

Bio Body Systems Big Ideas

- What is cell specialization
- What are levels of structure (cell, tissue, organ, organ system, organism)
- Compare worm, frog, human systems
- Function of organs such as: spleen, gallbladder, heart
- Main function of systems: endocrine, excretory, reproductive, integumentary, digestive, circulatory, skeletal, muscular
- What is homeostasis and why is it necessary
- Positive and negative feedback loops
- Processes in breathing: signals, diffusion, alveoli, capillaries
- Pulmonary circulation, pulmonary vein - carries O₂-rich
- Red v. white blood cells
- Immune system: first defenses, memory cells, HIV
- Joint types & functions

Chapter	Subject	Key Sections	
28	Homeostasis	2,3	pink
29	Nervous Endocrine	2,6	salmon
30	Cardiovascular (circulatory) Pulmonary (respiratory)	2,3,5	yellow (2 pages)
31	Immune	2,3	green
32	Digestive Excretory	2,4	blue
33	Skeletal (Muscular) (Integumentary)	1	white

7 pages total

Spleen: Healthline

The **spleen** is the organ that is responsible for both the storage and purification of red blood cells. It is positioned in the left upper abdomen, and is the largest organ of the lymphatic system.

The spleen serves a critical role in immune function because it purifies the blood and helps the immune system to recognize and attack foreign pathogens and allergens.

Gall Bladder: Healthline

The **gallbladder** is a pear-shaped, hollow structure located under the liver and on the right side of the abdomen. Its primary function is to store and concentrate bile, a yellow-brown digestive enzyme produced by the liver. The gallbladder is part of the biliary tract.

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Section 3: Interactions Among Systems

Study Guide B

KEY CONCEPT
Systems interact to maintain homeostasis.

VOCABULARY
thermoregulation

MAIN IDEA: Each organ affects other organ systems.

1. The organs in the body work together like members of a pit crew servicing a race car. What other analogies can you think of to illustrate organ systems working together?
school! principal in charge, cafeteria supplies food, custodians clean up, teachers teach, students learn...
2. Fill in the table below to explain what each organ does to help produce vitamin D in your body.

Organ	Function
Skin	absorb UV, make inactive vitamin D
Liver	convert inactive D → intermediate
Kidneys	convert intermediate → active vit. D

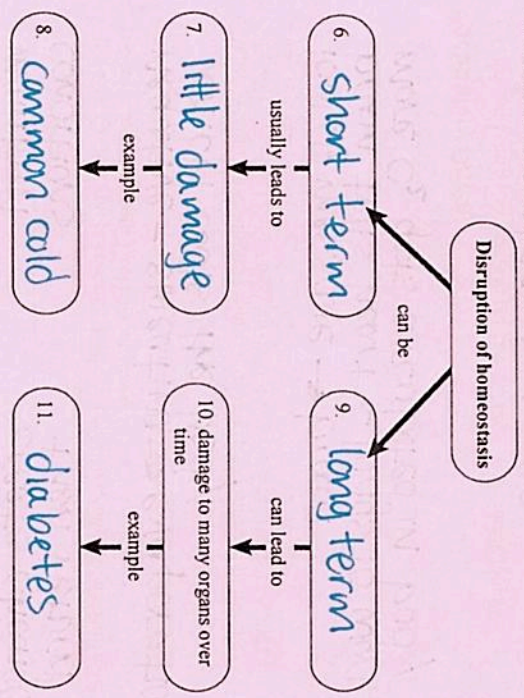
3. What role does the hypothalamus play to help regulate body temperature?
brain gets signal about change in temp, sends signals through nerves & endocrine & activates circulatory, sweat/shiver, heart & breathing rates

- MAIN IDEA: A disruption of homeostasis can be harmful.
4. List three reasons why homeostasis in the body might be disrupted.
sensors/messages don't work properly, injuries overwhelm system, germs disrupt system

Study Guide B continued

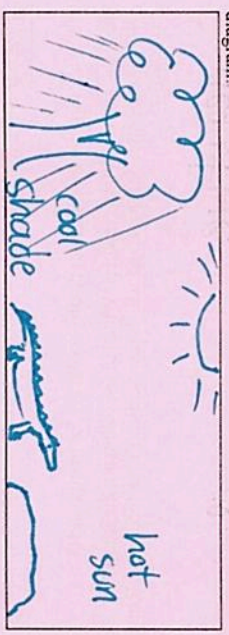
5. Why is a long-term disruption of homeostasis usually more serious than a short-term disruption?
there is more damage done to more systems, it is harder to repair

Fill in the concept map to help you remember what you know about long-term and short-term disruption of homeostasis.



