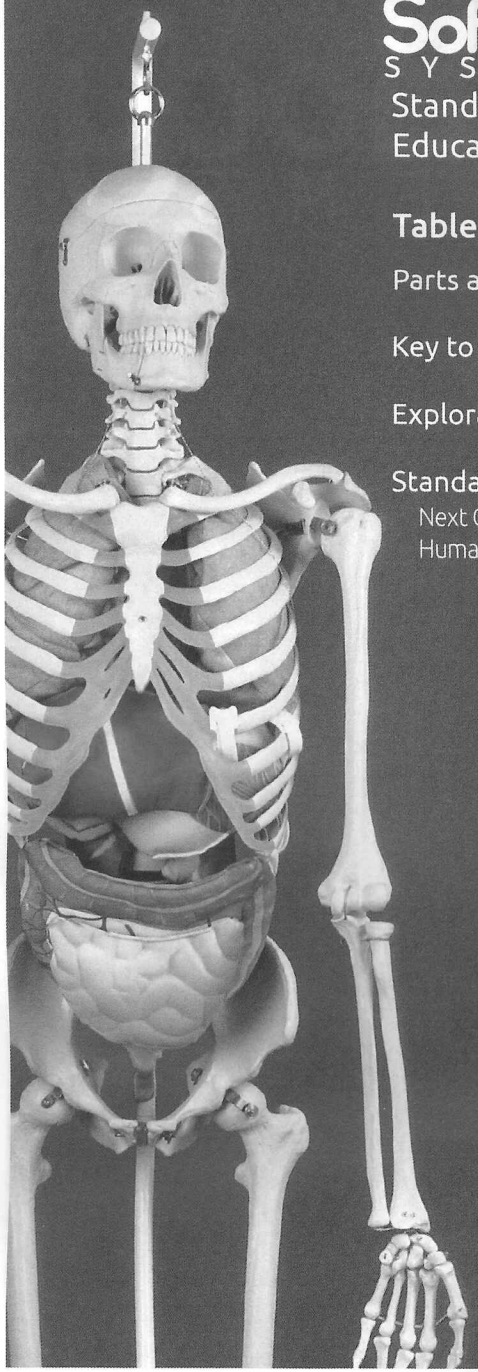


# Soft Body SYSTEMS

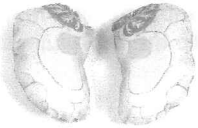
## Standard Thorax Organs Educator's Guide

### Table of Contents



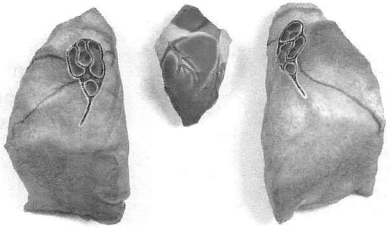
## Parts Included in this set

Brain
- *left and right hemispheres*



Heart

Lungs - *left and right*



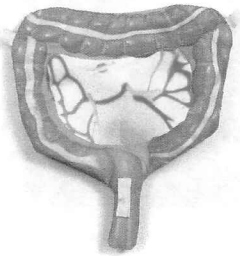
Liver

Stomach

Duodenum-Pancreas-Spleen

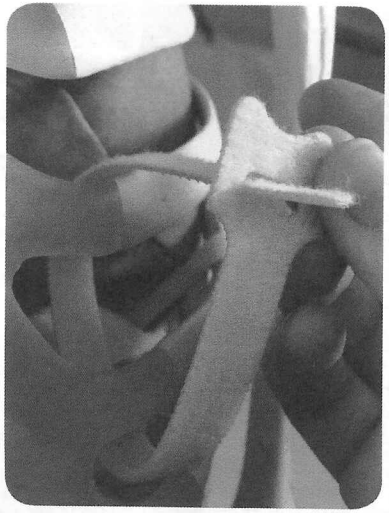
Kidneys - *left and right*
Small Intestine

Colon *(posterior view shown)*



## Disassembly Guide

Each organ may be attached and removed independently, however, it is easier to disassemble beginning with the inferior abdominal organs and work superiorly to the thorax.

