

Figure-Based Approach in Creating ChatGPT-4o-Resistant Multiple-Choice Questions for Introductory Biology Courses: an Instructional Guide

Kyeng Gea Lee, Mark J Lee, Soo Jung Lee

Supplementary Material

Evaluation Summary of Figure-Based Multiple-Choice Questions Created Following the Instructional Guide

Table S1 summarizes the results of evaluation on ChatGPT-4o for the four questions that have been created following the instructional guide in the main article. The following are listed: the correct choice, the choice that ChatGPT-4o selected in each trial, the figure number in this document for the saved webpage of its response, and the ratio of correct response for each question. The results of corresponding figure evaluations are also included listing the correct identification of the labels, how ChatGPT-4o identified these, and the figure number for the saved webpage of the evaluation.

Table S1. Evaluation of Questions Created Following the Instructional Guide on ChatGPT-4o

Evaluation Item	Result Summary
Duodenum Figure (Figure 2)	- Correct Label: X - Duodenum - Evaluation Result (Fig. S1): X - Pancreas
Duodenum Question	- Correct Choice: Fourth - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S2) - Third; Trial 2 (Fig. S3) - Third; Trial 3 (Fig. S4) - Second; Trial 4 (Fig. S5) - Second - Ratio of Correct Response: 0/4
Brain Figure (Figure 3)	- Correct Labels: W - Pons; X - Medulla Oblongata; Y - Corpus Callosum; Z - Midbrain - Evaluation Result (Fig. S6): W - Medulla Oblongata; X - Pons; Y - Cerebellum; Z - Midbrain
First Brain Question	- Correct Choice: First - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S7) - Second; Trial 2 (Fig. S8) - First; Trial 3 (Fig. S9) - Fourth; Trial 4 (Fig. S10) - Second - Ratio of Correct Response: 1/4
Second Brain Question	- Correct Choice: Fourth - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial

	1 (Fig. S11) - Second; Trial 2 (Fig. S12) - Second; Trial 3 (Fig. S13) - Second; Trial 4 (Fig. S14) - Second - Ratio of Correct Response: 0/4
Heart Figure (Figure 4)	- Correct Labels: W - Right Atrium; X - Inferior Vena Cava; Y - Left Atrium; Z - Right Ventricle - Evaluation Result (Fig. S15): W - Left Atrium; X - Left Ventricle; Y - Right Atrium; Z - Right Ventricle
Heart question	- Correct Choice: Third - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S16) - First; Trial 2 (Fig. S17) - First; Trial 3 (Fig. S18) - Second; Trial 4 (Fig. S19) - Second - Ratio of Correct Response: 0/4

Evaluation Summary of Figure-Based Multiple-Choice Questions Created Without Following the Instructional Guide (Baseline Result or Negative Control)

Table S2 summarizes the trial results of evaluation on ChatGPT-4o for the three questions that have been created without following the instructional guide as described in the main article. The following are listed: the correct choice, the choice that ChatGPT-4o selected in each trial, the page number for the trial, the ratio of correct response for each question, and specific notes on question creation process that deviated from the guide.

Table S2. Evaluation of Questions Created Without Following the Method on ChatGPT-4o

Evaluation Item	Summary of Evaluation Results and Question Creation Notes
Small Intestine Question	- Correct Choice: Fourth - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S20) - Fourth; Trial 2 (Fig. S21) - Fourth; Trial 3 (Fig. S22) - Fourth; Trial 4 (Fig. S23) - Fourth - Ratio of Correct Response (Correct Count/Trial Count): 4/4 - Note: 1) The figure was produced using the same unlabeled base figure as duodenum question. 2) Step 2 (figure evaluation) was not carried out. 3) To reduce variables, the question text was kept the same as the duodenum question.
Third Brain Question	- Correct Choice: First - Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S24) - First; Trial 2 (Fig. S25) - First; Trial 3 (Fig. S26) - First; Trial 4 (Fig. S27) - First - Ratio of Correct Response (Correct Count/Trial Count): 4/4

- Note: 1) The figure was produced using the same unlabeled base image as duodenum question. 1) The placement of label letters was neither alphabetically randomized for structural and functional sequence nor were the label locations reversed. That is, step 1 strategy was not followed. 2) Step 2 (figure evaluation) was not carried out. 3) To minimize variables, the question text was kept the same as the first brain question with altered label assignments to the choices (to accommodate the changes in the label placement).

Second Heart Question

- Correct Choice: First

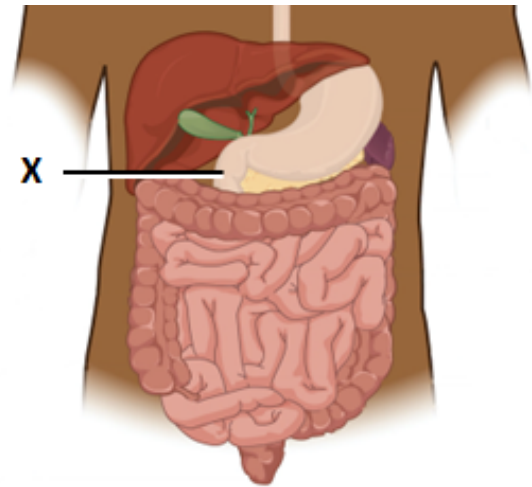
- Evaluation Result [Trial Number (Figure Number) - Selected Choice]: Trial 1 (Fig. S28) - First; Trial 2 (Fig. S29) - First; Trial 3 (Fig. S30) - First; Trial 4 (Fig. S31) - First

- Ratio of Correct Response (Correct Count/Trial Count): 4/4

- Note: 1) The placement of label letters was neither alphabetically randomized for structural and functional sequence nor were the label locations reversed. That is, step 1 strategy was not followed. 2) Step 2 (figure evaluation) was not carried out. 3) The question text is the same as the first heart question except for the fourth choice so that there are no two correct answers to the question. That is, Y --> Z --> W --> X would also be a correct answer for the second question. Therefore, it was changed to Y --> Z --> X --> W.

Note on the Copyright of the Images in This Study

The images included in this study are modifications (adaptations) of Figures 23.2, 13.12, and 19.9 in *Anatomy and Physiology 2e* by OpenStax (Betts et al., 2022; <https://openstax.org/details/books/anatomy-and-physiology-2e>). This book is licensed under the Creative Commons Attribution 4.0 International License (CC BY 4.0; <https://creativecommons.org/licenses/by/4.0/>) which permits to share (copy and redistribute the material in any medium or format for any purpose, even commercially) and to adapt (remix, transform, and build upon the material for any purpose, even commercially). Unmodified source images: Access for free at openstax.org.



What do you see in this figure?

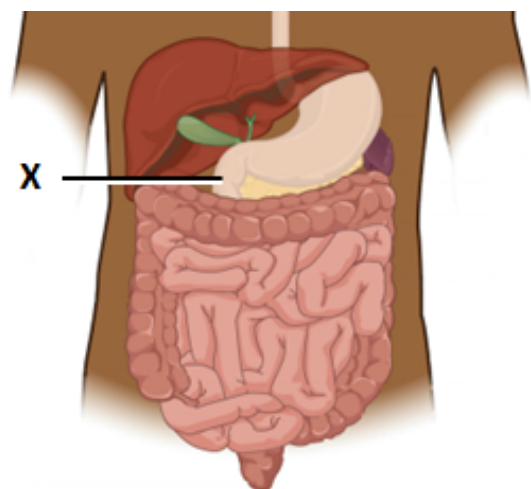


The figure shows a diagram of the human digestive system. The structures visible in the diagram include:

1. Liver (in red)
2. Stomach (below the liver)
3. Gallbladder (green, beneath the liver)
4. Pancreas (yellow, below the stomach)
5. Spleen (purple, to the left of the stomach)
6. Small intestine (long, coiled structure in the middle)
7. Large intestine (framing the small intestine)
8. Rectum (at the bottom)

The label "X" is pointing to the pancreas.



