Name: Date:

**Biology Lab Activities: Human Body (Digestion and Excretion)**

*Last updated: 11/1/22*

# Background Questions

Read the [Digestive System Overview article](https://www.visiblebody.com/learn/digestive/digestive-10-facts) on the Visible Body Learn Site and explore the 3D model of the small intestine. Use what you’ve learned to answer the following questions.

1. Where does digestion begin?

1. What is a bolus?
2. Food is moved through the digestive system by way of involuntary smooth muscle contractions called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. What is chyme and where is it created?
4. Where does most nutrient absorption occur?

1. Nutrients absorbed from chyme are passed into the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Where is indigestible waste compacted?

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Lab 1: Digestive System Overview

# Activity 1: Label the key structures of the digestive system

1. Review the [Digestive System Overview article](https://www.visiblebody.com/learn/digestive/digestive-10-facts) and read the [Digestive System Glossary](https://www.visiblebody.com/learn/digestive/glossary) on the Visible Body Learn Site.

1. Label the digestive structures in the head and neck by matching the numbered labels in the image below to the list included here.
   * Explore [this 3D model of the oral cavity](https://www.visiblebody.com/learn/digestive/digestive-oral-cavity) in your browser or in AR to find the structures you need to label.
   * Fill in the blanks to label the structures from the list.

