This course supports the assessment for GMT1. The course covers 5 competencies and represents 3 competency units.

Introduction

Welcome to Human Physiology! This course covers the following topics:

- metabolism
- homeostasis
- fluid balance
- oxygenation
- mobility

These topics underlie the functions of the major organ systems and the dysfunctions that can lead to major problems in the vital organs. They provide a basis for understanding the whole human system and the fundamental skills needed in your nursing program.

Watch the following video for an introduction to this course:

Note: To download this video, right-click the following link and choose "Save as...": [download video].

Competencies

This course provides guidance to help you demonstrate the following 5 competencies:

- **Competency 211.3.1: Metabolism**
  The graduate determines levels of blood metabolites, determines the effect of diet on blood levels of metabolites, explains regulation of blood glucose, recognizes the effect of exercise on plasma glucose levels, and recognizes the effect of diabetes on plasma glucose and ketones.

- **Competency 211.3.2: Homeostasis**
  The graduate determines the effects of given factors on enzyme action and explains specific effects of given types of enzyme activity.

- **Competency 211.3.3: Fluid Balance**
  The graduate determines the effect of given levels of hydration on urine output, explains factors affecting urine output, and explains how diabetes affects the need for fluid intake.

- **Competency 211.3.4: Oxygenation**
  The graduate measures properties of ventilation and gas exchange, can discuss the role of gas pressure and pH on ventilation, calculates measure of effective heart functioning, recognizes the effect of exercise on cardiac function, and discusses how cardiac and pulmonary function maintain states of homeostasis in oxygenation.

- **Competency 211.3.5: Mobility**
  The graduate measures muscle stimulation, recognizes the effect of muscle fiber length and stimulus on muscle contraction, and explains how botulism affects muscle
contraction.

**Nursing Dispositions Statement**
Please review the [Statement of Nursing Dispositions](mailto:).  

**Course Instructor Assistance**
As you prepare to successfully demonstrate competency in this subject, remember that course instructors stand ready to help you reach your educational goals. As subject matter experts, mentors enjoy and take pride in helping students become reflective learners, problem solvers, and critical thinkers. Course instructors are excited to hear from you and eager to work with you.

Successful students report that working with a course instructor is the key to their success. Course instructors are able to share tips on approaches, tools, and skills that can help you apply the content you’re studying. They also provide guidance in assessment preparation strategies and troubleshoot areas of deficiency. Even if things don’t work out on your first try, course instructors act as a support system to guide you through the revision process. You should expect to work with course instructors for the duration of your coursework, so you are welcome to contact them as soon as you begin. Course instructors are fully committed to your success!

**Preparing for Success**

The information in this section is provided to detail the resources available for you to use as you complete this course.

**Learning Resources**
The learning resources listed in this section are required to complete the activities in this course. For many resources, WGU has provided automatic access through the course. However, you may need to manually enroll in or independently acquire other resources. Read the full instructions provided to ensure that you have access to all of your resources in a timely manner.

**Automatically Enrolled Learning Resources**

You can access the learning resources listed in this section by clicking on the links provided throughout the course. You may be prompted to log in to the WGU student portal to access the resources.

**Power Phys**
PowerPhys is a required component of the course and is used in the performance assessment. Use of this resource will be necessary to complete the required tasks, and you will have access to the link within the Taskstream environment. You can familiarize yourself with the resource by clicking the link below.


*Note: PowerPhys is the sole resource required to complete this course. Any additional reading outside PowerPhys is supplemental and is not required.*
VitalSource E-Texts
The following textbook is available to you as an e-text within this course. You will be directly linked to the specific readings required within the activities that follow.


*Note: This e-text is available to you as part of your program tuition and fees, but you may purchase a hard copy at your own expense through a retailer of your choice. If you choose to do so, please use the ISBN listed to ensure that you receive the correct edition.*

Keeping Current With Assignments
The study of the human body requires you to learn multiple systems that coexist and interact in a complex way. It is recommended that the student begin an anatomy notebook (or electronic folder) in this domain of study. Suggested divisions include these topics:

- Vocabulary
- Simulation Notes
- Experiment Notes (Lab Reports)
- Questions and Answers

Pacing Guide
The pacing guide suggests a weekly structure to pace your completion of learning activities. It is provided as a suggestion and does not represent a mandatory schedule. Follow the pacing guide carefully to complete the course in the suggested timeframe.

- **Pacing Guide: Human Physiology**

*Note: This pacing guide does not replace the course. Please continue to refer to the course for a comprehensive list of the resources and activities.*

Before you begin GMT1, please read the announcements and access the resources found in the [Anatomy and Physiology II and Labs Learning Community](#).