Vocabulary Check

11. Think of a diagram that might illustrate the term thermoregulation for someone unfamiliar with the word. Use the space below to sketch your diagram.



Key info from 28-1
 cells → tissues → organs → organ systems → organism

Ch 28 Name Key

Section 2: Mechanisms of Homeostasis

Study Guide B

KEY CONCEPT

Homeostasis is the regulation and maintenance of the internal environment.

VOCABULARY

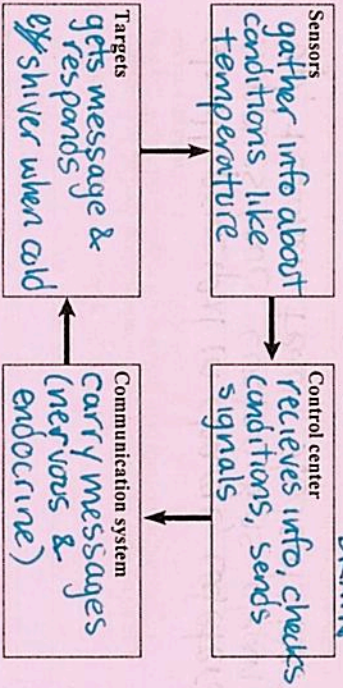
homeostasis	negative feedback
feedback	positive feedback

MAIN IDEA: Conditions within the body must remain within a narrow range.

1. Give two reasons why it is so important that the internal environment of the body remains stable.

- enzymes need specific conditions to function
 - we need very specific mineral levels
 of calcium, potassium

2. Homeostasis is maintained by control systems. Fill in the name and function of the parts of the control system in the cycle diagram below.



3. What might happen if a target organ cannot respond?

homeostasis will fail
 organism may die!

Study Guide B continued

MAIN IDEA: Negative feedback loops are necessary for homeostasis.

4. Study the following line drawings. Which of the following diagrams represents negative feedback and which represents positive feedback? Explain your answer.



maintain conditions
 create change, then return

5. It's a hot day and you're sweating. Is this response an example of a positive or negative feedback loop? Explain your answer.

negative - sweating → evaporation, which cools the body

6. When you run, your muscles require more oxygen as their level of activity increases. Explain briefly how your control systems act to bring more oxygen into your body.

low O₂ message → brain
 brain tells heart & lungs to work harder
 more O₂ gets circulated in body

Vocabulary Check

7. What is the difference between positive and negative feedback loops?

neg: counteract change
 pos: increase change to get result

8. Think of an analogy that would illustrate the process of feedback for someone who does not know what the word means.

drivers use wheel, pedals to keep car at a constant speed & direction

Section 2: Neurons

Study Guide B

KEY CONCEPT

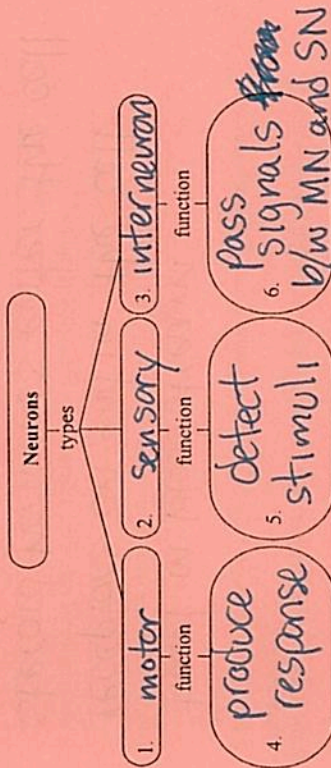
The nervous system is composed of highly specialized cells.

VOCABULARY

neuron	action potential
dendrite	synapse
axon	terminal
resting potential	neurotransmitter
sodium-potassium pump	

MAIN IDEA: Neurons are highly specialized cells.

Use the concept map to organize your notes on neurons.



7. What is the difference between the function of an axon and a dendrite?

dendrites receive impulses
axons transmit impulses

Study Guide B continued

MAIN IDEA: Neurons receive and transmit signals.