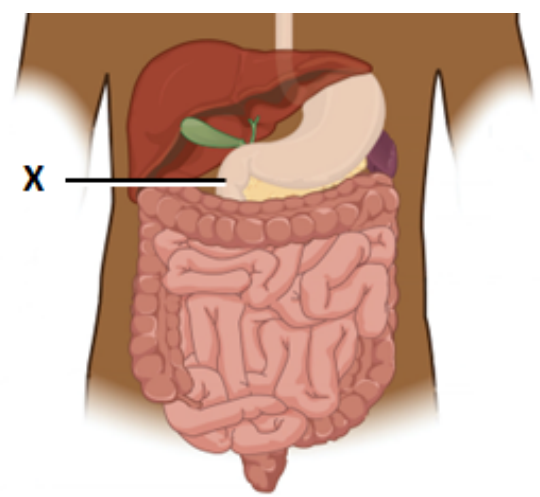


Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.

The structure labeled "X" in the figure is pointing to the pancreas.

The correct statement about the pancreas is:

- It secretes pancreatic juice for chemical digestion.

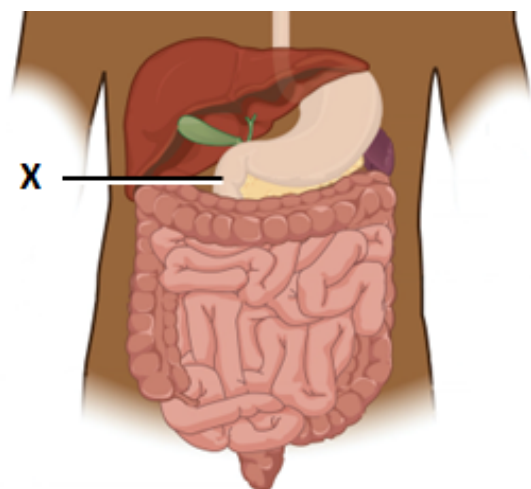


Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.

The structure labeled "X" in the image is the pancreas. Here is the correct statement about structure X:

It secretes pancreatic juice for chemical digestion.

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Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.

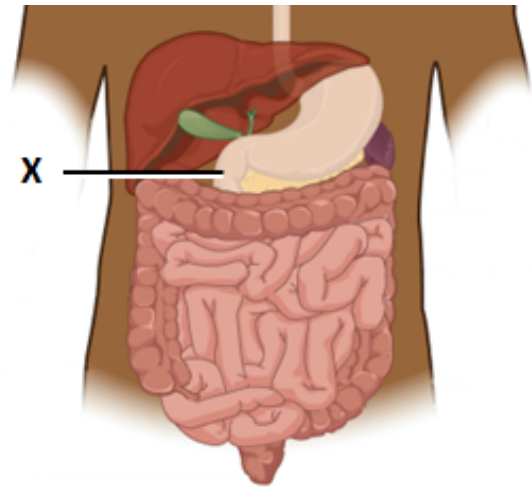


The structure labeled "X" in the figure is the stomach.

The correct statement about the stomach is:

- It secretes hydrochloric acid.





Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.

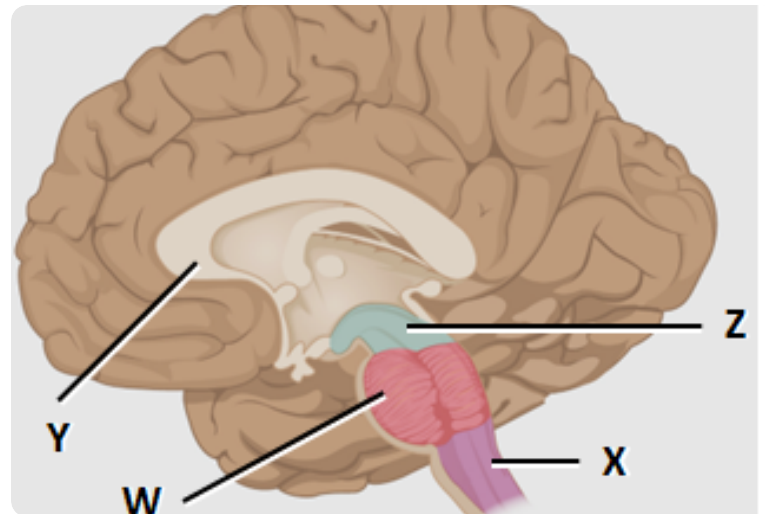


The structure labeled "X" in the figure is the stomach. The correct statement about the stomach is:

It secretes hydrochloric acid.

Hydrochloric acid is essential for the digestive process in the stomach, helping to break down food and providing an acidic environment for enzymes to function.





What do you see in this figure?



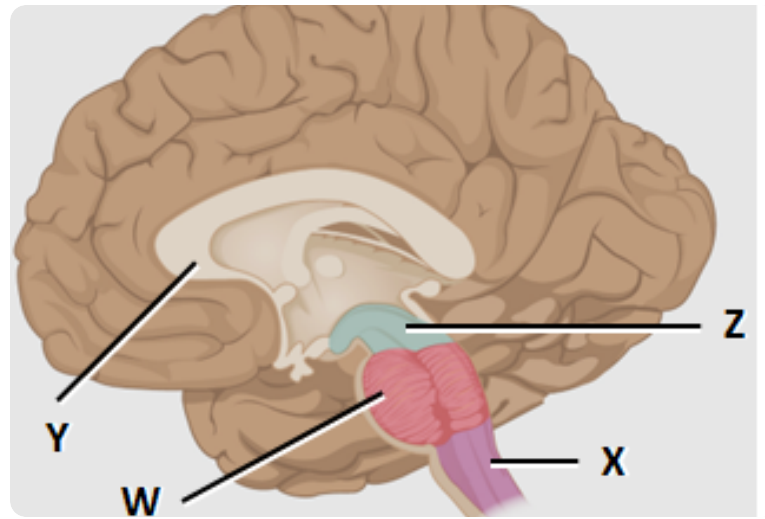
The image is a labeled diagram of the human brain showing specific parts of the brainstem and nearby structures. Here are the labels and corresponding parts:

- **W:** Medulla oblongata
- **X:** Pons
- **Y:** Cerebellum
- **Z:** Midbrain



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Which statement is correct about the labeled figure?

W is directly connected to the spinal cord.

X is the main connection between the cerebellum and the brainstem.

Y connects the cerebral hemispheres.

Z is the thalamus that relays sensory information to the cerebral cortex.



The correct statement about the labeled figure is:

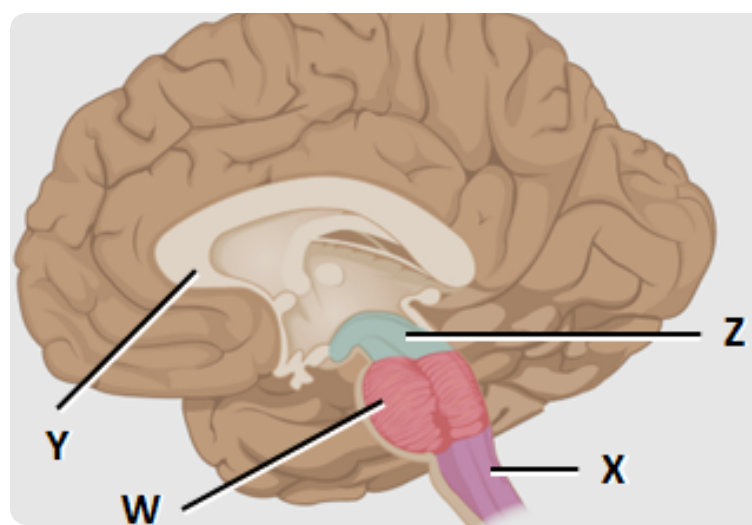
X is the main connection between the cerebellum and the brainstem.

Here's a brief explanation of the labels:

- **W:** This is the pons, which is not directly connected to the spinal cord. Instead, it relays signals between the cerebrum and the cerebellum and between the medulla and the midbrain.
- **X:** This is the cerebellar peduncle, which connects the cerebellum to the brainstem.
- **Y:** This is the corpus callosum, which connects the cerebral hemispheres.
- **Z:** This is the thalamus, which relays sensory information to the cerebral cortex.