Metabolism and Homeostasis
The activities associated with this subject will introduce you to glucose metabolism and glucose regulation in exercise.

This will section will focus on catabolic and anabolic metabolism, with special emphasis on diabetes. Diabetes is on the rise especially in the pediatric population; thus, it is important that healthcare professionals be well versed in the physiology of metabolism and homeostasis.

**Glucose Metabolism**
Glucose metabolism is an important process in the body. It is one that we cannot live without. When the process of glucose metabolism does not work properly, it can have dire consequences.
This topic addresses the following competencies:

- **Competency 211.3.1: Metabolism**
  The graduate determines levels of blood metabolites, determines the effect of diet on blood levels of metabolites, explains regulation of blood glucose, recognizes the effect of exercise on plasma glucose levels, and recognizes the effect of diabetes on plasma glucose and ketones.

- **Competency 211.3.2: Homeostasis**
  The graduate determines the effects of given factors on enzyme action and explains specific effects of given types of enzyme activity.

**Initial Concept Map: Glucose Metabolism**

Think about what you already know about glucose metabolism or blood sugar. What terms about glucose metabolism do you already know? Make a concept map to show what terms you know, what systems of the body are involved, and what processes and interactions occur.

For information on creating a concept map, visit the following web page:

- ["Create a Concept Map"](http://www.example.com)

**Endocrine System Functions**

Read the following in *Essentials of Human Anatomy and Physiology*:

- **chapter 9 ("The Endocrine System")**

First look over and try to answer the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?" If you are unable to answer a question, go to the text and review the material covering that topic.

Click on the "Summary" section and read the summary of the above section. Continue on to the end-of-chapter questions and answer questions 2, 10, 12, and 14. Review material whenever you are unable to answer a question with confidence.

Go to the in the Human Physiology Message Board and post a message about pertinent insights you have found.

**Teaching About Glucose Metabolism**

Explain glucose metabolism in your own words to a family member or peer.

**Connecting New Knowledge of Blood Glucose Regulation**

Given your new knowledge of blood glucose regulation, answer the following questions:

- Why is a person often not hungry after a full night of sleep, even though they have not eaten for ten or eleven hours?
• Why does a person who has eaten a high-carbohydrate snack feel hungry after one or two hours?

Modify Concept Map: Glucose Metabolism

Now go back to your initial concept map. Add to or modify it based on what you have learned.

What questions do you still have?

Task 211.3.1-01-05 Performance Task

Complete the PowerPhys experiment “Blood Glucose Regulation” and submit the report in Taskstream for the following task:

• Human Physiology: Task 211.3.1-01-05

For details about this performance assessment, see the "Assessment" tab in this course.

Note: Once you begin the laboratory report in PowerPhys, you cannot return to the information or data-collection sections, or you will lose your data and answers in the report. Save your completed report as a PDF, review the rubric for the task, and submit it through Taskstream.

Homeostasis

This topic will guide you through your study of homeostasis.

This topic addresses the following competencies:

• Competency 211.3.1: Metabolism
  The graduate determines levels of blood metabolites, determines the effect of diet on blood levels of metabolites, explains regulation of blood glucose, recognizes the effect of exercise on plasma glucose levels, and recognizes the effect of diabetes on plasma glucose and ketones.

• Competency 211.3.2: Homeostasis
  The graduate determines the effects of given factors on enzyme action and explains specific effects of given types of enzyme activity.

Initial Concept Map: Homeostasis

Homeostasis describes a balance within the body. This might involve an acid-base balance or a balance in enzymes, minerals, temperature, etc. In order for the body to work effectively and efficiently, it needs to be in homeostasis. Normally the body will seek this state. However, under stress or sickness homeostasis may not occur.

Make a concept map to show everything you know about homeostasis. You will add to it as you complete this section.

Homeostasis and the Digestive System

Read the following in Essentials of Human Anatomy and Physiology
chapter 14 ("The Digestive System and Body Metabolism").

Answer the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?"
If you are unable to answer a question, go to the section of the text covering that topic and review the material.

Click on the chapter summary and read the summary of the above section. Continue on to the end-of-chapter questions and answer questions 10, 11, 13, 24, 25, 32, 33, 35, and 37. Review material whenever you are unable to answer a question with confidence.

Go to the Human Physiology Message Board and discuss pertinent insights with your peers.

**Enzyme Sucrase**

Given your new knowledge related to the enzyme sucrase, think about a person with an inadequate supply of sucrase.

