LECTURE SYLLABUS

COURSE: Spring 2013 Advanced Human Anatomy, Biology 128
Lecture: MWF 8:00-9:00 am (Brousseau 233)
Lab: M 1-5 pm (Brousseau 233)

INSTRUCTOR: Greg Smith

COURSE DESCRIPTION: The study of the anatomy of the human body. This course is taught through a regional approach, emphasizing the structural relationships and functional aspects of gross anatomy, histology and embryology. References to the evolution and variation of anatomic structure will be included. Extensive out of class dissections will be expected.

OFFICE HOURS: TBD

REQUIRED TEXT: Human Anatomy by Marieb, Mallatt and Wilhelm, 6th edition


EXAMS: There will be approximately 4 exams given during the semester. The exams will consist of matching, true-false, multiple choice, and essay questions, all of which will emphasize the relationships of the anatomic structures studied in the course. Simple regurgitation of terms is not an indication of anatomic knowledge. Your success in the class will be determined by your ability to assimilate a large volume of information and your ability to answer to exam questions requiring application of your knowledge. Finally, while each exam including the final will not be comprehensive, they will incorporate information that is learned throughout the semester.

GRADES AND GRADING: To determine the final course grade, the lecture portion will contribute 50% and the lab portion will contribute 50%. The final grade scale will be as follows:

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<tr>
<th>Grade</th>
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<tr>
<td>A</td>
<td>90 - 100%</td>
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Please note: I will drop your lowest exam score at the end of the semester before calculating your final average. Because of this, I do NOT give make-up exams. For example, if you miss an exam for ANY reason, the score from that exam will be a 0 and will probably end up being the score that I would drop. Please note that you must take the final exam.
Notice: Correct spelling of the anatomic terms is essential to the correct use of anatomical terms. This is a normal expectation for this subject. Accurate spelling is expected for full credit on all exam questions.

Academic Honor Code
Saint Mary's College expects every member of its community to promote and abide by ethical standards, both in conduct and exercise of responsibility towards other members of the community. Academic Honesty must be demonstrated at all times to maintain the integrity of scholarship and the reputation of the College. Academic dishonesty is a serious violation of College policy because, among other things, it undermines the bonds of trust and honesty between members of the community and betrays those who may eventually depend upon the College’s academic integrity and knowledge.

As an expression of support for academic integrity throughout the Saint Mary’s learning community and as an administrative tool to discourage academic dishonesty, Saint Mary’s has implemented an Academic Honor Code. The Academic Honor Code has been approved by the ASSMC Student Body, the Faculty Academic Senate, the Provost and the President of Saint Mary’s College.

Pledge
All students, whether undergraduate or graduate, are expected to sign a pledge to follow this Academic Honor Code. The pledge reads as follows:

As a student member of an academic community based in mutual trust and responsibility, I pledge:
• to do my own work at all times, without giving or receiving inappropriate aid;
• to avoid behaviors that unfairly impede the academic progress of other members of my community; and
• to take reasonable and responsible action in order to uphold my community’s academic integrity.

If I catch any student committing an act of plagiarism or cheating, I will report that student to the Honor Council.

St. Mary's College Statement of Accommodations
Reasonable and appropriate accommodations, that take into account the context of the course and its essential elements, for individuals with qualifying disabilities, are extended through the office of Student Disability Services. Students with disabilities are encouraged to contact the Student Disability Services Coordinator at (925) 631-4164 to set up a confidential appointment to discuss accommodation guidelines and available services.

Additional information regarding the services available may be found at the following address on the Saint Mary’s website: http://www.stmarys-ca.edu/academics/academic-advising-and-achievement/student-disability-services.html
Spelling disabilities: correct spelling of the following terms is essential to the correct use of anatomical terms and a normal expectation of this subject. Accurate spelling is expected for full credit on all exams.

ATTENDANCE: Attendance is expected. If you miss a lecture, not only will you miss the lecture material but also the information that results from student questions and discussions. Finally, I ask that you arrive to class on time. Entering the classroom late will result in your missing directions for the lecture period. **Coming in late also creates a distraction for me and the other students. Absences and/or coming into class late will likely have a negative effect on your final grade.**

FOOD: Please do not bring food and drinks into the classroom, it is not a dining area.

CELL PHONES: I do want to see nor hear your cell phones, smart phones, etc. Please turn them off and put them away before class begins.

