

EXAM  
CODE **506**

CATALOG  
NUMBER **BIOx210**

TAKE ADVANTAGE OF ONLINE  
**PRACTICE  
EXAMS**  
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# Anatomy & Physiology

CREDIT  
HOURS

**6**

LEVEL

**LOWER**

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## SECTION ONE

# Preparing for the Exam

## Before You Choose This UExcel Exam

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### Uses for the Examination

- Excelsior College, the test developer, recommends granting six (6) semester hours of lower-level undergraduate credit to students who receive a letter grade of C or higher on this examination.
- Other colleges and universities also recognize this exam as a basis for granting credit or advanced standing.
- Individual institutions set their own policies for the amount of credit awarded and the minimum acceptable score.

Examinees who have applied to Excelsior College should ask their academic advisor where this exam fits within their degree program.

Examinees **not enrolled** in an Excelsior College degree program should check with the institution from which they wish to receive credit to determine whether credit will be granted and/or to find out the minimum grade required for credit. Those who intend to enroll at Excelsior College should ask an admissions counselor where this exam fits within their intended degree program.

For more information on exam availability and actual testing information, see the [Exam Registration and Information Guide](#).

### Examination Length and Scoring

This examination consists of 120 multiple choice and other type questions. You will have three (3) hours to complete the exam. Your score will be reported as a letter grade. Questions are scored either correct (1) or incorrect (0). There is no partial credit. Each credit-bearing exam contains pretest questions, which are embedded throughout the exam. They are indistinguishable from the scored questions. It is to your advantage to do your best on all the questions. Pretest questions are being tried out for use in future versions of the exam.

The UExcel exams do **not** have a fixed grading scale such as A = 90–100%, B = 80–90%, and so forth, as you might have seen on some exams in college courses. Each UExcel test has a scale that is set by a faculty committee and is different for each exam. The process, called standard setting, is described in more detail in the [Technical Handbook](#). Excelsior puts each exam through a standard setting because different test questions have different levels of difficulty. To explain further, getting 70% of the questions right on the exam when the questions are easy does not show the same level of proficiency as getting 70% of questions correct when the questions are hard. Every form of a test (a form contains the test questions) has its own specific grading scale tailored to the particular questions on each exam form.

Please also note that on each form, some of the questions (referred to as pretest questions) count toward the score and some do not; the grading scale applies only to those questions that count toward the score. The area with percentage ratings on the second page of your score report is intended to help identify relative strengths and weaknesses and which content areas to emphasize, should you decide to take the examination again. Your grade

is **based on only the scored questions**. Therefore, the percentage ratings do not necessarily reflect the total percentage that counted toward your grade.

For the best view of the types of questions on this exam, see the sample questions in the back of this guide. Practice, practice, practice!

## Score Reporting

For most of our examinations, based on performance, an examinee is awarded a letter grade of A, B, C, or F. A letter grade of D can be given, but credit is awarded for A, B, and C letter grades only. The letter grades reported to examinees indicate that their performance was equivalent to the performance of students who received the same letter grade in a comparable, on-campus course.

More specifically, the letter grade indicates the examinee's proficiency relative to the learning outcomes specified in the exam content guide. Following are general descriptions of examinee performance at each level:

## Letter Grade Description

- A Highly Competent: Examinee's performance demonstrates an advanced level of knowledge and skill relative to the learning outcomes.
- B Competent: Examinee's performance demonstrates a good level of knowledge and skill relative to the learning outcomes.
- C Marginally Competent: Examinee's performance demonstrates a satisfactory level of knowledge and skill relative to the learning outcomes.
- D Not Competent (no credit recommended): Examinee's performance demonstrates weak knowledge of the content and minimal skill relative to the learning outcomes.<sup>①</sup>
- F Fail (no credit recommended): Examinee's performance demonstrates no knowledge of the content and no skill in the subject relative to the learning outcomes.

Credit is transcribed by Excelsior College for examinees who achieve letter grades of C or higher.

We encourage colleges and universities to use the Excelsior College letter grades of A, B, and C as acceptable standards for awarding credit.

<sup>①</sup> In general, two-hour exams do not award a D letter grade.

See page 30, at the back of this content guide, for a sample UExcel Grade Report for Examinations.

## Excelsior College Bookstore

The Excelsior College Bookstore offers recommended textbooks and other resources to help you prepare for UExcel exams.

The bookstore is available online at (login required): [www.excelsior.edu/bookstore](http://www.excelsior.edu/bookstore)

## Excelsior College Library

Library services are available to students enrolled in a degree program at Excelsior College. Created through our partnership with the Sheridan Libraries of The Johns Hopkins University, the library provides access to journal articles, books, websites, databases, reference services, and many other resources. To access the Excelsior College Library, visit [www.excelsior.edu/library](http://www.excelsior.edu/library) (login is required). Access to the library is available 24/7.

## Take Charge of Your Own Learning

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At Excelsior College, independent, self-directed study supported by resources we help you find is not a new concept. We have always stressed to students who take exams that they are acting as their own teacher, and that they should spend as much time studying for an exam as they would spend in a classroom and on homework for a corresponding college course in the same subject area.

Begin by studying the content outline contained in this content guide, at its most detailed level. You will see exactly which topics are covered, and where chapters on those topics can be found in the Recommended Resources. You will see exactly where you might need to augment your knowledge or change your approach.

The content outline, along with the learning outcomes for this exam and recommended textbooks, will serve as your primary resources.

## How Long Will It Take Me to Study?

Study for a UExcel exam is comparable to an equivalent college-level course. As an independent

learner, you should study and review as much as you would for the same subject in a campus-based college course. If you already have a background in the subject, you may be able to pass the exam successfully with fewer hours of study. It depends upon the learner as well as the subject, the number of credits (for example, a 6- or 8-credit exam will require more hours of study than a 3-credit exam), and the length of the exam. We strongly encourage you to create a long-term action or study plan, so that you have a systematic approach to prepare for the exam. We've included guidelines for creating such a plan.

## How Can I Create an Effective Long-Term Study Plan?

### 1. Determine the time you will require to complete your preparation for this exam.

If you have not studied the subject before, you should plan to budget approximately 45 hours of study time for every credit: 135 hours for 3 credits, 180 hours for 4 credits, 270 hours for 6 credits, and 360 hours for 8 credits. These hours are rules of thumb based on expectations for a student taking a course in the subject; it may take you more or less time, depending on how familiar you are with the material and how easily you absorb the information studying on your own. Aside from the content review, you should then factor in time to search for and use other resources, and to complete any projects and assignments in the study materials that will clarify your understanding of the topics in the content outline (that part in the content guide where the specific areas of study are spelled out). Spend more time on concepts and areas in which you feel you are weak. Totaled, this is approximately the amount of time you should expect to devote to a three-credit, campus-based course. The actual amount of time you require depends on many factors, and will be approximate. If your background is weak, you may need to set aside substantially more than 135–150 hours. If your background is strong, you may budget less time.

Take a few minutes to review the content outline to assess your familiarity with the content. Then, in the space below, write the number of hours you will allocate to complete preparing for the exam.

Hours Required =

### 2. Determine the time you will have available for study.

In self-study, you need structure, as well as motivation and persistence, and a methodical approach to preparation. There is no set class to keep you on task. You have to do that yourself. Construct a time-use chart to record your daily activities over a one-week period. The most accurate way to do this is to complete the chart on a daily basis to record the actual amount of time you spend eating, sleeping, commuting, working, watching television, caring for others and yourself, reading, and everything else in an adult's life. However, if your schedule is regular, you might prefer to complete the chart in one sitting and, perhaps, by consulting your appointment book or planner.

After you have recorded your activities, you will be ready to schedule study periods around these activities or, perhaps, instead of some of them. In the space below, write the number of hours you will be able to set aside for study each week.

Hours Required =

### 3. Divide the first number by the second number.

This will give you the number of weeks you will need to set aside for independent study. For example, if you think you will require 170 hours of study and you have 10 hours available to study each week, divide 170 hours by 10 hours and you will get 17. This means that you will need about 17 weeks to complete this course of study. However, you will also need to allow about a week for review and self-testing. Moreover, to be on the safe side, you should also add two weeks to allow for unforeseen obstacles and times when you know you will not be able to study (e.g., during family illnesses or holidays). So, in this case, you should allot a total of 18 to 19 weeks to complete your study.

### 4. Schedule your examination to coincide with the end of your study period.

For example, if you plan to allow 18 weeks for study, identify a suitable examination date and begin study at least 18 weeks before that date. (The date you begin study assumes that you will have received all of your study materials, particularly textbooks, by that time.)

### **5. Format a long-term study plan.**

You will need to use a calendar, planner, or some other tool to format and track your long-term study plan. Choose a method that is convenient and one that keeps you aware of your study habits on a daily basis. Identify the days and exact hours of each day that you will reserve for study throughout your whole independent study period. Check to see that the total number of hours you designate for study on your long-term study plan adds up to the number of hours you have determined you will need to complete this course of study (Step 1).

