SYLLABUS: BIO K212 - ANATOMY & PHYSIOLOGY II

Spring Semester, 2011
Lecture: CRN 11599 Section T05 6:00 - 9:00 Tuesday, Rm. D105

Lab: CRN 11600 Section T5A 6:00 - 9:00 Thursday, Rm. A219

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Office Hours: Tuesday and Thursday; before or after class, or by appointment.

COURSE: BIO 212 - Anatomy & Physiology II is the second semester of a two semester sequence. Biology 211 - Anatomy & Physiology I must be taken prior to this course. This is especially important if transferring to a four-year institution with a major requiring a full academic year of anatomy and physiology or if the student is enrolled in Three River's nursing. *BIO 211 and 212 with a minimum grade of C+ is also the pre-requisite for the TRCC nursing program*. BIO 212 presents the students with a lecture/laboratory study of endocrinology, reproduction, hematology, cardiovascular, respiratory, digestive, excretory systems, and acid-base balance.

PRE-REQUISITE FOR THE COURSE: BIO 211 with a grade of C or better.

CREDIT; 4 credit hours consisting of 3 contact hours of lecture meeting T/Th; 12:30 – 1:55 and 3 hours of laboratory per week meeting T or Th 9:00 – 12:00.

REQUIRED TEXTS;

Fundamentals of Anatomy and Physiology by Frederic Marini and Judi Nath, 8th edition, Benjamin-Cummings Publishers. (with COURSE COMPASS)

Mammalian Anatomy of the Cat, by Sebastini, 2nd ed, Morton Publishing Company

OTHER REQUIRED MATERIALS:
dissecting kit,
disposable gloves,
lab coat or apron which are available from the bookstore.

ADDITIONAL REFERENCE TEXTS: (optional)
Applications Manual for Fundamentals of Anatomy and Physiology, by Martini, Welch, and Newsome,7th ed. Benjamin Cummings Publishers. (included free with the textbook)

A Photographic Atlas for the Anatomy & Physiology Laboratory, by K.M. Van De Graaff & J.L. Crawley, Morton Publishing Co. 6th ed.

Fundamentals of Anatomy and Physiology, The Study Guide, by Charles Seiger, Benjamin Cummings Publishers, 7th ed. ISBN: 0-13-046407-4

Outline of Cat Anatomy with Reference to Human, by Stephen Gilbert, Univ. of Washington Press 2000, ISBN: 0

CLASS ATTENDANCE;

Attendance of class is required. **Attendance is noted**. Absences can be very detrimental due to the nature of the material. An explanation of all absences is very much appreciated, especially if presented in advance when possible. It is the student's responsibility to obtain materials and notes for any classes that they miss.

CLASS CANCELLATION PROCEDURE:

If class is cancelled due to Professor Kirk's absence, class members will be notified by the following methods of communication: email, phone tree, and written notification posted by the Academic Office on the classroom/lab door.

If class is cancelled due to the college closing or not opening for the day due to weather, etc, students are notified by:

>text message (if you are registered for this service. If you are not, log in to MyCommnet and click on MyCommNet Alert to register.)
>Check posting on www.trcc.commnet.edu
>Check for recorded message on 1-860-886-0177
>email message from Prof. Kirk
>announcement on Course Compass
>local radio and television closing announcements

COLLEGE CLOSING: For weather related closings call the college at (860) **886-0177**

METHODS OF STUDENT EVALUATION; GRADING POLICIES

A. The student's grade for the course represents their ability to master course objectives, attitude, rate of improvement, proficiency and knowledge of course material.

B. Final course letter grades are determined by the total points accumulated. Students can estimate their progress toward a letter grade during the semester by using the table below after calculating their point percentage:

Letter Grade*	Approximated Percentages for Letter Grade	
A	100	92
A-	91.999...	90
B+	89.999...	87
B	86.999...	82
B-	81.999...	80
C+	79.999...	77
C	76.999...	72
C-	71.999...	70

D+	69.999...	65
D	64.999...	60
F	59.999...	0

** The instructor reserves the right to use subjective evaluation, especially in cases where the final percentage score is on a borderline between grades*

C. Points are obtained by the following methods of evaluation:

l. **Lecture (70% of course grade – possible 500 points):**

a. Major Exams (400 points): Four major exams worth 100 points each will be given. Each will evaluate the student's knowledge of the material given since the last major exam.

b. Weekley quizzes (100 points): Each week, quizzes worth 10 points each will be given, of the previous week's lecture material. The best 8 quiz grades will be used and converted to the same value as a major test, i.e. 100 points by dividing your total quiz points by 0.8.

For example if your best 8 quizzes totaled 64 out of possible 80 points your quiz score calculation would look like this:

64/0.8 = 80 points added to your lecture total

NOTE! WEEKLY QUIZZES CANNOT BE MADE UP IF MISSED UNDER ANY CIRCUMSTANCES. A MISSED QUIZ COUNTS AS A LOW QUIZ GRADE TO BE DROPPED.

2. **Laboratory (30% of course grade – possible 150 points):**

a. Practical exams (90 points): Two laboratory practical exams, each worth 45 points, will be given and will include (1) the digestive, urogenital, and reproductive systems (2) circulatory system including the heart, and the nervous systems.

b. Lab reports and quizzes (60 points): The following written reports will be required:

Renal regulation of osmolarity (30 points)
Cardiac Anatomy (10 points)
Cardiovascular physiology (10 points)
Pulmonary function (10 points)

D. Exam and quiz questions for lecture and/or laboratory material may consist of multiple choice, true/false, fill in the blank, matching, identification, or essay questions. Some questions might be reserved as an extra credit option.

E. Absence on examination days:

STUDENTS ARE REQUIRED TO TAKE EXAMS AS SCHEDULED.

ANY MAKE-UP EXAMS WILL BE TAKEN ON THE SAME DAY AS THE LAST TEST

F. Final letter grades for the course are determined by the following steps:

Taking the total points accumulated from lecture and lab, and dividing by 6.50.
For example, if a student's lecture and lab points added up to a total of 585 points, then 585/6.50 = 90% = A-

Laboratory Safety

Food, drink, and chewing gum are not permitted to be brought into the laboratory for any reason. Students are expected to wear appropriate attire which may require safety eyewear, laboratory gloves, and labcoat or apron.