8. What is the role of the sodium-potassium pump?

it moves ions to maintain Na^+ and K^+ concentrations
write additional details about what is happening in each of your drawings.

9. Draw a picture to match each of the captions in the table. In the third column, write additional details about what is happening in each of your drawings.

Caption	Drawing	Description
The neuron is stimulated and Na^+ ions flow into the axon.		
The action potential travels down the axon as more Na^+ ions enter and K^+ ions leave.		
Neurotransmitters enter the synapse and bind to receptors on another neuron, stimulating Na^+ ions to enter that cell.		

see pg 822

10. What happens after neurotransmitters bind to the other neuron's receptors?

an action potential is generated

Vocabulary Check

neurotransmitter i. the molecule that transmits a signal from one neuron to another

synapse 12. a gap between neurons

terminal 13. end of an axon

action potential 14. moving electrical impulse

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Holt McDougal Biology

Study Guide B

Study Guide B

KEY CONCEPT

The endocrine system produces hormones that affect growth, development, and homeostasis.

VOCABULARY

hormone	hypothalamus	releasing hormone
gland	pituitary gland	

MAIN IDEA: Hormones influence a cell's activities by entering the cell or binding to its membrane.

1. How do hormones get from the gland that produced them to the cells they will affect?

travel in bloodstream

2. What determines whether or not a hormone will affect a cell?

receptors on and in the cell

3. How are steroid hormones different from nonsteroid hormones?

steroid hormones enter the cell

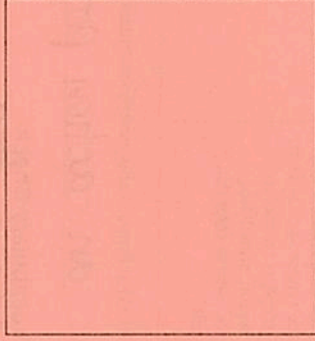
MAIN IDEA: Endocrine glands secrete hormones that act throughout the body.

Use the text and Figure 6.3 to fill in the chart.

Gland	Location	Secretes Hormones that Control
4. hypothalamus	<u>brain</u>	<u>growth, repr. maturity</u>
5. pituitary	<u>brain</u>	<u>growth, water balance in blood</u>
6. thyroid	<u>neck</u>	<u>metabolism, growth, and development</u>
7. thymus	<u>chest</u>	<u>white blood cells</u>
8. adrenal glands	<u>by kidneys</u>	<u>blood pressure, breathing rate, fight-or-flight response</u>
9. pancreas	<u>by intestines</u>	<u>digestion and glucose metabolism</u>
10. gonads	<u>pelvis</u>	<u>reproductive dev., function</u>

MAIN IDEA: The hypothalamus interacts with the nervous system and endocrine system.

Draw the diagram of a hormone feedback loop found under this Main Idea within the Section 6 text, and answer the following questions.



11. Which of the hormones in your diagram are releasing hormones?

TRH TSH

12. What stimulates the hypothalamus to stop producing TRH?

rise in body temp

13. Explain why the thyroid gland will stop producing thyroxine when the body warms.

TRH and TSH are no longer released

MAIN IDEA: Hormonal imbalances can cause severe illness.

14. How do hormone imbalances cause illness in many different body systems?

they are distributed through the body in the blood

Vocabulary Check

For each term, write a clue that helps you to remember the word's definition.

15. Hormone

chemical signal

16. Pituitary gland

helps w/ growth

17. Hypothalamus

helps w/ growth

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Key

Name _____ Class _____ Date _____

Section 2: Respiration and Gas Exchange

Study Guide B

KEY CONCEPT

The respiratory system exchanges oxygen and carbon dioxide.

VOCABULARY

red blood cell	emphysema
hemoglobin	asthma

MAIN IDEA: Gas exchange occurs in the alveoli of the lungs.

1. What are the three principles of gas exchange?

O₂ and CO₂ carried by blood, gases move by diffusion, alveoli must be moist to help diffusion

2. What is the advantage of having so many clusters of alveoli in the lungs?

MORE SURFACE AREA!

Fill in diagram A about oxygen diffusion and diagram B about carbon dioxide diffusion. Add arrows to show the direction in which the gases move.

A

Alveolus
O₂ concentrations are higher than in the capillary.

