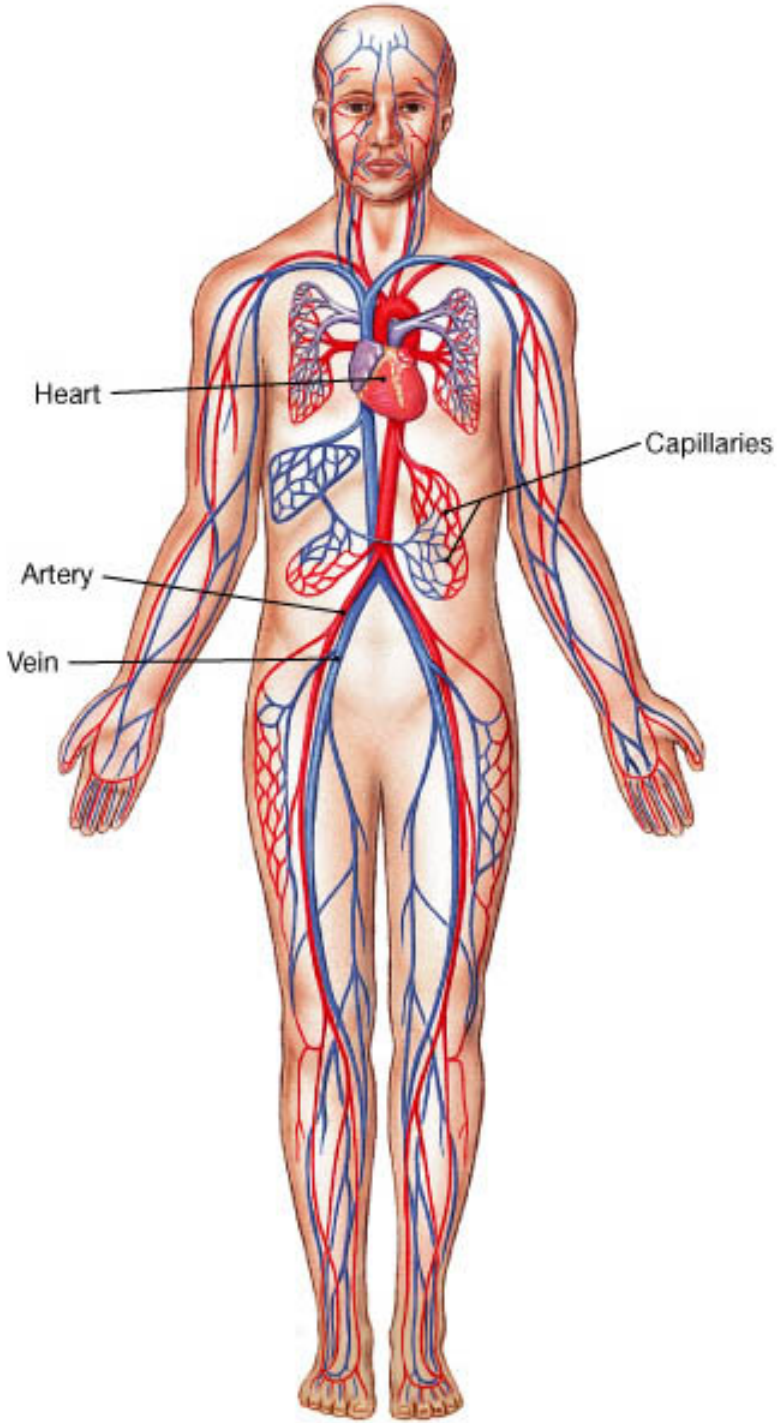

Pineal gland
Pituitary gland
Parathyroid gland
Thyroid gland
Thymus
Pancreas
Adrenal gland
Testis in male
Ovary in female