Procedure for Withdrawing from the Course(s):

A student who finds it necessary to discontinue a course must complete a withdrawal form obtained from the Registrar's Office. The student may need to have the instructor's or their advisor's signature in order to withdraw and receive a "W" grade for the course. **Students who do not withdraw but stop attending will be assigned a "F" grade**, signifying failure and no credit. F grades count as courses attempted and may adversely affect the good standing status of the student receiving the grade.

Academic Integrity at Three Rivers

Academic integrity is essential to a useful education. Failure to act with academic integrity severely limits a person's ability to succeed in the classroom and beyond. Furthermore, academic dishonesty erodes the legitimacy of every degree awarded by the College. In this class and in the course of your academic career, present only your own best work; clearly document the sources of the material you use from others; and act at all times with honor. (taken from the Academic Integrity policy of Three Rivers Community College)

Disabilities:

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Disabilities Counseling Services. To avoid any delay in the receipt of accommodations, you should contact the counselor as soon as possible. Please note that I cannot provide accommodations based upon disability until I have received an accommodation letter from the Disabilities Counselor. Your cooperation is appreciated.

Revisions to the Syllabus

The instructor reserves the right to revise the academic schedule, objectives, and/or topical outline contained in this syllabus

SPECIFIC OBJECTIVES FOR THE LECTURE PORTION OF THE COURSE

The following lecture- learning units are within corresponding folders within the Assignment Section of Course Compass. Additional learning aids are also within those folders such as: reading assignments, dates, testing, computer programs within the lab, on-line learning aids from the textbook publisher, class notes and handouts, Internet links, and practice exam questions.

I. **Endocrinology**: study of control by endocrine glands

Upon completion of a study of the endocrine system, the student should be able to correctly answer questions concerning the following:

A. Describe the basic overall makeup of the endocrine system.

1. List and describe methods of intercellular communication
2. Define the following:

exocrine gland	tropic hormone
feedback regulation	hormone
endocrine gland	target cells

3. Describe the chemical structure groups hormones may be divided into: amino acid derivatives, peptides, lipid derivatives.
4. Describe proposed mechanisms in which hormones initiate responses from target organ cells by discussing lipid solubility, receptor, G-protein, adenyl cyclase, cyclic AMP, protein kinases, phospholipase C, Ca^{++}.

*5. Define prostaglandins and leukotrienes.

6. List the names and locations of the major endocrine glands

B. Describe the anatomy and physiology of the pituitary gland.

1. Describe the anatomy of the pituitary and its relationship to the hypothalamus of the brain using the following terms:

sella turcica	adenohypophysis	anterior pituitary
infundibulum	releasing and inhibiting factors	hypophyseal portal system
median eminence	posterior pituitary	neurohypophysis

2. Describe the function and feedback control of the following adenohypophyseal hormones:

a. growth hormone (somatotropin)	c. prolactin (lactogenic hormone)
b. gonadotropic hormones:	d. thyroid stimulating hormone
1) follicular stimulating hormone	e. adrenocorticotropic hormone
2) luteinizing hormone	*f. melanocyte stimulating hormone

3. In reference to growth hormone, define somatomedins, glucose-sparing effect, and diabetogenic effect.

4. Describe the function and feedback control (if any) of the following neurohypophyseal hormones:
   a. oxytocin
   b. anti-diuretic hormone (vasopressin)
   c. Define: paraventricular and supraoptic nucleus, milk-let-down reflex, antiduresis, osmoreceptors, and hypothalamic-hypophyseal nerve tract

***will not be covered in class**

5. Know the normal plasma osmolarity level in milliosmols per liter

*6. Define:

Dwarfism	Diabetes insipidus	Cushing's disease
gigantism	acromegaly	

C. Describe the anatomy and physiology of the thyroid gland.

1. State the location of the gland.
2. Describe the anatomy of the gland by discussing:

Lateral lobes Pyramidal lobe	Isthmus Follicles	Follicular and parafollicular cells

3. Discuss the functions and feedback control of thyroxin (T4), triiodothyronine (T3), and calcitonin.

*4. Describe the chemical formation of T3 and T4 .

*5. Define:

hypo-hyperthyroidism Grave's disease (thyrotoxicosis) myxedema protein-bound iodine (thyroxin-binding globulin)	cretinism thyroid storm exophthalmos thyroglobulin	radioactive iodine uptake goiter

D. Describe the anatomy and physiology of the parathyroid glands.

1. Discuss the function of the feedback regulation of parathormone.
*2. Define hypo-hyperparathyroidism, hypo-hypercalcemia and state the abnormalities that result.
3. Know what the normal blood calcium ion concentration is.

E. Describe the adrenal (suprarenal) glands.

1. Describe the anatomy and physiology of the adrenal cortex.
   a. Describe the location of the gland and state the cellular layers (zonas) from superficial to deep and list which hormone groups are secreted by each.
   b. Describe the function and feedback regulation of aldosterone by describing the renin-angiotensin pathway.
   c. Know the normal blood sodium and potassium ion level
   d. State secretion site, function of, and control of natriuretic hormone.
   e. List the three major glucocorticoids, stating which is most abundant.
   f. List functions of and describe the feedback control of glucocorticoids. Be sure to relate stress and chronic inflammation to the above.
   g. Define:

*hypo-hypernatremia *hypo-hyperkalemia *Addison's disease *Cushing's disease	*virilism *gynecomastia mineralcorticoid glucocorticoids	gluconeogenesis gonadocorticoids adrenocorticoids

2. Describe the suprarenal medulla (adrenal medulla).
   a. List the functions of epinephrine and norepinephrine.
   b. Define glycogenolysis, chromaffin cells, and sympathomimetic.
   c. Discuss the relationship between the adrenal medulla and the sympathetic nervous system.

***will not be covered in class**

H. Be able to discuss the endocrine functions of the Islets of Langerhans of the pancreas.

1. List the functions of insulin and glucogon and the type of cells that secrete them.
2. Describe the feedback control between insulin, glucogon, and blood glucose

levels.