Capillary and alveolus walls
O₂ diffuses from alveolus to capillary

Capillary
O₂ binds to hemoglobin in blood, carried to cells

O₂

B

Alveolus
CO₂ and H₂O separate, are exhaled

Capillary and alveolus walls
CO₂ and H₂O diffuse from cap. to alveolus

Capillary
CO₂ and water vapor concentrations are higher than in alveolus.

CO₂

Name _____ Class _____ Date _____

Study Guide B continued

3. What is the function of hemoglobin in red blood cells?

one hemoglobin binds with four oxygen molecules

4. When CO₂ levels in the blood increase, how does the nervous system respond?

sensors send info to brain, which tells diaphragm (& lungs) to work harder

MAIN IDEA: Respiratory diseases interfere with gas exchange.

5. In the chart below, summarize how each activity or disease affects the lungs' ability to exchange gases.

Activity or Disease	Effect on Lungs
smoking	chemicals → mutations → cancer
emphysema	damaged alveoli → lungs fail
asthma	airways restrict, people gasp for air
cystic fibrosis	mucus in lungs → blockage, infections

Vocabulary Check

6. Asthma comes from the Greek word *asthma*, which means "to pant." How does this meaning relate to the definition of *asthma*?

people with asthma pant or gasp for air during an attack

7. What is the definition of *hemoglobin*? Why does it give blood its reddish color?

it's an iron-based protein that binds with O₂
*red like Mars, has oxidized iron!

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Key

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Section 3: The Heart and Circulation Study Guide B

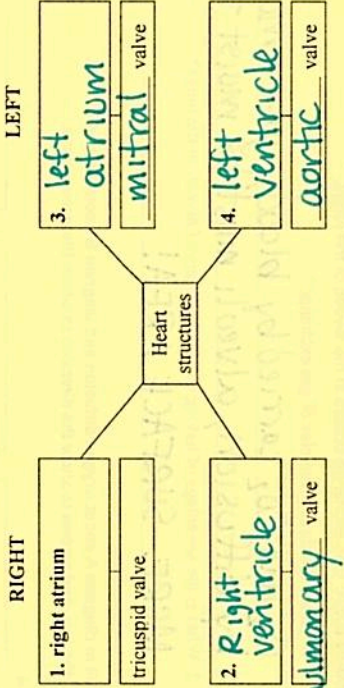
KEY CONCEPT

The heart is a muscular pump that moves the blood through two pathways.

VOCABULARY

atrium	pacemaker
ventricle	pulmonary circulation
valve	systemic circulation

MAIN IDEA: The tissues and structures of the heart make it an efficient pump. Fill in the pattern notes with the main chambers and valves of the heart. Use Figure 3.1 to help you.



5. Explain what makes the heart such an efficient, self-regulating pump.

works continuously, valves prevent backflow, muscle exerts strong force on small volume, speed & force can change as needed

6. After the SA node stimulates the atria to contract, what happens next in the heartbeat cycle?

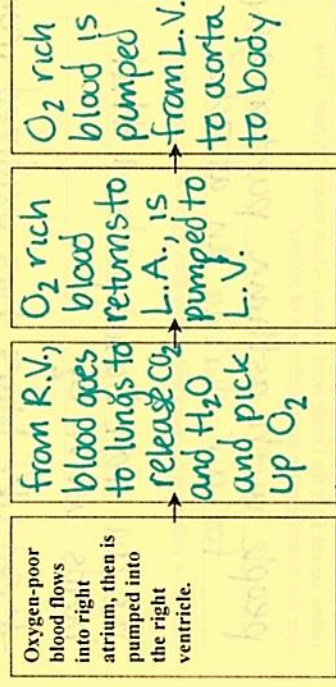
signal spreads to AV node, which stimulates ventricles to contract

atrioventricular
smooth

Name _____ Class _____ Date _____

Study Guide B continued

Fill in the process diagram below to summarize the blood flow in the heart.



GAS EXCHANGE

MAIN IDEA: The heart pumps blood through two main pathways.

7. What are the main functions of the pulmonary circulation and the systemic circulation?

pulm.: carry blood to lungs to dump CO2 & H2O then pick up O2

systemic: carry O2 rich blood to body & O2 poor blood back

Vocabulary Check

8. An atrium in a building is the first room or area that people enter before going into the rest of the building. How does this meaning relate to the location and function of an atrium in the heart?

blood enters the atrium first

9. Systemic means "related to an entire system," while pulmonary is based on the Latin *pulmo*, which means "lung." Make up a table or draw a diagram using these clues to help you remember the difference between pulmonary and systemic circulations.