The Cardiovascular System

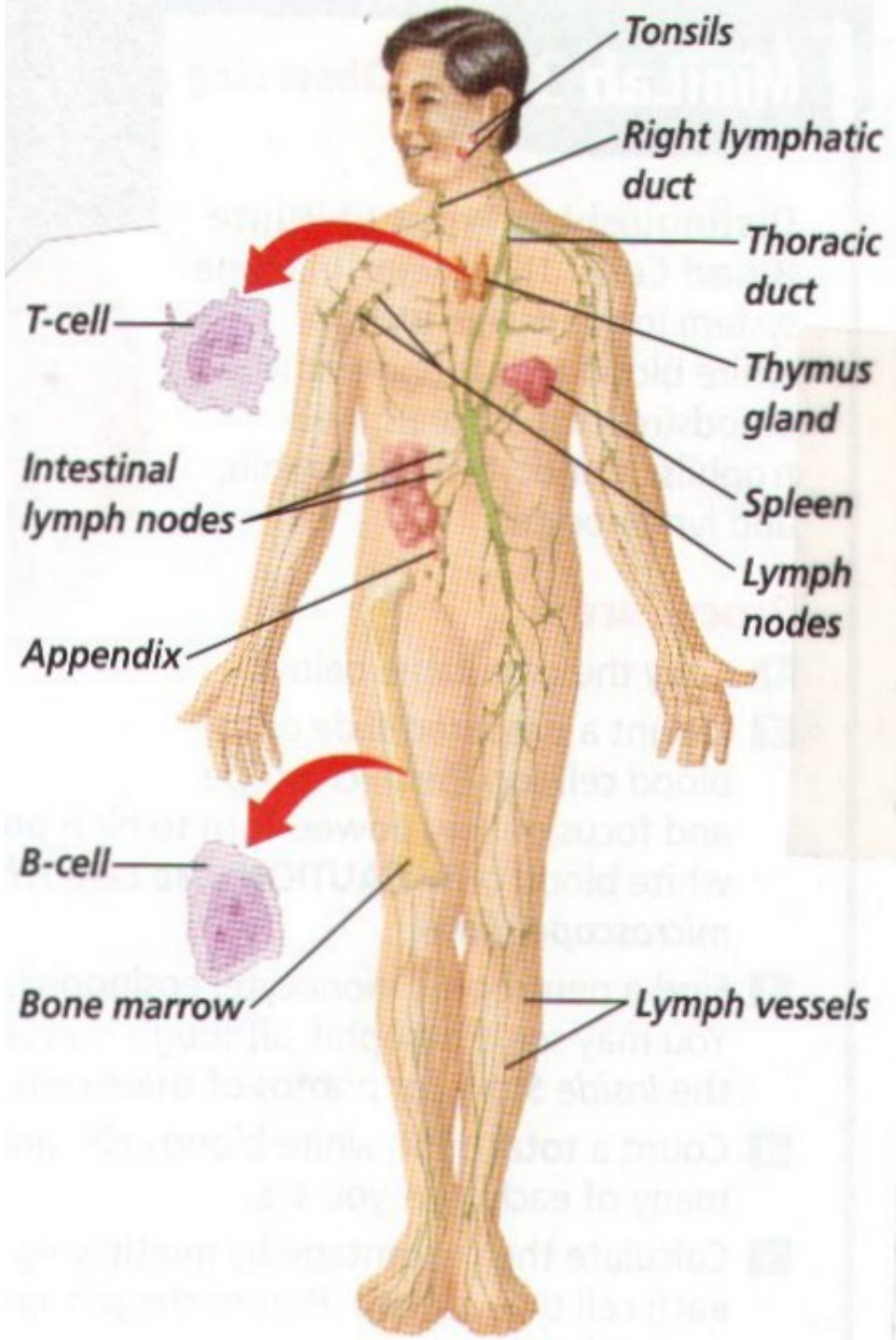


Fig

1.6

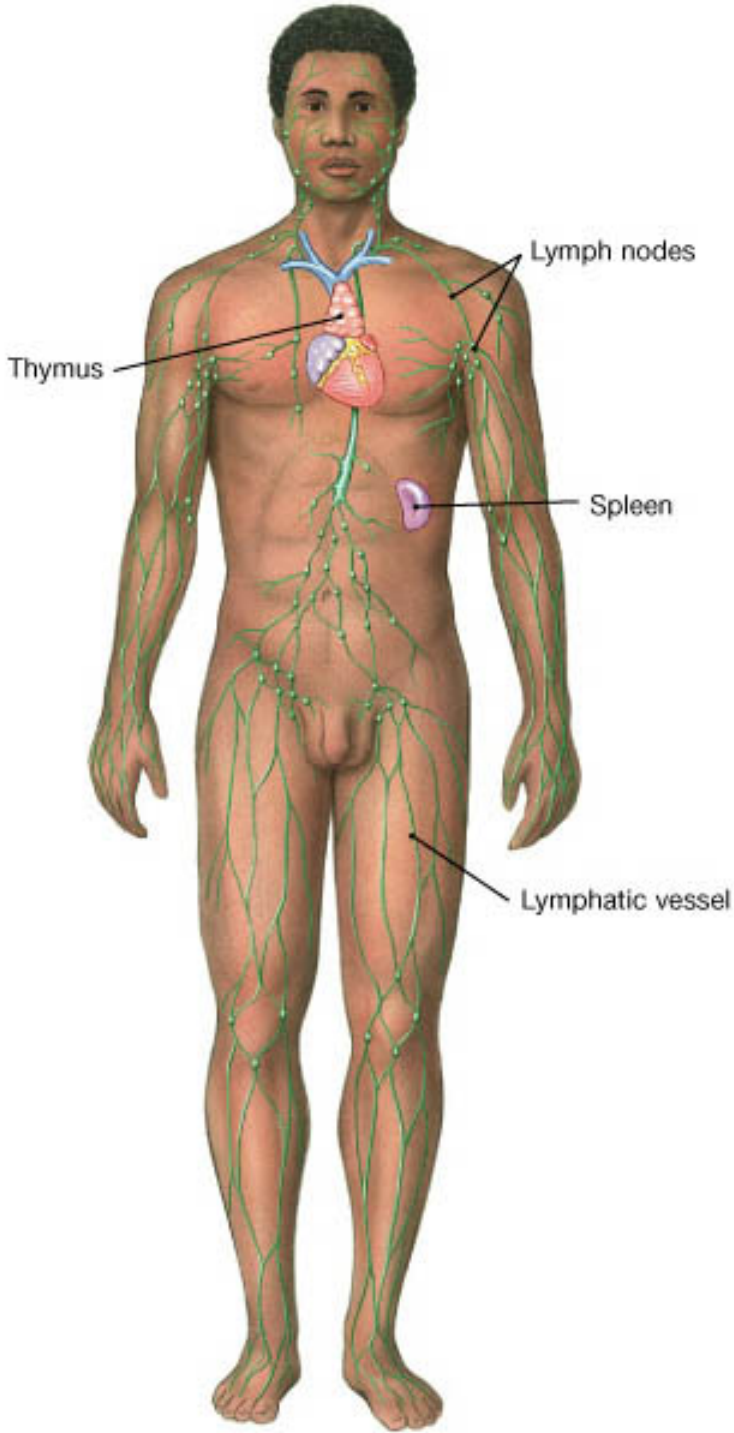


The Lymphatic System

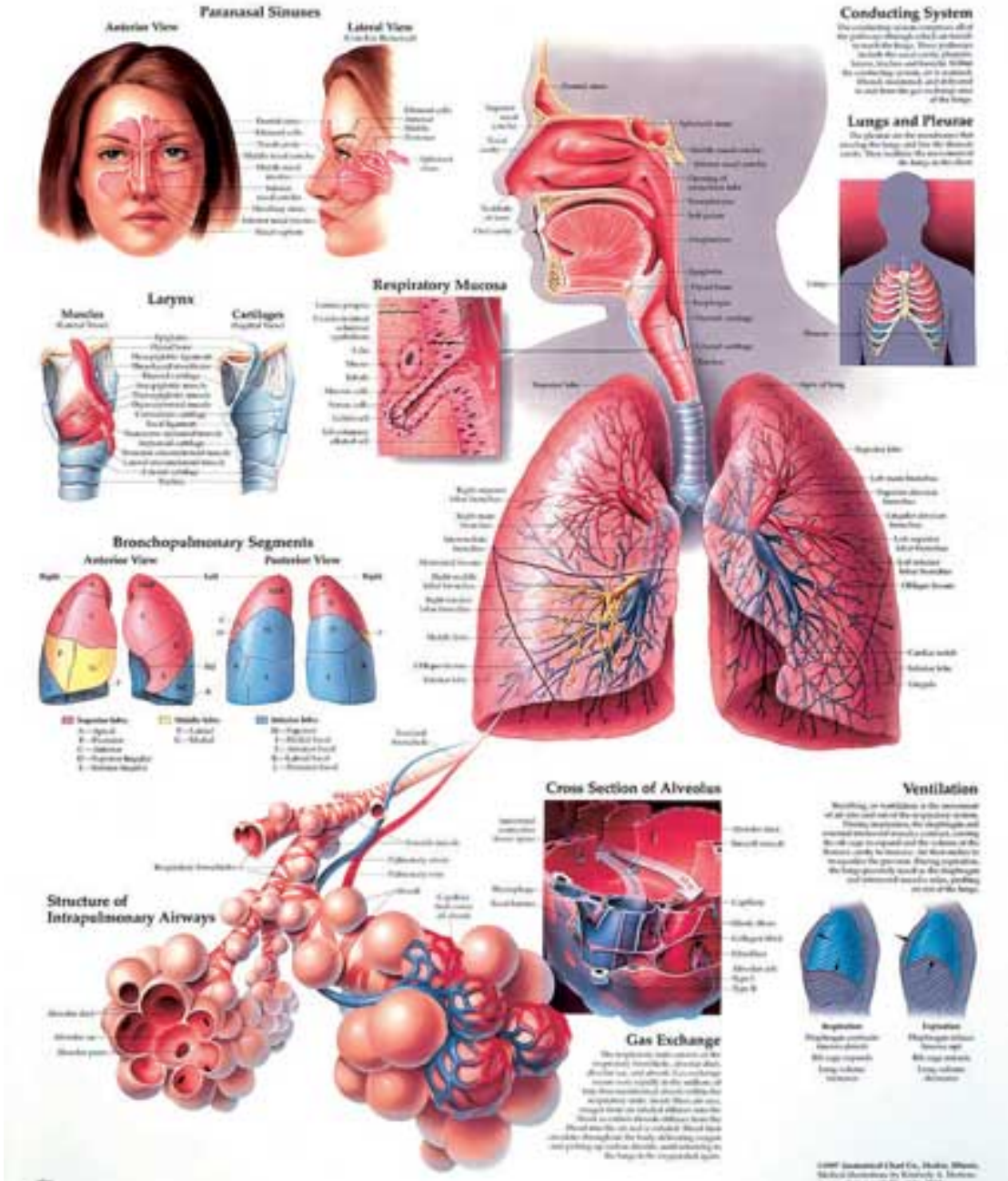


Fig

1.6

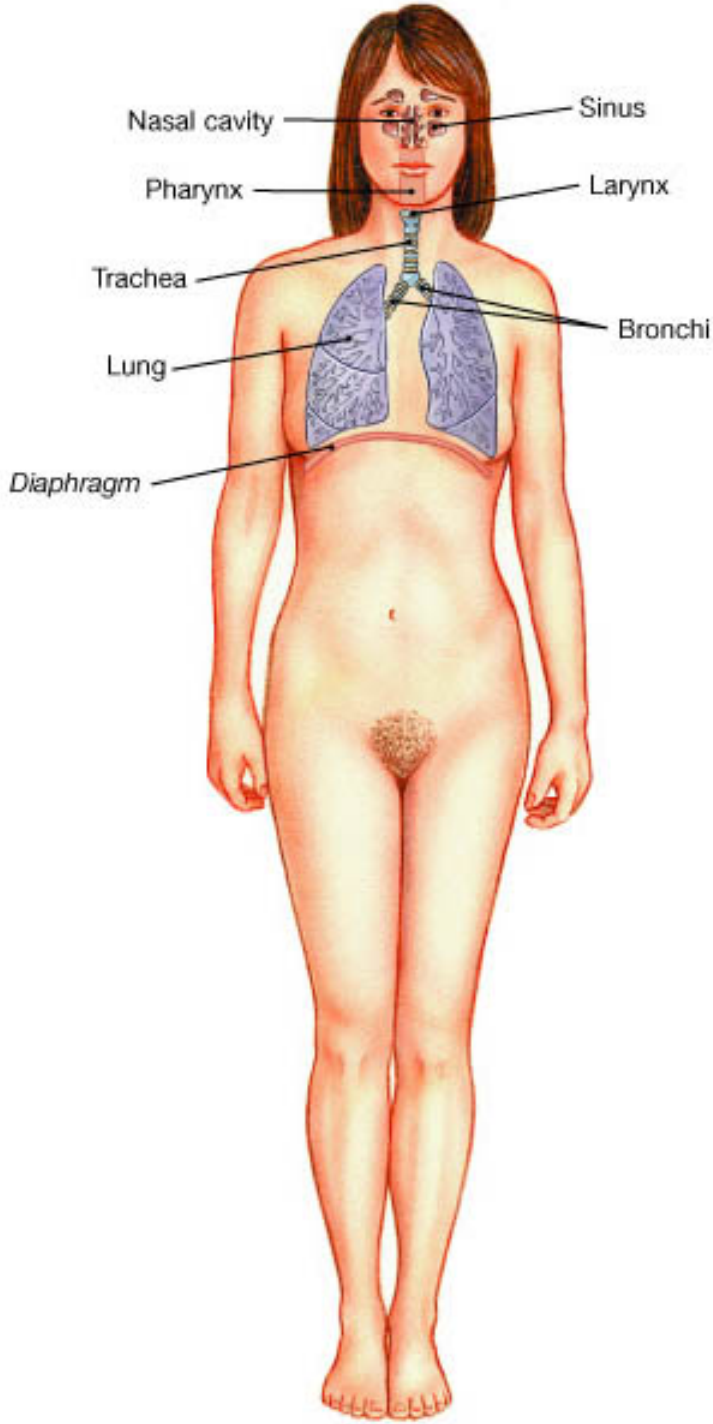


THE RESPIRATORY SYSTEM



Fig

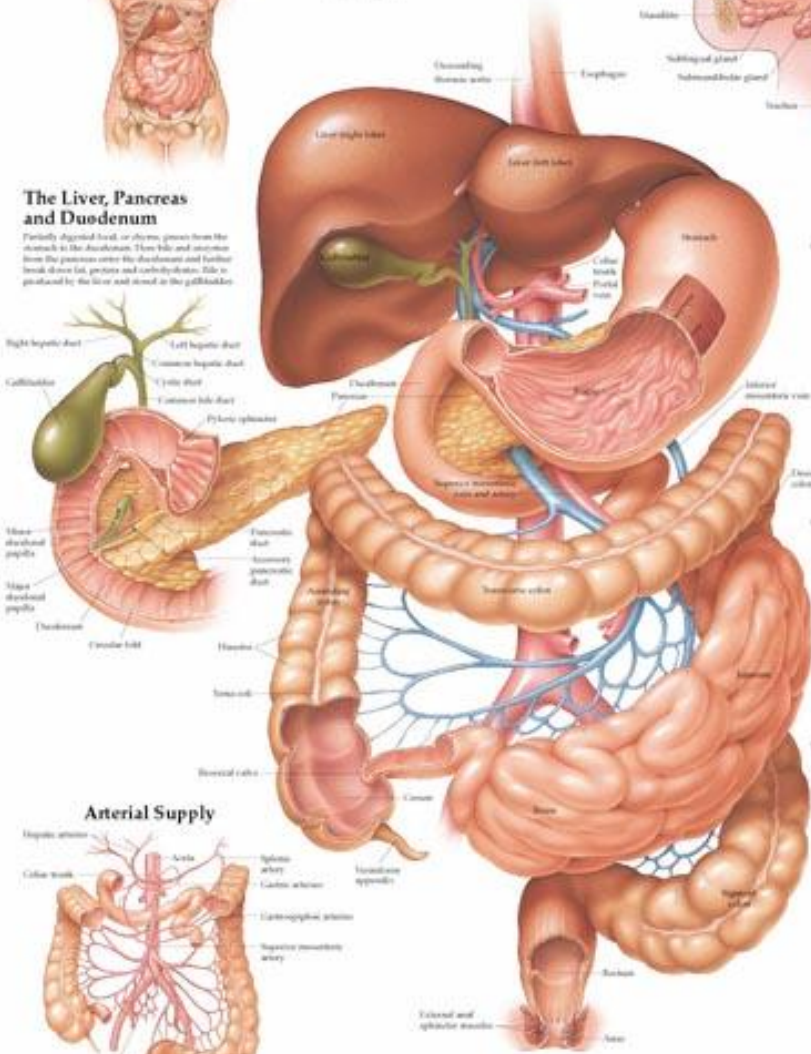
1.6


Nasal cavity
Sinus
Pharynx
Larynx
Trachea
Bronchi
Lung
Diaphragm

THE DIGESTIVE SYSTEM

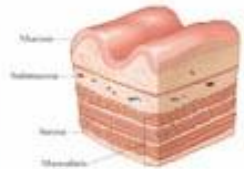
The Oral Cavity, Salivary Glands and Stomach

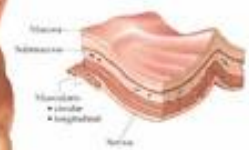
Digestion begins in the mouth as food is mixed with saliva. Saliva breaks down the starch in food into smaller sugars. After moving to the stomach through the esophagus, food is further broken down by enzymes and hydrochloric acid. A layer of mucus protects the stomach lining from damage by the hydrochloric acid.



The Liver, Pancreas and Duodenum

Partially digested food, or chyme, passes from the stomach to the duodenum. Then bile and enzymes from the pancreas enter the duodenum and further break down fat, protein and carbohydrates. Bile is produced by the liver and stored in the gallbladder.