### **6. Record in your long-term study plan the content you plan to cover during each study period.**

Enter the session numbers, review, and examination preparation activities you will complete during each study period. While it is suggested that approximately 160–170 hours of study is required for this exam, each and every student may require different timelines based on their comfort with, and comprehension of, the material.

You now have a tentative personal long-term study plan. Keep in mind that you will have to adjust your study plan, perhaps several times, as you study. It is only by actually beginning to work systematically through the material, using the content outline, that you will be able to determine accurately how long you should allow for each unit.

## **What Learning Strategy Should I Use?**

The following guidelines are intended to help you acquire the grounding in the knowledge and skills required for successful completion of this examination.

### **1. Approach learning with a positive attitude.**

Most students are capable of learning subject content if they devote enough time and effort to the task. This devotion will give you a positive edge and a feeling of control.

### **2. Diligently complete the exact work you specified in your study plan.**

Your study plan is being designed for the specific purpose of helping you achieve the learning outcomes for this exam.

### **3. Be an active learner.**

You should actively engage in the learning process. Read critically, take notes, and continuously monitor your comprehension. Keep a written record of your progress, highlight content you find difficult to grasp, and seek assistance from someone in your learning community who can help you if you have difficulty understanding a concept.

### **4. Be patient: you may not understand everything immediately.**

When encountering difficulty with new material, be patient with yourself and don't give up. Understanding will come with time and further study. Sometimes you may need to take a break and come back to difficult material. This is especially true for any primary source material (original letters, documents, and so forth) that you may be asked to read. The content outline will guide you through the material and help you focus on key points. You will find that many concepts introduced in earlier sessions will be explained in more detail in later sessions.

### **5. Apply your learning to your daily life.**

Use insights you gain from your study to better understand the world in which you live. Apply the learning whenever you can. Look for instances that support or contradict your reading on the subject.

### **6. Accommodate your preferred way of learning.**

How do you learn best? Common ways to learn are reading, taking notes and making diagrams, and by listening to someone (on video or live). Others learn by doing. Do any of these descriptions apply to you? Or does your learning style vary with the learning situation? Decide what works for you and try to create a learning environment to accommodate your preferences.

## **Study Tips**

Become an active user of the resource materials. Aim for understanding rather than memorization. The more active you are when you study, the more likely you will be to retain, understand, and apply the information.

The following techniques are generally considered to be active learning:

- **preview or survey** each chapter

- **highlight or underline text** you believe is important
- **write questions or comments** in the margins
- **practice re-stating content** in your own words
- **relate what you are reading** to the chapter title, section headings, and other organizing elements of the textbook
- **find ways to engage** your eyes, your ears, and your muscles, as well as your brain, in your studies
- **study with a partner or a small group**
- **prepare your review notes** as flashcards or create recordings that you can use while commuting or exercising

When you feel confident that you understand a content area, review what you have learned. Take a second look at the material to evaluate your understanding. If you have a study partner, the two of you can review by explaining the content to each other or writing test questions for each other to answer. Review questions from textbook chapters may be helpful for partner or individual study, as well.

Study smart for your UExcel exam! Success starts with establishing a relationship with your advisor.

## Using UExcel Practice Exams

The official UExcel practice exams are highly recommended as part of your study plan. They can be taken using any computer with a supported web browser such as Google Chrome.

The practice exam package comes with two sets of questions. Please be aware that there will be fewer questions on the practice exams than there will be on the exam you take for credit. Generally, the practice questions will not be the same as the ones you will see when you take the actual exam for credit. They are intended to expose you to the types of questions you'll encounter in the actual exam. Practice questions are a tool, and do not provide a full exam experience. For example, the practice question sets do not have time limitations. Begin with the Content Guide, especially the detailed content outline. Memorizing specific questions and answers on the practice sets is not as effective as using the questions to practice, along with the content outline, to see which concepts you may need to study further. To register for the practice exam, visit [www.excelsior.edu](http://www.excelsior.edu) and log into your MyExcelsior

account. **Please note: You must be registered for the corresponding credit-bearing exam before you can register for the practice exam.**

Practice exams are not graded. Rather, they are intended to help you make sure you understand the subject and give you a sense of what the questions will be like on the exam for credit. Ideally, you would check any questions you got wrong, look at the explanations, and go back to the textbook to reinforce your understanding. After taking both forms of the practice exam, you should feel confident in your answers and confident that you know the material listed in the content outline.

Practice exams are one of the most popular study resources. Practice exams are typically shorter than the credit-bearing exam. Since the questions are drawn from the same pool of questions that appear on the credit-bearing exam, what you will see when you sit for the graded exam will be roughly the same. Used as intended, these practice exams will enable you to:

- Review the types of questions you may encounter on the actual exam.
- Practice testing on a computer in a timed environment.
- Practice whenever and wherever it is convenient for you.

Take two different forms of a practice exam within a 180-day period. (We highly recommend that you take the first form of the practice exam as a pretest, early in the study period. Use the results to identify areas to further study and carry out a plan. Then take the second form as a post-test and see how much you have improved.)

Although there is no guarantee, our research suggests that exam takers who do well on the practice exams are more likely to pass the actual exam than those who do not take advantage of the opportunity. Note that since the practice exams are not graded (calibrated) the same way as the scores on the credit-bearing exam, it will be hard for you to use the practice exams as a way to predict your score on the credit-bearing exam. The main purpose of the practice exams is for you to check your knowledge and to become comfortable with the types of questions you are likely to see in the actual, credit-bearing exam.

## About Test Preparation Services

Preparation for UExcel® exams and Excelsior College® Examinations, though based on independent study, is supported by Excelsior College with a comprehensive set of exam learning resources and services designed to help you succeed. These learning resources are prepared by Excelsior College so you can be assured that they are current and cover the content you are expected to master for the exams. These resources, and your desire to learn, are usually all that you will need to succeed.

There are test-preparation companies that will offer to help you study for our examinations. Some may imply a relationship with Excelsior College and/or make claims that their products and services are all that you need to prepare for our examinations.

Excelsior College does not endorse the products and services of any tutorial or test preparation firm. We do not review the materials provided by these firms for the content or compatibility of their material and resources with UExcel® exams or Excelsior College Examinations®. No test preparation vendor is authorized to provide admissions counseling or academic advising services, or to collect any payments, on behalf of Excelsior College. Excelsior College does not send authorized representatives to a student's home nor does it review the materials provided by test preparation companies for content or compatibility with Excelsior College examinations.

To help you become a well-informed consumer, we suggest that before you make any purchase decision regarding study materials provided by organizations other than Excelsior College, you consider the points outlined on our website at [www.excelsior.edu/testprep](http://www.excelsior.edu/testprep).

## Exam Preparation Strategies

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Each learner is different. However, all learners should read the content outline in the exam's Content Guide and ensure that they have mastered the concepts. For someone with no prior knowledge of the subject, a rule of thumb is 135 hours of study for a 3-credit exam—this number is just to give you an idea of the level of effort you will need, more or less.

## Content Guides

This content guide is the most important resource. It lists the outcomes, a detailed content outline of what is covered, and textbooks and other study resources. It also has sample questions and suggestions for how to study. Content guides are updated periodically to correspond with changes in particular examinations and in textbook editions. Examinees can download any of the latest free UExcel content guides by visiting the individual exam page or from the list at [www.excelsior.edu/contentguides](http://www.excelsior.edu/contentguides).

### Using the Content Outline

Each content area in the content outline includes the most important sections of the recommended resources for that area. These annotations are not intended to be comprehensive. You may need to refer to other chapters in the recommended textbooks. Chapter numbers and titles may differ among textbook editions.

This content outline contains examples of the types of information you should study. Although these examples are many, do not assume that everything on the exam will come from these examples. Conversely, do not expect that every detail you study will appear on the exam. Any exam is only a broad sample of all the questions that could be asked about the subject matter.

### Using the Sample Questions and Rationales

Each content guide provides sample questions to illustrate those typically found on the exam. These questions are intended to give you an idea of the level of knowledge expected and the way questions are typically phrased. The sample questions do not sample the entire content of the exam and are not intended to serve as an entire practice test.

# Recommended Resources for the UExcel Exam in Anatomy & Physiology

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The resources listed below were selected by the faculty members on the examination committee for use in developing this exam.

Resources listed under “Strongly Recommended” were used by the committee to verify all the questions on the exam. Please refer to the Content Outline to see which parts of the exam are cross-referenced to these resources.

Resources listed under “Optional” provide additional material that may deepen or broaden your understanding of the subject, or that may provide an additional perspective on the exam content. Textbook resources, both Strongly Recommended and Optional, may be purchased from the Excelsior College bookstore at [www.excelsior.edu/bookstore](http://www.excelsior.edu/bookstore).