3. Be able to state what the normal blood glucose level is and the primary reason for its regulation.
4. Define:

Alpha & beta cells	Ketosis	Hypo & hyperglycemia
Diabetes mellitus II	Acetic acid	Glucosuria
Glycogenesis	Acetoacetic acid	Ketones
Glycogenolysis	Acetone	Ketonuria
Acidosis	Hyperinsulinism	Polyuria

F. Discuss the endocrine functions of the testes.
   1. List the functions of testosterone and inhibin.
   2. Discuss the relationship of testosterone, FSH, and ICSH on spermatogenesis.
   3. Define spermatogenesis, spermatogonia, interstitual cells of Leydig, and sustentacular cells.

G. Discuss the endocrine function of the ovaries.
   1. List the functions and site of production of estrogens and inhibin.
   2. List the functions and site of production of progesterone.

*H. Briefly describe the function of the hormone, melatonin, secreted by the pineal gland.

*I. Describe the function of the hormones, leptin and resistin, secreted by adipose.

*J. Describe the involvement of hormones with stress by discussing the alarm, resistance, and exhaustion phase.

*K. Be aware of the affect of hormones on behavior.

*L. Be aware pf the affects of hormones and athletic performance.

II. **Reproductive system:** Upon completion of a study of the reproductive system, the student should be able to correctly answer questions concerning the following:

A. Describe the male reproductive system.
   1. Briefly describe the descent of the testes by defining the inguinal canal, spermatic cord, tunica vaginalis, gubernaculum, and cryptorchidism.
   2. Define spermatic cord and be able to list its contents.
   3. Describe the function of the scrotum by defining dartos and cremaster muscles.
   4. Describe the structure and function of the testes and associated structures by defining:

tunica albuginea	sustentacular cells	testes
spermatogonia	tunica vaginalis	spermatogenesis
lobules	rete testes	spermatozoa
testosterone	seminiferous tubules	FSH
interstitual cells of Leydig	ICSH	meiosis
primary spermatocytes	secondary spermatocytes	spermatids

   5. State parts and function of the epididymis, vas deferens, seminal vesicles, ejaculatory ducts, prostate gland, and bulbourethral glands.

***will not be covered in class**

   4. Describe the anatomy of the penis and urethra by defining:

Prostatic urethra	Corpora cavernosa	Glans

Membranous urethra Penile urethra	Corpora spongiosum	prepuce

5. Describe the composition of semen.

B. Describe the anatomy of the female reproductive system.
1. Describe the location and structure of the ovary.
   a. Organize the ovary into its layers using the following terms: tunica, albuginea, stroma (cortex and medulla).
   b. Define oogenesis and differentiate between oogonium, primary oocyte, secondary oocyte, ovum, first and second polar body.
   c. Define follicles and differentiate between primordial, primary, secondary (growing), tertiary (mature or Graafian) follicles, follicular cells (thecal and granulosa).
   d. Define ovulation and corona radiata
   e. Define corpus luteum and corpus albicans.
2. State the purpose and location of parts (infundibulum, fimbriae, ampulla, and isthmus) of the fallopian tubes.
3. Locate and define the following parts of the uterus:

Fundus Body Cervix isthmus	Internal cervical os External cervical os Cervical canal	Serosa Mymetrium endometrium

*4. Define anteflexion and retroflexion

*5. Briefly describe the overall structure of the vagina and define Bartholin's glands

*C Briefly describe the support for the female reproductive tract by defining: ovarian ligament, suspensory ligament, broad ligament (divided into mesovarium, mesosalphinx), uterosacral ligament, and round ligament.

D. Describe the female sexual cycle (menstrual).
1. State the purpose of the cycle.
2. List hormones involved in the regulation of the cycle.
3. Relate pituitary hormones, feedback regulation, and causes to the cyclic changes in ovarian and uterine structures. (link with objectives 4 and 5 below)
4. Describe the ovarian cycle by defining follicular phase, ovulation, luteal phase
5. Describe the uterine cycle by defining the menses, proliferative and secretory phase.
6. Describe the hormonal and structural changes in the cycle caused by fertilization. Describe the role of human chorionic gonadotropin.

*7. Define: menstruation, menarche, and menopause.

*E. Briefly describe fertilization and development by defining the following:

fertilization, gestation, trimesters, cleavage, implantation,	morula, blastocyst (with inner cell mass and trophoblast cells), gastrula (gastrulation),	germ layers (ectoderm, mesoderm, and endoderm), placenta, extraembryonic membranes, embryo, fetus

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*F. Briefly describe the chorion, amnion, the basic structure of the placenta, and placental circulation.

***will not be covered in class**

III. **Cardiology:** study of the heart

Upon completion of a study of the heart, the student should be able to correctly answer questions concerning the following subject matter.

A. Describe the general path of circulation.

1. Define: heart, arteries, arterioles, capillaries, veinules, veins, systemic and pulmonary circulation.

*2. Compare the tissue structure of the different types of vessels.

B. Be able to describe the anatomy of the heart using the following terms:

mediastinum	bicuspid & tricuspid	pulmonary trunk
pericardium (parietal & visceral)	valves	aorta
epicardium	mitral valve	vena cavas
myocardium	coronary arteries (and	pulmonary arteries and veins
endocardium	major	foramen ovale
right & left atria	branches)interventricular	ductus arteriosus
right & left ventricle	septum	fossa ovalis
interatrial septum	atrial-ventricular septum	ligamentum arteriosum
right & left AV valves	apex	papillary muscle
aortic & pulmonary semilunar valves	base	chordae tendonae
coronary sinus		

C. Trace the path of blood through the heart, naming chambers, valves, and major vessels (aorta & vena cavas) of the systemic and pulmonary circulation.

D. Describe how the heart muscle itself received nourishment by being able to trace the path of blood through the coronary circulation. Be able to do this by diagramming the following vessels: left and right coronary artery, anterior and posterior descending arteries, circumflex and marginal arteries, coronary veins, and coronary sinus.