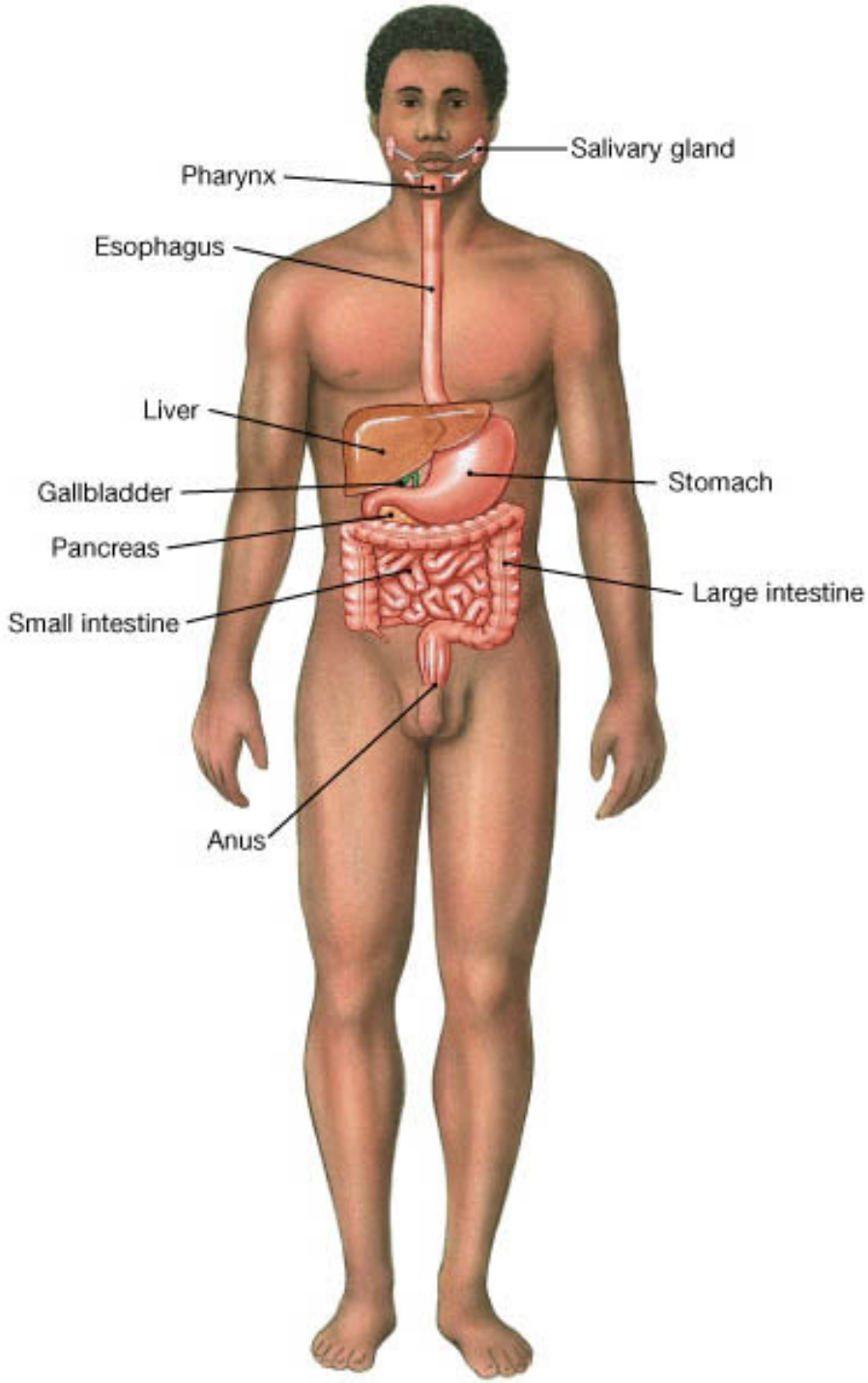
Arterial Supply

The Small and Large Intestines

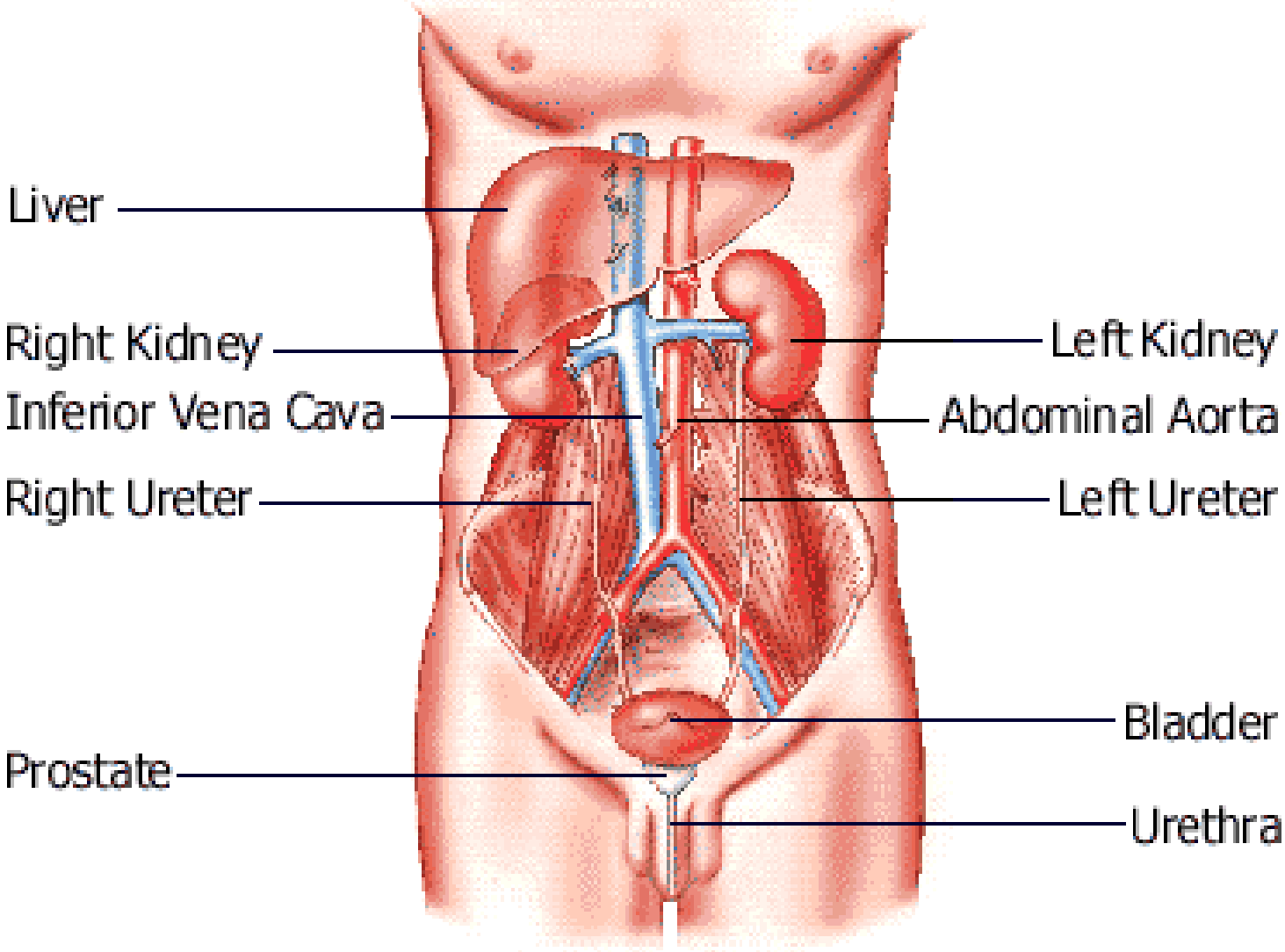
Chyme moves to the last parts of the small intestine, the jejunum and ileum, where nutrients are absorbed into the bloodstream. The nutrients travel to the liver via the hepatic portal system to store, for further metabolism and storage. Undigested material enters the colon, where water and electrolytes are absorbed. The remaining waste is stored until eliminated.

Fig

1.6


Salivary gland
Pharynx
Esophagus
Liver
Gallbladder
Stomach
Pancreas
Large intestine
Small intestine
Anus