You should allow ample time to obtain the necessary resources and to study sufficiently before taking the exam, so plan appropriately, with an eye towards your own personal learning needs. See the sections in this guide on the Excelsior College Bookstore and the Excelsior College Library, and under Reducing Textbook Costs, to help you secure the Strongly Recommended resources successfully.

## Textbook Editions

Textbook editions listed in the UExcel content guides may not be the same as those listed in the bookstore. Textbook editions may not exactly match up in terms of table of contents and organization, depending upon the edition. However, our team of exam developers checks exam content against every new textbook edition to verify that all subject areas tested in the exam are still adequately available in the study materials. If needed, exam developers will list additional Strongly Recommended resources to ensure that all topics in the exam are still sufficiently covered. Public libraries may have the textbooks you need, or may be able to obtain them for you through interlibrary loan to reduce textbook costs. You may also consider financial aid, if you qualify, to further help defray the steep cost of textbooks. A section on open educational

resources (OER) has been included in this guide to help you locate additional, possibly free resources to augment your study.

## Strongly Recommended

Martini, F., Nath, J., Bartholomew, E. (2018). *Fundamentals of anatomy and physiology*. (11th ed.). Upper Saddle River NJ: Prentice Hall, as Benjamin Cummings.

Martini, F., Nath, J., and Bartholomew, E. (2017), Modified Mastering A&P with Pearson eText, Standalone Access Card for Fundamentals of Anatomy & Physiology (24-month access)

The enhanced product that comes with this book needs an access code. If you purchase the book new at the Excelsior College Bookstore, you will receive information on how to use the access code. The study materials may be purchased from the [Excelsior College Bookstore](#).

## Optional Resources

The examination development committee did not identify any specific Optional resources for this exam. If you would like to explore topics in more depth, we encourage you to refer to available Open Educational Resources (OER).

## Library Resources for Anatomy & Physiology

This content guide is the first place to start to study. Excelsior's Library has also developed an [Exam Resources page](#) for the exam, based on this content guide. The [Exam Resources page](#) provides additional materials that complement the resources in this guide for students who are enrolled.

## Reducing Textbook Costs

Many students know it is less expensive to buy a used textbook, and buying a previous edition is also an option. The Excelsior College bookstore includes a buyback feature and a used book marketplace, as well as the ability to rent digital versions of textbooks for as long as students need them. Students are encouraged to explore these and the many other opportunities available online to help defray textbook costs.

## Practice Exam

The Anatomy and Physiology exam has a corresponding practice exam, which is delivered in the Canvas learning platform.

## Open Educational Resources

There are many resources available online free of charge that may further enhance your study for the exam. Known as Open Educational Resources (OER), these may be textbooks, courses, tutorials, or encyclopedias. Any additional OER that you find independently should be used to augment study—not as replacements for the Strongly Recommended resources.

Most sites for university-based OER can be searched through [www.ocwconsortium.org](http://www.ocwconsortium.org) and/or [www.oercommons.org](http://www.oercommons.org).

Sites that specialize in web courses designed by college professors under contract with the website sponsor, rather than in web versions of existing college courses, include:

[www.education-portal.com](http://www.education-portal.com)

[www.opencourselibrary.org](http://www.opencourselibrary.org) (abbreviated as OCL)

We have included specific courses that cover material for one or more UExcel® exams from the sites in the listings above. It's worth checking these sites frequently to see if new courses have been added that may be more appropriate or may cover an exam topic not currently listed.

Sites like Khan Academy ([www.khanacademy.com](http://www.khanacademy.com)) and iTunes U feature relatively brief lessons on very specific topics rather than full courses. Full courses are also available on iTunes U (<http://www.apple.com/education/ipad/itunes-u/>). We have chosen a few courses and collections for this listing.

## Other Online Resources

This section of the OER Guide is provided to allow learners to independently search for resources.

### Open Online Textbooks

BookBoon

<http://bookboon.com/en/textbooks-ebooks>

Flatworld Knowledge

<http://catalog.flatworldknowledge.com/#our-catalog>

## College Readiness

Khan Academy

<http://www.khanacademy.org/>

Hippocampus

<http://www.hippocampus.org/>

Open Course Library

<http://opencourselibrary.org/collg-110-college-success-course/>

## Study Aids

Education Portal

<http://education-portal.com/>

Khan Academy

<http://www.khanacademy.org/>

Annenberg Learner

<http://www.learner.org/>

OpenCourseWare

<http://ocwconsortium.org/en/courses/search>

OER Commons

<http://www.oercommons.org/>

Open Course Library

<http://www.opencourselibrary.org/>

To achieve academic success, rate yourself at Excelsior College's Self-Regulated Learning Lab. Visit the Diagnostic Assessment & Achievement of College Skills site at <https://srl.daacs.net/>

It's free!

## SECTION TWO

# Content Outline

### **General Description of the Examination**

The UExcel Anatomy and Physiology examination is based on material typically taught in an eight-credit, two-semester lower-level course sequence in anatomy and physiology.

The examination measures knowledge and understanding of the integrative mechanisms that contribute to the functioning of the human body. Topics include an overview of the human body, the chemical basis of life, dynamics of support and motion, integration and regulatory mechanisms, maintenance of the human body, the urinary system, fluid and electrolyte balance, and reproduction and development.

Those beginning to study for this exam should be familiar with basic terms of biology and with concepts such as basic cell structure and function.

### **Learning Outcomes**

After you have successfully worked your way through the recommended study materials, you should be able to demonstrate the following learning outcomes:

1. Describe the fundamental concepts of anatomy and physiology, and the organizational scheme and standard terminology of the body. (Aligns to GECC 2.1)
2. Describe the major chemical constituents of the body, the chemical reactions, and the equilibrium state. (Aligns to GECC 2.1)
3. Describe the supporting tissue, skeletal system, muscle tissue, and tissue physiology. (Aligns to GECC 2.1)
4. Describe the nervous system, endocrine system, histological and functional classification of general and special sensory receptors, and structure and function of each special sense organ. (Aligns to GECC 2.1)
5. Describe the circulatory, respiratory, digestive, and urinary systems and the mechanisms of metabolism. (Aligns to GECC 2.1)
6. Describe the fluid compartments and acid-base balance. (Aligns to GECC 2.1)
7. Describe the function of the human reproductive system and its principal components, and explain prenatal development and the process of labor and delivery. (Aligns to GECC 2.1)

### **General Education Career Competencies Addressed in this Exam**

GECC-2: Mathematical and Scientific Problem Solving: Apply scientific knowledge and reasoning to make evidence-based decisions.

## Content Outline

The content outline describes the various areas of the test, similar to the way a syllabus outlines a course. To fully prepare requires self-direction and discipline. Study involves careful reading, reflection, and systematic review.

The major content areas on the Anatomy & Physiology examination, the percent of the examination, and the hours to devote to each content area are listed below.

Content Area	Percent of the Examination	Hours of Study
I. The Human Body: An Overview	5%	13
II. Chemical Basis of Life	5%	13
III. Dynamics of Support and Motion	12%	32
IV. Integration and Regulatory Mechanisms	23%	62
V. Maintenance of the Human Body	33%	89
VI. Urinary System	10%	27
VII. Fluid and Electrolyte Balance	5%	13
VIII. Reproduction and Development	7%	19
<b>Total</b>	<b>100%</b>	

\*Approximate: For those examinees who know the topic well, less time may be needed to learn the subject matter. For those who are new to the subject matter, more time may be required for study.

NOTE: Occasionally, examples will be listed for a content topic to help clarify that topic. However, the content of the examination is not limited to the specific examples given.