Word List

Esophagus

Oral cavity

Salivary glands

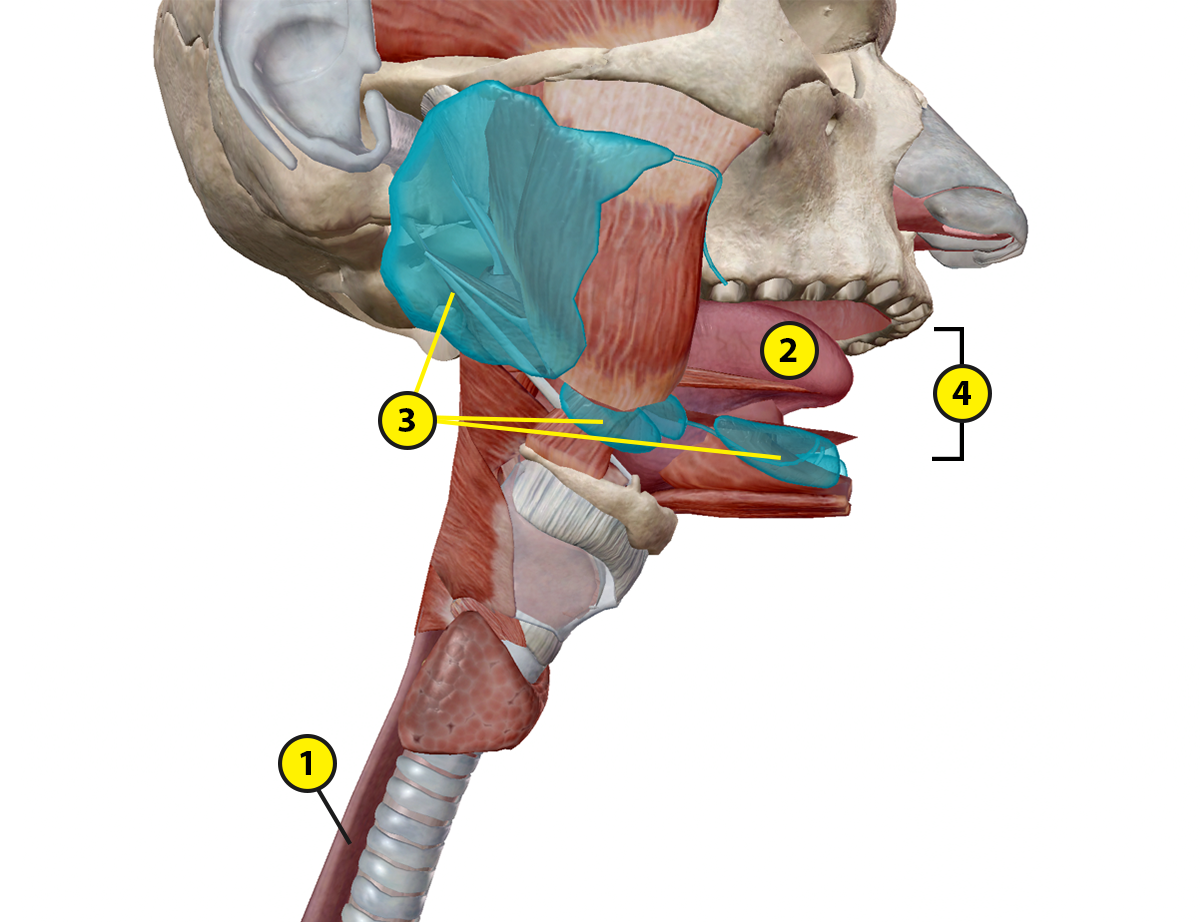
Tongue

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1. Label the digestive structures in the abdomen and pelvis by matching the numbered labels in the image below to the list included here.
   * Explore the 3D model of the lower digestive structures in your browser or in AR to find the structures you need to label.
   * Fill in the blanks to label the structures from the list.

Word List:

Anal canal

Large intestine

Rectum

Small intestine

Stomach

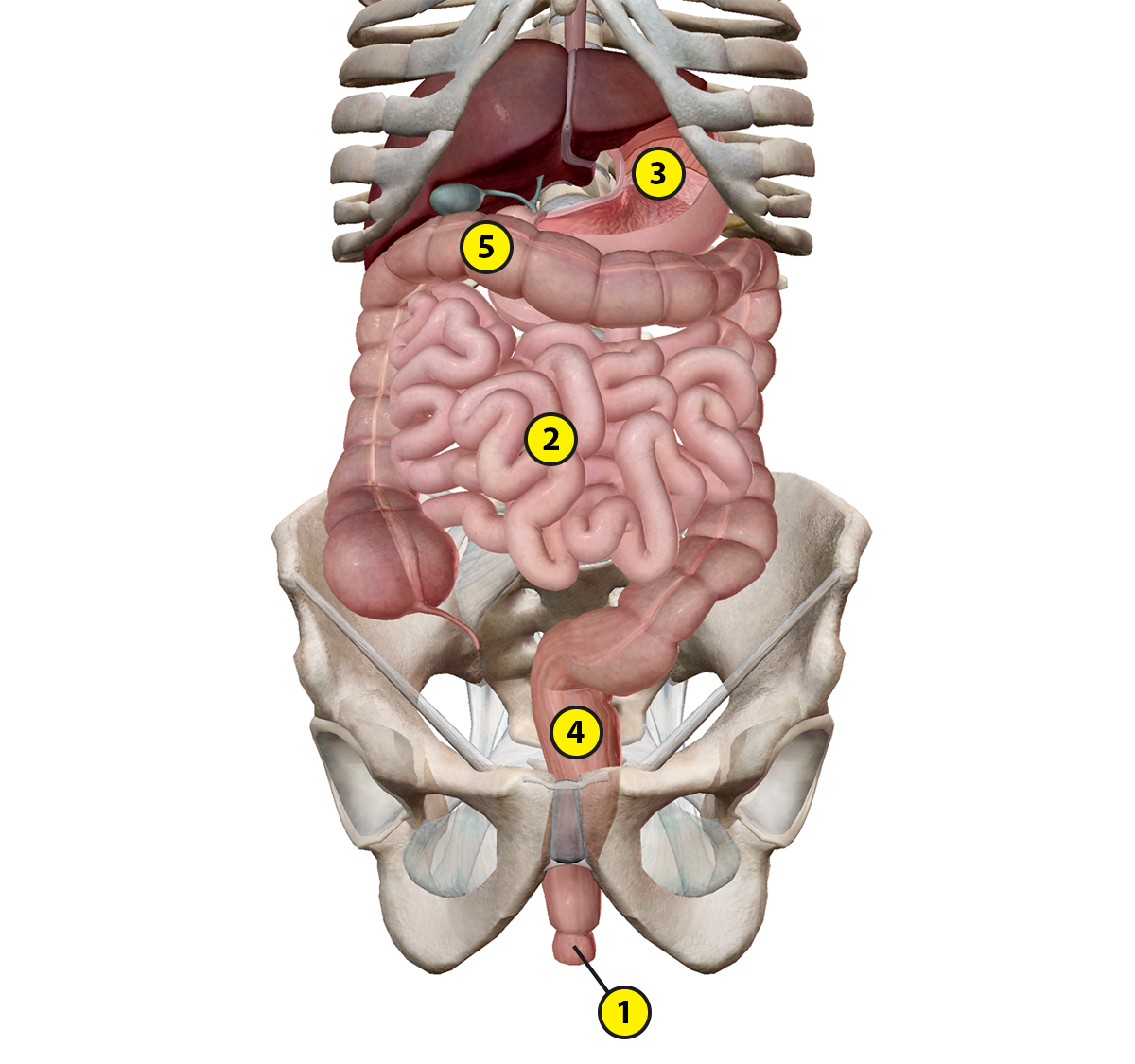
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Lab 1: Digestive System Overview