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Key

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Section 5: Blood

Study Guide B

KEY CONCEPT

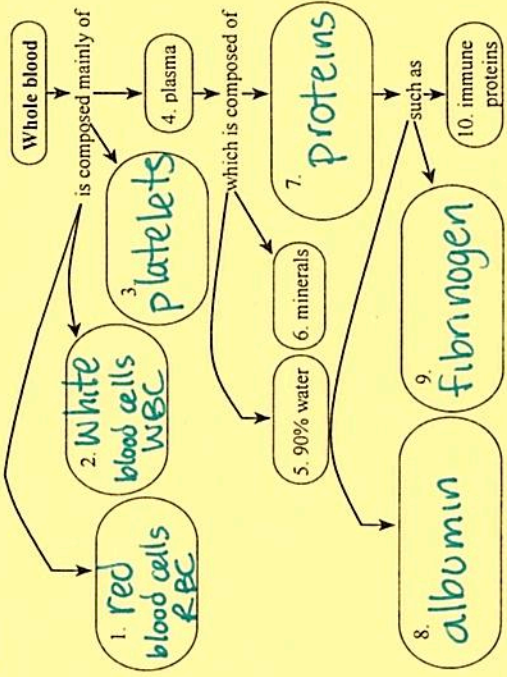
Blood is a complex tissue that transports materials.

VOCABULARY

platelet	ABO blood group	white blood cells
plasma	Rh factor	

MAIN IDEA: Blood is composed mainly of cells, cell fragments, and plasma.

Complete the following concept web to help you remember the components in blood.



11. Summarize how plasma proteins and the water in plasma help to maintain homeostasis in the body.

Help stabilize blood volume
control bleeding, fight pathogens,

Name _____ Class _____ Date _____

Study Guide B continued

MAIN IDEA: Platelets and different types of cells have different functions.

12. Complete the chart below to describe the structures and functions of blood cells and platelets.

Blood Component	Structure	Functions
Red blood cells	round & concave, no nucleus, has hemoglobin & marles	transport O ₂ , nutrients, waste
White blood cells	round & rough, no hemoglobin	fight infection, remove waste
Platelets	cell fragments, can change shape	patch torn blood vessels to stop bleeding

groceries & garbage

defense

repairs

* immune

13. Why is it important for a person to receive a blood type and Rh factor that is compatible with his or her own blood?

their immune system would attack foreign protein
AB - accept any type O - donate to any type

14. Describe two ways that platelets act to help heal a torn or injured blood vessel.

form spiky extensions to block hole,
release clotting factors to form net to repair hole

15. In what way can clots and the inability to form clots be life-threatening?

clots in arteries can block blood to brain, heart
without clots, could bleed to death

Vocabulary Check

16. What does the term ABO blood group stand for?

people have type A, B, AB, or O blood

17. To keep from getting plasma and platelet confused, remember that the suffix -let means "small." A platelet is a small part of a cell. Draw and label a sketch of a platelet and plasma to help you remember the difference between these two terms.



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Key

Section 2: Immune System Study Guide B

KEY CONCEPT

The immune system consists of organs, cells, and molecules that fight infections.

VOCABULARY

immune system	B cell	passive immunity
phagocyte	antibody	active immunity
T cell	interferon	

MAIN IDEA: Many body systems protect you from pathogens.

1. What is the immune system?

protects body from infection

2. For each, describe how it helps the immune system by protecting the body from pathogens.

Tissue or Body System	How it Protects the Body from Infection
skin	<u>physical barrier to pathogens</u>
mucus membrane	<u>traps pathogens in nose or mouth</u>
circulatory system	<u>brings WBCs to infection site</u>

MAIN IDEA: Cells and proteins fight the body's infections.

