I. Catalog Information

BIOL 40C  Human Anatomy and Physiology  5 Unit(s)

Prerequisite: Biology 40B with a grade of C or better.
(Formerly Biology 47C.)

Four hours lecture, three hours laboratory, one additional hour to be arranged in the Science Center Resource Center.

Study of the endocrine system, lymphatic system, digestive system, metabolism, urinary and reproductive systems, embryological development and classical Mendelian and modern biochemical genetics, including genetic engineering.

II. Course Objectives

A. Examine and describe the location, anatomy, and function of the endocrine glands.
B. Describe hormone action, hormone classification, and regulation of hormone secretion.
C. Describe the hypothalamic-pituitary axis and investigate the endocrine organs it regulates.
D. Examine and describe the gross and microscopic anatomy of the lymphatic system and relate morphology to function.
E. Investigate and describe the non-specific and specific immune responses.
F. Examine, compare, and contrast the histologic and gross anatomy of the digestive tract and its accessory organs.
G. Distinguish the contributions of each of the organs of the digestive system to the processes of digestion and absorption.
H. Summarize the major metabolic pathways and their interrelations.
I. Examine and describe the gross and microscopic anatomy of the urinary system.
J. Investigate and analyze the process of urine formation and its role in the maintenance of homeostasis.
K. Describe the physiological importance of the main electrolytes and of proper acid/base balance.
L. Examine and describe the gross and microscopic anatomy of the reproductive system.
M. Distinguish the role played by each of the organs of the reproductive system in the process of reproduction.
N. Investigate the hormonal control of reproduction.
O. Describe the events of human development in-utero and shortly after birth.
P. Study and predict patterns of inheritance.
Q. Investigate the molecular basis of genetic disorders.

III. Essential Student Materials

None

IV. Essential College Facilities

   Lecture - Audiovisual equipment (including: computer, slide, overhead, and videotape projectors)
   Laboratory - Models, microscopes, prepared slides, preserved specimens, assorted laboratory instruments, glassware, and equipment
   Adjunct - Computers and software, meeting space for tutorial and study groups

V. Expanded Description: Content and Form

   A. Examine and describe the location, anatomy, and function of the endocrine glands.
      1. Study the hormonal regulation of the body.
      2. Compare and contrast the nervous and endocrine systems.
      3. Evaluate the location and function of endocrine tissues and organs.
   B. Describe hormone action, hormone classification, and regulation of hormone secretion.
1. Classify the various hormone schemes.
2. Study the mechanisms of hormone action.
3. Discuss the regulation of hormone secretion.

C. Describe the hypothalamic-pituitary axis and investigate the endocrine organs it regulates.
   1. Describe the neurosecretory cells of the hypothalamus and hypothalamic releasing hormones.
   2. Define the neurosecretory cells of the anterior and posterior pituitary glands and their effects.
   3. Describe the hormones of the posterior pituitary - target cells and actions.
   4. List the hormones of the anterior pituitary - and study their target cells and actions.
   5. Relate the hormones of the adrenal gland to target cells and effects on these cells.
   6. Study the thyroid gland and thyroid hormones; identify the target cells for these hormones and the effects of the hormones on the target cells.

D. Examine and describe the gross and microscopic anatomy of the lymphatic system and relate morphology to function.
   1. Study an overview of lymphatic tissues, structures, organs and vessels.
   2. Describe the formation of lymph and details of lymphatic circulation.
   3. Identify the different types of white blood cells and discuss their roles in non-specific immunity.

E. Investigate and describe the non-specific and specific immune responses.
   1. Study the mechanisms of non-specific resistance to disease.
   2. Compare and contrast cell mediated vs. antibody mediated specific immune responses
   3. Describe the structure and action of antibodies and differentiate between the five classes of antibodies
   4. Deduce how vaccinations trigger the specific immune response
   5. Discuss homeostatic dysfunctions of the disorders of the lymphatic system such as autoimmune disease and allergies

F. Examine, compare, and contrast the histologic and gross anatomy of the digestive tract and its accessory organs.
   1. Describe the general organization and functions of the gastrointestinal tract.
   2. Recognize the histology and gross anatomy of the organs of the digestive system.

G. Distinguish the contributions of each of the organs of the digestive system to the processes of digestion and absorption.
   1. Differentiate between the three phases of deglutition and the three phases of gastric activity
   2. Review the catabolism of nutrient macromolecules
   3. Describe how each of the organs of the GI tract contribute to mechanical and chemical digestion.
   4. List mechanisms and sites of nutrient absorption.
   5. Critique the role of accessory glands (salivary glands, liver and pancreas) in digestion.
   6. Summarize the events and outcome of defecation.