Urinary System

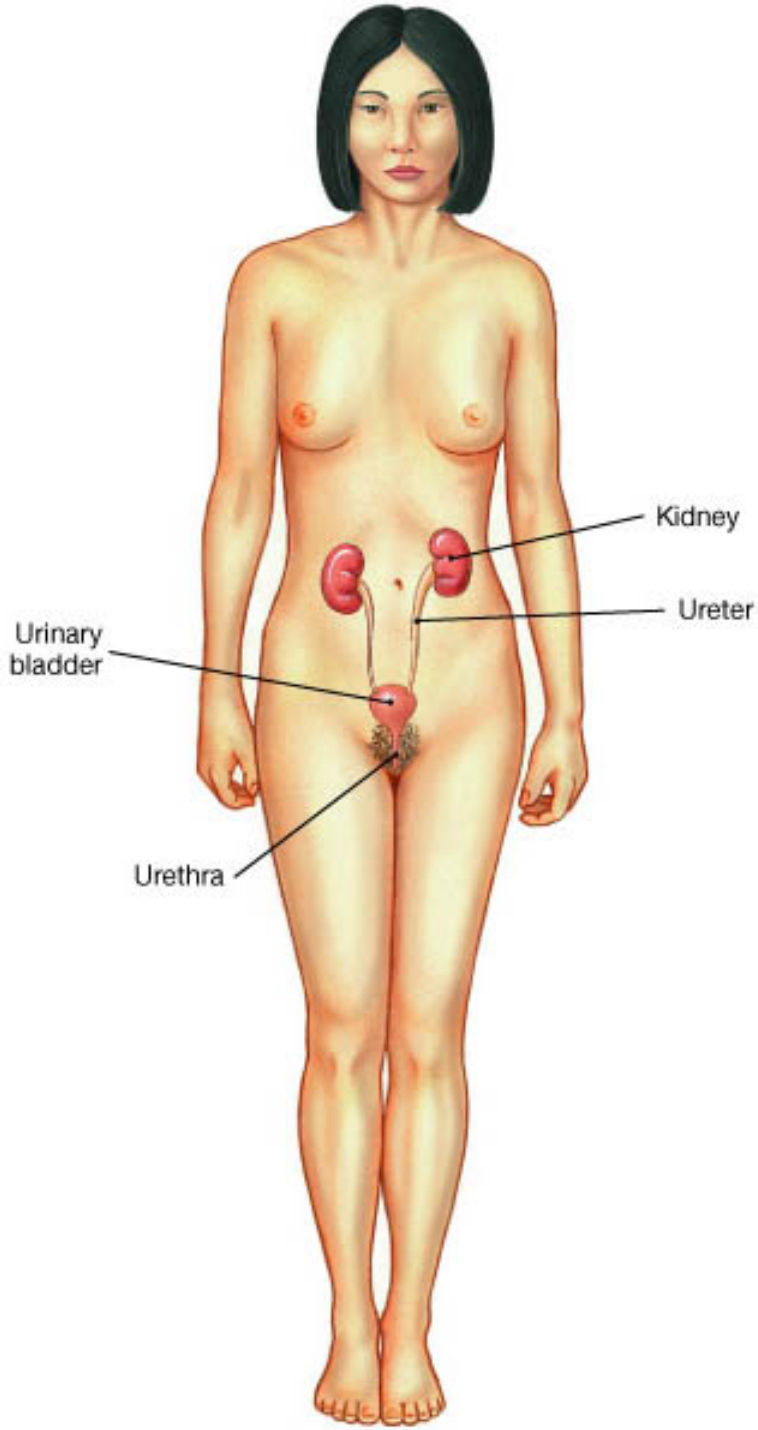


From the MediClip Color Anatomy 2, 1996

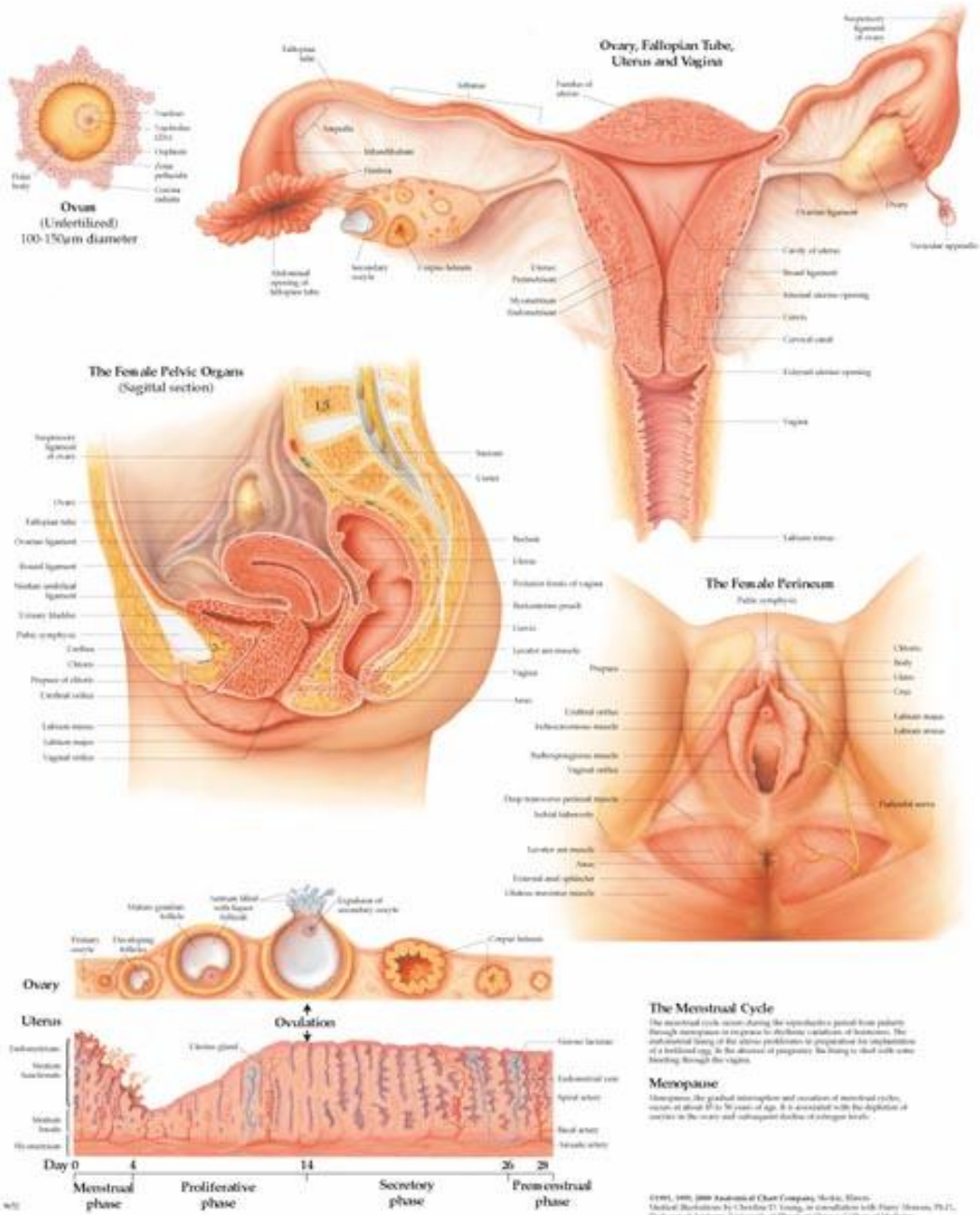
Williams & Wilkins, a Waverly Company

Fig

1.6



THE FEMALE REPRODUCTIVE SYSTEM



The Menstrual Cycle

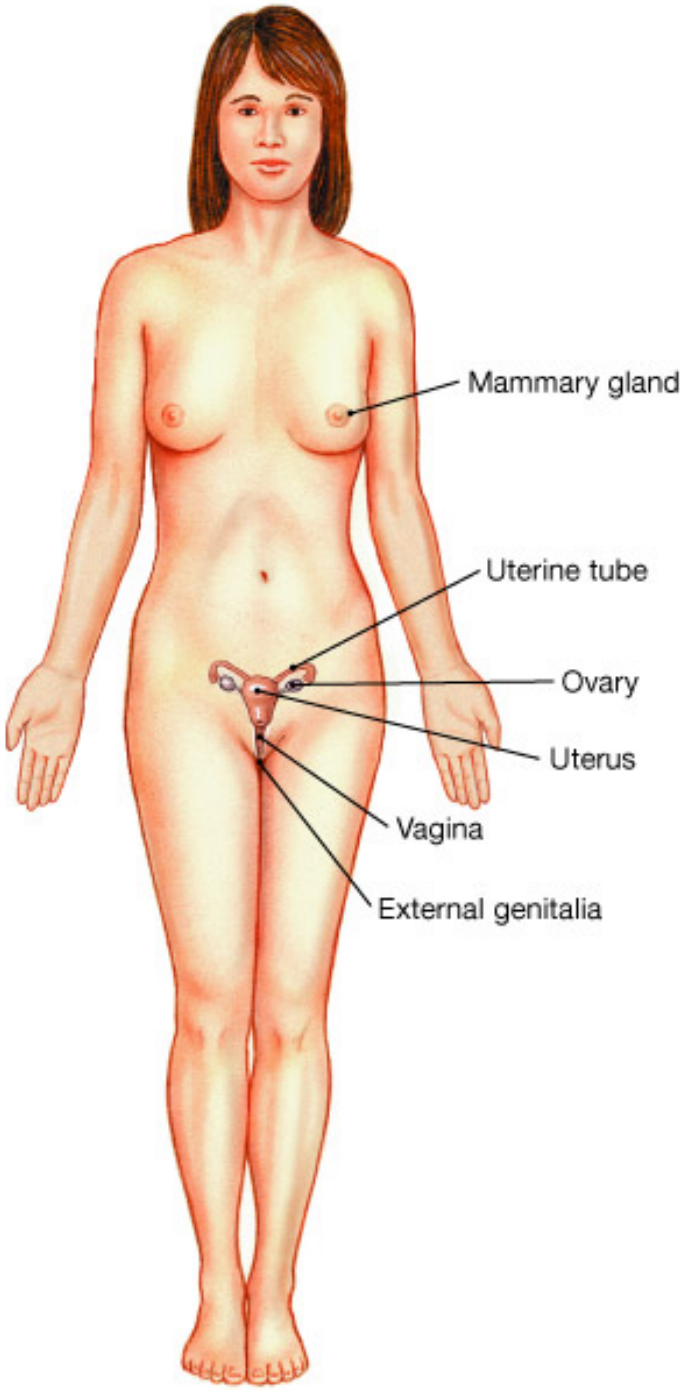
The menstrual cycle occurs during the reproductive period from puberty through menopause in response to rhythmic variations of hormones. The endometrial lining of the uterus proliferates in preparation for implantation of a fertilized egg. In the absence of pregnancy the lining is shed (with some bleeding through the vagina).

Menopause

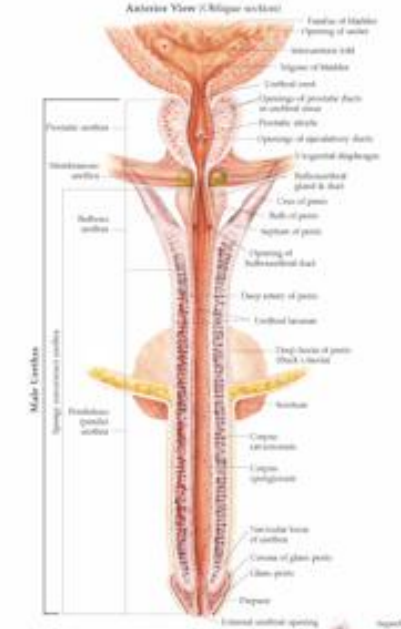
Menopause, the gradual interruption and cessation of menstrual cycles, occurs at about 45 to 50 years of age. It is associated with the depletion of oocytes in the ovary and subsequent decline of estrogen levels.