# Activity 2: Explore the functions of digestive system structures

Refer to your labeled digestive system image from Activity 1 and use what you’ve learned from the Learn Site article and glossary to match each of the following structures with its description.

Structures:

1. Anal canal
2. Epiglottis
3. Esophagus
4. Large intestine
5. Oral cavity
6. Salivary glands
7. Small intestine
8. Stomach
9. Tongue
10. Rectum

Descriptions:

\_\_\_ Structures that secrete saliva to aid in chewing and swallowing of the bolus,

beginning chemical digestion

\_\_\_ A structure that contains the teeth, tongue, and hard and soft palates

\_\_\_ A muscular organ that mixes food in the oral cavity and works with the teeth to

break down food into small masses that can be swallowed

\_\_\_ A long, hollow, muscular tube that extends from the pharynx to the stomach

\_\_\_ A structure that prevents choking by folding down to close off the larynx and

trachea, directing the bolus into the esophagus

\_\_\_ A structure that has four regions and three muscle layers, provides food storage,

and breaks down ingested food into chyme

\_\_\_ The final segment of the large intestine, which primarily stores and expels solid

waste

\_\_\_ A structure, located at the distal end of the rectum, that extends to the anus and

temporarily stores solid waste that’s ready to be eliminated from the body

\_\_\_ A structure that has three regions: the duodenum, jejunum, and ileum

\_\_\_ A structure—composed of the colon, cecum, appendix, rectum, and anal

canal—that carries out the final phases of digestion, absorption, and elimination

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Lab 2: Accessory Organs of the Digestive System

# Activity 1: Label the accessory digestive organs

1. Read the [Accessory Organs article](https://www.visiblebody.com/learn/digestive/digestive-accessory-organs) on the Visible Body Learn Site.
2. Match the numbered labels in the image below to the list included here:
   * Explore the 3D model of the liver in your browser or in AR to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List:

Common bile duct

Common hepatic duct

Cystic duct

Gallbladder

Liver

Pancreas

\_\_\_

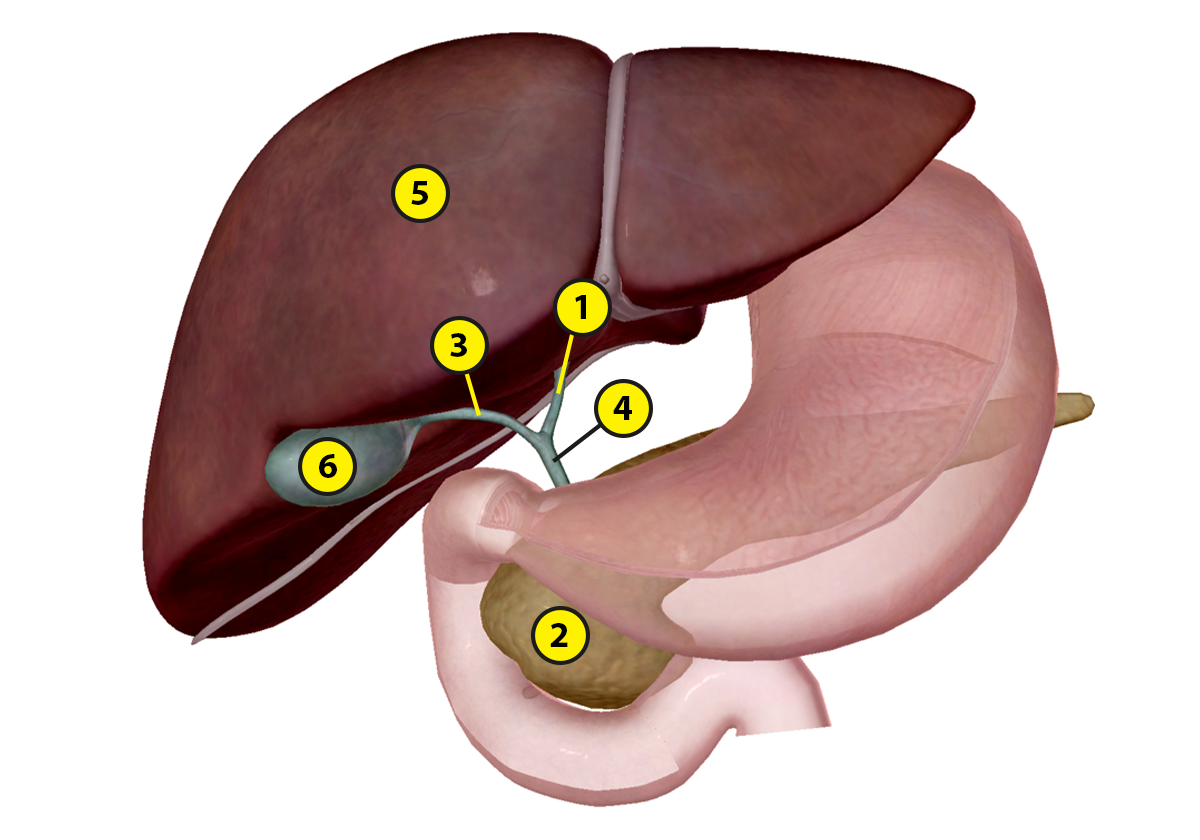
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Name: Date:

Lab 2: Accessory Organs of the Digestive System

# Activity 2: Explore the functions of the accessory digestive organs

Refer to your labeled accessory digestive organs image from Activity 1 and use what you’ve learned from the [Digestive System Glossary](https://www.visiblebody.com/learn/digestive/glossary) on the Visible Body Learn Site to answer the following questions.

1. The liver secretes \_\_\_\_\_\_\_\_ to emulsify \_\_\_\_\_\_\_\_ in the small intestine.
2. If bile is not needed immediately for digestion, it flows up the cystic duct into the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. When necessary, this organ releases bile into the duodenum of the \_\_\_\_\_\_\_\_\_ intestine.
3. What does the pancreas produce and secrete into the small intestine?
4. What is the endocrine role of the pancreas?

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Lab 3: Digestion, Absorption, and Elimination

# Activity 1: Explore how food travels through the digestive system

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1. Read the [Propulsion and Peristalsis article](https://www.visiblebody.com/learn/digestive/digestive-propulsion-and-peristalsis) on the Visible Body Learn Site and explore the 3D model of the esophagus to see how it connects the pharynx to the stomach.
2. Number the following statements, from 1 to 10, to accurately show the path food takes through the digestive system.

\_\_\_ Gastric juices, produced in the gastric gland and containing hydrochloric acid and enzymes,

digest food into chyme.

\_\_\_ Solid waste is temporarily stored in the rectum before it is passed through the anal canal.

\_\_\_ The tongue rises to the roof of the mouth, directing the bolus out of the oral cavity.

\_\_\_ Food is consumed and taken into the oral cavity.

\_\_\_ Pancreatic juice passes through the pancreatic ducts into the duodenum to aid digestion in the

small intestine.

\_\_\_ The bolus passes from the oral cavity to the pharynx and into the esophagus.

\_\_\_ Chyme travels through the small intestine, where nutrients are absorbed into the bloodstream.

\_\_\_ Food is chewed and mixed with saliva secreted by the salivary glands to break it down into a

small mass called the bolus.

\_\_\_ Chyme travels through the large intestine, where water and specific vitamins are absorbed and

the remaining waste materials pass to the rectum.