3. How do basophil cells react when a pathogen enters the body?

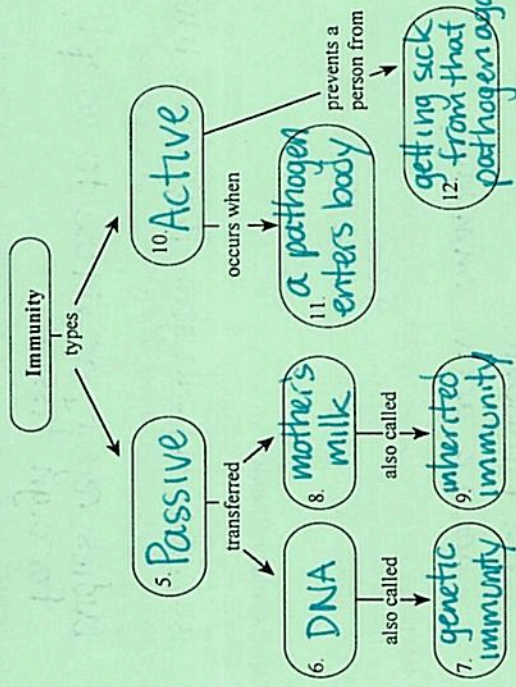
release chemicals to attract phagocytes or eosinophils

4. What are three ways that antibodies help fight infection?

1. bind to membrane proteins to disable pathogen
2. cause pathogens to clump for easier disposal
3. activate proteins to weaken pathogen membranes

Study Guide B continued

MAIN IDEA: Immunity prevents a person from getting sick from a pathogen. Fill in the blanks in the concept map to take notes on the differences between active and passive immunity.



Vocabulary Check

13. Come up with a way to remember the difference between B cells and T cells.

T cells cause infected cells to burst - terrifying!
B cells help create specific antibodies - better!

14. The word *phagocyte* comes from two Greek words: *phago-* means "to eat" and *-cyte* means cell. How can this help you remember the definition of the word *phagocyte*?

they engulf or eat other cells

15. *Interferon* is similar to the word *interference*. How can this clue help you remember what *interferon* means?

interferons get cells to block viruses

T cells terminate
B cells build

Section 3: Immune Responses
Study Guide B

KEY CONCEPT

The immune system has many responses to pathogens and foreign cells.

VOCABULARY

inflammation	memory cell	humoral immunity
antigen	cellular immunity	tissue rejection

MAIN IDEA: Many body systems work to produce nonspecific responses.

1. What is the difference between a specific immune response and a nonspecific immune response?

specific - unique to pathogen
nonspecific - same for all pathogens

In the table, write the characteristics of each of the nonspecific immune responses. Then, in the third column, explain how this nonspecific response helps the immune system to fight off infections.

Nonspecific Response	Characteristics	How it Helps the Immune System
2. inflammation	redness, itching, swelling, etc	leaky blood vessels deliver WBCs
3. fever	increased body temp	WBCs mature faster

MAIN IDEA: Cells of the immune system produce specific responses.

4. How does the immune system know if a foreign particle has infected the body?

detects antigens (proteins on pathogens)

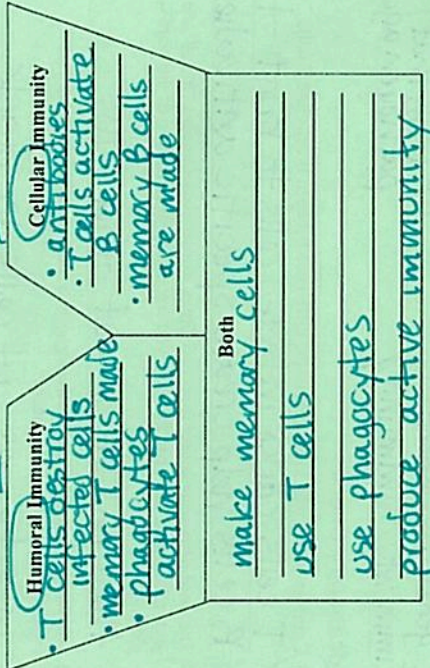
5. What is the role of memory cells in providing acquired immunity?

respond quickly if a pathogen invades a second time

ATTENTION!

Study Guide B continued

Using Figures 3.3 and 3.4, write the differences for each type of immunity on the right or left side of the Y diagram below. Then, write the similarities on the bottom of the Y.



MAIN IDEA: The immune system rejects foreign tissues.

6. Donors and recipients should have few differing antigens.
7. An organ recipient takes drugs that weaken the immune system.

Vocabulary Check

8. What do *memory cells* remember?

antigen on pathogens that have invaded before

9. How does the word *rejection* help you to remember what *tissue rejection* means?

bodies reject, or refuse to accept, foreign tissue

10. The prefix *anti-* means "destroying" and, the suffix *-gen* means "something that produces or lives." How can this help you remember the definition for the word *antigen*?

antigens are proteins on a pathogen, & pathogens kill living cells

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Key

Name _____ Class _____ Date _____
Section 2: Digestive System
Study Guide B

KEY CONCEPT
The digestive system breaks down food into simpler molecules.