COURSE GOALS:
The course objective is to familiarize the student with the various structures that make up the human body. The course will develop in a sequential manner, proceeding from systemic over-view, then moving on to the regions of the body. In each region, the student will locate and identify the various structures and their related parts as outlined in the laboratory schedule of objectives. The embryologic and evolutionary aspects of these regions will be investigated.

LABORATORY HINTS: The laboratory is scheduled for 4 hours/week, therefore it is imperative that you locate each item listed in this syllabus in your lecture text and lab dissector PRIOR to coming to each scheduled lab period. Highlight the labels of diagrams and written descriptions in your texts and write page numbers in your syllabus for easy reference. During the lab period, you may find making drawings helpful, especially for those structures not diagrammed in the lab manual. Finally, I encourage cooperation, if a student locates and identifies a structure, that student should share this information with the rest of the class.

LIBRARY PROJECT:
One of the outcomes of dissecting a cadaver is that you will discover there are variations in the anatomy of humans. What you see in texts and atlases are images of "general" or "typical" anatomy. But not everyone is "put together" the same. As a part of this course, you will give a presentation on an anomaly that is either present in the previously dissected cadavers or your cadaver. The Head of Collection Management in the St. Mary's Library will give the class guidance as to the resources available to assist you in describing what the anomaly is and why it may occur. The purpose of this project is to give you an appreciation that variation is the basis of evolutionary adaptation. Each student will give a short presentation describing a condition and the anatomical background for the condition.
COURSE OBJECTIVES:

The student will learn:

- how the embryological development of a human results in the formation of the organs
- how disruptions of embryological development can lead to variations, anomalies or misplacements of the organs
- the specific anatomy of the structures and organs of the human body (i.e. size, color, orientation, among other characteristics)
- the three-dimensional relationships of the structures and organs of the human body
- the skills necessary to dissect a human cadaver
- to identify by appearance the tissues of the body
- the physical properties of the tissues
- to tolerate ambiguity: what is seen in a text or lab atlas may not correlate with what you are shown or taught in the course

COURSE OUTCOMES

The student will be able to:

- describe the position and orientation of the structures of the body using anatomic nomenclature.
- describe the organization of the human body from simplest to most complex.
- describe the embryological basis for the organization of the body.
- describe the organization of each organ system from simplest to most complex.
- demonstrate proficiency of the dissection skills taught in the laboratory.
- evaluate case studies and journal articles related to anatomy.
COURSE OUTLINE
I. Intro to Systems Anatomy, Histology and Embryology

CYTOLOGY:
The student should know the following organelles and inclusions, their relationships, and functions (review your Biology 2 lecture notes for this information):

- cell membrane
- nucleus
- endoplasmic reticulum
- nucleolus
- ribosome
- vesicles
- golgi apparatus (dictyosome)
- lysosomes
- mitochondria
- lipid vacuoles
- centriole
- glycogen
- microtubules
- pigments
- microfilaments
- mitosis (the student should know the phases and their characteristics)

EPITHELIA:
The student should know the following type of epithelia, the characteristics that distinguishes it, and its relationships to other structures:

anatomy - basement membrane (made of basal lamina and reticular layer)
cell junctions - desmosome (linker protein, intermediate fibers, plaque), tight junction (interlocking proteins), gap junctions (connexons)
types - stratified squamous epithelium
gland formation - merocrine (eccrine), apocrine and holocrine

CONNECTIVE TISSUE:
The student should know the following connective tissue cells, fibers, and types (with examples in the body):

Connective tissue proper
cells - fibroblasts, macrophage, plasma cells, lipid cells, and melanocytes
fibers - collagen, elastic
ground substance - chemical makeup
types - loose irregular (areolar), dense irregular, dense regular, adipose

Cartilage
types - hyaline cartilage, elastic cartilage, fibrocartilage
distinguishing characteristics

Bone
types - compact, spongy (composition, functions)
endochondral formation
periosteum, red and yellow marrow

**CONTRACTILE TISSUE**
skeletal muscle - gross level morphology

**INTEGUMENT**
The student should know the following structures and their relationships:

epidermis (strata: corneum, lucidum, granulosum, spinosum, and germinativum)
dermis (layers, sweat glands, sebaceous glands, hair follicles, arrector pili)

**EMBRYOLOGY**
embryology, tissue classification and organ formation
blastocyst - embryoblast
amniotic cavity, yolk sac
epiblast, hypoblast

gastrulation - primitive node, primitive streak, notochord (separation from endoderm)
invagination and differentiation - ectoderm, mesoderm, endoderm

**Neuroectoderm**
neurulation - neural plate - neural folds, neural groove, neural tube, cranial and caudal
europores
neural crest cells - mesenchyme among other structures described later