Thus, the correct statement among the provided options is that X is the main connection between the cerebellum and the brainstem.





Which statement is correct about the labeled figure?
 W is directly connected to the spinal cord.
 X is the main connection between the cerebellum and the brainstem.
 Y connects the cerebral hemispheres.
 Z is the thalamus that relays sensory information to the cerebral cortex.

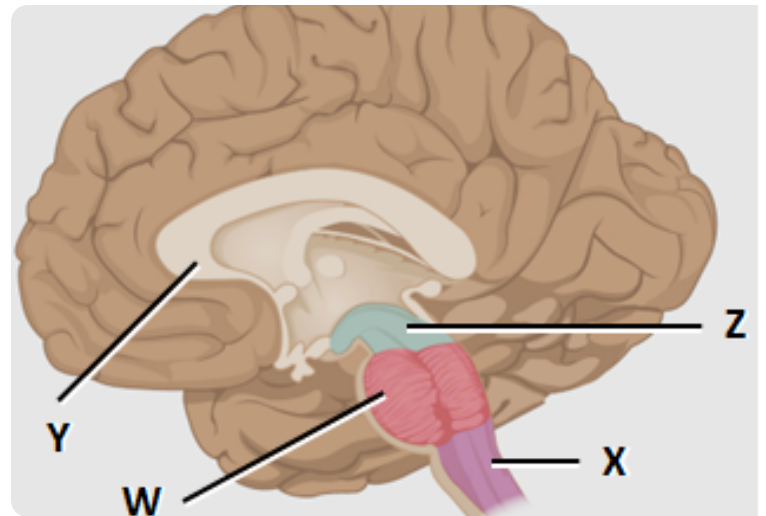
To determine which statement is correct about the labeled figure, let's analyze each label:

- **Label W:** This appears to be pointing to the pons, which is part of the brainstem. The pons is directly connected to the spinal cord through the medulla oblongata.
- **Label X:** This is pointing to the cerebellar peduncles, which connect the cerebellum to the brainstem.
- **Label Y:** This is pointing to the corpus callosum, which connects the left and right cerebral hemispheres.
- **Label Z:** This is pointing to the thalamus, which relays sensory information to the cerebral cortex.

Given this information, the correct statement is:

- **Y connects the cerebral hemispheres.**

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Which statement is correct about the labeled figure?

W is directly connected to the spinal cord.

X is the main connection between the cerebellum and the brainstem.

Y connects the cerebral hemispheres.

Z is the thalamus that relays sensory information to the cerebral cortex.



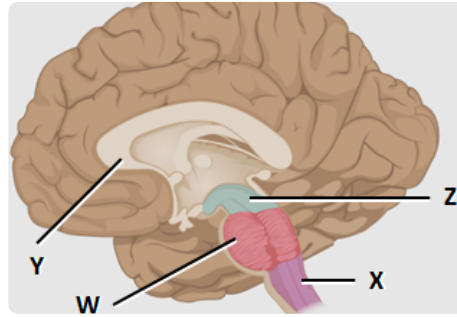
The correct statement about the labeled figure is:

Z is the thalamus that relays sensory information to the cerebral cortex.

Here is a brief description of the labels in the image:

- **W:** Corpus Callosum - connects the left and right cerebral hemispheres.
- **X:** Pons - connects the cerebellum to the brainstem.
- **Y:** Corpus Callosum - connects the cerebral hemispheres.
- **Z:** Thalamus - relays sensory information to the cerebral cortex.





Which statement is correct about the labeled figure?
 W is directly connected to the spinal cord.
 X is the main connection between the cerebellum and the brainstem.
 Y connects the cerebral hemispheres.
 Z is the thalamus that relays sensory information to the cerebral cortex.

In the labeled figure of the brain:

- W is the cerebellum.
- X is the pons.
- Y is the corpus callosum.
- Z is the thalamus.

Let's analyze the statements:

1. **W is directly connected to the spinal cord.**
 - Incorrect. The cerebellum (W) is not directly connected to the spinal cord; it communicates with the spinal cord through the brainstem structures.
2. **X is the main connection between the cerebellum and the brainstem.**
 - Correct. The pons (X) serves as a major connection between the cerebellum and the brainstem.
3. **Y connects the cerebral hemispheres.**
 - Correct. The corpus callosum (Y) is a large band of neural fibers that connects the two cerebral hemispheres.
4. **Z is the thalamus that relays sensory information to the cerebral cortex.**
 - Correct. The thalamus (Z) functions as the relay station for sensory information to the cerebral cortex.

Based on this information, the correct statements about the labeled figure are:

- X is the main connection between the cerebellum and the brainstem.
- Y connects the cerebral hemispheres.
- Z is the thalamus that relays sensory information to the cerebral cortex.



This is a multiple choice question. There should be one correct answer.

Given the options:

1. W is directly connected to the spinal cord.
2. X is the main connection between the cerebellum and the brainstem.
3. Y connects the cerebral hemispheres.
4. Z is the thalamus that relays sensory information to the cerebral cortex.

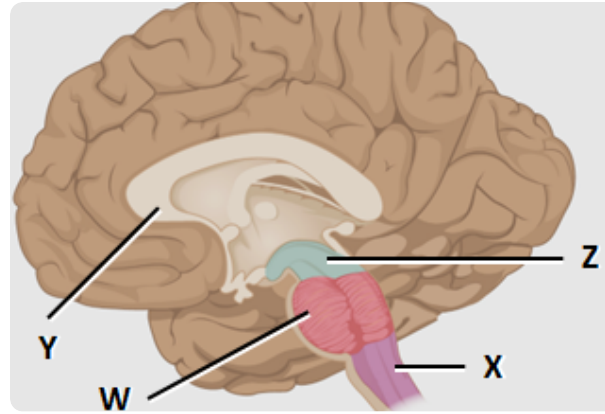
Since this is a multiple-choice question with only one correct answer, let's identify the single most accurate statement:

- W is directly connected to the spinal cord. (Incorrect)
- X is the main connection between the cerebellum and the brainstem. (Correct)
- Y connects the cerebral hemispheres. (Correct)
- Z is the thalamus that relays sensory information to the cerebral cortex. (Correct)

Since the question is designed to have only one correct answer, and "X is the main connection between the cerebellum and the brainstem" is the most directly and unambiguously correct statement in the context of the brain structures and their connections:

The correct answer is: X is the main connection between the cerebellum and the brainstem.





Which statement is correct about the labeled figure?
 W is directly connected to the spinal cord.
 X is the main connection between the cerebellum and the brainstem.
 Y is a major center for sensory-motor coordination.
 Z functions in providing visual orientation.



The labeled brain regions in the provided image correspond to the following structures:

- W is the cerebellum.
- X is the pons.
- Y is the thalamus.
- Z is the superior colliculus.

Based on these identifications:

1. W is directly connected to the spinal cord. (Incorrect, W is the cerebellum, which is not directly connected to the spinal cord.)
2. X is the main connection between the cerebellum and the brainstem. (Correct, X is the pons, which acts as a major relay between the cerebellum and the brainstem.)
3. Y is a major center for sensory-motor coordination. (Correct, Y is the thalamus, which is involved in sensory and motor signal relay and coordination.)
4. Z functions in providing visual orientation. (Correct, Z is the superior colliculus, which is involved in visual processing and orientation.)

So, the statements "X is the main connection between the cerebellum and the brainstem" and "Y is a major center for sensory-motor coordination" are correct.



This is a multiple choice question. There should be one correct answer.



Based on the identification of the labeled brain regions and their functions:

- **W (Cerebellum):** Not directly connected to the spinal cord.
- **X (Pons):** Main connection between the cerebellum and the brainstem.
- **Y (Thalamus):** Major center for sensory-motor coordination.
- **Z (Superior colliculus):** Functions in providing visual orientation.