\_\_\_ Peristaltic waves move the bolus down the esophagus into the stomach.

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Lab 3: Digestion, Absorption, and Elimination

# Activity 2: Simulate digestion

*Adapted from Explorit Science Center’s Science Assembly Program at the University of California, Davis*

## Introduction:

In this lab, you will mimic the stages of digestion, using the supplies provided. After completing each step, use the appropriate term from the word list to fill in the chart identifying what each activity item represents.

## Directions:

1. Add a sleeve of saltine crackers and 4 tablespoons of baking soda to the plastic bag and securely seal the bag.
2. Crush the saltine crackers using your knuckles.
3. Add ¼ cup of water to the bag.
4. Add ⅓ cup of vinegar to the bag.
5. Mash the contents of the bag, so the liquid mixture fully coats the crackers.
6. Insert the sponge into the plastic bag and seal it.
7. Move the cracker mixture around to coat the sponge until the water is absorbed.
8. Remove the sponge and air from the plastic bag.
9. Seal the bag and roll it from the bottom to the top.
10. Hold the rolled up bag over the trash can.
11. Cut one end of the bag and squeeze the contents into the trash can.

Word List:

Bolus

Chyme

Food

Saliva

Small and large intestines

Stomach acid

## Table 1

| Activity Items | Gastrointestinal Structure/Object |
| --- | --- |
| Crackers |  |
| Water |  |
| Vinegar |  |
| Crackers mixed with water |  |
| Crackers mixed with vinegar |  |
| Sponge |  |

## Discussion Questions:

Use what you’ve learned from Activities 1 and 2, as well as the [Propulsion and Peristalsis article](https://www.visiblebody.com/learn/digestive/digestive-propulsion-and-peristalsis) on the Visible Body Learn Site, to answer the following questions.

1. What step in Activity 2 represents mechanical digestion? Explain why.
2. What step in Activity 2 represents chemical digestion? Explain why.
3. What is the role of saliva in digestion?
4. What is the role of stomach acid in digestion?
5. Inflammatory bowel diseases, such as Crohn’s disease and ulcerative colitis (UC), involve chronic inflammation of the small and large intestines.
   1. Which stage or stages of digestion would be affected by these conditions?
   2. How would you modify the activity you just did to model this?
6. Which element of the gastrointestinal system would cause irritation of the esophagus in GERD (gastroesophageal reflux disease)?

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Lab 3: Digestion, Absorption, and Elimination

# Activity 3: Explore the structures involved in absorption and elimination

Read the [Absorption and Elimination article](https://www.visiblebody.com/learn/digestive/digestive-absorption-and-elimination) on the Visible Body Learn Site and explore the 3D model of the large intestine. Use what you’ve learned to complete the following activities.

1. The small intestine is where most nutrient absorption takes place. \_\_\_\_\_\_\_\_\_ that line the walls of the small intestine absorb nutrients into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the circulatory system and \_\_\_\_\_\_\_\_\_\_\_\_ of the lymphatic system.
2. The large intestine, also called the \_\_\_\_\_\_\_\_\_, compacts liquid waste into solid waste, called \_\_\_\_\_\_\_\_\_.
3. Number the following structures, from 1 to 7, to accurately show the path waste takes through the large intestine.

\_\_\_ Ascending colon

\_\_\_ Anal canal

\_\_\_ Cecum

\_\_\_ Descending colon

\_\_\_ Rectum

\_\_\_ Sigmoid colon

\_\_\_ Transverse colon

1. In a process called \_\_\_\_\_\_\_\_\_\_\_\_\_\_, the body expels waste products from digestion through the rectum and anus. This reflex is mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_, controlled by the autonomic nervous system, but the somatic nervous system helps control the timing of elimination.

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Lab 4: Urinary System Overview

# Activity 1: Explore urinary system structures

Read the [Urinary System Structures article](https://www.visiblebody.com/learn/urinary/urinary-system-structures) and the [Urinary System Glossary](https://www.visiblebody.com/learn/urinary/glossary) on the Visible Body Learn Site. Use what you’ve learned to answer the following questions.