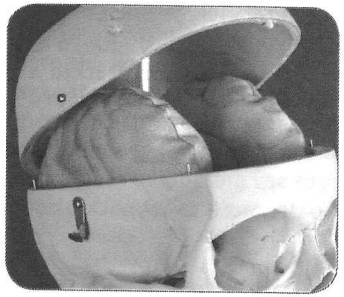


Organs are attached to the skeleton via hook/loop zip ties.

To remove, find the end of the appropriate zip tie and peel it away from itself.

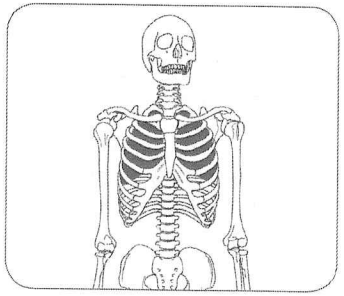
Pull the end out of the slot. Keep the zip tie attached to the organ or the skeleton so it doesn't get lost.

## Assembly Guide



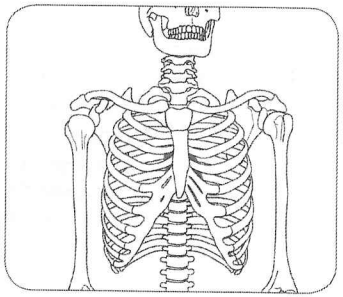
### The Brain

The brain fits in the skull.



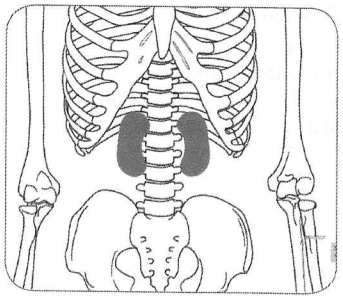
### The Lungs

The organs fit snugly in the rib cage. The apex of the lung extends all of the way up just superior to the first rib. The mediastinal structures/root of the lung should face medially. The anterior aspect of the lung extends to the fifth rib space. Posteriorly the lungs extend all the way to the T9 vertebra.



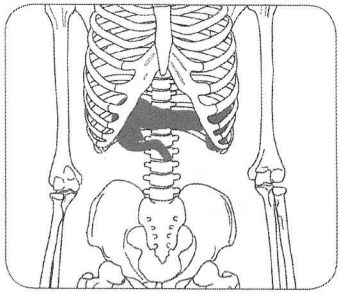
### The Heart

The main part of the heart is located directly behind the sternum. It presses into the mediastinal surfaces of the lungs on both sides, slightly more on the left side. Please note that the chest bracket on most skeletons will make it difficult to place the heart in the perfectly correct position.



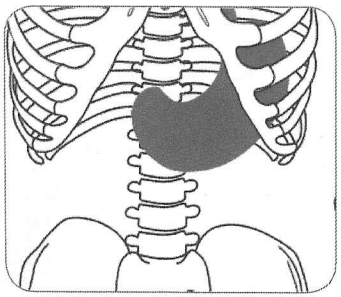
### The Kidneys

The kidneys are on the posterior wall of the upper abdomen on either side of the vertebral column. The right kidney is slightly lower than the left its upper area is only covered by the 12th rib whereas the upper margin of the left kidney extends to the 11th rib.



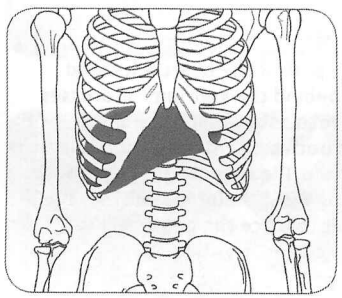
### The Duodenum-Pancreas-Spleen

The pancreas lies immediately anterior to the kidneys. The spleen is firmly tucked into the lower left portion of the rib cage, and the duodenum is to the right.