E. Discuss the electrophysiology of the heart.

1. Describe the electrical properties of cardiac muscle, using the following terms: working cells, pacemaker cells, automaticity, fast and slow channels, and plateau
2. Describe the location of conducting structures and trace the path of the electrical activity using the following terms:

SA Node	Rt & Lt bundle branches	Resting and threshold potentials
Atrial myocardium	Purkinjie system	Refractory periods
AV node	Ventricular myocardium	AV delay
AV bundle (of HIS)		

3. State why the SA node is the pacemaker.
4. State the purpose of the electrical conduction system described in objectives 2 and 3 above.
5. State why cardiac muscle will not go into tetanic contraction.
6. Define ectopic pacemaker. State what happens if the SA node is not the pacemaker and how the heart rate is affected by ectopic pacemakers.
7. Define heart block and ventricular escape.

***will not be covered in class**

*8. In reference to the ECG, define:

QRS interval	t-wave	p-wave
QRS complex	p-r interval	Eithoven's triangle
QT interval	s-t segment	Eithoven's standard of leads

F. Describe the cardiac cycle and the pumping action of the heart.

1. Define systole and diastole.
2. Describe the pumping action of the atria and discuss the causes of the A, C, and V waves on the atrial pressure curve.
3. Describe the pumping action of the ventricles using:

Period of isovolumetric relaxation	Period of ejection	Dicrotic notch
Period of isometric (isovolumetric contraction)	Period of rapid fill	Afterload

4. State the cause of valvular opening and closing.
5. List the names and causes of the four heart sounds.

G. Discuss cardiac volumes

1. Define: end diastolic volume and state its normal amounts
   a. Define filling time, venous return and describe how they, along with the size of the heart affect end diastolic volume.
   b. Define cardiac reserve.
   c. Be able to calculate maximum heart rate, and relate it to filling time.
2. Define end diastolic volume and state its normal amounts.
3. Define stroke volume output and state its normal amounts
   a. If given EDV and ESV, be able to calculate stroke volume.
   b. Define preload, Starling's law, contractility, positive and negative inotropic agents, and afterload and describe how they affect stroke volume.
4. Define cardiac output and state its normal amounts.
5. If given stroke volume and heart rate, be able to calculate cardiac output.

H. Discuss mechanisms that control cardiac output.

1. Discuss factors that affect cardiac output by affecting venous return (intrinsic autoregulation flowchart)
2. Discuss reflex control by the autonomic nervous system using such terms as:

Parasympathetic stimulation	Cardioaccelerator	Tachycardia
Sympathetic stimulation	Cardioinhibitor	Bradycardia
Vagus nerves	Norepinephrine	Glossopharyngeal nerve
Great cardiac nerves	Acetylcholine	Carotid sinus
baroreceptors	chemoreceptors	Cardiac center

*G. Define the following:

Ischemia	Mitral valveprolapse	Congestive heart failure
Angina pectoris	Heart block	Valvular insufficiency
Myocardialinfarction	Flutter	Valvular stenosis
Murmur	Premature ventricular contraction (PVC)	Fibrillation
Myocarditis	Endocarditis	Ballon angioplasty
Cardiac arrhymias	Cardiac tamponade	Coronary thrombosis

electrocardiogram		

***will not be covered in class**

*IV. **Anatomy of the Circulatory System:**

Upon completion of a study of the anatomy of the circulation system, the student should be able to correctly answer questions concerning the following subject matter.

A. State the origin, general location, and destination of the following major arteries:

aortic arch	left gastric	pericardial
ascending aorta	hepatic	bronchial
thoracic aorta	splenic	esophageal
abdominal aorta	superior mesenteric	renal
coronary	inferior mesenteric	testicular or ovarian
brachiocephalic	suprarenal	common iliac
common carotid	basilar	internal iliac
external carotid	Circle of Willis	external iliac
internal carotid	thyrocervical trunk	femoral
subclavian	internal thoracic	popliteal
vertebral	axillary	anterior tibial
intercostal	brachial	posterior tibial
phrenic	ulnar	
celiac	radial	

B. State the structures drained, general location, and destination of the following major veins:

cephalic	brachiocephalic	hepatic
external jugular	internal iliac	suprarenal
internal jugular	anterior tibial	renal
basilar	posterior tibial	testicular or ovarian
ulnar	great saphenous	inferior vena cava
radial	inferior mesenteric	common iliac
axillary	portal (hepatic)	small saphenous
brachial	hepatic portal system	popliteal
subclavian	superior mesenteric	femoral
pericardial	superior vena cava	external iliac
azygos	gastric and splenic	

V. **Physiology of Circulation:**

Upon completion of a study of circulatory physiology, the student should be able to correctly answer questions concerning the following:

A. Be able to describe the percentage of blood volume distribution within the different blood vessels.

B. Discuss blood flow rates (perfusion) to different body structures at rest and at exercise.
   1. Correlate with metabolic rates and needs for oxygen and nutrients.
   2. Correlate with changing diameters of the blood vessels affecting perfusion rates.

C. Describe the physical factors causing blood flow.
   1. State the importance of blood flow (perfusion).
   2. Describe the causes of blood flow.
      a. Discuss the relationship of pressure gradients, elasticity of arteries and

perfusion.

b. Describe the relationship of resistance to perfusion by discussing viscosity and tube geometry.

***will not be covered in class**

D. Contrast blood flow in arteries, arterioles, capillaries, veinules, and veins according to resistance, construction, innervation, and velocity.

E. Discuss arterial blood pressure.

1. Define pulse and pulse pressure.
2. Define and be able to calculate mean blood pressure.
3. Derive an equation for mean arterial pressure from the equation for perfusion.
4. List factors that may alter arterial pressure by affecting cardiac output.
5. Discuss factors affecting blood volume.
6. Discuss factors which may affect arterial pressure by affecting peripheral resistance.
   a. Describe the vasomotor reflex
   b. Correlate blood volume and viscosity to blood pressure

VI. **Hematology:** study of blood

Upon completion of a study of blood, the student should be able to correctly answer questions concerning the following:

*A. List and describe the major functions of blood.