1. The main role of the urinary system is to filter \_\_\_\_\_\_\_\_\_ and remove \_\_\_\_\_\_\_\_\_ from the body.
2. Urine is produced in the \_\_\_\_\_\_\_\_\_\_\_ and stored in the \_\_\_\_\_\_\_\_\_\_\_. Which structure does the urine pass through to get from the kidneys to the bladder?
3. What structure allows urine to be excreted from the bladder out of the body?

1. One of the principal differences between the male and female urinary system is the structure of the urethra. The female urethra is about 4 cm long, extending from the bladder neck to the external urethral orifice in the vestibule of the vagina. The male urethra is \_\_\_\_\_\_\_\_\_\_ than the female urethra. It is divided into \_\_\_\_\_\_\_\_\_ sections as it extends from the bladder neck through the prostate and the penis to the urethral orifice.

Name: Date:

Lab 4: Urinary System Overview

# Activity 2: Compare female and male urinary anatomy

As you learned in Activity 1, the size and position of lower urinary structures varies with male and female anatomy. The position and size of the kidneys and ureters is essentially the same across the male and female urinary systems.

1. Label the female urinary system structures by matching the numbered labels in the image below to the list included here:
   * Explore the female urinary anatomy images in the [Urinary System Glossary](https://www.visiblebody.com/learn/urinary/glossary) on the Visible Body Learn Site to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List:

Bladder

Kidney

Renal artery

Renal vein

Ureter

Urethra

\_\_\_

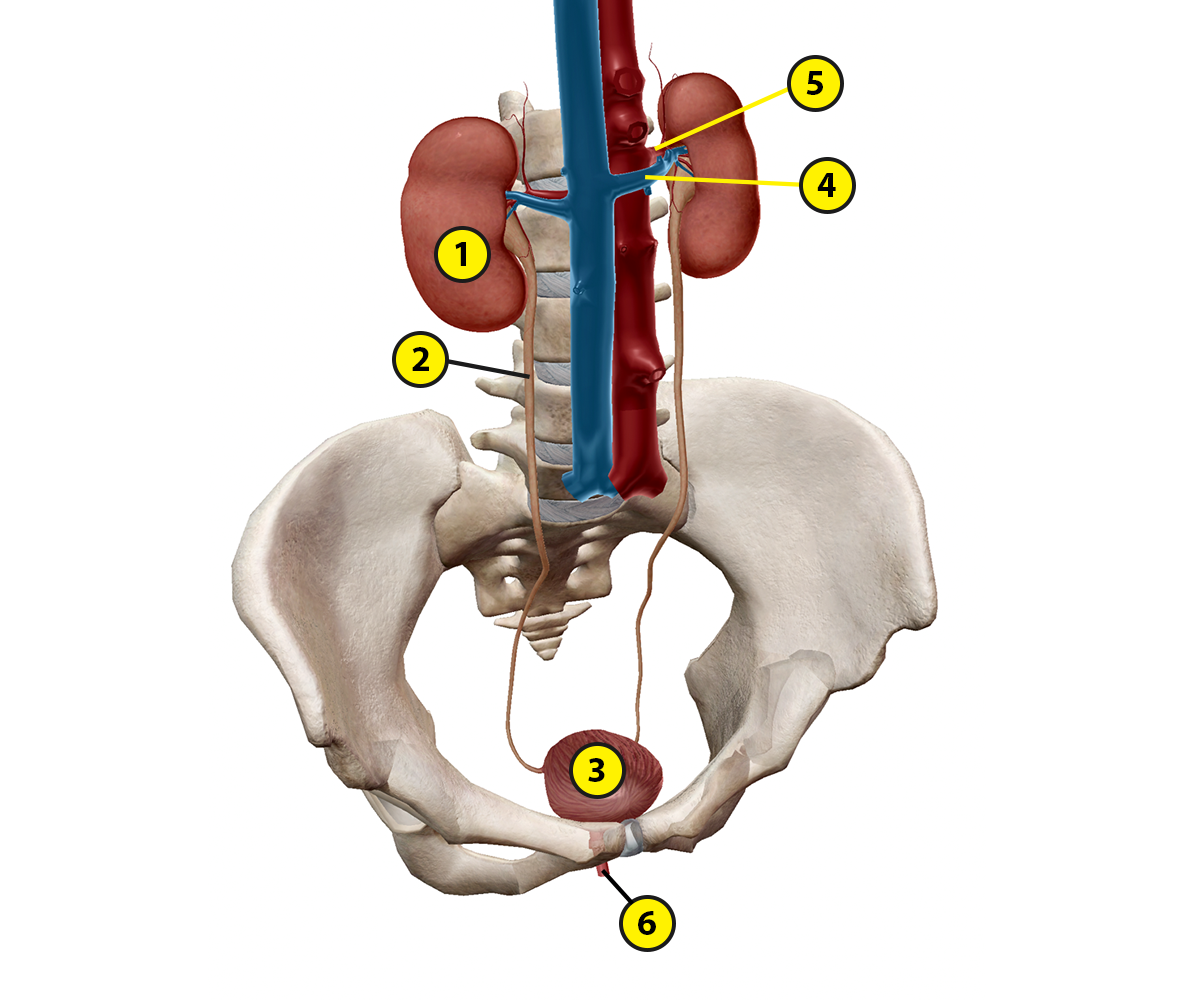
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1. Label the male urinary system structures by matching the numbered labels in the image below to the list included here:
   * Explore the 3D model of the male urethra on the [Urinary System Structures](https://www.visiblebody.com/learn/urinary/urinary-system-structures) page of the Visible Body Learn Site to find the structures you need to label.
   * Fill in the blanks to label the structures from the list below.