**Ectoderm**
skin - epithelium, hair, nails, sweat glands, mammary glands
ectodermal thickenings - lens and otic placodes

**Mesoderm**
paraxial mesoderm, intermediate mesoderm and lateral mesoderm
parietal and visceral mesoderm layers (intraembryonic coelom (cavity))

1. **paraxial mesoderm**
somitomeres (segments) - somites

**somites**
sclerotome - form vertebrae
dermomyotome - dermomyotome - dermis and subcutaneous tissue (dorsal body)
myotome - muscle (epimere and myomere) to trunk and limbs

nerve extend to dermal tissue and muscle by segments

2. **intermediate mesoderm**
nephrogenic tissue and gonads
3. lateral (plate) mesoderm
somatic mesoderm - parietal serosa, dermis on ventral skin, connective tissue of limbs (bones, joint and ligaments)

visceral mesoderm - visceral serosa, heart, blood vessels, walls of respiratory and digestive organs (not the inner linings)

Skeletal system
axial skeleton
sclerotomes - (mesenchyme) loose tissue surrounds spinal cord and notocord, forms vertebrae and part of intervertebral discs
notocord - forms nucleus pulposus
ribs - extensions of vertebrae
sternum - formed from somatic mesoderm

axial musculature
myotome

limb skeleton
somatic mesoderm of lateral plate - mesenchyme
mesenchyme induces ectoderm to form apical ectodermal ridge
mesenchyme differentiates into hyaline cartilage to form "models" for the bones handplates and footplates
cell necrosis needed to form digits

Limb muscles
dermomyotome of somite
myotome develops into muscles organized by function (e.g. flexors and extensors)
nerves from segments extend into the limbs

Bone formation
bony collar
cartilage calcification and breakdown - chondroblast, chondroclast
periosteal bud - primary ossification center
epiphysis (secondary ossification center), epiphyseal plate, diaphysis

vertebrae and ribs
sclerotome, annulus fibrosus, nucleus pulposus

bone shape - spongy bone, compact bone
bone healing - callus
osteoporosis

Nervous system
neural plate, neural fold, neural groove (folic acid)
neural tube, anterior neuropore, posterior neuropore
neural crest cells - melanocytes, teeth, sensory neurons, sympathetic ganglion,
  Schwann cells, adrenal medulla
brain, spinal cord, spinal nerves

**Heart formation**
pericardial bulge
heart tubes - truncus arteriosus, ventricle, sinus venosus (left and right atria)
septa - interventricular septum, first interatrial septum, second interatrial septum, foramen ovale
truncus arteriosus - aorta, pulmonary trunk (pulmonary arteries)

End of material for first exam

**Posterior Trunk, Upper Limb and Lower Limb**

**Fascia**
superficial fascia (subcutaneous fat, hypodermis), deep fascia, subserous fascia

**Vertebral column**
general anatomy
curvatures
vertebrae (annulus fibrosus, fibrocartilage, nucleus pulposus, ground substance)
facet joints (diarthrosis - synovial joints, capsule, synovial membrane, articular cartilage)
ligaments - anterior and posterior longitudinal ligaments
rib articulations (rib head - demifacet, rib tubercle - facet)

**Neurons**
neuron body, unipolar vs. multipolar, axon

**Glial cells**
Schwann cell (unmyelinated vs. myelinated), node of Ranvier, neurilemma,
  oligodendrocyte, astrocyte, satellite cell, microglia

**Peripheral nerve**
endoneurium, perineurium, epineurium

**Spinal cord**
regions (C, T, L, S - name and numbering convention), relationship to vertebral column,
  conus medullaris, cauda equina, filum terminale, intervertebral foramina

**Spinal cord cross-section**
posterior root and ganglion, anterior root, spinal nerve, denticulate ligament, posterior
  branch and anterior branch of spinal nerve
Meninges
pia mater, arachnoid layer, dura mater, subarachnoid space, spinal tap

Relationship of spinal cord and vertebrae
disc protrusion

Spinal cord tracts
sensory (fasciculus gracilis, fasciculus, anterior spinothalamic, lateral spinothalamic)
motor (anterior corticospinal, posterior corticospinal)

Sympathetic nervous system
thoracolumbar roots, paravertebral chain of ganglia, fight or flight function

Vertebral and spinal cord vasculature
intercostal and lumbar arteries
venous plexus
spinal tap