### I. The Human Body: An Overview

#### 5 PERCENT OF EXAM

Martini (2015)

Ch. 1, An Introduction to Anatomy and Physiology

Ch. 3, The Cellular Level of Organization

#### A. Basic anatomical terminology

1. Body cavities and regions
2. Anatomical position, planes, and directional terms

#### B. General organization of the body

1. Cell structure and function as revealed by electron microscopy (including cell membrane receptor sites)
2. Fundamental body tissues
  - a. Epithelial
  - b. Connective
  - c. Muscle
  - d. Nervous
3. Organs: definition and examples
4. Systems: definition and examples

### C. Skin (Integument)

1. Epidermis
2. Dermis (receptors, glands, hair follicles, nails)

### D. Maintenance of the internal environment

1. Homeostasis
2. Cellular fluid dynamics
  - a. Osmosis
  - b. Filtration
  - c. Diffusion
  - d. Active transport
  - e. Endocytosis and exocytosis

## II. Chemical Basis of Life

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### 5 PERCENT OF EXAM

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#### Martini

#### Ch. 2, The Chemical Level of Organization

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### A. Atomic structure

1. Elements and isotopes
2. Atomic weights

### B. Chemical bonds

1. Ionic bonds
2. Covalent bonds
3. Hydrogen bonds

### C. Types of reactions

1. Decomposition
2. Synthesis
3. Reversible reactions
4. Enzymes and chemical reactions

### D. Inorganic compounds

1. Water and its properties
2. Aqueous solutions
3. Colloids and suspensions
4. Hydrogen ions in body fluids
5. Inorganic acids and bases
6. Salts

7. Buffers and pH control

### E. Organic compounds

1. Carbohydrates
  - a. Monosaccharides
  - b. Disaccharides
  - c. Polysaccharides
2. Lipids
  - a. Fatty acids
  - b. Glycerol
  - c. Steroids
  - d. Phospholipids
3. Proteins
  - a. Structure of proteins
  - b. Protein shape
  - c. Enzyme function
4. Nucleic acids
  - a. Structure of nucleic acids
  - b. RNA and DNA

## III. Dynamics of Support and Motion

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### 12 PERCENT OF EXAM

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#### Martini

#### Ch. 4, The Tissue Level of Organization

#### Ch. 5, The Integumentary System

#### Ch. 6, Bones and Bone Structure

#### Ch. 7, The Axial Skeleton

#### Ch. 8, The Appendicular Skeleton

#### Ch. 9, Joints

#### Ch. 10, Muscle Tissue

#### Ch. 11, The Muscular System

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### A. Supporting tissue

1. Anatomy
  - a. Gross anatomy
    - 1) Bone
      - (a) Types: long, short, flat, irregular, sesamoid

- (b) Markings (processes): elevations (for example: ridge or crest, tubercle, tuberosity, malleolus, trochanter, spine, head, condyles), depressions (for example: pit or fovea, fossa, groove or sulcus), openings (for example: foramen, canal or meatus, fissure)
- 2) Cartilage: hyaline, white fibrous, elastic
- b. Microscopic anatomy
  - 1) Bone (osseous tissue): osteoblasts, osteocytes, osteoclasts, periosteum, Sharpey's fibers, osteon (Haversian) system, lacunae, canaliculi, Haversian canal, lamellae, Volkmann's canal, interstitial lamellae, endosteum, bone marrow (yellow and red), organic and inorganic constituents
  - 2) Cartilage: cells in intercellular matrix, chondrogenic layer (chondroblasts and chondrocytes), perichondrium
- 2. Development and growth
  - a. Intramembranous ossification
  - b. Intracartilaginous or endochondral ossification
  - c. Hormonal influences: for example: growth hormone (GH) (somatotropin), thyroxine, adrenocorticotrophic hormone, parathyroid hormone, calcitonin, estrogen, testosterone
  - d. Other chemical influences: vitamins and minerals

## B. Skeletal system

- 1. Divisions
  - a. Axial: skull (cranial and facial bones), hyoid, vertebral column, sternum, ribs
  - b. Appendicular (girdles and extremities)

- 1) Upper limb: pectoral girdle (clavicles, scapulae), humerus, radius, ulna, carpals, metacarpals, phalanges
- 2) Lower limb: pelvic girdle (hip bones), femur, patella, fibula, tibia, tarsals, metatarsals, phalanges

## 2. Articulations

### a. Types

- 1) Synarthrosis (immovable): for example: sutures
- 2) Amphiarthrosis (slightly moveable): for example: symphysis pubis, intervertebral disks
- 3) Diarthrosis (fully moveable): gliding, hinge joint (ginglymus), condyloid joint, saddle joint, pivot joint, ball-and-socket joint

- b. Movements: flexion, extension, adduction, abduction, circumduction, rotation

## C. Muscle Tissue

### 1. Types and characteristics

- a. Skeletal (striated, voluntary)
- b. Smooth (nonstriated, involuntary)
- c. Cardiac (striated, involuntary)

### 2. Gross anatomy

- a. Attachment: origins, insertions (for example: by tendons and aponeuroses)
- b. Levers: first class, second class, third class (fulcrum, effort, resistance)
- c. Location and function of major muscles (Textbooks identify these muscles.)

## D. Muscle physiology

- 1. Contractions: muscle twitch, tetanus (complete vs. incomplete), summation (temporal, spatial)
- 2. Mechanism of contraction

- a. Electrical and mechanical aspects (for example: stimuli [subthreshold, threshold], action potential, latent period, period of contraction, relaxation, all-or-none principle, graded strength principle, absolute and relative refractory period, tonus, motor unit, excitation-contraction coupling, calcium effect, summation [temporal, spatial])
  - b. Chemical and thermal aspects (for example: sliding filament theory [actin, myosin, regulating proteins], energy sources [ATP-creatine phosphate-glycogen], heat formation, oxygen debt, fatigue)
3. Exercise physiology: isometric and isotonic contractions, white and red fibers, strength vs. endurance

- b. Supportive cells
  - 1) CNS: neuroglia or glial cells (astrocytes, oligodendrocytes, microglia, ependymal cells)
  - 2) PNS: Schwann cells
- 2. Nerve impulse: membrane excitation (gated, voltage-regulated potential), membrane inhibition, facilitation, saltatory conduction
- 3. Synapse: excitation (EPSP), inhibition (IPSP), convergence, divergence, calcium modulation, neurotransmitters, MAO, specificity of receptors (adrenergic, cholinergic), fatigue
- 4. Reflexes (knee jerk, stretch, withdrawal)
- 5. Development and growth
  - a. Ectoderm: neural (medullary) plate, neural tube (brain and spinal cord)
  - b. Brain: forebrain, midbrain, hindbrain
- 6. Divisions
  - a. Central nervous system
    - 1) Brain: gray and white matter
      - (a) Forebrain (prosencephalon): telencephalon (lateral ventricles, cerebral cortex, basal nuclei, rhinencephalon), diencephalon (third ventricle, epithalamus, thalamus, metathalamus, hypothalamus)
      - (b) Midbrain (mesencephalon): cerebral aqueduct, cerebral peduncles, corpora quadrigemina
      - (c) Hindbrain (rhombencephalon): fourth ventricle, metencephalon (cerebellum, pons), myelencephalon (medulla oblongata)
    - 2) Spinal cord: gray and white matter

#### IV. Integration and Regulatory Mechanisms

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**23 PERCENT OF EXAM**

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##### Martini

- Ch. 12, Nervous Tissue
- Ch. 13, The Spinal Cord, Spinal Nerves, and Spinal Reflexes
- Ch. 14, The Brain and Cranial Nerves
- Ch. 15, Sensory Pathways and the Somatic Nervous System
- Ch. 16, The Autonomic Nervous System and Higher-Order Functions
- Ch. 17, The Special Senses
- Ch. 18, The Endocrine System

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#### A. Nervous system

- 1. Cell types
  - a. Neuron: cell body, dendrites, axon, neurofibrils, myelin sheath, nodes of Ranvier, telodendria
    - 1) Structural classification: unipolar, bipolar, multipolar
    - 2) Functional classification: afferent (sensory), efferent (motor), association (interneuron)

- (a) Ascending tracts (sensory) (for example: posterior columns, spinothalamic pathways, spinocerebellar pathways)
  - (b) Descending tracts (motor) (for example: pyramidal pathways [corticospinal tracts], extrapyramidal pathways [rubrospinal and reticulospinal])
  - 3) Meninges: dura mater, arachnoid, pia mater
  - 4) Cerebrospinal fluid (formation, flow, reabsorption, function)
  - b. Peripheral nervous system
    - 1) Cranial nerves (12 pairs): name, number, type, function
    - 2) Spinal nerves
      - (a) Thirty-one pairs (8 cervical, 12 thoracic, 5 lumbar, 5 sacral, 1 coccygeal): dorsal root, ventral root
      - (b) Plexi: cervical, brachial, lumbar, sacral
  - c. Autonomic nervous system (visceral efferent system)
    - 1) Sympathetic division (thoracolumbar)
    - 2) Parasympathetic division (craniosacral)
    - 3) Anatomical and functional aspects
      - (a) Preganglionic (white rami root) and postganglionic (gray rami root) fibers (for example: adrenergics, cholinergics)
      - (b) Autonomic plexus
- 1) Nociceptors: location and characteristics, sensitivities, types of painful sensations
  - 2) Thermoreceptors: location, pathways, difference from pain receptors
  - 3) Mechanoreceptors: location and characteristics of tactile receptors, baroreceptors, and proprioceptors (for example, Meissner's, laminated, and Ruffini corpuscles; carotid and aortic sinuses; stretch receptors of the lung; muscle spindles, Golgi tendon organs, and joint capsule receptors)
  - 4) Chemoreceptors: location and response mechanisms (general senses; carotid and aortic bodies)
- 2. Special senses
    - a. Visual
      - 1) Anatomy of eye (for example: layers of eyeball, extraocular muscles)
      - 2) Physiology of vision and errors of refraction (CNII)
    - b. Auditory
      - 1) Anatomy of ear: external ear, middle ear, inner ear
      - 2) Physiology of hearing (mechanics, organ of Corti) (CNVIII)
    - c. Olfactory: olfactory nerves, olfactory membrane, conchae (CNI)
    - d. Gustatory: tongue, taste buds (papillae of tongue), classes of taste (CNXI, XII)
    - e. Balance and equilibrium
      - 1) Anatomy of semicircular canals (utricle and saccule)
      - 2) Physiology of balance (static vs. dynamic equilibrium) (CNVIII)