B. Discuss the composition and functions of the major components parts of blood.

1. State the quantity and the percentage of body weight made up of blood.
   a. Define and state normal hematocrit value.
   b. Define hypo- and hypervolemia.
2. Describe the shape, size, life span, normal RBC count, and functions of the erythrocytes.
3. Describe the leukocytes.
   a. State normal WBC and differential WBC count values.
   b. Organize leukocytes into granulocytes verses agranulocytes.
   c. Describe the anatomy, function, and site of production of neutrophils, eosinophils, basophil, monocytes, and lymphocytes.
   d. List and describe the properties of WBC, such as amoeboid movement, margination, diapedesis, chemotaxis, phagocytosis.
   e. In relation to WBCs, define the following:

PMN	*histocompatibility	*antigen-antibody complex
poly	antigen	memory T-cells
bands	antibody	*tissue typing
cytotoxic T-cells	juvs	helper T-cells
B, T, & NK-lymphocytes	segs	fixed macrophages
plasma cells	suppresser T-cells	free macrophages

4. State normal numbers, site of production, and function of the platelets.
5. Be able to describe plasma.
   a. State the volume and percentage of blood composed of plasma.
   b. List the major chemical components of plasma.
   c. List, describe the function, and state production site of the major plasma

proteins: albumen, globulins, and fibrinogen.

6. Describe hemoglobin.
   a. State the normal quantity of hemoglobin.
   b. Discuss the effect of age on hemoglobin production.
   c. List different forms of hemoglobin.

***will not be covered in class**

   d. State the major functions of hemoglobin.
   e. Describe the chemical structure of the hemoglobin molecule.

C. Describe the process of hematopoiesis.
   1. Discuss the mesoblastic, hepatic, and myeloid stage of hematopoiesis.
   2. List and discuss the sequence of erythrogenesis using the following: stem cell, hemocytoblast, proerythroblasts, erythroblast, normoblast, and reticulocyte.
   3. List nutrients needed for adequate RBC formation and discuss the relationship between vitamin B12, intrinsic factor, and pernicious anemia.
   4. Describe the role of erythropoietin.
   5. In reference to iron metabolism, define: ferrous versus ferric iron, transferrin, apoferritin, ferritin, and hemosiderin.

D. Describe the process involved in the destruction of old erythrocytes.
   1. State the major organs where old RBCs are destroyed.
   2. Describe the sequence involved in the breakdown of hemoglobin using the following terms:

heme	bilirubin	stercobilin
globin	urobilinogen	liver
iron	urobilin	kidney
biliverdin	urochrome	jaundice

   3. Describe the anatomy of the biliary tract.

* E. Describe the processes that protect us from infection (immunity and inflammation).
   1. Define immunity.
   2. Organize lymphocytes into their specific varieties and briefly state the function of each.
   3. List and know the basic location of lymphoid tissues such as: lymphoid nodules, tonsils, lymph nodes, thymus, and spleen.
   4. Describe nonspecific defenses against disease.
      a. List physical barriers.
      b. List and define varieties of phagocytes. Also define margination, diapedesis, chemotaxis, and adhesion. .
      c. Describe inflammation.
         (1) List the four local signs of inflammation.
         (2) Describe the cells, chemicals, and steps involved in the inflammatory response.
         (3) State the purpose (goals) of inflammation.
      d. Briefly define other non-specific defenses such as: NK cells, complement, interferon, cytokines, fever, and pyrogens.
   5. Define the following forms of immunity: innate, active (natural and induced), passive (natural and induced).
   6. Briefly describe the process of immunity.

a. List and briefly describe the properties of immunity.
b. Briefly describe cell-mediated immunity by discussing T-cells (and their varieties), antigen presenting cells, and their interactions.
c. Briefly describe humoral immunity by discussing B-cells (and their varieties) and antibody.
d. List and briefly define the five classes of antibody (immunoglobulin).
e. List and briefly discuss how antibodies destroy antigen

***will not be covered in class**

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F. Discuss the processes involved in hemostasis.
1. Define hemostasis.
2. List factors that prevent coagulation.
3. Define vascular spasm and platelet plug.
4. Discuss the intrinsic and extrinsic pathway for clot formation using the following terms:

calcium	Thromboplastin	thrombin
prothrombin	clotting factors	fibrinogen
prothrombin activator (prothrombinase)	platelets	fibrin

5. Define serum, thrombus, embolus, streptokinase, tissue plasminogen activator (TPA)

G. Define the following miscellaneous hematology terms:

hematocrit	anemia	leukopenia
buffy coat	hypochromia	diff count
RBC count	hyperchromia	thrombocyte
polycythemia	WBC count	thrombocytopenia
oligocythemia	leukocytosis	megakaryocyte

VII. **<u>Respiratory System:</u>**

Upon completion of a study of the respiratory system, the student should be able to correctly answer questions concerning the following:

A. State the functions of the respiratory system.
B. List and define phases of respiration.
*C. Describe the anatomy of the respiratory system.
1. Describe the walls, contents, lining, and associated structures of the nasal cavities.
2. Describe the location, boundaries, and lining of the pharynx.
3. Describe the anatomy of the larynx.
a. List boundaries
b. List functions.
c. List and locate the cartilages of the larynx.
4. Describe the overall anatomy of the lungs by discussing the root, hilus, surfaces, lobes, and segments.
5. Describe the location, boundaries, and construction of the trachea.
6. Describe the organization of the bronchial tree by defining and stating numbers of primary, secondary, and segmental bronchi.
7. Describe the construction of the micro- airway tubes by defining: lobular, terminal, and respiratory bronchioles, alveolar duct, alveolar sac, and alveolus.
8. Describe the micro-anatomy and the significance of the alveolar-capillary

membrane.

D. Describe the physiology of pulmonary ventilation.
   1. List muscles used in normal and forced inspiration and expiration.
   *2. Review the pleural cavity, fluid, and membranes.

***will not be covered in class**

   3. Define intrapleural, intra-alveolar , and ambient pressure.
   4. Discuss factors that maintain a partial vacuum intra-pleural pressure.
      a. State the mechanism for gas absorption from the pleural cavity.
      b. State causes of elastic recoil of the lungs.
      c. Discuss the relationship between surfactant and surface tension.
   5. Define compliance and airway resistance.
   6. List sequence of events causing inspiration and expiration.
   7. Define the various pulmonary volumes and capacities.
   8. Define anatomical, alveolar and physiological dead space volume.
   9. Define and be able to calculate minute respiratory and alveolar ventilation volume.
   10. Describe the humoral and neural control of ventilation.
      a. Describe the Hering-Breuer reflex.
      b. Describe the effects of blood CO_2, O_2, and pH on neural control through peripheral and central chemoceptors.
      c. List the basic components of the respiratory center in the pons and medulla.