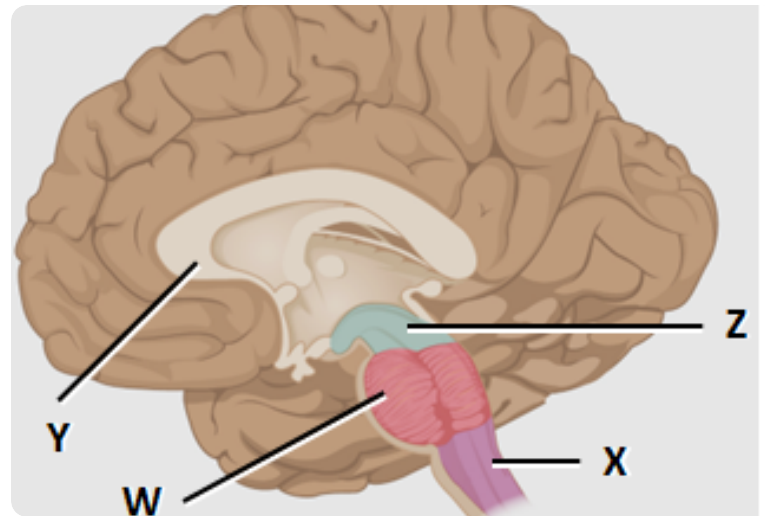
Therefore, the correct statement is:

X is the main connection between the cerebellum and the brainstem.



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Which statement is correct about the labeled figure?

W is directly connected to the spinal cord.

X is the main connection between the cerebellum and the brainstem.

Y is a major center for sensory-motor coordination.

Z functions in providing visual orientation.



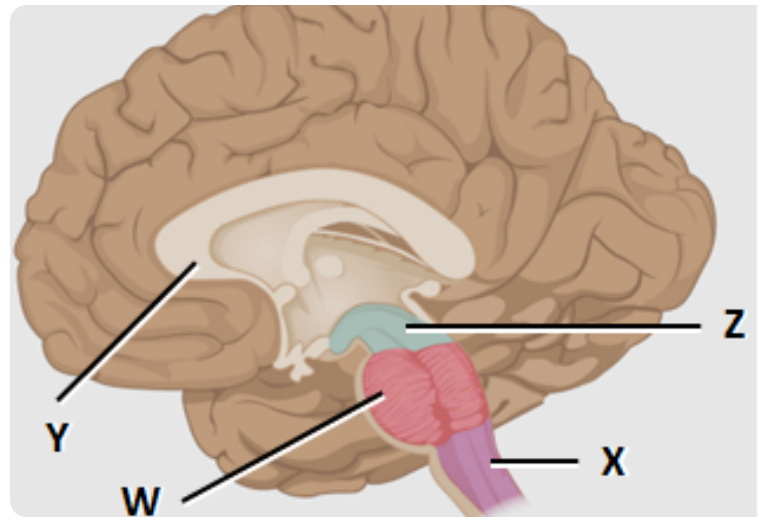
The correct statement about the labeled figure is:

X is the main connection between the cerebellum and the brainstem.

Here are the explanations for each label:

- **W:** This is the cerebellum, which is involved in motor control and coordination.
- **X:** This is the pons, which is part of the brainstem and connects the cerebellum to the brainstem.
- **Y:** This is the thalamus, which acts as a relay center for sensory and motor signals to the cerebral cortex.
- **Z:** This is the superior colliculus, which is involved in visual orientation and eye movement.





Which statement is correct about the labeled figure?

W is directly connected to the spinal cord.

X is the main connection between the cerebellum and the brainstem.

Y is a major center for sensory-motor coordination.

Z functions in providing visual orientation.



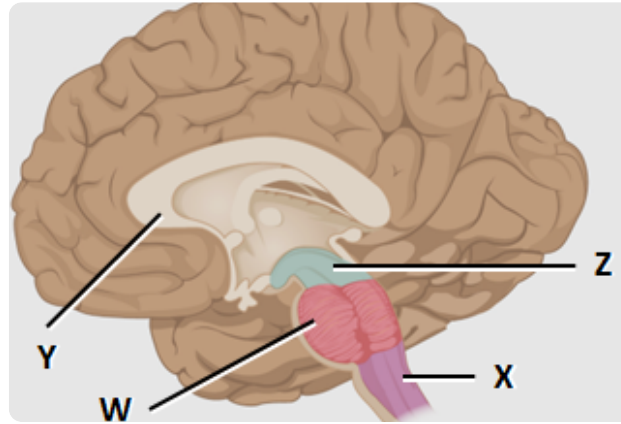
In the labeled figure of the brain:

1. **W is directly connected to the spinal cord:** This is incorrect. W is pointing to the pons, which is not directly connected to the spinal cord.
2. **X is the main connection between the cerebellum and the brainstem:** This is correct. X is pointing to the cerebellar peduncles, which connect the cerebellum to the brainstem.
3. **Y is a major center for sensory-motor coordination:** This is incorrect. Y is pointing to the thalamus, which acts as a relay station for sensory and motor signals to the cerebral cortex but is not primarily responsible for sensory-motor coordination.
4. **Z functions in providing visual orientation:** This is incorrect. Z is pointing to the midbrain, which includes structures involved in visual orientation but is not solely responsible for this function.

Therefore, the correct statement about the labeled figure is:

X is the main connection between the cerebellum and the brainstem.





Which statement is correct about the labeled figure?
 W is directly connected to the spinal cord.
 X is the main connection between the cerebellum and the brainstem.
 Y is a major center for sensory-motor coordination.
 Z functions in providing visual orientation.



To determine which statement is correct about the labeled figure, we need to identify the brain structures labeled W, X, Y, and Z.

1. **W:** The structure labeled W is the cerebellum.
2. **X:** The structure labeled X is the pons.
3. **Y:** The structure labeled Y is the thalamus.
4. **Z:** The structure labeled Z is the superior colliculus.

Now, let's analyze each statement:

1. **W is directly connected to the spinal cord.**
 - The cerebellum (W) is not directly connected to the spinal cord. It connects to the brainstem, which in turn connects to the spinal cord.
2. **X is the main connection between the cerebellum and the brainstem.**
 - The pons (X) is indeed the main connection between the cerebellum and the brainstem. This statement is correct.
3. **Y is a major center for sensory-motor coordination.**
 - The thalamus (Y) is a major relay center for sensory and motor signals to the cerebral cortex but is not primarily a center for sensory-motor coordination. This function is more closely associated with the cerebellum.
4. **Z functions in providing visual orientation.**
 - The superior colliculus (Z) is involved in visual processing and orientation, including reflexive responses to visual stimuli. This statement is correct.

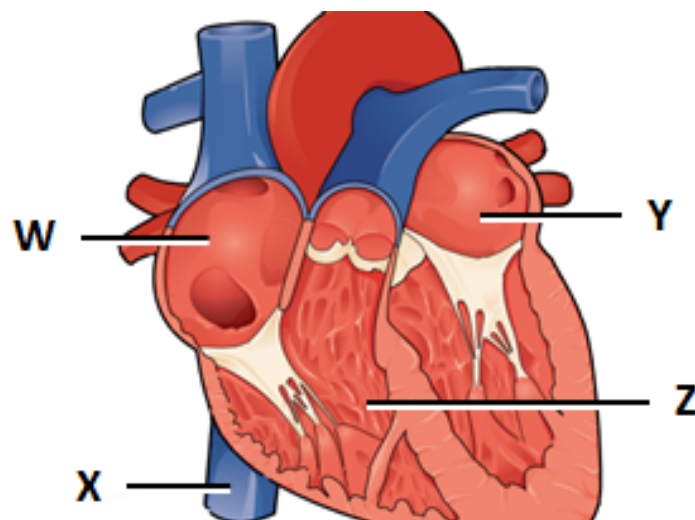
Given the analysis, two statements are correct:

- **X is the main connection between the cerebellum and the brainstem.**
- **Z functions in providing visual orientation.**

However, since the question asks for the correct statement, the primary and most directly verifiable statement is:

X is the main connection between the cerebellum and the brainstem.