## B. Senses

- 1. General senses
  - a. Simple classification (interoceptors, exteroceptors, and proprioceptors)
  - b. Detailed classification

## C. Endocrine system

- 1. Hormones

- a. Amino acid derivatives
  - b. Peptide hormones
  - c. Proteins
  - d. Steroids
2. Mechanisms of hormonal action: first and second messengers
- a. Plasma membrane: adenyl cyclase mechanisms, c-AMP
  - b. Cytosol: nuclear membrane receptor mechanism
3. Endocrine glands: structure and function
- a. Pituitary (hypophysis cerebri)
    - 1) Neurohypophysis (pars nervosa): ADH, oxytocin
    - 2) Adenohypophysis (pars distalis): ACTH, GH, TSH, FSH, LH (ICSH)
    - 3) Relationship to hypothalamus (hypothalamic-hypophyseal portal system and tract)
  - b. Thyroid: thyroxine ( $T_4$ ), triiodothyronine ( $T_3$ ), calcitonin
  - c. Parathyroid: parathormone (PTH)
  - d. Adrenal (suprarenal)
    - 1) Medulla: epinephrine, norepinephrine, relationship to the sympathetic division of the autonomic nervous system
    - 2) Cortex: glucocorticoids, mineralocorticoids, sex hormones
  - e. Pancreas: islets of Langerhans, insulin, glucagon
  - f. Gonads
    - 1) Ovaries: estrogens and progesterone
    - 2) Testes: androgens (testosterone)
  - g. Thymus
  - h. Pineal gland: melatonin
  - i. Placenta: estrogens, progesterone, human chorionic gonadotropin (hCG)
4. Other secretory tissue
- a. Gastrointestinal mucosa (enteroendocrine cells): gastrin, secretin, cholecystokinin (CCK)
  - b. Kidney (for example: renin, erythropoietin)
5. Hypothalamus
- a. Releasing factors and inhibiting factors
  - b. Posterior pituitary hormones (ADH, oxytocin)

## V. Maintenance of the Human Body

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### 33 PERCENT OF EXAM

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#### Martini

**Ch. 19, Blood**

**Ch. 20, The Heart**

**Ch. 21, Blood Vessels and Circulation**

**Ch. 22, The Lymphatic System and Immunity**

**Ch. 23, The Respiratory System**

**Ch. 24, The Digestive System**

**Ch. 25, Metabolism, Nutrition, and Energetics**

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#### A. Circulatory system

- 1. Blood
  - a. Characteristics: color, specific gravity, pH, temperature
  - b. Formed elements: characteristics, life cycle, number, function
    - 1) Erythrocytes (red blood cells)
    - 2) Leukocytes (white blood cells)
    - 3) Thrombocytes (platelets)
  - c. Nonformed elements (plasma): components and characteristics
    - 1) Water
    - 2) Proteins (albumin, globulin, fibrinogen)
    - 3) Salts

- 4) Gases
  - 5) Nutrients
  - 6) Enzymes and hormones
  - 7) Waste products
  - d. Blood typing (agglutinins, agglutinogens)
    - 1) ABO groups
    - 2) Rh factor
  - e. Hemostasis: vessel constriction, platelet plugging, coagulation (intrinsic and extrinsic)
2. The heart: a dual pressure pump
- a. Structure
    - 1) Layers: pericardium, endocardium, myocardium, epicardium
    - 2) Chambers: atria, ventricles
    - 3) Valves: tricuspid, bicuspid (mitral), aortic and pulmonic semilunar
    - 4) Pulmonary vs. systemic circulation (for example: superior vena cava, pulmonary trunk, aorta)
    - 5) Coronary circulation: coronary arteries, cardiac veins, coronary sinus
    - 6) Conduction system
      - (a) Intrinsic (S-A node, A-V node, Bundle of His, left and right bundle branches, Purkinje fibers)
      - (b) Extrinsic (vagal and cardiac nerve modulation)
  - b. Function
    - 1) Properties of cardiac muscle: automaticity, intercellular conductivity (gap junctions)
    - 2) Origin of heartbeat and conduction pathway
    - 3) Cardiac cycle: phases (systole, diastole), pressure and volume changes, heart sounds, ECG
    - 4) Control of cardiac output
      - (a) Nervous control: vagus and cardiac nerve
      - (b) Autoregulation
      - (c) Role of receptors: baroreceptors (Bainbridge reflex, aortic sinus reflex, carotid sinus reflex)
      - (d) Other factors affecting frequency and strength of heart action (for example: blood pressure, emotional excitement, blood temperature, physical factors [size, age, gender])
3. Vascular system
- a. Divisions: systemic, pulmonary
  - b. Vessels: histology and function
    - 1) Arteries: layers, elastic arteries, muscular arteries, vasa vasorum
    - 2) Veins: layers, valves, vasa vasorum
    - 3) Capillaries: distribution
  - c. Location of major vessels (Textbooks identify these vessels.)
  - d. Special circuits
    - 1) Hepatic portal system
    - 2) Coronary
    - 3) Cerebral (circle of Willis)
    - 4) Renal
    - 5) Fetal
    - 6) Hypothalamic and hypophyseal portal systems
4. Cardiovascular physiology
- a. Pressure dynamics: blood distribution to body organs and organ needs
  - b. Regulation and maintenance of blood pressure
    - 1) Cardiac output (stroke volume times heart rate)
    - 2) Resistance to blood flow: vasodilation, vasoconstriction, blood viscosity

- 3) Role of chemoreceptors and baroreceptors
  - 4) Effect of nervous stimulation
  - c. Capillary exchange
    - 1) Fluid exchange: a result of the balance between
      - (a) Hydrostatic pressure
      - (b) Osmotic (oncotic) pressure
    - 2) Diffusion (nutrients, gases)
5. Lymphatic system
- a. Anatomical organization: lymph capillaries, right lymphatic duct, thoracic duct, lymph nodes
  - b. Lymph fluid: origin, composition, flow, function
  - c. Structure of lymph vessels and organs: spleen, thymus, tonsillar tissue, pharyngeal tissue (adenoid)
6. Immune responses
- a. Nonspecific resistance to disease
  - b. Specific resistance to disease
    - 1) Antigens and antibodies
    - 2) Cellular and humoral immunity
      - (a) T lymphocytes (helper, cytotoxic, suppressor, memory)
      - (b) B lymphocytes (active and memory)
      - (c) Types of immunity: active and passive

## B. Respiratory system

- 1. Anatomy
  - a. Respiratory tract (conducting and respiratory portions — changes in histology)
  - b. Respiratory muscles: diaphragm and intercostals
  - c. Pleura (visceral and parietal layers)
- 2. Physiology
  - a. Compliance

- b. Diffusion of gases: pressure (intraalveolar and intrapleural)
  - 1) Boyle's Law
  - 2) Charles' Law
  - 3) Dalton's Law
  - 4) Henry's Law
- c. Mechanisms of ventilation
  - 1) Inspiration
  - 2) Expiration
  - 3) Lung volumes and capacities (for example: tidal volume, inspiratory reserve, expiratory reserve, residual volume, vital capacity)
- d. Gas exchange and transport
  - 1) Oxygen, carbon dioxide
  - 2) Hemoglobin dissociation curve
- e. Control ventilation
  - 1) Nervous control
    - (a) Medulla oblongata (inspiration, expiration)
    - (b) Pons varolii (apneustic area and pneumotaxic area)
    - (c) Lungs (Hering-Breuer reflex)
  - 2) Chemical control: pH, carbon dioxide ( $\text{PCO}_2$ ), hypoxia ( $\text{PO}_2$ )
  - 3) Other controls: temperature change, pressure change, voluntary (cerebrum)

## C. Digestive system

- 1. Anatomy and functions of the alimentary canal
  - a. Microscopic anatomy: serosa, muscular layers, submucosa, mucosa, lymph nodes (Peyer's patches)
  - b. Gross anatomy

- 1) Alimentary tract: mouth, pharynx, esophagus, cardiac (esophageal) sphincter, stomach, pyloric sphincter, small intestine (duodenum, jejunum, ileum), ileocecal valve, large intestine (caecum, vermiform appendix, ascending colon, transverse colon, descending colon, sigmoid colon, rectum, anal canal)
  - 2) Accessory organs: tongue, teeth, salivary glands, pancreas, liver, gallbladder
2. Physiology of the digestive process
- a. Physical (mechanical) digestion: ingestion, mastication, deglutition, peristalsis, segmentation, pendular movement, defecation
  - b. Chemical digestion: catalytic enzymes and hydrolysis of carbohydrates, lipids, proteins
  - c. Control of digestion
    - 1) Nervous control: autonomic nervous system (parasympathetic and sympathetic), myenteric and submucosal plexus
    - 2) Hormonal control: gastrin, enterogastrone (GIP), secretin, cholecystokinin (CCK)
  - d. Mechanisms of absorption: simple diffusion, facilitated diffusion, osmosis, active transport, endocytosis, physical factors (particle size, concentration of materials, lipid solubility, surface area)