Blood vessels
tunica intima (stratified squamous epithelium), tunica media (smooth muscle, elastic fibers), tunica externa (vasa vasorum)
elastic artery, muscular artery, arteriole, venule, vein, capillary

Posterior trunk
muscles
rotatores, multifidus (proprioception)
erector spinae (spinalis, longissimus, iliocostalis) extension of vertebral column
trapezius, latissimus dorsi
rhomboideus major and minor, levator scapulae

Pectoral girdle
clavicle (sternoclavicular joint), scapula (acromioclavicular joint)

Shoulder
joint - glenoid cavity, head of the humerus, glenoid labrum, capsule, tendon of the long head of the biceps brachii, anterior dislocation
muscles - rotator cuff (supraspinatus, infraspinatus, teres minor, subscapularis - actions)
vasculature - thyrocervical trunk (transverse cervical a., suprascapular a.), posterior and anterior humeral circumflex a.
thoracic outlet and role of clavicle in blood flow

Brachial plexus
shoulder nerves (dorsal scapular - rhomboideus major and minor, suprascapular-
supraspinatus and infraspinatus, axillary -deltoides and teres minor)
roots, trunks, divisions, cords (relation to axillary artery), nerves (axillary, radial, ulnar
Anatomical spaces
quadrangular space (axillary n. posterior humeral circumflex a.), intermediate triangular space (deep brachial a. and radial n.)
space created by clavicle and scapula

Elbow joint
ulna (hinge joint), radius (rotation)
radial and ulnar collateral ligaments, annular ligament
interosseus ligament (membrane)

Forearm
muscles - triceps brachii, palmaris longus, flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus, pronator teres
vasculature - axillary, brachial, radial, ulnar a.
venous plexus (cephalic and basilic v.)

Wrist joint
radius and scaphoid bones, vasculature, ulnar and lunate, triquetral bones
Colle's fracture
carpal tunnel (flexor retinaculum, flexor digitorum superficialis tendons, flexor digitorum profundus tendons, flexor pollicis longus tendon, median nerve
tendon sheaths, flexor retinaculum

Hand
blood vessels (superficial palmar, arch deep palmar arch, common digital and proper digital arteries)
nerves (ulnar, median, common and proper digital nerves, distribution)

Pelvis
sacrum (wedge, articular surface, sacral foramina)
sacroiliac joint (interosseus sacroiliac ligament)
ilium, ischium, pubis, acetabulum (crescent shape)
pubic symphysis (fibrocartilage)
maleness versus female (pelvic outlet, shape of sacrum, width of ilia, subpubic angle, orientation of acetabulum)
sacrotuberous ligament (shock absorber), sacrospinous ligament
greater and lesser sciatic foramina
muscles - gluteus maximus (extensor, inferior gluteal n., superior and inferior gluteal a.),
gluteus medius and minimus (abductors, superior gluteal n. and a.,
piriformis (lateral rotator)
relationship of the muscles for locomotion
vasculature - external iliac artery (for later), internal iliac artery (posterior and anterior trunks), superior gluteal artery and vein, inferior gluteal artery and vein
nerves - lumbosacral plexus, sciatic nerve, superior gluteal nerve, inferior gluteal nerve,
pudendal nerve and sciatic nerve, injection site
superior region of greater sciatic foramen (formed by piriformis, superior gluteal a., v. and n.)
inferior region of greater sciatic foramen (inferior gluteal a., v. and n., sciatic n., pudendal n.)

**Hip joint**
capsule and ligaments - range of motion
vasculature to acetabulum (obturator a. - branches to acetabulum and ligament to head of femur)
deep branch of femoral a. (medial and lateral femoral circumflex arteries - to neck of femur)

**Posterior thigh**
muscles - semitendinosus, semimembranosus and biceps femoris (tendons form popliteal fossa for tibial n. and popliteal a.)
vasculature - femoral artery becomes popliteal artery after passing through adductor hiatus
nerves - sciatic nerves branches into tibial nerve and common fibular nerve

**Knee**
we will discuss this joint in detail with the anterior view of the body

**Posterior leg**
muscles - gastrocnemius and soleus (plantarflexion), ruptured Achille's tendon, tibialis posterior, flexor digitorum, flexor hallucis longus (plantarflexion and individual actions)
Tom, Dick And Harry
vasculature - posterior tibial artery, anterior tibial artery and fibular artery
great saphenous vein (drains foot, leg and thigh), small saphenous vein
nerves - tibial nerve, common fibular nerve

**Ankle joint**
tibia, fibula and talus
deltoid ligament (tibial, calcaneus, talus, navicular)
anterior and posterior talofibular ligaments, calcaneofibular ligament
calcaneonavicular ligament (spring ligament)
flexor retinaculum (tibialis posterior, flexor digitorum longus, flexor hallucis longus, posterior tibial a., and tibial n.)