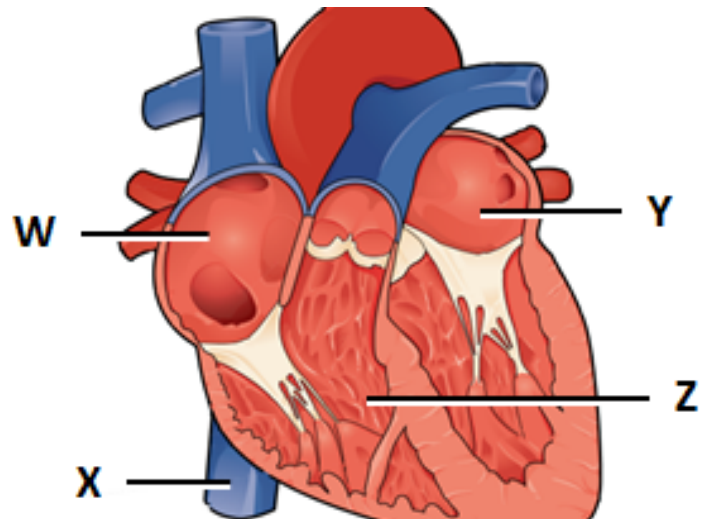
What do you see in this figure?



The figure is a diagram of the human heart, showing its internal structure and the major blood vessels associated with it. The heart is divided into four chambers and has several key parts labeled:

- **W:** Left Atrium – Receives oxygen-rich blood from the lungs through the pulmonary veins.
- **X:** Left Ventricle – Pumps oxygen-rich blood to the body through the aorta.
- **Y:** Right Atrium – Receives oxygen-poor blood from the body through the superior and inferior vena cavae.
- **Z:** Right Ventricle – Pumps oxygen-poor blood to the lungs through the pulmonary arteries.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> W --> X.



The labeled structures in the heart diagram represent different parts of the heart's anatomy. Here is the sequence of blood flow through these structures:

- **W:** Right atrium
- **X:** Right ventricle
- **Y:** Left atrium
- **Z:** Left ventricle

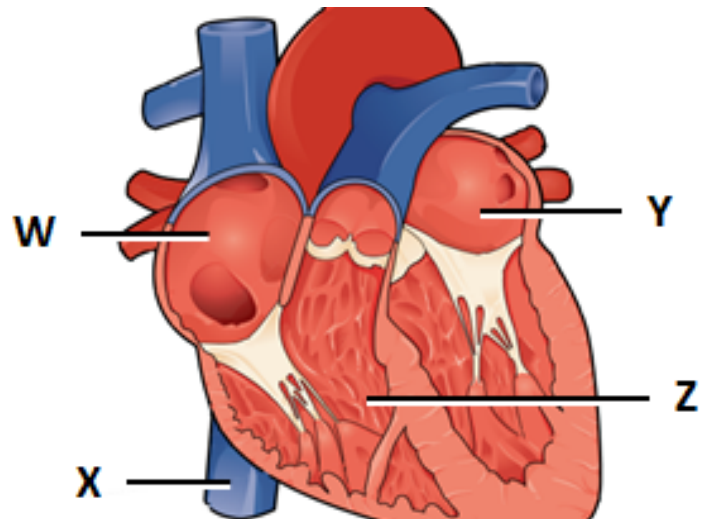
The correct sequence of blood flow through these structures is as follows:

1. Blood enters the heart through the right atrium (W).
2. It is then pumped into the right ventricle (X).
3. From the right ventricle, blood is pumped to the lungs for oxygenation and then returns to the heart, entering the left atrium (Y).
4. Finally, blood moves from the left atrium to the left ventricle (Z), from where it is pumped out to the rest of the body.

Therefore, the correct sequence is:

W --> X --> Y --> Z.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> W --> X.



The labeled structures in the image of the heart represent the following:

- W: Right atrium
- X: Right ventricle
- Y: Left atrium
- Z: Left ventricle

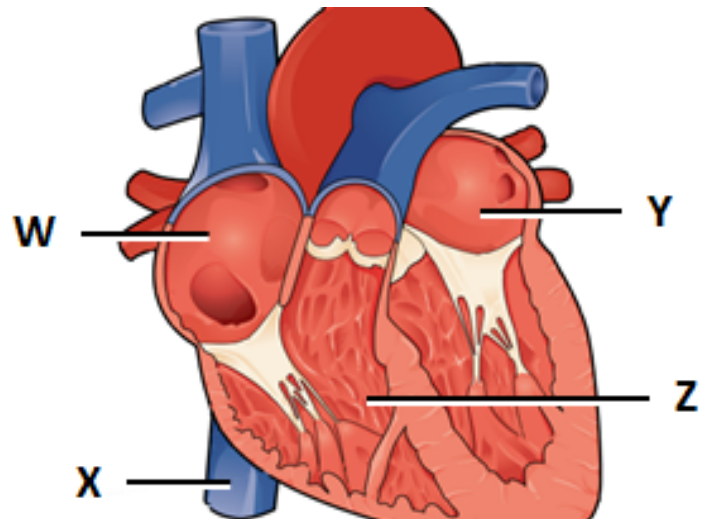
The correct sequence of blood flow through these labeled structures is:

W --> X --> Y --> Z.

Explanation:

1. Blood enters the heart through the right atrium (W).
2. It then flows into the right ventricle (X).
3. From the right ventricle, blood is pumped to the lungs to get oxygenated.
4. Oxygenated blood returns to the heart, entering the left atrium (Y).
5. Finally, it flows into the left ventricle (Z), from where it is pumped out to the rest of the body.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> W --> X.



The correct sequence of blood flow through the labeled structures in the heart diagram is:

W --> X --> Z --> Y.

Here's the breakdown:

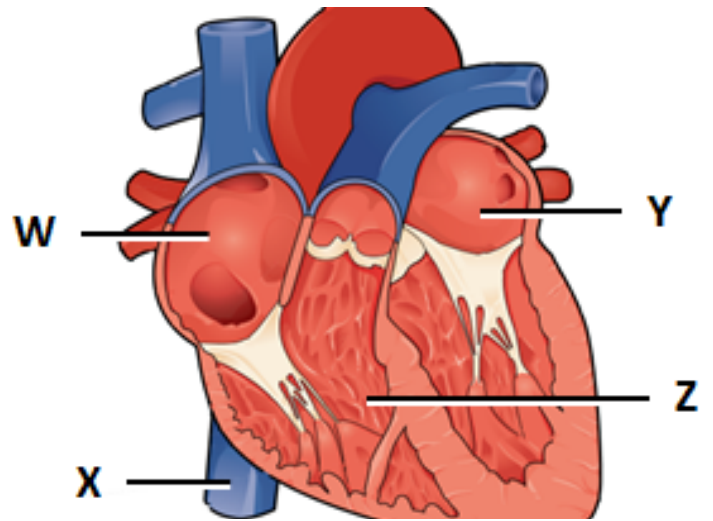
1. **W:** Right atrium
2. **X:** Right ventricle
3. **Z:** Left atrium
4. **Y:** Left ventricle

Blood flow sequence:

1. Blood enters the right atrium (W) from the body.
2. It then flows into the right ventricle (X).
3. From the right ventricle, blood is pumped to the lungs, and after oxygenation, it returns to the left atrium (Z).
4. Finally, blood moves from the left atrium into the left ventricle (Y), from where it is pumped out to the rest of the body.



Is this conversation helpful so far?



Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> W --> X.



The correct sequence of blood flow through the labeled structures in the heart is:

W --> X --> Z --> Y.