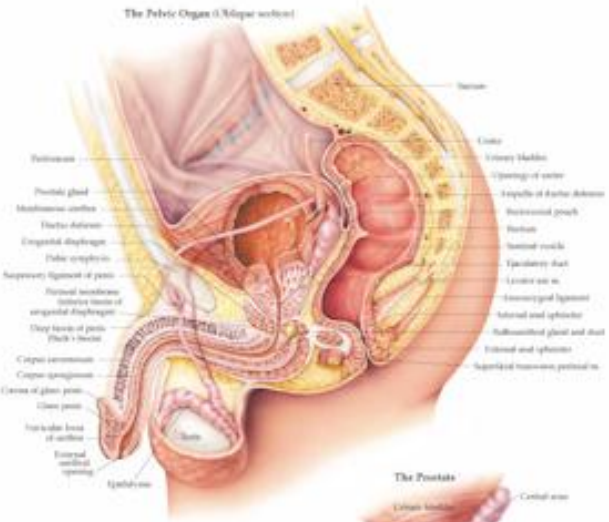
Fig

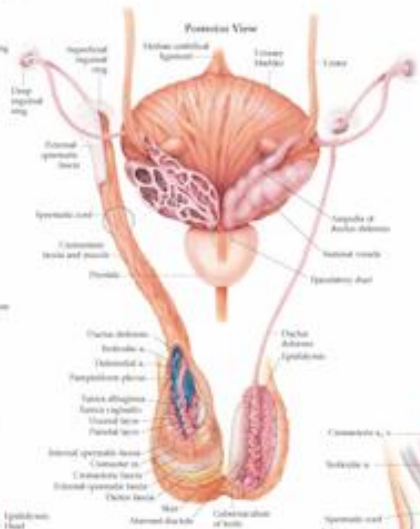
1.6

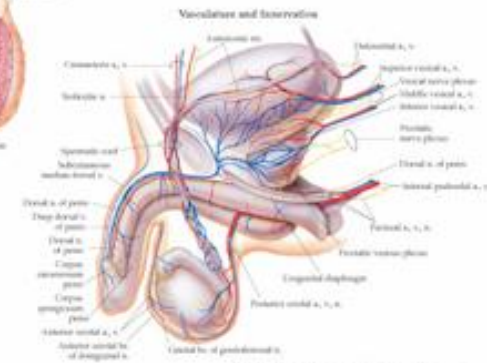

Mammary gland
Uterine tube
Ovary
Uterus
Vagina
External genitalia

THE MALE REPRODUCTIVE SYSTEM



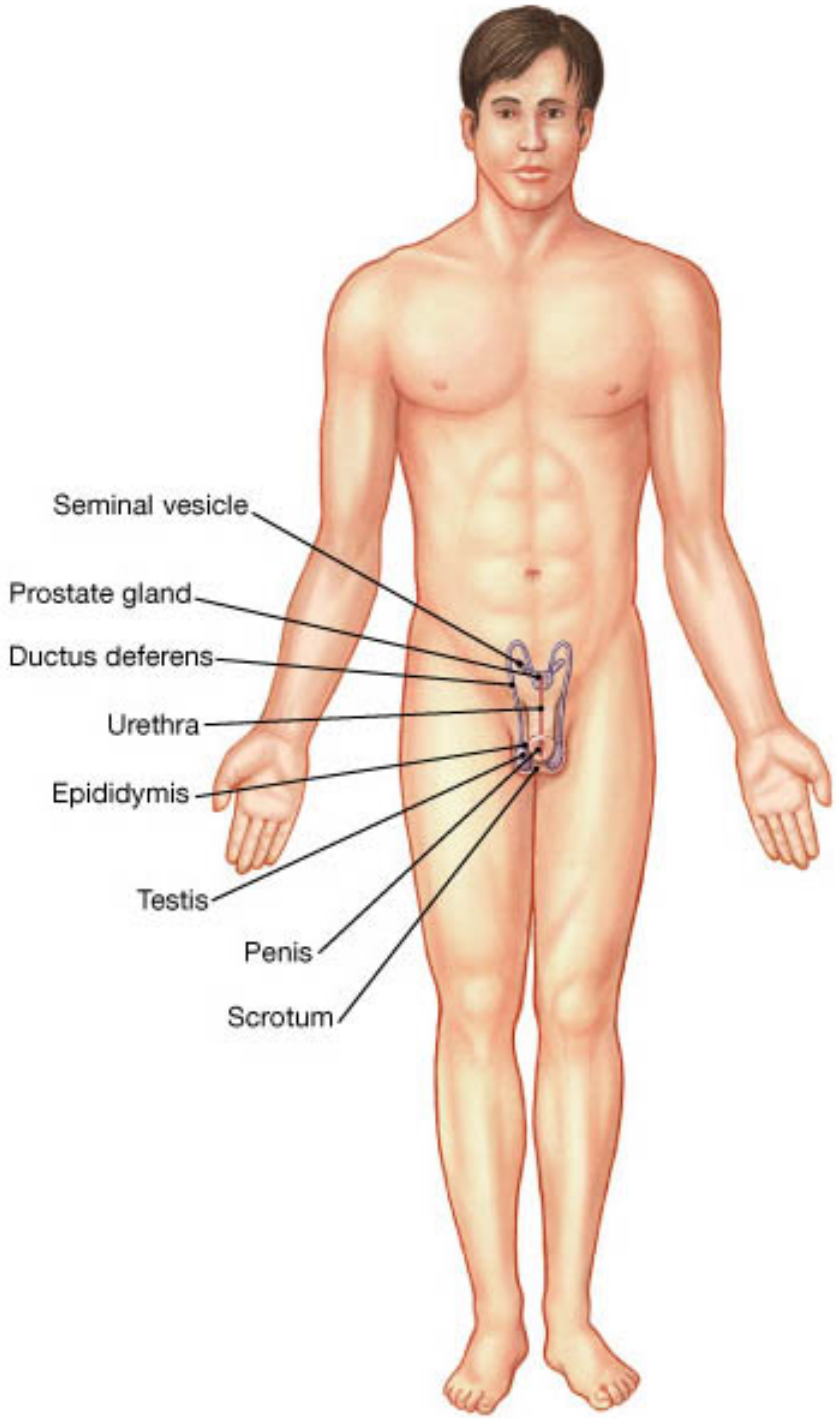






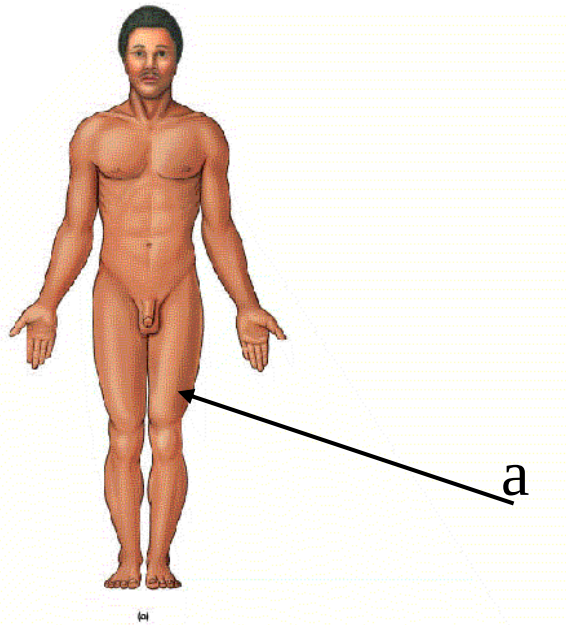
Fig

1.6

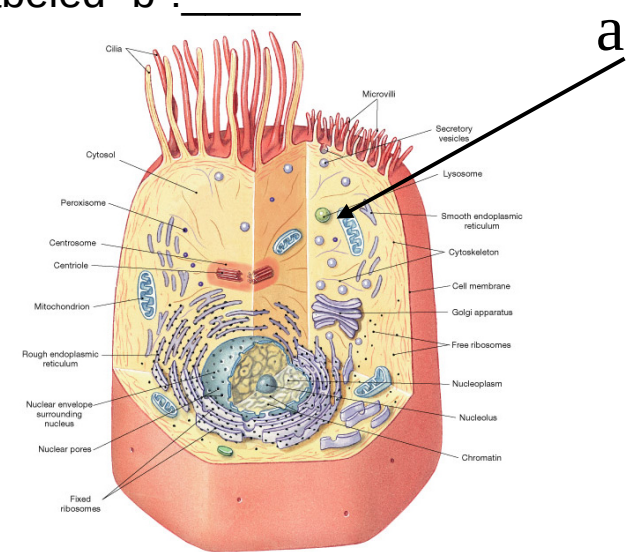

Seminal vesicle
Prostate gland
Ductus deferens
Urethra
Epididymis
Testis
Penis
Scrotum

EXAM STYLE

- **Station 2)** **(4 pts)**
- a) Identify the **anatomical landmark** labeled “a”:___
- b) Identify the **anatomical landmark** labeled “b”:___
- c) Identify the **anatomical landmark** labeled “c”:___
- d) Identify the **anatomical landmark** labeled “d”:___



- **Station 24)** **(4 pts)**
- a) Identify the **organelle** labeled “a”:_____
- b) What is the function of the organ labeled “a”:_____
- c) Identify the **organelle** labeled “b”:_____
- d) What is the function of the organ labeled “b”:_____



- **Station 28)** **(6 pts)**
- **Essay**

- **Station 30)** **(5 pts)**
- **Multiple choice**

- **Lab clean up- push in chairs & put away models at the end of each class!**

- **10 minute break**