E. Describe the physiology of gas exchange.
   1. Define Charles, Boyle's and Dalton's gas laws.
   2. List factors affecting diffusion of gases.
   3. Describe the composition of alveolar air and compare with atmospheric air.
   4. Describe the diffusion of oxygen and carbon dioxide across pulmonary and systemic capillary walls.
   5. State normal alveolar and venous pO_2, and pCO_2 values.
   6. Know the normal "blood gas" concentration.
   7. Define venous admixture.

F. Describe the physiology of gas transport by the blood.
   1. Discuss oxygen transport by reviewing oxyhemoglobin and by discussing the oxyhemoglobin dissociation curve and the effects of temperature and pH on it.
   2. Describe the Bohr effect.
   3. Define O_2 - hemoglobin saturation.
      a. Know the normal "O_2 sats" for both arterial and venous blood.
      b. If given an oxyhemoglobin dissociation curve and blood gas concentration, be able to determine O_2 sat level. If given the O_2 sat level, be able to determine the blood gas concentration (O_2).
   4. Briefly discuss oxygen transport in the dissolved state.
   5. Define carboxyhemoglobin
   6. Discuss carbon dioxide transport by:
      a. review carbaminohemoglobin
      b. List four methods of carbon dioxide transport and amounts carried by each.
      c. Define carbonic anhydrase and the chloride-bicarbonate ion shift.

VIII. **<u>Digestive System:</u>**

Upon completion of a study of the digestive system, the student should be able to correctly answer questions concerning the following: (Much of this material will be

linked with the dissection in lab)

A. State the overall purpose of digestion.

B. List the overall chemical breakdown processes for carbohydrates, lipids, protein, and nucleic acids.

***will not be covered in class**

*C. Describe the overall anatomy of the G-I tract.

1. List and state the purpose of the different types of teeth.
2. State dentition of the deciduous and permanent teeth.
3. State the location, drainage, and type of saliva produced by the parotid, submaxillary, and sublingual glands.
4. Define mastication (chewing) and list muscles of mastication (temporalis and masseter).
5. List and define the layers of the G-I tract wall as seen in cross section.
6. Describe the location, purpose, mucosa and muscularis makeup of the esophagus.
7. Define the following areas and parts of the stomach:

gastroesophageal junction	pyloric valve	cardia rugae
fundus	gastric glands	antrum -mucous cells
body	-parietal cells	curvatures (greater, lesser)
chief cells	pylorus	

8. Describe the overall anatomy of the small intestine.
   a. Describe the course of the duodenum.
   b. Define and locate the jejunum and ileum.
   c. Contrast the mucosa of the small intestine segments by defining: villi, Brunner's glands, central lacteal, and Peyer's patches.
9. Describe the biliary system.
   a. List the lobes of the liver.
   b. List the major functions of the liver and gall bladder.
   c. Describe the drainage of bile from the liver by locating and defining: hepatic cystic, common bile ducts; ampulla of Vater, and sphincter of Oddi.
   d. Describe the overall location, parts, and drainage of the pancreas.
10. Describe the overall anatomy of the large intestine by defining and locating:

ileo-cecal valve	ascending colon	sigmoid colon
splenic flexure	transverse colon	hepatic flexure
descending colon	cecum	rectum
appendix	haustra	

11. Define the following:

mastication	greater omentum	duodenal cap
deglutition	lesser omentum	duodenojejunal flexure
bolus	mesentery	peritoneum
chyme	mesocolon	

*D. Describe the overall physiology of the digestive system.

1. State the purpose of G-I tract secretions.
2. List the chemical secretions and digestive action of saliva.
3. Describe the digestive functions of the stomach.
   a. Describe the chemical mechanism of hydrochloric acid secretion by the parietal cells of the stomach.

***will not be covered in class**

b. Describe the chemical activation of pepsinogen into pepsin and the digestive function of it on protein molecules.

4. List the digestive secretions of the pancreas and the digestive actions of each.
5. Describe the effect of the hormone, cholecystokinin on the ball bladder.
6. State the purpose of bile.
7. List the digestive secretions of the small intestine and the digestive actions of each
8. Describe the basic absorption of nutrients.
9. State the digestive and absorption functions of the large intestine.
10. Describe basic movements of the G-I tract.
    a. Define segmentation and peristalsis.
    b. Define enterogastric reflex and defecation.
    c. Define gastrin and secretin.

IX. **Excretory System:**

Upon completion of a study of the excretory system, the student should be able to correctly answer questions concerning the following:

A. List the functions of the excretory system.
B. Locate and describe the fixation and shape of the kidneys.
C. Describe the internal anatomy of the kidneys.
    1. Locate the following: capsule, hilus, cortex, medulla, pyramids, columns, calyx, and pelvis.
    2. Describe the structure of the nephron.
    3. Describe the blood supply to the kidneys and nephrons within.
D. Describe the course of the ureters.
E. Describe the overall anatomy of the urinary bladder by defining trigon, urethra, internal and external urethral sphincters.
F. Describe the basic physiology of micturition.
G. Describe the physiology of urine formation.
    1. Discuss the dynamics of glomerular filtration.
        a. Define glomerular filtration.
        b. State the cause of glomerular filtration.
        c. State composition of glomerular filtrate.
        d. State regulation of glomerular filtration rate and its effect on urine formation.
    2. Describe tubular reabsorption.
        a. Define tubular reabsorption.
        b. State the quantity of glomerular filtrate that is reabsorbed.
        c. State which chemical substances are reabsorbed.
        d. Describe the basic mechanism for the reabsorption of an ionic and a non-ionic chemical substance using NaCl and glucose as examples.
        e. Describe the counter-current mechanism for producing a dilute or concentrated urine by discussing osmolarity changes associated with the loop of Henle and the mechanism of ADH.

***will not be covered in class**

        f. Describe how the kidneys regulate the normal plasma concentration of sodium, potassium, and calcium ions through tubular reabsorption controlled by the hormones aldosterone and parathormone.