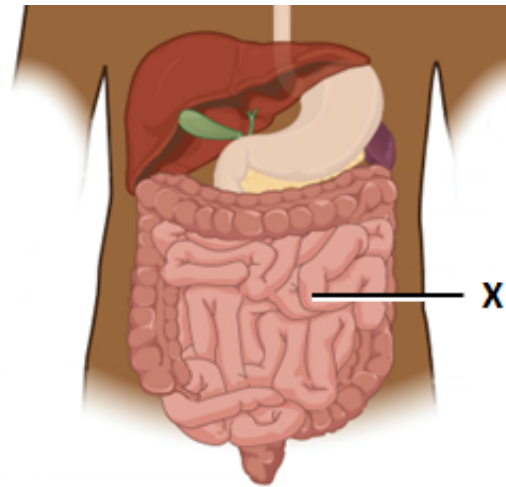
Here's the reasoning:

- W: Right Atrium (receives deoxygenated blood from the body)
- X: Right Ventricle (pumps deoxygenated blood to the lungs)
- Z: Left Atrium (receives oxygenated blood from the lungs)
- Y: Left Ventricle (pumps oxygenated blood to the body)

Thus, blood flows through the heart in the following sequence:

1. Deoxygenated blood enters the Right Atrium (W).
2. Blood moves from the Right Atrium to the Right Ventricle (X).
3. Blood is then pumped to the lungs to get oxygenated and returns to the Left Atrium (Z).
4. Finally, blood moves from the Left Atrium to the Left Ventricle (Y), from where it is pumped to the rest of the body.





Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.



The structure labeled "X" in the image you provided is a part of the small intestine. The correct statement about structure X is:

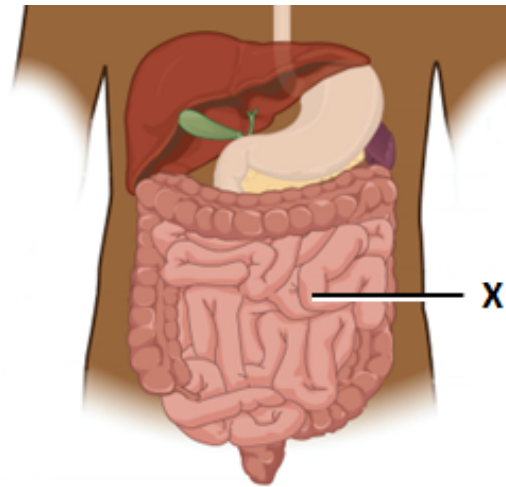
- **It's part of the alimentary canal.**

The other statements are incorrect because:

- The liver produces bile.
- The stomach secretes hydrochloric acid.
- The pancreas secretes pancreatic juice.

Thus, the small intestine is correctly identified as a part of the alimentary canal.





Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.

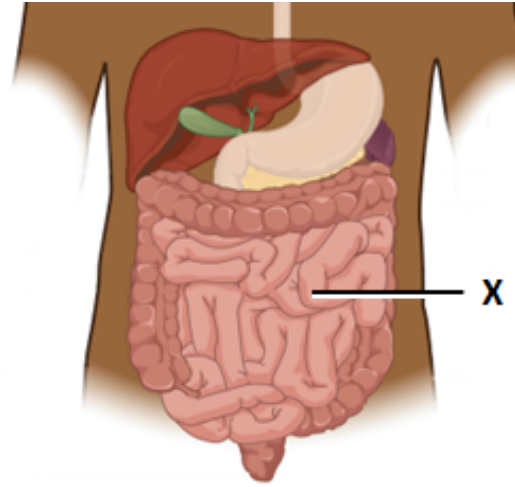


The structure labeled "X" in the image is part of the small intestine. Therefore, the correct statement about structure X is:

- **"It's part of the alimentary canal."**

The small intestine is a crucial part of the digestive system where most of the digestion and absorption of nutrients occurs. The other statements refer to functions of different organs (the liver produces bile, the stomach secretes hydrochloric acid, and the pancreas secretes pancreatic juice), so they do not apply to the small intestine.





Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.






The structure labeled "X" in the image is part of the small intestine. Among the given statements, the correct one is:

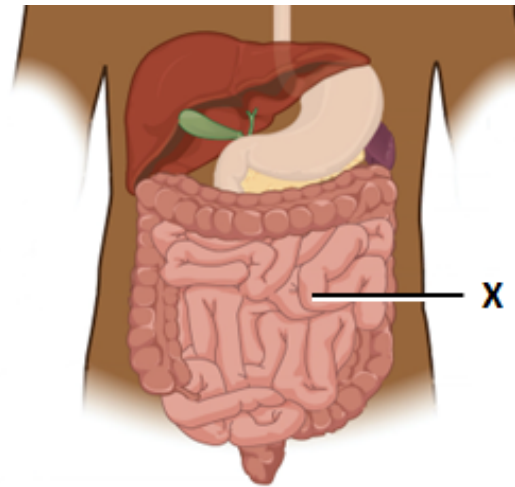
"It's part of the alimentary canal."

The small intestine is indeed part of the alimentary canal, which is the continuous tube through which food passes, including the mouth, pharynx, esophagus, stomach, small intestine, and large intestine. The other statements are incorrect because:

- The production of bile occurs in the liver, not the small intestine.
- Hydrochloric acid is secreted by the stomach, not the small intestine.
- Pancreatic juice is secreted by the pancreas, which releases it into the small intestine, but the small intestine itself does not secrete pancreatic juice.



Is this conversation helpful so far?   



Which statement is correct about structure X in the figure?
It produces bile to facilitate lipid digestion.
It secretes hydrochloric acid.
It secretes pancreatic juice for chemical digestion.
It's part of the alimentary canal.



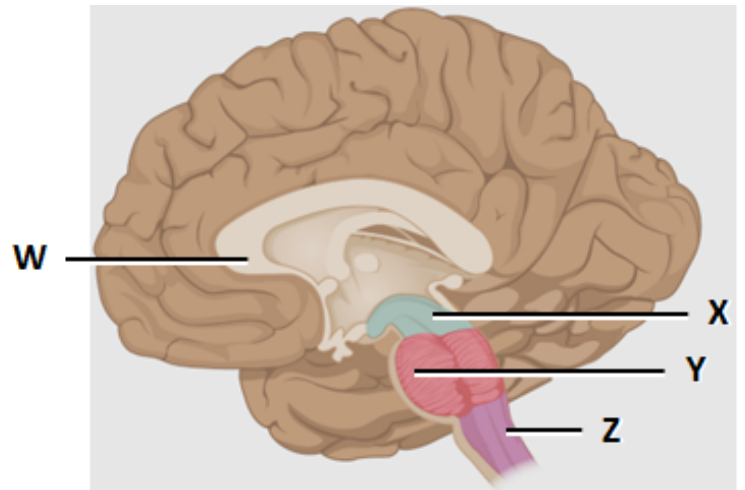
The structure labeled "X" in the image is part of the small intestine. The small intestine is part of the alimentary canal, which is responsible for digestion and absorption of nutrients. Therefore, the correct statement about structure X is:

- **It's part of the alimentary canal.**

The other statements do not apply to the small intestine:

- Bile production occurs in the liver.
- Hydrochloric acid is secreted by the stomach.
- Pancreatic juice is secreted by the pancreas, not the small intestine.





Which statement is correct about the labeled figure?
 W connects the cerebral hemispheres.
 X is the main connection between the cerebellum and the brainstem.
 Y is directly connected to the spinal cord.
 Z is the thalamus that relays sensory information to the cerebral cortex.



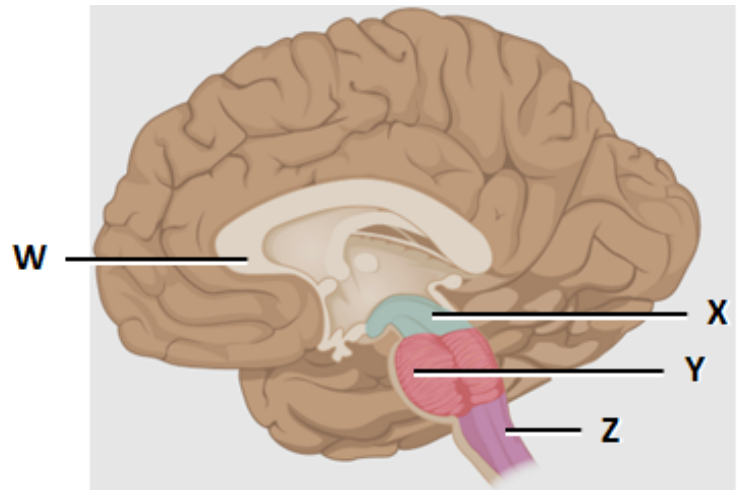
Let's analyze the labeled brain diagram:

1. **W** - This structure appears to be the **corpus callosum**, which is a large band of neural fibers connecting the two cerebral hemispheres and enabling communication between them.
2. **X** - This structure looks like the **pons**, which is a part of the brainstem. The pons acts as a major pathway for communication between the cerebellum and the brainstem.
3. **Y** - This appears to be the **medulla oblongata**, which is directly connected to the spinal cord and plays a critical role in controlling vital autonomic functions.
4. **Z** - This structure does not appear to be the thalamus. The thalamus is located more centrally in the brain and is not directly connected to the spinal cord as shown in this image. The structure labeled Z seems to be the **spinal cord** itself.