**Foot**
medial and lateral longitudinal, transverse arches
plantar aponeurosis
posterior tibial artery (medial and lateral plantar arteries)
tibial nerve (medial and lateral plantar nerves)
end of material for second exam

Anterior trunk, upper and lower limbs

**Thorax**
landmarks- jugular notch, larynx, thyroid gland, hyoid bone, sternal angle, xiphoid process

**Mammary gland**
lobes, alveolar cells, mammary ducts, supernumery nipples

**Lymphatic system**
endothelial cells, lymph capillaries (leaky), lymph nodes (lymphocytes), location of nodes, muscle pumping, metastasis
cisterna chyli, thoracic, right lymphatic duct, connection to subclavian veins

**Ribs**
types, costal cartilage, shape of rib cage, synchondrosis, diarthrosis, sternum, biomechanics, forced breathing (scalene muscles, abdominal muscles)
tercostal vein, artery, nerve, radiation pain

**Pectoral girdle**
sternoclavicular joint (articular disc), acromioclavicular joint

**Thoracic outlet and axillary inlet**
 thoracic outlet - brachiocephalic aretery, common carotid artery, subclavian artery and vein, internal jugular vein, external jugular vein, brachiocephalic vein, vagus nerve, phrenic nerve

axillary inlet - subclavian artery and vein, brachial plexus divisions and cords

**Brachial plexus**
nerves (C₅-C₈, T₁), trunks (superior, middle, inferior), divisions, cords (medial, lateral, posterior), anterior and middle scalene muscles (positions)

**Shoulder**
humerus - greater tubercle, lesser tubercle, intertubercular groove (sulcus)
latissimus dorsi, teres major, pectoralis major, supraspinatus and subscapularis insertions

**Clavipectoral triangle**
pectoralis major, deltoid
cephalic vein, thoracoacromial artery (branches - acromial, deltoid, clavicle, pectoralis major - all dogs can pee)

pectoralis minor
medial and lateral pectoral nerves
serratus anterior - long thoracic nerve (C₅, 6, 7)
biceps brachii tendon, transverse humeral ligament

**Upper limb blood flow**
subclavian artery, axillary artery (thoracoacromial artery, anterior circumflex humeral artery, posterior circumflex humeral artery), brachial artery (deep brachial artery) cephalic vein, basilic veins, brachial veins, axillary vein, subclavian vein

**Axillary area nerves**
cords
medial and lateral pectoral nerves, cutaneous nerves, radial nerve, musculocutaneous nerve, median nerve and ulnar nerve (positions), radial nerve (triangular interval, fractures)

**Elbow**
blood vessels - brachial artery, radial artery, ulnar artery, cephalic vein, basilic vein, median cubital vein
nerves - radial nerve, ulnar nerve, median nerve

**Forearm**
radius, ulnar, interosseous membrane
muscles - brachioradialis, extensor digitorum communis
anatomical snuff box - extensor pollicis longus, extensor pollicis brevis, radial artery trapezium, scaphoid

**Posterior hand**
venous plexus

**Abdomen**
linea alba, fascia of rectus abdominis
muscles - rectus abdominis (tendinous inscriptions), external oblique, internal oblique, transversus abdominis,

**Inguinal ligament**
anterior superior iliac spine, pubic tubercle, retinaculum for psoas major and iliacus (origin insertion, actions), opening for femoral vein, artery and nerve superficial inguinal ring

**Pelvic structures**
vessels - external iliac artery and vein, obturator artery
nerves - femoral nerve, obturator nerve, genitofemoral nerve, ilioinguinal nerve

**Fascia lata**

**Thigh**
muscles - sartorius, quadriceps femoris (rectus femoris, vastus lateralis, vastus
medialis, vastus intermedius), tensor fasciae latae (origins, insertions, actions as given)

**Femoral triangle**
inguinal ligament, sartorius, adductor longus
femoral nerve- anterior thigh muscles
femoral artery - deep femoral, medial and lateral circumflex femoral arteries (femoral neck), femoral vein (great saphenous vein thru fascia)
lymphatic structures - lymph nodes

**Medial thigh**
muscles - gracilis, adductor brevis, longus, magnus (origins, insertions and actions as given)
obturator nerve
genitofemoral nerve - to external genitalia
fascial compartments