#### D. Metabolism

1. Nutrient metabolism of carbohydrates, proteins, and lipids
  - a. Anabolism (glycogenesis, gluconeogenesis, lipogenesis, protein synthesis)
  - b. Catabolism (glycogenolysis, glycolysis, lipolysis, protein degradation)

2. Energy metabolism (aerobic and anaerobic): role of enzymes and phosphorylation, TCA (Krebs) cycle, oxidative phosphorylation, electron transport chain, role of NAD and FAD (Students are not responsible for the individual biochemical events of these processes.)
3. Daily calorie requirement, nutritional needs, body heat
4. Calorimetry: basal metabolic rate (BMR)
5. Vitamins and minerals

## VI. Urinary System

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### 10 PERCENT OF EXAM

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#### Martini

#### Ch. 26, The Urinary System

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- A. **Gross anatomy: kidney** (capsule, pelvis, calyces, medulla, cortex, renal columns, renal pyramids), ureters, bladder, urethra, blood supply
- B. **Microscopic anatomy: nephron** (glomerulus, podocytes, renal [Bowman's] capsule, proximal convoluted tubule, loop of Henle [nephron loop], distal convoluted tubule), collecting duct
- C. **Nephron dynamics (homeostatic maintenance)**
  1. Glomerular filtration (GFR, GFP)
    - a. Hydrostatic pressure
    - b. Osmotic pressure
    - c. Fluid exchange
  2. Tubular reabsorption
  3. Tubular secretion
  4. Countercurrent multiplier/exchanger
  5. JGA (renin-angiotensinogen mechanism)
- D. **Control of renal function**
  1. Hormonal: antidiuretic hormone (ADH or vasopressin), aldosterone
  2. Nervous: autonomic nerves
- E. **Micturition reflex and voluntary control**

## F. Urine composition

1. Physical characteristics: color, transparency, pH, specific gravity, quantity
2. Constituents
  - a. Inorganic: chlorides; sulphates; phosphates of sodium, potassium, magnesium, and calcium; water; ammonium salts
  - b. Organic: creatinine, urea, uric acid

- a. Male: testes
- b. Female: ovaries
2. Accessory reproductive organs
  - a. Male: epididymis, vas deferens (ductus deferens), seminal vesicles, ejaculatory ducts, prostate gland, bulbourethral (Cowper's) glands, urethra, penis
  - b. Female: fallopian tubes (oviducts), uterus, vagina, greater vestibular (Bartholin's) glands, external genitalia

## VII. Fluid and Electrolyte Balance

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### 5 PERCENT OF EXAM

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#### Martini

#### Ch. 27, Fluid, Electrolyte, and Acid-Base Balance

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- A. **Fluid compartments:** distribution of water and electrolytes in the body, movement of water, water intake and output, adjustment of excess fluid intake, regulation by hormones, stress situations, reserve body water, milliequivalents, important cations and anions
  1. Extracellular (interstitial fluid, plasma)
  2. Intracellular
- B. **Acid-base balance:** normal pH range, pH regulation, sources of acid and base
  1. Blood buffers
  2. Respiratory regulation
  3. Renal regulation
  4. Acid-base disturbances (acidosis, alkalosis)

## B. Physiology of reproductive system

1. Gametogenesis: reduction division
  - a. Spermatogenesis
  - b. Oogenesis
2. Hormonal control
  - a. Female: oogenesis, menstrual cycle (FSH, LH, estrogen, progesterone)
  - b. Male: spermatogenesis, gonadotropins (FSH, LH [ICSH]), testosterone
3. Nervous control
  - a. Erection (parasympathetic)
  - b. Ejaculation (sympathetic)
4. Fertilization and implantation
5. Pregnancy
  - a. Hormonal control: corpus luteum (estrogen, progesterone), placenta (hCG)
  - b. Development
    - 1) First trimester
    - 2) Second trimester
    - 3) Third trimester
6. Parturition: stages, hormonal control (oxytocin, relaxin)
7. Lactation: nervous and hormonal control, nutritional aspects

## VIII. Reproduction and Development

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### 7 PERCENT OF EXAM

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#### Martini

#### Ch. 28, The Reproductive System

#### Ch. 29, Development and Inheritance

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- A. **Anatomy**
  1. Primary reproductive organs

## SECTION THREE

# Sample Questions

The sample questions give you an idea of the level of knowledge expected in the exam and how questions are typically phrased. They are not representative of the entire content of the exam and are not intended to serve as a practice test.

Rationales for the questions can be found on pages 23–26 of this guide. In that section, the correct answer is identified and each answer is explained. The number in parentheses at the beginning of each rationale refers to the corresponding section of the content outline. For any questions you answer incorrectly, return to that section of the content outline for further study.

1. What is the name given to an imaginary plane that divides the body into right and left halves?
  - 1) coronal
  - 2) frontal
  - 3) sagittal
  - 4) transverse
2. Which statement best explains what happens when oxygen and hydrogen combine to form water ( $H_2O$ )?
  - 1) Hydrogen becomes weakly negative.
  - 2) Oxygen remains in an unstable state.
  - 3) Oxygen loses its high electronegativity.
  - 4) There is unequal sharing of electrons.
3. Which cordlike structure attaches muscle to bone?
  - 1) aponeurosis
  - 2) fascicle
  - 3) ligament
  - 4) tendon
4. Which property of cardiac muscle prevents tetanic contractions?
  - 1) sliding of actin and myosin
  - 2) branching muscle fibers
  - 3) long refractory period
  - 4) low extracellular calcium
5. Which component of the spinal reflex arc is responsible for delivering an efferent impulse to either a muscle or a gland?
  - 1) association neuron
  - 2) postganglion neuron
  - 3) motor neuron
  - 4) sensory neuron
6. Which is a function of the cerebellum?
  - 1) control of voluntary scanning movements of the eyes
  - 2) production of coordinated movement
  - 3) regulation of autonomic body functions
  - 4) regulation of emotions

7. What results from sectioning the corpus callosum?
  - 1) The brain ceases to function and death occurs.
  - 2) The capacity for abstract thought is lost.
  - 3) Information transfer between the cerebral hemispheres is lost.
  - 4) Control of autonomic functions is lost.
8. Which ability would be impaired by damage to hair cells at the basal end of the cochlea?
  - 1) discriminating loudness
  - 2) discriminating the direction of sound
  - 3) hearing high-frequency sounds
  - 4) hearing low-frequency sounds
9. Which compensatory response is likely to occur when the blood calcium level is low?
  - 1) Fecal calcium will be higher than normal.
  - 2) Urine calcium will be higher than normal.
  - 3) Osteoclast activity will be greater than normal.
  - 4) Calcium deposition in bone will be greater than normal.
10. When does ejection of blood from the ventricles occur during an ECG trace?
  - 1) between the QRS and T waves
  - 2) right after the P wave
  - 3) between the T and P waves
  - 4) right after the T wave
11. During which phase of the cardiac cycle is the pressure in the aorta the highest?
  - 1) early atrial diastole
  - 2) atrial systole
  - 3) early ventricular diastole
  - 4) ventricular systole
12. In a normal heart, which of the following decreases cardiac output?
  - 1) increased stroke volume
  - 2) increased heart rate
  - 3) increased venous return to the heart
  - 4) increased parasympathetic stimulation of the heart
13. Which cells in the islets of Langerhans produce insulin?
  - 1) alpha cells
  - 2) beta cells
  - 3) delta cells
  - 4) F cells
14. Which statement best explains why stimulating the sympathetic nervous system will increase arterial blood pressure?
  - 1) Cardiac output will increase and total peripheral resistance will remain unchanged.
  - 2) Cardiac output will remain unchanged and total peripheral resistance will increase.
  - 3) Cardiac output will increase and stroke volume will decrease.
  - 4) Cardiac output and total peripheral resistance will both increase.
15. Which condition may result from the hypersecretion of gastric juices?
  - 1) acute pancreatitis
  - 2) cirrhosis
  - 3) peptic ulcers
  - 4) peritonitis
16. What is the effect of the Hering-Breuer reflex?
  - 1) It controls the basic rhythm of respiration.
  - 2) It constricts terminal bronchioles.
  - 3) It stimulates inspiration.
  - 4) It prevents overinflation of the lungs.
17. Which is the correct pathway of filtrate through the nephron?
  - 1) Bowman's capsule, proximal convoluted tubule, loop of Henle, distal convoluted tubule
  - 2) Bowman's capsule, loop of Henle, proximal convoluted tubule, collecting tubule
  - 3) Bowman's capsule, collecting tubule, proximal convoluted tubule, loop of Henle
  - 4) collecting tubule, Bowman's capsule, loop of Henle, distal convoluted tubule