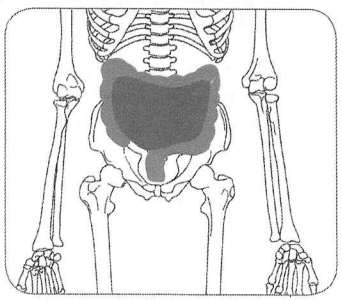
### The Stomach

The stomach lies anterior to the pancreas and slightly medial to where the spleen is located. The esophagus should point cephalically just to the left of the line of the vertebral column. The pyloric end of the stomach will align closely to the proximal end of the duodenum.



### The Liver

Note that the liver is rather wide on its right lateral side. This side fills in the lower right ribcage, and it will push up into the lower aspect of the right lung.



### The Small Intestine & Colon

The small intestine and colon fill the majority of the lower abdomen. The rectum should be attached so that it is directly anterior to the sacrum and coccyx.

## Key to Organs of the Thorax and Abdomen

Once students have mastered the location of the organs within the thorax via assembly and disassembly of the model, they can begin to learn the key morphological features of the individual organs. Using an anatomical atlas as a guide, students will label each organ with key anatomical locations of the instructor's choosing. For convenience, a numbered list of suggestioned items is provided below. A few strategies for labeling the organs may include flagged push pins *(also a good option for assessment)* or labeling tape.

**Brain**

1 Frontal lobe
2 Precentral gyrus
3 Central sulcus
4 Postcentral gyrus
5 Parietal lobe
6 Occipital lobe
7 Cerebellum
8 Lateral cerebral sulcus *(Sylvian fissure)*
9 Temporal lobe
10 Cingulate gyrus
11 Sulcus of corpus callosum
12 Corpus callosum
13 Septum pellucidum
14 Body of fornix
15 Thalamus
16 Hypothalamus
17 Medulla oblongata
18 Pons *(not shown on model)*
19 Arbor vitae

**Heart**

1 Right atrium
2 Right coronary artery
3 Right ventricle
4 Apex
5 Left anterior descending artery
6 Left ventricle
7 Left atrium
8 Pulmonary artery
9 Aorta
10 Superior vena cava
11 Right pulmonary artery
12 Left pulmonary artery
13 Right pulmonary veins
14 Left pulmonary veins
15 Coronary sinus
16 Inferior vena cava
17 Posterior descending artery

**Right lung**

1 Apex
2 Superior lobe
3 Horizontal fissure
4 Anterior border
5 Middle lobe
6 Oblique fissure
7 Inferior lobe
8 Thoracic surface
9 Posterior border
10 Base *(Diaphragmatic surface)*
11 Mediastinal surface
12 Area for thymus
13 Groove for inferior vena cava
14 Line of reflection of pleura
15 Hilum - root of lung
16 Right bronchus
17 Right pulmonary artery
18 Right superior and middle pulmonary v.
19 Right inferior pulmonary v.
20 Cardiac impression of right lung
21 Groove for subclavian a.
22 Groove for superior vena cava
23 Area for trachea
24 Esophageal area
25 Groove for azygous v.

**Left lung**

1 Apex
2 Superior lobe
3 Anterior border
4 Oblique fissure
5 Thoracic surface
6 Inferior lobe
7 Posterior border
8 Base *(Diaphragmatic surface)*
9 Mediastinal surface
10 Groove for descending aorta
11 Groove for aortic arch
12 Groove for subclavian a.
13 Area for thymus
14 Hilum - root of lung
15 Left inferior pulmonary v.
16 Left superior and middle pulmonary v.
17 Left pulmonary a.
18 Left bronchus
19 Cardiac impression of left lung

**Stomach**

1 Esophagus
2 Fundus
3 Body
4 Pyloric region
5 Cardiac notch
6 Muscularis externa: inner oblique layer
7 Muscularis externa: middle circular layer
8 Muscularis externa: outer longitudinal layers *(not shown on model)*
9 Myenteric nerve plexus (of Auerbach)