Word List:

Bladder

Membranous urethra

Prostate

Prostatic urethra

Spongy urethra

Ureter

\_\_\_

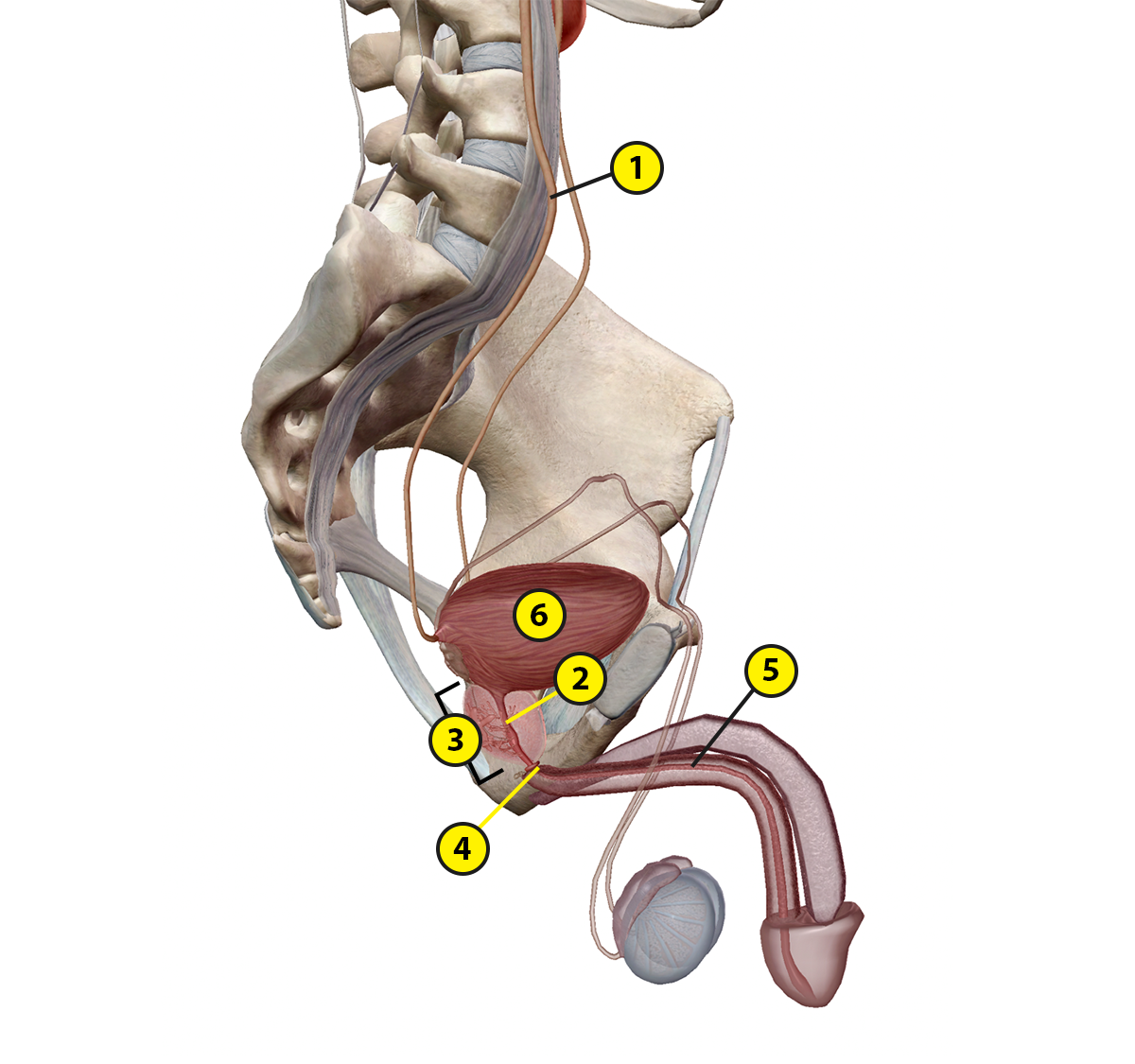
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Lab 5: Urine Creation, Storage, and Elimination