18. During cellular respiration, a diminished supply of oxygen will result in the storage of hydrogen as which acid?
- 1) acetic
  - 2) citric
  - 3) lactic
  - 4) pyruvic
19. Which hormone increases the reabsorption of sodium and the secretion of potassium by the kidney?
- 1) aldosterone
  - 2) antidiuretic hormone (ADH)
  - 3) thyroxine
  - 4) cortisol
20. The renin-angiotensin mechanism regulates the production of which hormone?
- 1) aldosterone
  - 2) cortisol
  - 3) glucagon
  - 4) insulin
21. An increase in renal bicarbonate reabsorption would tend to have which effect on body fluids?
- 1) increased acidity
  - 2) increased pH
  - 3) decreased buffering capacity
  - 4) decreased osmolarity
22. Which would be the effect of afferent impulses from lactating breasts to the hypothalamus?
- 1) Release of posterior pituitary hormones would increase.
  - 2) Lactiferous ducts would not develop.
  - 3) The milk let-down reflex would not occur.
  - 4) Prolactin levels would increase.
23. What is the main source of progesterone following degeneration of the corpus luteum during pregnancy?
- 1) corpus albicans
  - 2) follicular epithelial cells
  - 3) placenta
  - 4) thecal cells

## SECTION FOUR

# Rationales

### 1.(IA2)

- 1) The coronal plane divides the body into ventral (anterior) and dorsal (posterior) planes.
- 2) The frontal plane is the same as the coronal plane.
- \*3) The sagittal plane divides the body in half along the vertical (longitudinal) axis, thus dividing into right and left halves.
- 4) The transverse plane divides the body into superior and inferior halves.

### 2.(IIB)

- 1) Hydrogen becomes weakly positive.
- 2) Oxygen forms a stable atom in the water molecule.
- 3) Oxygen's electronegativity remains the same within the water molecule.
- \*4) Hydrogen and oxygen have different electronegativities, resulting in an unequal sharing of electrons.

### 3.(IIIC2)

- 1) An aponeurosis is a broad sheetlike tendon that connects muscle to other muscle or to bone.
- 2) A fascicle is a bundle of muscle or nerve cells surrounded by a connective tissue membrane.
- 3) A ligament is composed of dense regular collagen fibers with some elastin. A ligament connects bone to bone.
- \*4) A tendon is a cordlike structure composed of dense regular collagen fibers. A tendon connects muscle to bone.

### 4.(IIID1/2)

- 1) Actin and myosin interact to promote muscle contraction in all muscle tissue.
- 2) Branching muscle fibers allow for sequential and rhythmic contraction associated with cardiac muscle.
- \*3) The refractory period is the period during which muscle contraction cannot be initiated.
- 4) Low extracellular calcium inhibits proper muscle contraction.

### 5.(IVA1/4)

- 1) Association neurons connect sensory and motor neurons.
- 2) Postganglionic neurons transmit impulses from preganglionic fibers to the target organ.
- \*3) Motor neurons carry impulses from the central nervous system to a series of effectors, i.e., muscles or glands.
- 4) Sensory neurons transmit impulses from sense organs to the central nervous system.

### 6.(IVA6a)

- 1) Voluntary eye movements are controlled by the oculomotor and trochlear cranial nerves.
- \*2) The cerebellum coordinates motor function with the cerebrum through three paired bundles of nerve fibers known as the cerebellar peduncle.
- 3) Regulation of autonomic body functions is done by the autonomic nervous system comprised of the sympathetic and the parasympathetic divisions.
- 4) Regulation of emotions is largely in the domain of the hypothalamus and limbic system.

\*correct answer

#### 7.(IVA6)

- 1) Brain function depends upon adequate blood supply and not on the corpus callosum.
- 2) Abstract thought is controlled by higher centers in the cerebral cortex.
- \*3) The corpus callosum consists of commissural fibers carrying information between the right and left cerebral hemispheres.
- 4) Autonomic function is associated with brain stem activity.

#### 8.(IVB2b)

- 1) Loudness is dependent upon sound intensity. The greater the sound intensity, the greater the vibration of the basilar membrane which leads to increased transmission of nerve impulses to the brain.
- 2) Each ear receives the vibrating signal from slightly different positions. Discriminating the direction of sound is done by the temporal lobes of the brain.
- \*3) The basilar membrane is narrower and stiffer at the base of the cochlea where high-frequency (high-pitched) sounds produce maximum vibration and greater transmission of nerve impulses to the brain.
- 4) Low-frequency sounds cause maximum vibration at the apex of the cochlea where the basilar membrane is wider and more flexible.

#### 9.(IVC)

- 1) Less calcium will be lost in the feces.
- 2) Less calcium will be excreted in the urine.
- \*3) Osteoclasts are bone-dissolving cells that release calcium into the bloodstream.
- 4) Bone will be broken down in an attempt to raise blood calcium levels.

#### 10.(VA2)

- \*1) The QRS wave reflects the spread of the impulse throughout the ventricles, forcing blood into the aorta and pulmonary artery.
- 2) The P wave represents the spread of an electrical impulse through the atria and their subsequent contraction.
- 3) The T wave represents repolarization of the electrical tissue and the P wave represents the beginning of the next cardiac cycle.
- 4) Right after the T wave, the heart is at rest.

#### 11.(VA2a)

- 1) In early atrial diastole, the atria are filling with blood from the venous system.
- 2) Atrial systole involves contraction of the atria, forcing blood into the ventricles.
- 3) In early ventricular diastole, the ventricles are receiving blood from the atria.
- \*4) In ventricular systole, the ventricles are contracting and forcing blood into the aorta and pulmonary artery.

#### 12.(VA2b)

- 1) An increased stroke volume increases the amount of blood ejected from the ventricle.
- 2) A more rapid heart rate increases the amount of blood forced out of the heart.
- 3) As more blood returns to the heart, more blood is subsequently ejected.
- \*4) The parasympathetic nervous system has an inhibitory effect on cardiac function.

#### 13.(IVC3e)

- 1) Alpha cells produce glucagon which raises blood sugar.
- \*2) Beta cells produce insulin which lowers blood sugar.
- 3) Delta cells secrete somatostatin which inhibits the secretion of insulin and glucagon.
- 4) F-cells secrete hormones which regulate the release of pancreatic digestive enzymes.

\*correct answer

14.(VA4b)

- 1) See 4).
- 2) See 4).
- 3) The sympathetic nervous system stimulation of the adrenal medulla releases epinephrine and norepinephrine which will cause an increase in cardiac output and an increase in stroke volume.
- \*4) The sympathetic nervous system stimulation of the adrenal medulla releases epinephrine and norepinephrine which will cause an increase in cardiac output and vasoconstriction in visceral blood vessels resulting in an increase in peripheral resistance.

15.(VC2)

- 1) Acute pancreatitis results from severe insults to the pancreas.
- 2) Cirrhosis is a hardening of the liver tissue.
- \*3) Gastric juices are rich in hydrochloric acid, which causes irritation in the gastric mucosa.
- 4) Peritonitis is an inflammation of the peritoneum and is usually the result of infection.

16.(VB2d)

- 1) The basic rhythm of respiration is regulated by the medullary rhythmicity center which is located in the medulla oblongata.
- 2) Constriction of terminal bronchioles is caused by histamine.
- 3) Inspiration is part of the medullary rhythmicity center in the medulla oblongata and is stimulated by high CO<sub>2</sub> levels, low O<sub>2</sub> levels, and falling pH levels.
- \*4) Stretch receptors are found within the bronchioles and lung tissue. When the receptors are stretched, nerve signals are sent via the vagus nerve to the apneustic center and medullary rhythmicity center and further inspiration is inhibited. Therefore, the Hering-Breuer reflex protects the lungs from overinflation damage.

17.(VIB/C)

- \*1) This represents the path by which the blood filtrate passes on the way to the final production of urine.
- 2) The loop of Henle transports the filtrate from the proximal convoluted tubule to the distal convoluted tubule.
- 3) The collecting tubule represents the end of the filtration process.
- 4) The collecting tubule represents the end point of the pathway.

18.(VD2)

- 1) Acetic acid is formed when pyruvic acid is decarboxylated and joined with CoA to enter the mitochondria during aerobic oxidation when the oxygen supply is adequate.
- 2) During aerobic oxidation, citric acid is formed in the mitochondria when the acetyl group of acetic acid is joined with oxaloacetic acid.
- \*3) When oxygen is inadequate, pyruvic acid is reduced by two hydrogen ions to form lactic acid. Lactic acid can be transported to the liver to be reformed into glucose or pyruvic acid.
- 4) Pyruvic acid is the end product of anaerobic glycolysis.