Read the following article:

- "Congenital Sucrase-Isomaltase Deficiency"

Do you think a person could survive if they lacked the sucrase enzyme entirely? Write down your thoughts in your notes.

**Modify Concept Map: Homeostasis**

Return to your initial concept map. Now that you have completed this module, can you add to the concept map? Can you explain the action of enzymes in promoting homeostasis?

**Task 211.3.2-01-06 Performance Task**

Complete the PowerPhys experiment “Enzyme Activity” and submit the report in Taskstream for the following task:

- Human Physiology: Task 211.3.2-01-06

For details about this performance assessment, see the "Assessment" tab in this course.

*Note: Once you begin the laboratory report in PowerPhys, you cannot return to the information or data-collection sections, or you will lose your data and answers in the report. Save your completed report as a PDF, review the rubric for the task, and submit it through Taskstream.*

**Fluid Balance**

The activities associated with this subject will introduce you to concepts related to hydration, fluid balance, and oxygenation.

**Fluid Balance**

Mountain climbers often face Acute Mountain Sickness (AMS), which results from a lack of oxygen to the brain. The optimum oxygen saturation needed for life is 98-99%, but did you know
that the Himalayan sherpas can function well with oxygenation levels that are dramatically lower? These facts indicate that, although there is a need for proper oxygenation, the optimum levels can vary based on adaptation. Fluid balance goes hand in hand with oxygenation, as low circulation of fluid caused by dehydration can reduce oxygen flow to various parts of the body.

This topic addresses the following competency:

- **Competency 211.3.3: Fluid Balance**
  The graduate determines the effect of given levels of hydration on urine output, explains factors affecting urine output, and explains how diabetes affects the need for fluid intake.

**Initial Concept Map: Fluid Balance**

Make a concept map on everything you know or think you know about fluid balance and imbalance. Think about what happens when there is imbalance. Make as many connections between body systems and processes as possible.

**Fluid, Electrolyte, and Acid-Base Balance**

Read the following in *Essentials of Human Anatomy and Physiology*:

- chapter 15 ("The Urinary System")

Answer the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?" Review material if you cannot answer the questions.

Click on the chapter summary section and read the summary of the above section. Continue to the end-of-chapter questions and answer questions 4-8, 12, and 17-20. Review material whenever you are unable to answer a question with confidence.

Go to the Human Physiology Message Board and discuss pertinent insights with your peers.

**Daily Urine Production**

Given your new knowledge of the influence of fluid intake on urine formation, what do you think happens when a person becomes overhydrated? Who do you think is most vulnerable to overhydration?

For more information, visit the following web page and read about overhydration:

- Merck Manual's "Overhydration"

**Modify Concept Map: Fluid Balance**

Go back to your initial concept map and add or modify it. Be sure you can include the following terms and show connections between these terms:

- urine production
- urine output
- urine osmolarity
- water loading
- ADH
- plasma osmolarity

Task 211.3.3-01-05 Performance Task

Complete the PowerPhys experiment “Influence of Fluid Intake on Urine Formation” and submit the report in Taskstream for the following task:

- Human Physiology: Task 211.3.3-01-05

For details about this performance assessment, see the "Assessment" tab in this course.

Note: Once you begin the laboratory report in PowerPhys, you cannot return to the information or data-collection sections, or you will lose your data and answers in the report. Save your completed report as a PDF, review the rubric for the task, and submit it through Taskstream.

Oxygenation

This subject will delve into the concept of oxygenation and how cells use oxygen.

Oxygenation

The optimum oxygen saturation needed for life is 98-99%, but the optimum levels can vary based on adaptation.

This topic addresses the following competency:

- Competency 211.3.4: Oxygenation
  The graduate measures properties of ventilation and gas exchange, can discuss the role of gas pressure and pH on ventilation, calculates measure of effective heart functioning, recognizes the effect of exercise on cardiac function, and discusses how cardiac and pulmonary function maintain states of homeostasis in oxygenation.

Initial Concept Map: Oxygenation

Make a concept map on oxygenation. What systems are involved? What role does the cell play? Use your notes to document your thoughts.

Physiology of the Heart and Circulation

Read the following in Essentials of Human Anatomy and Physiology

- chapter 11 (“The Cardiovascular System”)

First try to answer all the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?" Review material if you cannot answer the questions.

Click on the chapter summary and read the entire summary section. Continue on to the end-of-chapter questions and answer questions 2-6, 15, 23, 25, 37-39, 44, 45, and 50. Review material whenever you are unable to answer a question with confidence.
Be prepared to discuss the content in the Human Physiology Message Board.