Given this analysis, the correct statement is:

W connects the cerebral hemispheres.





Which statement is correct about the labeled figure?

W connects the cerebral hemispheres.

X is the main connection between the cerebellum and the brainstem.

Y is directly connected to the spinal cord.

Z is the thalamus that relays sensory information to the cerebral cortex.



The correct statement about the labeled figure is:

- **W connects the cerebral hemispheres.**

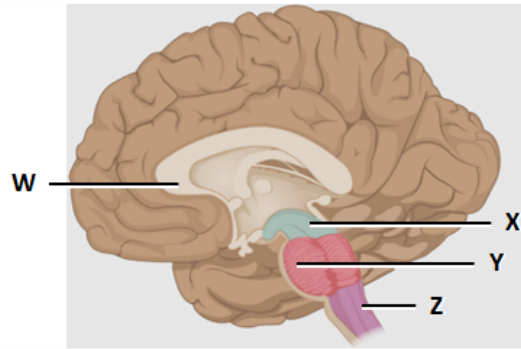
Here's a breakdown of the labels:

- **W** represents the **corpus callosum**, which connects the two cerebral hemispheres.
- **X** represents the **pons**, which is a part of the brainstem and serves as a connection between the cerebellum and the brainstem.
- **Y** represents the **medulla oblongata**, which is directly connected to the spinal cord.
- **Z** does not represent the thalamus. Instead, the thalamus is located higher in the brain.

Thus, the statement about W is the correct one.



Figure S26. The Third Brain Question (Created Without Following the Instructional Guide) - Trial 3



Which statement is correct about the labeled figure?

W connects the cerebral hemispheres.

X is the main connection between the cerebellum and the brainstem.

Y is directly connected to the spinal cord.

Z is the thalamus that relays sensory information to the cerebral cortex.



Based on the labeled diagram of the brain provided:

1. **W connects the cerebral hemispheres** - This statement is correct. W appears to be the **corpus callosum**, which is the structure that connects the two cerebral hemispheres.
2. **X is the main connection between the cerebellum and the brainstem** - This statement is correct. X appears to be the **pons**, which is the primary connection between the cerebellum and the brainstem.
3. **Y is directly connected to the spinal cord** - This statement is correct. Y appears to be the **medulla oblongata**, which is directly connected to the spinal cord.
4. **Z is the thalamus that relays sensory information to the cerebral cortex** - This statement is incorrect. Z is not the thalamus; instead, Z appears to be the **spinal cord**. The thalamus is located deeper in the brain, above the brainstem, and not as shown in Z.

Thus, the correct statements are:

- W connects the cerebral hemispheres.
- X is the main connection between the cerebellum and the brainstem.
- Y is directly connected to the spinal cord.

The incorrect statement is:

- Z is the thalamus that relays sensory information to the cerebral cortex.



This is a multiple choice question. There should be one correct answer.



Apologies for the confusion. Given that it's a multiple-choice question with only one correct answer, let's evaluate the statements again:

1. **W connects the cerebral hemispheres** - **Correct.** W is likely the corpus callosum.
2. **X is the main connection between the cerebellum and the brainstem** - **Correct.** X is likely the pons.
3. **Y is directly connected to the spinal cord** - **Correct.** Y is likely the medulla oblongata.
4. **Z is the thalamus that relays sensory information to the cerebral cortex** - **Incorrect.** Z is likely the spinal cord, not the thalamus.

Since there should be only one correct answer in a multiple-choice format, the correct answer would be the one that is undeniably correct and unique:

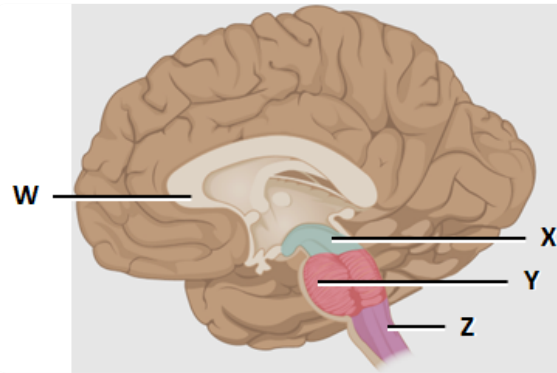
- **W connects the cerebral hemispheres.**

This is the most straightforward and unambiguous correct statement given the labeled diagram.

Therefore, **W connecting the cerebral hemispheres** is the correct answer.



Figure S27. The Third Brain Question (Created Without Following the Instructional Guide) - Trial 4



Which statement is correct about the labeled figure?

W connects the cerebral hemispheres.

X is the main connection between the cerebellum and the brainstem.

Y is directly connected to the spinal cord.

Z is the thalamus that relays sensory information to the cerebral cortex.



The labeled diagram is a sagittal section of the human brain. Let's go through each of the labeled parts to determine the correct statement:

- **W:** This structure appears to be the **corpus callosum**, which is a thick band of nerve fibers that connects the two cerebral hemispheres. The statement "W connects the cerebral hemispheres" is correct.
- **X:** This structure is likely the **pons**, which is part of the brainstem. It acts as a bridge between different parts of the nervous system, including the cerebellum and the brainstem. The statement "X is the main connection between the cerebellum and the brainstem" is also correct.
- **Y:** This structure is likely the **medulla oblongata**, which is the lower part of the brainstem and connects directly to the spinal cord. The statement "Y is directly connected to the spinal cord" is correct.
- **Z:** This structure seems to be the **cerebellum**. However, the statement says that "Z is the thalamus that relays sensory information to the cerebral cortex," which is incorrect because the thalamus is located above the brainstem, near the center of the brain, not at the position indicated by Z.

Thus, the correct statements are:

- W connects the cerebral hemispheres.
- X is the main connection between the cerebellum and the brainstem.
- Y is directly connected to the spinal cord.

The incorrect statement is:

- Z is not the thalamus; it appears to be the cerebellum.



This is a multiple choice question. There should be one correct answer.



Given that this is a multiple-choice question with one correct answer, the correct statement among the options provided is:

- **W connects the cerebral hemispheres.**

The other statements are either incorrect or do not correctly describe the labeled structures in the image.

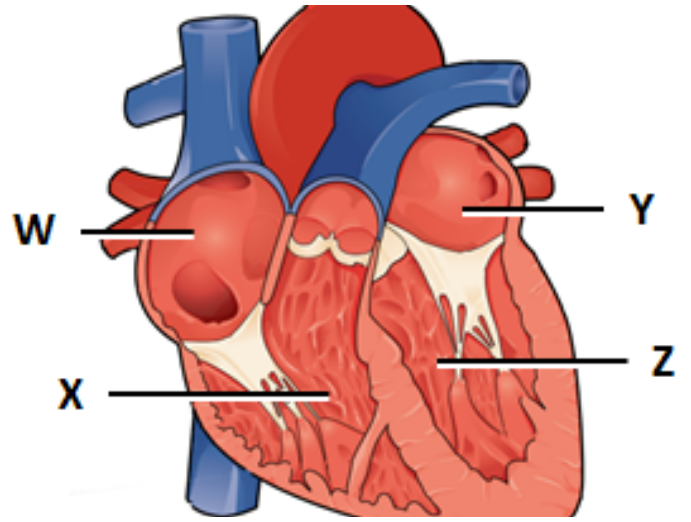


Is this conversation helpful so far?