**Adductor hiatus**
femoral artery and vein pass through to popliteal artery and vein

**Knee**
femur, tibia, fibula, patella
medial and lateral collateral ligaments
anterior and posterior cruciate ligaments
medial and lateral menisci (meniscus - singular) - fibrocartilage and hyaline cartilage
medial collateral ligament attachment to medial meniscus
patellar ligament - tibial tuberosity, Osgood-Schlatter’s disease
biomechanics
vasculature

**Leg**
tibia and fibula
interosseus membrane - opening for anterior tibial artery and deep fibular nerve, anterior and posterior tibiofibular ligament - syndesmosis (high ankle sprains)
anterior leg muscles - tibialis anterior (eccentric contractions), extensor hallucis longus, extensor digitorum longus
anterior compartment - fascia, anterior tibial artery, deep fibular nerve
lateral leg muscles - fibularis longus, fibularis brevis, fibularis tertius (anterior compartment by nerve)
vessels - anterior tibial nerve, dorsalis pedis artery, great saphenous vein, small saphenous vein
anterior and posterior tibiofibular ligaments, high ankle sprain

**Foot**
extensor retinaculum, anterior tibial artery (position) - dorsalis pedis artery, dorsal
venous arch

**Dermatomes**
sensory distribution

**External genitalia**
testes - embryonic origin, gubernaculum testis (cryptorchidism)
pouch formation (processus vaginalis) - transversalis fascia, internal oblique muscle
(cremaster muscle)

**Spermatic cord**
ductus deferens, testicular artery and vein (pampiniform plexus), lymphatics, genital
branch of the genitofemoral nerve

**Scrotum**
Dartos muscle

**Inguinal rings**
deep and superficial
indirect hernias versus direct hernias
Valsalva maneuver

**Testes**
tunica vaginalis (transversalis fascia), tunica albuginea (septa), seminiferous tubules,
cells (spermatogonia, $1^o$ and $2^o$ spermatocytes, spermatids, spermatozoa,
sustentacular), spermatogenesis (meiosis), spermiogenesis (differentiation), interstitial
cells (testosterone)

**Spermatozoa**
-(acrosome, nucleus, mitochondria, flagellum), epididymis, ductus deferens

**Temperature control**
-counter current flow, Cremaster and Dartos muscles

end of material for third exam

**Trunk cavities**

**Face development**
stomodeum - mouth opening to esophagus, maxillary and mandibular prominences
nasal placodes - medial nasal prominences
maxillary prominences - hard palate
cleft lip versus palate

**Oral cavity**
stratified epithelium
hard palate, soft palate
teeth, tongue
palatine tonsils, lingual tonsils
salivary glands - parotid, submandibular, sublingual
oropharynx
epiglottis

**Nasal cavity**
septum, concha(e), meatus
pseudostratified ciliated columnar epithelium
nasopharynx - pharyngeal tonsil

**Embryology**
folding of endoderm and splanchnic mesoderm to form the digestive tube
fold of amniotic cavity to form coelom - peritoneal cavity
invagination to form mouth which joins digestive tube
respiratory diverticulum - trachea and lungs
longitudinal pinching - esophagus and trachea
tongue, epiglottis, thyroid and cricoid cartilages (thyrocricoid membrane)

**Larynx**
thyroid cartilage, cricoid cartilage, arytenoid cartilage, vocal cords, thyrocricoid membrane

**Thorax**
thoracic outlet
ribs - pectus excavatum
arteries - internal thoracic, intercostal, bronchial, superior epigastric
veins - hemiazygous, accessory hemiazygous, azygous, superior vena cava
lymphatics - nodes (thoracic)
nerves - phrenic (C3, 4, 5), vagus
costodiaphragmatic (costophrenic) space
sympathetic chain (ganglia) - thoracolumbar nerves
ganglion - information can ascend, descend, exit from ganglion

**Trachea**
cartilage rings
tracheal membrane and muscle

**Pleura(e)**
pleurale - parietal and visceral layers (cavity or space)

**Lungs**
left lung (superior and inferior lobes, oblique fissure)
right lung (superior, middle and inferior lobes, transverse and oblique fissures)
hilus - primary bronchi, pulmonary arteries and veins, lymphatic vessels
conducting system - primary bronchus, secondary bronchus (matching the lobes),
bronchioles (no cartilage), terminal bronchioles (simple columnar epithelium, smooth muscle, no goblet cells)
respiratory system - respiratory bronchioles (simple cuboidal, no cilia), alveolar ducts, alveolar sacs, alveoli (type I - simple squamous and cannot divide, type II - simple cuboidal and can divide, secrete surfactant)
elastic fibers
emphysema, pulmonary fibrosus