VOCABULARY

digestion	esophagus	chyme
digestive system	peristalsis	small intestine
sphincter	stomach	bile

MAIN IDEA: Several digestive organs work together to break down food.

1. What is the main function of digestion?
Break big complex molecules into small molecules the body can use
2. Give an example of mechanical and chemical digestion.
mech: chewing, smooth muscles churn & mix
chem: enzymes in saliva, acid in stomach, bile
3. How do smooth muscles and sphincters keep food moving in one direction throughout the digestive system?
5. muscles push food forward,
sphincters prevent backup,
4. What happens after digestion is completed?
nutrients are absorbed, sent to cells
waste is eliminated

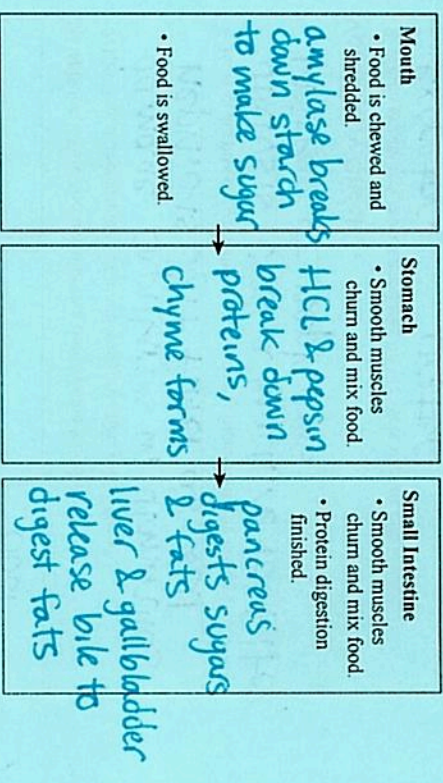
MAIN IDEA: Digestion begins in the mouth and continues in the stomach.

5. Fill in the chart below to help you remember facts about key digestive enzymes.

Enzyme	Function
salivary amylase, amylase	break starch into sugar
pepsin, peptides	break down proteins
lipase	break down fats

Name _____ Class _____ Date _____
Study Guide B continued

MAIN IDEA: Digestion is completed in part of the small intestine.
Fill in the process diagram below to summarize the digestion of food as it moves through the mouth, stomach, and small intestine. Use Figure 2.4 to help you.



6. What keeps the stomach from digesting itself?
pepsin is only active when food is present,
layer of mucus protects stomach lining

Vocabulary Check

7. The word *esophagus* is based on the Greek terms *ois-*, which refers to "carrying something," and *phagos*, which means "food." How can these Greek terms help you remember the meaning of *esophagus*?
esophagus "carries" food to stomach
8. Think of an analogy that might help you to explain the meaning of *peristalsis* to someone who does not know the word.
like squeezing toothpaste in tube
(or yogurt, or cream cheese)

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Key

1943
early dialysis

Name _____ Class _____ Date _____

Section 4: Excretory System

Study Guide B

KEY CONCEPT

The excretory system removes wastes and helps maintain homeostasis.

VOCABULARY

excretory system	urinary bladder	dialysis
kidney	nephron	
ureter	glomerulus	

MAIN IDEA: The excretory system eliminates nonsolid wastes and helps maintain homeostasis.

1. What are the main organs of the excretory system?

lungs, skin, kidneys, ureters, bladder, urethra

2. Name three ways that the excretory system eliminates nonsolid wastes:

exhalation, sweat, urine

3. What are the waste products removed by the lungs?

carbon dioxide, water vapor

MAIN IDEA: The kidneys help to maintain homeostasis by filtering the blood.