# Activity 1: Explore the three stages of urine creation that occur in the kidneys

Read the [Urine Creation article](https://www.visiblebody.com/learn/urinary/urine-creation) on the Visible Body Learn Site and use what you’ve learned to answer the following questions.

1. The kidneys filter unwanted substances from the blood and produce urine to excrete them. What are the three main steps of urine formation?
2. Complete the following sentences about the three main steps of urine formation.
   1. Each kidney contains over 1 million tiny structures called \_\_\_\_\_\_\_\_\_\_. Each of these structures contains a glomerulus, the site of blood filtration. \_\_\_\_\_\_\_\_\_ and small solutes are filtered out of the blood during this step of urine formation.
   2. Within the glomerulus, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ keeps blood cells and large proteins in the bloodstream. Fluid that has passed through this structure is called \_\_\_\_\_\_\_\_\_\_\_\_.
   3. Filtrate leaves the glomerulus and passes into the renal tubule for the second step of urine formation, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. During this step, water, essential ions, glucose, amino acids, and smaller proteins are reabsorbed into \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   4. \_\_\_\_\_\_\_\_\_\_\_\_\_, the third step of urine formation, occurs at the same time as the second step. During this step, waste ions and hydrogen ions pass from the capillaries into the renal tubule.
3. Urine is about \_\_\_\_\_% water and \_\_\_\_\_% waste products, such as urea, creatinine, ammonia, and uric acid. Ions such as sodium, potassium, hydrogen, and calcium are also excreted in urine.

Name: Date:

Lab 5: Urine Creation, Storage, and Elimination

# Activity 2: Explore the structure of the bladder and the process of micturition

Read the [Urine Storage and Elimination article](https://www.visiblebody.com/learn/urinary/urine-creation) on the Visible Body Learn Site and use what you’ve learned to answer the following questions.

1. The bladder is shaped like a \_\_\_\_\_\_\_\_\_\_\_ when it is empty.
2. Which structures allow the bladder to expand as it fills with urine?
3. What triggers the micturition reflex?
4. What involuntary muscle actions occur during micturition?
5. The \_\_\_\_\_\_\_\_\_\_\_\_ urethral sphincter has voluntary control over micturition.
6. Urinary tract infections, or UTIs, occur when bacteria enter the urethra and infect the urinary tract. (See the [CDC’s website](https://www.cdc.gov/antibiotic-use/community/for-patients/common-illnesses/uti.html) for more information about UTIs.)

Using the [Urinary System Glossary](https://www.visiblebody.com/learn/urinary/glossary) on the Visible Body Learn Site, review the differences in structure between the male and female urethra. What elements of the female urethra would increase the risk of a UTI?