X. **Acid-Base Regulation:** Upon completion of a study of acid-base regulation, the

student should be able to correctly answer questions concerning the following:

A. State normal range for blood pH and extreme ranges for acidosis and alkalosis.
B. List three defense mechanisms for controlling body fluid pH.
C. List and discuss acid-base buffers within body fluids.
   1. Define buffer.
   2. Using the Henderson-Hasselbach equation, demonstrate the dynamics of the carbon dioxide-bicarbonate ion buffer system.
   3. List other chemical buffers within the body fluids and relate their buffering power compared to the carbon-dioxide-bicarbonate ion buffer system.
D. Describe how the respiratory system regulates pH.
   1. Discuss effects of hydrogen ion concentration on alveolar ventilation and visa versa.
   2. Relate the buffering power of the respiratory system to that of chemical buffers of the body fluids.
E. Describe how the kidneys regulate pH.
   1. Describe tubular secretion of hydrogen ions.
*F. Define and list causes of: respiratory acidosis, respiratory alkalosis, metabolic acidosis, and metabolic alkalosis.

***will not be covered in class**

SPECIFIC OBJECTIVES FOR THE LABORATORY PORTION OF THE COURSE

I. **Renal Regulation of Osmolarity of Body Fluids Experiment Lab:** The student will correctly complete a class experiment demonstrating how the kidneys regulate osmolarity of body fluids and complete a laboratory report describing the experiment and answering questions.

II. **Internal Anatomy of the Cat:** Upon completion of a dissection of the internal anatomy of the cat, the student should be able to correctly identify the following structures during a laboratory practical exam.

Chapter: "Digestive System"

lymph nodes	cerebellum
parotid gland	cerebrum
parotid duct	hypophysis (pituitary gland)
submaxillary gland	medulla
submaxillary duct	pons
sublingual gland	nasal choncha
incisors	internal nares
canines	palatine tonsils
premolars	pharynx
molars	larynx
papillae of tongue	glottis
frenulum of tongue	epiglottis
hard palate	cricoid cartilage
soft palate	jejunum
thyroid cartilage, arytenoid cartilage	ileum

vocal cord
thyroid gland
trachea
pleural cavity
mediastinum
parietal & visceral pleura
anterior, middle, & posterior lobes of lungs
bronchi
pericardium
pericardial cavity
heart
thymus gland
root of lung
parietal & visceral peritoneum
peritoneal cavity
greater omentum
omental bursae
gastrosplenic ligament
lesser omentum
gastrohepatic ligament
hepatoduodenal ligament
spleen
epiploic foramen
mesentery
mesoduodenum
duodenum
stomach
fundus of stomach
cardiac orifice
pyloric valve
rugae
cecum
ascending colon
transverse colon
descending colon
rectum
mesocolon
right medial & lateral liver lobe
left medial & lateral liver lobe
caudate liver lobe
gall bladder
cystic duct
hepatic duct
common bile duct
falciform ligament
diaphragm
central tendon of the diaphragm
**celiac artery
**hepatic artery
**gastric artery
**splenic artery
**superior mesenteric artery
**portal vein (hepatic portal vein)
**superior mesenteric vein
**gastrosplenic vein
greater & lesser curvature of stomach
ileocecal valve
pancreas
ampulla of Vater
pancreatic duct
body of stomach
pylorus of stomach
esophagus

**to be identified on the second lab practical exam with the circulatory system

Chapter: "Urogenital System"

kidneys
adrenal gland
hilus of kidney
ureter
urinary bladder
urethra
penis
scrotum
testes
spermatic cord
inguinal canal
mesosalpinx
uterine horns
internal & external inguinal ring
ductus deferens (vas deferens)
prostate gland
bulbourethral gland
epididymus
ovaries
mesovarium
ovarian ligament
Graffian follicles
corpus luteum
fallopian tube
abdominal ostium (infundibulum)
fimbrae

body of uterus
vagina
mesometrium
broad ligament
cervix
urethral orifice
labia majora
clitoris

Chapter: "The Circulatory System"

pulmonary artery
pulmonary veins
precava (superior vena cava)
internal & external jugular veins
intercostal veins
internal mammary veins
innominate veins (brachiocephalic)
subclavian veins
axillary veins
brachial vein
aorta (ascending, arch, thoracic, abdominal)
innominate artery (brachiocephalic)
inferior mesenteric artery
ovarian or spermatic vein
external iliac artery
popliteal artery
left & right subclavian artery
left & right common carotid artery
internal & external carotid artery
internal mammary artery
vertebral artery
axillary artery
brachial artery
intercostal arteries
celiac artery
superior mesenteric artery
renal arteries
spermatic (testicular) artery
ovarian artery
postcava (inferior vena cava)
hepatic vein
femoral artery
femoral vein

Chapter: "Nervous System"

meninges
-dura mater
-arachnoid mater
-pia mater
cerebrum
gyrus
sulcus
fissure
corpus callosum
lateral ventricle
cerebellum
pons
medulla
spinal cord
facial nerve
cervical plexus
brachial plexus
phrenic nerve
vagus nerve
lumbosacral plexus
femoral nerve
sciatic nerve
sympathetic ganglia (trunk)

III. **Anatomy of the Heart Lab**: Upon completion of a dissection of a heart, the student should be able to complete a lab practical exam.

A. Complete a dissection of a heart and be able to identify the following heart structures on a lab practical exam.

parietal pericardium
visceral pericardium
pericardial space
epicardium
myocardium
endocardium
bicuspid valve
pulmonary valve
aortic valve
interventricular septum
superior and inferior vena cava
aorta

right and left atria	pulmonary artery
right and left ventricles	pulmonary veins
tricuspid valve	coronary arteries
papillary muscles	chordae tendonae

IV. **Cardiovascular Physiology Lab**:
Upon completion of a lab exercise, the student should be able to complete a lab report concerning the following:

A. Record an electrocardiogram, and from the tracing, be able to:
   1. identify p, qrs, t-waves, and s-t segment
   2. determine the p-r interval
   3. determine the heart rate

B. Record the pulse wave and on it identify the dicrotic notch.
C. Listen to heart sounds, identifying S1 and S2 and the valves making the sound.
D. Obtain a blood pressure

V. **Hematology Lab:** Upon completion of a laboratory study of blood, the student should be able to correctly answer questions concerning the following and have completed the following:

A. The student is to complete the following complete blood count (CBC) tests:

wbc count	hemoglobin determination
differential wbc count	hematocrit
rbc count	

B. The student is to determine blood glucose concentration, sedimentation rate, blood type (ABO and Rh), and calculate estimation of blood volume, total O_2 carrying capacity, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin content (MCHC).
C. The student should be able to interpret results, define hematology terms given in this lab, and describe the basic methods used for analysis.