4. What are the main parts of the kidney?

cortex, medulla, NEPHRON, renal artery, renal vein

5. The kidneys release key hormones to help maintain homeostasis. In what other ways do the kidneys help to maintain homeostasis?

remove waste from blood
maintain pH, fluid, electrolyte balance

excess
remove Na, K, ammonium salts

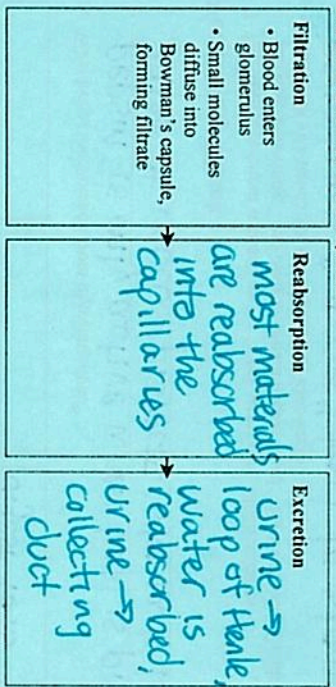
Name _____ Class _____ Date _____
Study Guide B continued

MAIN IDEA: Nephrons clean the blood and produce urine.

6. What are the main functions of the glomerulus and Bowman's capsule?

filter blood, remove smaller molecules
→ filtrate
ex urea

Fill in the process diagram to summarize the three steps in which blood is filtered and urine is formed in the nephron.



MAIN IDEA: Injury and disease can damage the kidneys.

7. How can diabetes and high blood pressure affect the kidneys?

damage capillaries in glomerulus
nephrons don't filter as well

8. How is the process of dialysis similar to the function of the kidneys?

dialysis uses a machine to filter, instead of nephrons

Vocabulary Check

9. Which vocabulary words are based on the verbs excrete and urinate?

excretory, ureter

10. Dialysis is based on the Greek word dialuein, which means "to break apart." What "breaking apart" does a dialysis machine do?

breaks apart blood into waste, useful components

95%
H₂O

ch 33

Section 1: Skeletal System

Study Guide B

Key

KEY CONCEPT

The skeletal system includes bones and tissues that are important for supporting, protecting, and moving your body.

VOCABULARY

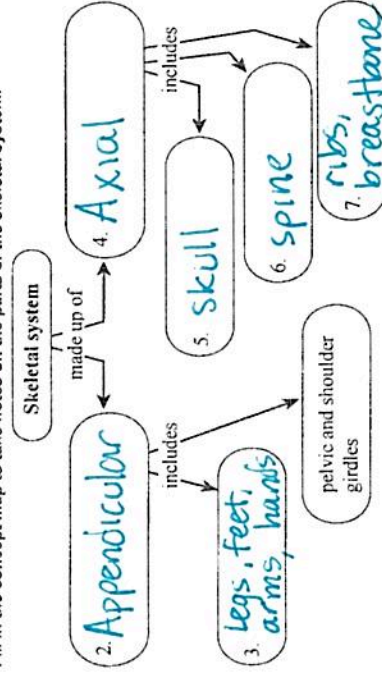
skeletal system	vertebrae	ligament
appendicular skeleton	cartilage	calcification
axial skeleton	joint	

MAIN IDEA: Your skeletal system is made up of the appendicular and axial skeletons.

1. What does the skeletal system do?

protects organs, supports body

Fill in the concept map to take notes on the parts of the skeletal system.



8. What is the function of the vertebrae?

protect spinal cord, support body's weight

9. How is cartilage different from bone?

Cartilage is flexible, protects ends of bones
bone is rigid, protects organs

Study Guide B continued

MAIN IDEA: Bones connect to form joints.

10. What is a joint?

a place where 2 bones meet

11. In what two places in the body are cartilaginous joints found?

spinal column, between ribs

12. How do ligaments work to allow synovial joints to move?

connect bones loosely to allow movement

13. What are the five types of synovial joints?

1. gliding, 2. pivot, 3. ball & socket, 4. saddle, hinge, 5. wrist

MAIN IDEA: Bones are living tissue.

14. What are the two types of bone?

compact, spongy

15. How do Haversian canals and red bone marrow link the skeletal system to the circulatory system?

H. canals transport blood in bone

Red bone marrow makes red blood cells

16. How do bones help to maintain chemical homeostasis in the body?

add or remove Ca from bones & blood

Vocabulary Check

17. The word *appendicular* shares the same root as the word *appendages*. How can this help you to remember the definition of the appendicular skeleton?

involves arms & legs (appendages)

18. The word *axial* contains the word *axis*. Knowing this, define what the axial skeleton is.

involves spine & skull (axis of body)

19. The prefix *calci-*, which means "calcium," is found in the vocabulary word *calcification*. How can this clue help you to remember the definition of *calcification*?

calcium is added to bone

20. What are two things that cartilage, joints, and ligaments all have in common?

all found between bone, help movement