H. Summarize the major metabolic pathways and their interrelations.
   1. Identify essential nutrients and the metabolic management of nutrient balance.
   2. Explain how carbohydrates, lipids, proteins and nucleic acids acids are metabolized and how their products are utilized by the human body.
   3. Identify the differences between absorptive and post absorptive states.
   4. Describe how metabolism contributes to body heat.

I. Examine and describe the gross and microscopic anatomy of the urinary system.
   1. Describe the basic components and functions of the urinary system.
   2. Examine the histology of the organs of the urinary system.

J. Investigate and analyze the process of urine formation and its role in the maintenance of homeostasis.
   1. Describe how glomerular filtration, tubular reabsorption and secretion contribute to urine formation.
   2. Discuss how glomerular filtration rate is controlled.
   3. Recognize normal and abnormal physical and chemical characteristics of urine.
4. Describe tests used to evaluate urinary tract function.
5. Describe how and why the kidney produces dilute vs. concentrated urine, including the role of kidney structures and hormones in this process.

K. Describe the physiological importance of the main electrolytes and of proper acid/base balance.
   1. Examine and identify the body's fluid compartments and the significance of fluid, electrolyte and acid-base balance.
   2. Describe sources of water input and output.
   3. Discuss the physiological importance of selected electrolytes and acid-base balance.

L. Examine and describe the gross and microscopic anatomy of the reproductive system.
   1. Identify and describe the organization of the reproductive systems.
   2. Identify the organs of the male reproductive tract and significant histological features.
   3. Identify the organs of the female reproductive tract and significant histological features.
   4. List homologous structures of the male and female reproductive systems.

M. Distinguish the role played by each of the organs of the reproductive system in the process of reproduction.
   1. Describe the processes of gametogenesis.
   2. Examine accessory reproductive glands and their function.

N. Investigate the hormonal control of reproduction.
   1. List the origin of sex steroids, their target cells, and mechanisms of action.
   2. Describe hormonal control of gametogenesis in males and females.
   3. Sequence the events of the female monthly reproductive cycles.
   4. Examine factors contributing to fertility and methods of birth control.
   5. Evaluate hormonal and physiological changes associated with menopause.

O. Describe the events of human development in-utero and shortly after birth.
   1. Detail the events leading to fertilization and early development of the zygote. Discuss how the maternal endometrium participates in the process of implantation and support of the developing zygote and/or embryo.
   2. Discuss significant features of embryonic development including the development of the primitive germ layers, the role of the yolk sac, and hormones that act to maintain pregnancy and development.
   3. Describe the sequential stages of embryonic and fetal growth with an emphasis on organ, nervous and musculo-skeletal system development.
   4. Compare and contrast various prenatal tests; identify the abnormalities which can be identified by each test as well as risks involved in each procedure.
   5. Discuss hormonal regulation of pregnancy, labor and delivery.
   6. Describe structural and physiological aspects of lactation.
   7. Describe physiological changes which occur in the infant during the labor process and after birth.

P. Study and predict patterns of inheritance.
   1. Define and recognize common genotypes, phenotypes, and allelic relationships.
   2. Understand major rules of Mendelian genetics and apply these rules for given scenarios.
   3. Employ Punnett Squares to make predictions about expected genetic outcomes in offspring of given parental genetic pairings.
   4. Describe the characteristics and rules governing autosomal dominant, autosomal recessive and sex-linked inheritance patterns.
   5. Identify the genotypes which are associated with gender determination.

Q. Investigate the molecular basis of genetic disorders.
   1. Discuss the causes of common genetic and chromosomal disorders.
   2. Discuss the characteristics of common genetic and chromosomal disorders.

VI. Assignments
A. Reading assignments from text, lab manual and other pertinent materials.

B. Writing assignments: Laboratory reports and summaries, scientific journal article summaries, critical thinking assignments

C. Collaborative learning exercises such as analysis of case studies, completion of investigative activities, and games designed to reinforce course content and allow for the application of subject matter

VII. Methods of Instruction

Lecture and visual aids
Discussion of assigned reading
Problem solving
In-class exploration of Internet sites
In-class quiz and examination review
Homework
Collaborative learning and small group exercises
Laboratory data collection, analysis, and write-up
Other: Quizzes, tests, written assignments in lecture and/or lab

VIII. Methods of Evaluating Objectives

A. Objective tests with written components
B. Laboratory quizzes
C. Practical exams
D. Critical thinking assignments analysis of case studies and completion of investigative questions designed to reinforce course content and allow for the application of subject matter

IX. Texts and Supporting References

A. Examples of Primary Texts and References

B. Examples of Supporting Texts and References

X. Lab Topics

1. Anatomy and physiology of lymphatic system
2. Anatomy and physiology of digestive system
3. Chemical and physical processes of digestion
4. Anatomy and physiology of endocrine glands and their hormones
5. Anatomy and physiology of the urinary system
6. Urinalysis
7. Anatomy and physiology of the reproductive system