VI. **Anatomy of the Kidney Lab:**

A. Upon completion of a dissection of a kidney, the student should be able to correctly identify the following:

renal capsule	cortex
renal artery	pyramid
renal vein	papillae
ureter	pelvis
hilus	calyx

B. Perform a routine urine analysis composed of a basic physical, chemical, and microscopic exam.

VII. **Respiratory Physiology Lab**: Upon completion of gathering data from respiratory physiology experimentation, the student should be able to correctly complete a lab

report containing the following:

A. Data from the following pulmonary function tests using a spirometer:

tidal volume	daily pulmonary ventilation
expiratory reserve volume	maximal breathing capacity
inspiratory reserve volume	forced expiratory volume (l sec.)
vital capacity	minute respiratory volume

B. Data from exercises demonstrating neural and humoral control of pulmonary ventilation.

C. Upon completion of the exercise, the student will also correctly answer examination questions concerning the following:
   1. Definitions of lung volumes and capacities.
   2. Neural and humoral control of respiration.
   3. Definitions of respiratory terms listed in the laboratory exercise.

COURSE OUTLINE: BIO 212 - HUMAN ANATOMY & PHYSIOLOGY II

I. Endocrinology

   A. Hormonal action and control
   B. Hormones, function, control, structures, and disorders of endocrine glands
      1. Adenohypophysis
      2. Neurohypophysis
      3. Thyroid
      4. Parathyroid
      5. Adrenal cortex
      6. Adrenal medulla
      7. Testes
      8. Ovaries
      9. Pancreas

II. Reproductive system

   A. Male reproductive system
   B. Female reproductive system
   C. Female reproductive cycle
   D. Fertilization and development

III. Cardiology

   A. General path of circulation
   B. Anatomy of the heart
   C. Path of blood flow through the heart
   D. Electrophysiology
   E. Pumping action and cardiac cycle
   F. Control of cardiac output

IV. Circulation

A. Major systemic arteries
B. Major systemic veins
C. Physiology of circulation
    1. Physics of blood flow
    2. Blood pressure

V. Hematology

A. General functions and characteristics of blood
B. Formed elements
    1. Erythrocytes
        a. characteristics; Lab values
        b. hemoglobin
        c. formation of
        d. iron metabolism
        e. destruction of
    2. Leukocytes
        a. characteristics; Lab values
        b. role in immunity and inflammation
    3. Platelets
C. Plasma
D. Hemostasis
E. Immunity

VI. Respiratory system

A. Functions and overview
B. Anatomy of the airway
C. Pulmonary ventilation
D. Gas exchange
E. Gas transport

VII. Digestive system

A. Purpose and overview
B. Chemical hydrolysis of food
C. Anatomy of the G-I tract and accessory structures
D. Biliary system
E. G-I motility
F. Secretion and absorption

VIII. Excretory system

A. Functions and overview
B. Chemicals excreted
C. Macro and microscopic anatomy of the kidneys
D. Urinary tract
E. Urine formation

F. Renal regulation of fluid and electrolytes

IX. Acid-Base Balance

A. pH and normal ranges
B. Regulatory mechanisms
1. Acid-base buffers
2. CO_2 - bicarbonate ion ratio
3. Respiratory regulation
4. Renal regulation
C. Metabolic and respiratory acidosis/alkalosis

Tentative Academic Schedule - Lecture

Spring Semester, 2011

Lecture: Tuesday 6:00 - 9:00, Room D105

Date	Topic
1. Jan 25	Course Introduction, Endocrinology: Chap. 18
2. Feb 1	Endocrinology: Supplements and Chap. 18
3. Feb 8	Reproductive System: Chap. 28, 29
4. Feb 15	Reproductive System: Chap. 28, 29
5. Feb 22	**Exam 1** Cardiovascular System: Heart Chap 20
6. Mar 1	Cardiovascular System: Circulation Chap. 21
7. Mar 8	Cardiovascular System: Blood Chap 19
8. Mar 22	Lymphatic System and Immunity: Chap 22
9. Mar 29	**Exam 2** Respiratory System: Chap. 23
10. Apr 5	Respiratory System: Chap. 23 & Digestive System
11. Apr 12	Digestive System: Chap. 24, 25
12. Apr 19	Digestive System: Chap. 24, 25
13. Apr 26	**Exam 3** Urinary System & Acid/Base Balance: Chap 26, 27
14. May 3	Acid/Base Balance: Chap. 27
15. May 10	Acid / Base Balance
16. May 17	**Last Exam**

Tentative Academic Schedule - Lab

LAB: Thursday 6:00 - 9:00, Room A219

Date	Topic
1. Jan 20	Lab Introduction & Endocrinology Lecture
2. Jan 27	Renal Regulation of Osmolarity
3. Feb 10	Cat dissection
4. Feb 17	Cat dissection
5. Feb 24	Cat dissection
6. Mar 3	**Lab Practical Exam 1** followed by cat dissection
7. Mar 10	Heart dissection/Cat dissection
8. Mar 24	Cat dissection and video
9. Mar 31	**Lab Practical Exam 2** Cardiovascular Physiology
10. Apr 7	Blood analysis
11. Apr 14	Blood analysis
12. Apr 21	Blood Analysis
13. Apr 28	**Blood quiz**/kidney anatomy/urine analysis
14. May 5	Pulmonary function analysis
15. May 12	**lab quiz over pulmonary volumes and urine analysis** followed by lecture
16.	

*dissection tools, safety glasses, and lab coat required; gloves recommended