**Mediastinum**
from jugular notch and 1st rib to sternal angle / T1 to T4 is superior mediastinum
sternal angle to xiphoid process- T4 to diaphragm is inferior mediastinum
superior mediastinum - esophagus, trachea, aorta, superior vena cava
inferior mediastinum
  - anterior - potential space
  - middle - heart
  - posterior - esophagus, aorta, inferior vena cava, trachea, primary bronchi)

**Heart**
layers - endocardium, myocardium (cardiac fibers - intercalated discs), epicardium
  (visceral pericardium), parietal pericardium, pericardial space - serous, fibrous pericardium
right atrium - superior and inferior vena cavae, coronary sinus, fossa ovalis, (foramen ovale), sinoatrial node
right ventricle - rt. atrioventricular valve, chordae tendinae, papillary muscles, pulmonary semilunar valve, pulmonary trunk
left atrium - pulmonary veins
left ventricle - lt. atrioventricular valve, chordae tendinae, papillary muscles, aortic semilunar valve, aorta
annulus fibrosus, atrioventricular node, atrioventricular bundle and bundle branches coronary arteries (aorta)
  - right coronary artery - marginal artery, post. interventricular artery
  - left coronary artery - left interventricular artery, circumflex artery
venous drainage of heart - coronary sinus

**Diaphragm**
skeletal muscle
diaphragmatic hiatuses (esophagus, aorta, thoracic duct, inferior vena cava)
hernia or stenosis

**Abdominal topography**
lines - transpyloric, transtubercular, lateral quadrants - hypochondriac, epigastric, lumbar, umbilical, iliac, hypogastric - contents

**General anatomy**

**Development**
digestive tube - expansion becomes stomach, ducts from duodenum (ventral -liver, gall bladder, ventral pancreas), dorsal duct - dorsal pancreas, rotation of ducts intestine formation - loop forms, 270° rotation of loop, elongation and differentiation to form small and large intestines

**Digestive tube architecture**
mucosa, submucosa, muscularis, serosa

**Stomach**
cardia, fundus, body, pylorus, ruga(e), pyloric sphincter
gastric pits, gastric glands, mucus neck cells

**Small intestines**
duodenum - villus(-i), intestinal glands, absorptive cells, goblet cells, central lacteals
jejunum, ileum, ileocecal valve

**Large intestines (colon)**
large intestines - cecum, vermiform appendix, ascending colon, hepatic flexure,
transverse colon, splenic flexure, descending colon, sigmoid colon, rectum, taenia coli,
hastra, epiploic appendages

**Liver**
hepatocytes (secretes bile - cholesterol, bile salts, lecithin, gall stones), bile ducts,
hepatic artery, hepatic portal vein, left and right hepatic ducts, common hepatic duct,
cystic duct, gall bladder, common bile duct

**Pancreas**
exocrine cells (digestive enzymes), pancreatic islets (insulin/glucagon for glucose metabolism), pancreatic duct, accessory pancreatic duct, hepatopancreatic sphincter, duodenal papilla

**Peritoneum**
visceral and parietal peritoneum
greater omentum, lesser omentum, coronary ligament, falciform ligament, mesentery,
peritoneum from stomach extends to transverse colon- greater omentum
retroperitoneum - duodenum, pancreas, aorta, kidneys

**Vasculature**
arteries
celiac trunk - hepatic artery, left gastric artery, splenic artery
superior mesenteric artery. -small intestines, first half of colon
inferior mesenteric artery - second half of colon, rectum

veins
splenic vein, inferior mesenteric vein, superior mesenteric vein, hepatic portal vein, portal circulation
**Embryonic vessels**
- umbilical vein - ligamentum teres
- ductus venosus - ligamentum venosum
- foramen ovale - foss ovalis
- ductus arteriosus - ligamentum arteriosum
- umbilical arteries - common/internal iliac a.