**Respiratory Physiology**

Read the following in *Essentials of Human Anatomy and Physiology*

- chapter 13 ("The Respiratory System")

First try to answer all the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?" Review material if you cannot answer the questions.

Click on the chapter summary and read the summary of the above section. Continue to the end-of-chapter questions and answer questions 15-24 and 29. Review material whenever you are unable to answer a question with confidence.

Go to the in the Human Physiology Message Board and discuss pertinent insights with your peers

**Cardiac Output**

Given your new knowledge about cardiac output, explain to a friend or family member why urine output is a good indicator of cardiac output given normal kidney function.

**Respiratory Volume**

Given your new knowledge about respiratory volume, do you feel that pregnant women living at a high altitude would have a different respiratory volume than pregnant women living at sea level? Conduct a search on the Internet to learn more about this if necessary. Be sure you can explain it to a friend or family member.

**Modify Concept Map: Oxygenation**

Go back to your initial concept map on oxygenation. Be sure you can accurately include the following terms:

- heart rate
- stroke volume
- cardiac cycle
- cardiac volume
- end-diastolic volume
- end-systolic volume
- minute ventilation
- arterial partial pressure of carbon dioxide
- arterial partial pressure of oxygen
- blood pH
- tidal volume
- hypercapnia
- hypoxemia
- respiratory volumes
- respiratory capacities
• lung capacities
• lung volumes

Show interactions and causal relationships within these terms.

**Task 211.3.4-01-14 Performance Task**

Complete the three following PowerPhys experiments:

• “Effects of Exercise on Cardiac Output”
• “Regulation of Pulmonary Ventilation”
• “Respiratory Volumes”

Once you have completed the three experiments, submit the reports in Taskstream for the following task:

• Human Physiology: Task 211.3.4-01-14

For details about this performance assessment, see the "Assessment" tab in this course.

*Note: Once you begin the laboratory report in PowerPhys, you cannot return to the information or data-collection sections, or you will lose your data and answers in the report. Save your completed report as a PDF, review the rubric for the task, and submit it through Taskstream.*

**Mobility**

The activities associated with this subject will introduce you to the mechanisms of muscle movement and mobility.

**Mobility**

Approximately half the body's mass is made up of muscle. Muscle is the dominant tissue in the heart and in the walls of other hollow organs of the body. Muscle tissue has the unique ability to contract or shorten muscles. This characteristic is essential for all body movement including movement in such systems as the digestive system, the cardiovascular system, and the renal system.

This topic addresses the following competency:

• **Competency 211.3.5: Mobility**
  The graduate measures muscle stimulation, recognizes the effect of muscle fiber length and stimulus on muscle contraction, and explains how botulism affects muscle contraction.

**Initial Concept Map: Mobility**

Make a concept map of everything you now know about mobility. Include organs and systems of the body involved in mobility. Outline as many connections and causal relationships as possible.

**Anatomy of Skeletal Muscle and Skeletal Muscle Activity**
Read the following in Essentials of Human Anatomy and Physiology:

- chapter 6 ("The Muscular System")

First try to answer all the self-assessment questions offered under the arrow pointing to "DID YOU GET IT?" Review material if you cannot answer the questions.

Go to the chapter summary section and read the summary of the above section. Continue to the end-of-chapter questions and answer questions 1, 2, 14-16, 34, 35, and 37. Review material whenever you are unable to answer a question with confidence.

Go to the in the Human Physiology Message Board and discuss pertinent insights with your peers.

**Muscle Contraction**

Given your new knowledge of the mechanism of muscle contraction, use the Muscle Physiology site to draw diagrams to show the four types of muscle contractions:

- concentric
- eccentric
- isometric
- passive

Use arrows or other symbols to show action.

**Modify Concept Map: Mobility**

Go back to your original concept map. Add to or modify it. Be sure to add new terms and new relationships.

**Twitch Contractions and Summation Simulation**

Complete the PowerPhys experiment “Twitch Contractions and Summation” and submit the report in Taskstream for the followling task:

- Human Physiology: Task 211.3.5-01-06

For details about this performance assessment, see the "Assessment" tab in this course.

*Note: Once you begin the laboratory report in PowerPhys, you cannot return to the information or data-collection sections, or you will lose your data and answers in the report. Save your completed report as a PDF, review the rubric for the task, and submit it through Taskstream.*

**Final Steps**

Congratulations on completing the activities in this course! This course has prepared you to complete the assessment associated with this course. If you have not already been directed to complete the assessment, schedule and complete your assessment now.