19.(VID1)

- \*1) Aldosterone from the adrenal cortex increases the retention of sodium and triggers the loss of potassium.
- 2) ADH from the posterior pituitary triggers the retention of water by the kidneys.
- 3) Thyroxine from the thyroid gland regulates cell metabolism.
- 4) Cortisol from the adrenal cortex elevates blood sugar and reduces inflammation.

\*correct answer

20.(VID&E)

- \*1) A decrease in blood volume leads the nephron juxtaglomerular cells to release renin. Renin converts angiotensinogen to angiotensin I. Angiotensin I is converted to angiotensin II in the lung. Angiotensin II stimulates the adrenal cortex to release aldosterone.
- 2) Cortisol is stimulated by pituitary ACTH.
- 3) Glucagon is produced in the alpha cells of the islets of Langerhans and is stimulated by epinephrine.
- 4) Insulin is produced in the beta cells of the islets of Langerhans and is stimulated by high blood glucose levels.

21.(VIIB)

- 1) Since bicarbonate absorbs  $H^+$ , acidity will be reduced. Increased acidity is caused by an increase in  $H^+$ .
- \*2) Increased pH is caused by a reduction of available  $H^+$ . Bicarbonate absorbs  $H^+$ , reducing the available  $H^+$  and causing pH to increase.
- 3) Bicarbonate is a component of the carbonic acid-bicarbonate buffer system. The more bicarbonate available, the greater the opportunity to absorb  $H^+$  and prevent a fall in pH.
- 4) Bicarbonate is a plasma solute. Any increase in solutes will increase osmolarity.

22.(VIIB7)

- 1) Prolactin has no connection with the posterior pituitary.
- 2) Prolactin triggers the development of lactiferous ducts.
- 3) The milk let-down reflex is a product of oxytocin release.
- \*4) Impulses from a suckling infant induce an increase in prolactin production and more milk production.

23.(VIIB5a)

- 1) A corpus albicans is a degenerated corpus luteum that has lost its capacity to produce progesterone.
- 2) Follicle cells are involved in producing estrogen and developing the secondary oocyte.
- \*3) The placenta is able to convert cholesterol to progesterone which is important to maintain the pregnancy after the corpus luteum degenerates.
- 4) Thecal cells surround the follicle and are involved in the secretion of steroids.

\*correct answer

## SECTION FIVE

# Taking the Exam

## Registering for Your Exam

### Register Online

[www.excelsior.edu/examregistration](http://www.excelsior.edu/examregistration)

Follow the instructions and pay by Visa, MasterCard, American Express, or Discover Card.

### Examination Administration

Pearson Testing Centers serve as the administrator for all Excelsior College computer-delivered exams.

### Accessibility Services

Excelsior College is committed to the principle that every individual should have an equal opportunity to enroll in an Excelsior College degree program, to register for courses or examinations in order to demonstrate their knowledge and skills under appropriate conditions, and to complete a degree.

The Accessibility Services Office at Excelsior College is responsible for considering requests for reasonable accommodations for individuals with verifiable, documented disabilities. If you are requesting an accommodation due to a disability/condition, complete a [Request for Accommodation form](#).

### Computer-Delivered Testing

The UExcel exams are delivered by computer. You can take this exam either in a [Pearson VUE testing center](#) or at your home or office with an online proctor. If you are interested in remote proctoring, visit [PearsonVUE OnVUE online proctoring](#).

The system is designed to be as user-friendly as possible, even for those with little or no computer experience. On-screen instructions are similar to those you would see in a paper examination booklet. You will use either the keyboard or the mouse to submit your answers, depending upon the type of question.

Before taking your exam, we strongly encourage you to go on a virtual tour of the testing center. To access this tour, click the What to Expect in a Pearson VUE test center at the following link: [home.pearsonvue.com/test-taker/security.aspx](http://home.pearsonvue.com/test-taker/security.aspx)

You also will receive a small, erasable whiteboard if you need one.

### Breaks

Breaks are only permitted for exams taken at Pearson VUE Testing Centers, and are not permitted during exams delivered via online proctoring.

### Online Proctoring

As of spring 2021, Excelsior is offering an [online delivery option](#) for UExcel exams, using OnVUE, Pearson VUE's online delivery and proctoring service.

You must use a personal (vs. an employer's) computer if you want to take the exam online and not in a testing center, so the exam can be effectively delivered to you.

Breaks are not allowed during an exam taken online from home. You may not leave your seat during an online-proctored exam, so be prepared to sit for two or three hours. If you need extra time, the exam will have to be taken at a PearsonVUE Testing Center, and an accommodation formally requested.

NOTE: English Composition, Spanish, Music, and College Writing will NOT be available for online proctoring.

## On the Day of Your Exam

### Important Reminders

On the day of your exam, remember to:

- dress comfortably: the computer will not mind that you're wearing your favorite relaxation outfit
- arrive at the test site rested and prepared to concentrate for an extended period
- allow sufficient time to travel, park, and locate the test center
- be prepared for possible variations in temperature at the test center due to weather changes or energy conservation measures
- bring your ID, but otherwise, don't weigh yourself down with belongings that will have to be kept in a locker during the test.

### Academic Integrity Nondisclosure Statement

- All examinees must agree to the terms of the Excelsior College Academic Integrity Policy before taking an examination. The agreement will be presented on screen at the Pearson VUE Testing Center before the start of your exam.
- Once the examinee agrees to the terms of the Academic Integrity Nondisclosure Agreement (NDA), the exam will begin.

If you choose not to accept the terms of the agreement

- your exam will be terminated
- you will be required to leave the testing center
- you will not be eligible for a refund. For more information, review the Student Policy Handbook at [www.excelsior.edu/studentpolicyhandbook](http://www.excelsior.edu/studentpolicyhandbook).

Student behavior is monitored during and after the exam. Electronic measures are used to monitor the security of test items and scan for illegal use

of intellectual property. This monitoring includes surveillance of Internet chat rooms, websites, and other public forums.

### UExcel Grade Report

After you complete the exam, you will be issued a UExcel Grade Report for Examinations. See the [sample UExcel Grade Report](#) in this content guide.

### Grade Appeals

If you believe that your score grade is incorrect, you may appeal your grade to [examcredit@excelsior.edu](mailto:examcredit@excelsior.edu). Details about the appeals process are in the [Student Handbook](#).

### What If I Miss My Appointment?

If you don't cancel or reschedule your testing appointment 24 hours before your test appointment, you will have to pay the full fee of the exam, even if you don't show up.

### Late Arrivals

You will also forfeit the exam fee if you arrive to the test center more than 15 minutes late.

### Information About UExcel Exams for Colleges and Universities

A committee of teaching faculty and practicing professionals determines the learning outcomes to be tested on each exam. Excelsior College Center for Educational Measurement staff oversee the technical aspects of test construction in accordance with current professional standards. To promote fairness in testing, we take special care to ensure that the language used in the exams and related materials is consistent, professional, and user friendly. Editorial staff perform systematic quantitative and qualitative reviews to ensure accuracy, clarity, and compliance with conventions of bias-free language usage.

Excelsior College, the test developer, recommends granting six (6) semester hours of lower-level undergraduate credit to students who receive a letter grade of C or higher on this examination. The exam fulfills the anatomy and physiology core requirement for the Excelsior College nursing degrees. Other colleges and universities also recognize this exam as a basis for granting credit or advanced standing.

Individual institutions set their own policies for the amount of credit awarded and the minimum acceptable score.

# Anatomy & Physiology Exam Development Committee

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# Sample Grade Report

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Excelsior College  
GRADE REPORT FOR EXAMINATIONS

Contact ID:

Test Date: 11/21/2020

Letter Grade: C

Examination Code and Title: 210 Statistics

Recommended Credit:  
3 Lower Level

Your examination results are expressed as a Letter Grade of A, B, C, or F. Your results are automatically verified when they are received at Excelsior College. If an error is detected, you will be notified immediately.

**Recommended Credit** is the number of semester hours credit that Excelsior College awards and recommends for your grade. Excelsior College awards and recommends credit for letter grades of C or better.

**If you plan to take another examination**, you may download free content guides and the User's Guide by visiting our website at [www.excelsior.edu/exams/content-guides/](http://www.excelsior.edu/exams/content-guides/).

**If you need an Excelsior College Official Examinations Transcript** to document the credit you have earned for this examination for another institution, the request can be made online by accessing the Excelsior College website ([www.excelsior.edu](http://www.excelsior.edu)), logging into your MyExcelsior account, and scrolling down to the For Exams Takers box and clicking on the Request transcripts link. If you do not already have a MyExcelsior username and password, you can obtain one at no cost by accessing the Excelsior College website, clicking the Log In to MyExcelsior button, and then clicking the link "Create a MyExcelsior User Account."



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