**end of material for fourth exam?**

**Urinary system**
- general anatomy - kidneys (position - migration), renal artery and vein, adrenal glands
  - superiorly, ureters, urinary bladder
- development - digestive tube separates from cloaca (this becomes the urinary bladder)
  - pronephros - primitive excretory structure
  - mesonephros - excretory structures degenerate, mesonephric duct persists as ductus deferens and epididymis in males, connects with cloaca, seminal vesicle, prostate gland, metanephros
  - metanephros - ureteric bud becomes metanephric duct which becomes ureter, metanephros forms kidney, rotation of mesonephric and metanephric ducts on urinary bladder

**Kidney**
- cortex
- medulla - pyramids, renal papilla(e)
- path of urine out of kidney - renal papilla, minor calyx (calyces), major calyx (calyces), renal pelvis, ureter

**nephron**
- afferent arteriole (juxtaglomerular apparatus), glomerulus, efferent arteriole, peritubular capillaries, vasa recta, Bowmans' capsule (visceral layer - podocytes and pedicels, parietal layer), proximal convoluted tubule, loop of Henle, distal convoluted tubule (macula densa), collecting tubule, renal papilla

**Gonadal tissue**
- indeterminate tissue
  - males - associated with mesonephric duct
  - females - associated with paramesonephric duct

**Male reproduction**
- testes, epididymis, ductus deferens (pathway), seminal vesicle, prostate gland,
  - ejaculatory duct, prostatic urethra, membranous urethra, bulbourethral gland, penis,
  - spongy urethra, corpus spongiosum, corpora cavernosum (helicine arteries)

**spermatozoa**
- acrosome, nucleus, mitochondria, flagellum, temperature control (counter current flow,
Female development
paramezonephric ducts become uterine tubes, uterus (fused) and part of vagina
uterus extends from urogenital sinus
sinovaginal bulb and part of uterus contribute to form vagina
cervix projects into vagina
vestibule - remnant of cloaca
gubernaculum ovary - descent of ovary
suspenosory ligament - ovarian artery and vein

Female reproduction
uterus - fundus, body, cervix)
layers - endometrium, myometrium, perimetrium (peritoneum), broad ligament
rectouterine and uterovesical pouches

ovary - follicles, oogonia, primary oocyte, secondary oocyte (forms around the time of
ovulation), ovum (formed with fertilization), timing during life

mature follicle - ovum, zona pellucidum, corona radiata, cumulus oophorus, antrum
liqueur folliculi), membrana granulosa, thca interna, theca externa, corpus luteum
uterine tubes - fimbriae, infundibulum, ciliated cells

midsagittal view - urinary bladder, uterus, rectum, rectouterine pouch, vesicouterine
pouch, anteverted vs. retroverted uterus, prolapsed uterus, urogenital triangle,
broad ligament, round ligament

External genitalia and pelvic floor
urinary bladder, prostate, (pubic symphysis, ischial tuberosities, coccyx)
vestibule (labia minora, urethra, opening of vagina)

Placenta
villi, intervilious space, fetal arterioles and venules

Embryology
-urethral groove - urethral opening, glans penis, glans clitoris, labioscrotal swelling
(scrotum, labia majora)

Cranium
neural crest cells - plate-like bones (spicules of bone), intramembranous bone
formation, connective tissue membrane in between bones - allows brain growth,
fontanelles, suture formation

Face
cartilaginous bone formation
Oral and naval cavities
stomadeum - mouth opening (to esophagus)
nasal placode - forms groove, medial nasal prominences fuse together
maxillary prominences move together - form hard palate by closing grooves
cleft lip or palate

Brain
lobes (frontal, parietal, temporal, occipital)
fissure - longitudinal, transverse, lateral
gyrus (gyri) - precentral and postcentral
central sulcus (sulci)
telencephalon - cerebral hemispheres, motor cortex, sensory cortex, primary association areas, basal ganglia, corpus callosum
diencephalon - thalamus, hypothalamus, mammillary bodies
mesencephalon - corpora quadrigemina (superior colliculi, inferior colliculi)
metencephalon - pons, cerebellum
myencephalon - medulla

Limbic system
corpus callosum, olfactory bulb, mammillary body, hippocampus

Ventricular system
ependyma
lateral ventricles, third ventricle, cerebral aqueduct, fourth ventricle, spinal canal medial and lateral apertures, subarachnoid space, arachnoid villi
hydroencephaly

Blood supply
vertebral artery, internal carotid artery, cerebral circle
superior sagittal sinus, inferior sagittal sinus, transverse sinus, internal jugular vein

Eye formation
outpouching of neural tube, optic groove, optic vesicles
vesicle contact with ectoderm induces lens formation
rotation of eyes to anterior position

Ear formation
otic placode invaginates from ectoderm to form otic vesicle (this becomes cochlea and semicircular canals)
ossicles form from mesoderm
extension of developing pharynx to form pharyngeal pouch (auditory tube)
invagination of ectoderm to form external auditory canal

end of material for final