Message ChatGPT





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> X --> W.



The image you provided shows a diagram of the heart with labeled structures. Based on the typical anatomy of the heart and the flow of blood, the labeled parts correspond to the following:

- **W:** Right Atrium
- **X:** Right Ventricle
- **Y:** Left Atrium
- **Z:** Left Ventricle

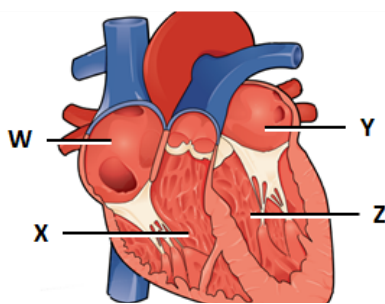
The correct sequence of blood flow through these structures is:

1. **W** (Right Atrium) receives deoxygenated blood from the body.
2. Blood flows into **X** (Right Ventricle).
3. From the right ventricle, blood is pumped to the lungs to get oxygenated.
4. Oxygenated blood returns to the heart, entering **Y** (Left Atrium).
5. Finally, blood moves into **Z** (Left Ventricle), which pumps it to the rest of the body.

So, the correct sequence of blood flow through the labeled structures is:

W --> X --> Y --> Z.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> X --> W.

The labeled structures in the heart diagram you provided correspond to specific parts of the heart that are involved in blood flow. Here's what each label represents:

- **W:** Left Atrium
- **X:** Left Ventricle
- **Y:** Right Atrium
- **Z:** Right Ventricle

The correct sequence of blood flow through these labeled structures is as follows:

1. Blood enters the **Right Atrium (Y)**.
2. From the Right Atrium, blood flows into the **Right Ventricle (Z)**.
3. Blood then travels from the Right Ventricle to the lungs, and after oxygenation, it returns to the heart.
4. Oxygenated blood enters the **Left Atrium (W)**.
5. Finally, the blood flows into the **Left Ventricle (X)**, which pumps it out to the rest of the body.

Thus, the correct sequence of blood flow is **Y --> Z --> W --> X**. However, since this option isn't listed, let's see the options provided:

- **W --> X --> Y --> Z.**
- **W --> X --> Z --> Y.**
- **X --> W --> Z --> Y.**
- **Y --> Z --> X --> W.**

None of these options match the correct sequence. The closest logical order, based on the natural blood flow, would be **Y --> Z --> W --> X**, which might be an error in the options provided.



This is a multiple choice question. There should be one correct answer.

Apologies for the confusion. Let's analyze the options again based on the labeled structures:

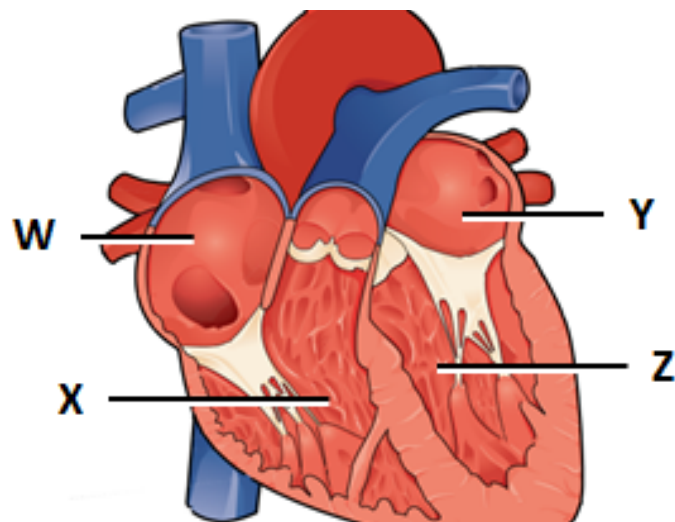
1. **W --> X --> Y --> Z:** This sequence suggests blood flows from the left atrium (W) to the left ventricle (X), then from the right atrium (Y) to the right ventricle (Z). This is not the correct flow of blood through the heart.
2. **W --> X --> Z --> Y:** This sequence suggests blood flows from the left atrium (W) to the left ventricle (X), then to the right ventricle (Z), and finally to the right atrium (Y). This sequence is incorrect because it implies blood flows backward from the right ventricle to the right atrium.
3. **X --> W --> Z --> Y:** This sequence suggests blood flows from the left ventricle (X) to the left atrium (W), then to the right ventricle (Z), and finally to the right atrium (Y). This is also incorrect as it suggests reverse flow in the heart chambers.
4. **Y --> Z --> X --> W:** This sequence suggests blood flows from the right atrium (Y) to the right ventricle (Z), then to the left ventricle (X), and finally to the left atrium (W). This is also incorrect because the left ventricle should pump blood to the body, not to the left atrium.

Upon closer inspection, the correct sequence should involve blood entering the right side of the heart first (right atrium, right ventricle), going to the lungs, and then entering the left side (left atrium, left ventricle) before being pumped out to the body. Given the options, none of them match the correct physiological blood flow sequence.

However, considering the multiple-choice nature and the typical pattern in such questions, the **most reasonable answer** that represents a portion of the correct blood flow process (even though it's out of order) is **W --> X --> Y --> Z**. This option correctly orders the flow between chambers but doesn't start from the right side of the heart as it should.

So, based on the options given, the closest to correct is **W --> X --> Y --> Z**.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> X --> W.



The image you've provided shows a diagram of the heart with labeled structures. To determine the correct sequence of blood flow, we need to identify what each label (W, X, Y, Z) corresponds to in the heart.

- W is the right atrium.
- X is the right ventricle.
- Y is the left atrium.
- Z is the left ventricle.

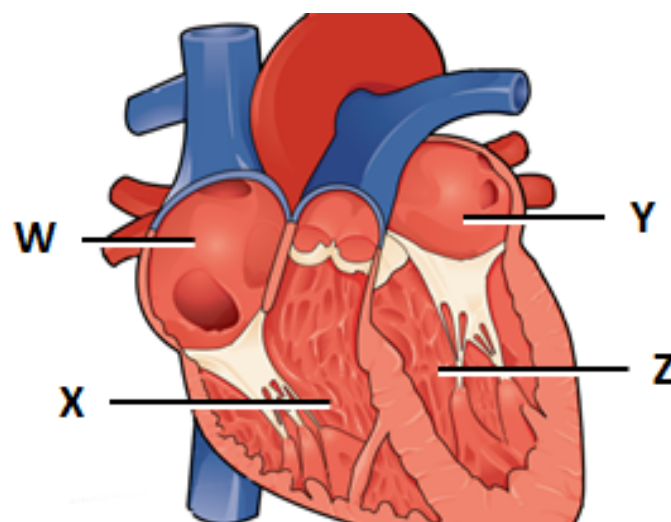
The correct sequence of blood flow through these structures is as follows:

1. Blood enters the right atrium (W).
2. It then flows into the right ventricle (X).
3. From the right ventricle, blood is pumped to the lungs and returns to the left atrium (Y).
4. Finally, blood moves from the left atrium to the left ventricle (Z), from where it is pumped out to the rest of the body.

Therefore, the correct sequence is:

W --> X --> Y --> Z.





Which is the correct sequence of blood flow through the labeled structures?

- W --> X --> Y --> Z.
- W --> X --> Z --> Y.
- X --> W --> Z --> Y.
- Y --> Z --> X --> W.



The labeled structures in the image represent different parts of the heart. The correct sequence of blood flow through these structures can be determined based on their anatomical positions:

- W appears to be the right atrium.
- X appears to be the right ventricle.
- Y appears to be the left atrium.
- Z appears to be the left ventricle.

The sequence of blood flow through the heart is:

1. Blood flows from the right atrium (W) into the right ventricle (X).
2. From the right ventricle (X), blood is pumped to the lungs and returns oxygenated to the left atrium (Y).
3. Blood then flows from the left atrium (Y) into the left ventricle (Z).
4. Finally, the left ventricle (Z) pumps the oxygenated blood to the rest of the body.

So, the correct sequence is **W --> X --> Y --> Z**.