**Liver**

1 Right lobe
2 Falciform ligament
3 Left lobe
4 Fundus of gallbladder *(not shown)*
5 Gallbladder
6 Quadrate lobe
7 Round ligament
8 Cystic duct
9 Common hepatic duct
10 Common bile duct
11 Hepatic artery
12 Hepatic portal vein
13 Caudate lobe
14 Bare area
15 Inferior vena cava
16 Diaphragmatic surface of liver

**Duodenum-Pancreas-Spleen**

1 Duodenum
  1.1 Superior part
  1.2 Descending part
  1.3 Horizontal part
  1.4 Ascending part
2 Plicae circulares
3 Minor papilla
4 Major papilla
5 Accessory pancreatic duct
6 Common bile duct
7 Pancreatic duct
8 Splenic artery
9 Head of pancreas
10 Body of pancreas
11 Tail of pancreas
12 Spleen
13 Superior mesenteric a.
14 Superior mesenteric v.

**Small Intestine**

1 Jejunal cut-end near the duodenal-jejunal junction
2 Ileal cut-end near the ileal-colic junction

**Colon - Large Intestine**

1 Cecum
2 Ileo-colic junction
3 Ascending colon
4 Transverse colon
5 Haustra
6 Tenia colae
7 Descending colon
8 Sigmoid colon
9 Rectum
10 Inferior mesenteric a.
11 Superior mesenteric a.

**Right Kidney**

1 Right Kidney *(anterior aspect)*
2 Right adrenal gland
3 Right Kidney *(posterior aspect)*
4 Renal artery
5 Renal vein
6 Ureter

**Left Kidney**

1 Left kidney *(anterior aspect)*
2 Left adrenal gland
3 Left kidney *(posterior aspect)*
4 Renal artery
5 Renal vein
6 Ureter

## Exploratory Activity Idea: An anatomical puzzle

**Alternative 1** *(two or more skeletons and organ sets required)*
Give one group of students the opportunity to assemble the organs into the skeleton using a reference of the bony landmarks such as vertebral level or rib coverage of each of the major organs of the thorax and abdomen.

Have another group assess and critique their work using the same reference.

Discussion questions:

What strategies did you use to orient the organs during the assembly process?

What landmarks were available on each of the organs to help you orient them in the body cavity?

**Alternative 2** *(one skeleton required)*
Give each pair of students an organ at the beginning of class. Allow them some time at the beginning of class to research everything they can about the location of that organ within the abdomen or thorax and write a few sentences about the location using anatomical locative descriptors such as medial-lateral, anterior-posterior, caudal-cepahlic, etc. Also, encourage them to describe the location of the organ with relation to vertebral level and ribs where appropriate. Finally, each pair will present their findings to the class as they assemble their organ into the skeleton.

## Exploratory Activity Idea: Comparison of models vs. specimen

Prior to working with the model it may be helpful for students to thoughtfully consider the differences between learning from models and learning from a dissection experience and/or prosected specimens. Some ideas for discussion starters are below.

State benefits and challenges of using models for learning anatomy. State benefits and challenges of learning anatomy via dissection.

What's missing in this model?
Most structures and continuity of vascular system
Continuity in the digestive system
Connective tissues
Pelvic organs
Diaphragm
Exterior body wall
Access to interior structures of the organs

The chest bracket can make it difficult to place some of the thoracic organs. Why does the model require such a bracket while our bodies do not? What is holding our skeleton in place?

If you were creating a model of the organs what materials would you use?

Discuss the use of colors and textures to signal differences in tissues. In what ways do the colors assist their understanding ?

## Exploratory Activity Idea: Create your own atlas

Students will create an atlas individualized to their class based upon lists of morphological features created by them or you (their instructor).

Each lab group or student is assigned a different organ and a list of morphological features related to that organ.

Each group will digitally photograph their assigned organs, and label the digital photographs in the computer.

Performance criteria:

- Were the photographs planned in the best way to show the necessary morphological features?
- Were the photographs executed well in terms of lighting and capturing sharp, crisp details of the model?
- Were the labels executed in an organized and legible manner?

The class will come together to evaluate an critique all of the "sections" of the atlas.

Groups/students will then have the opportunity to edit/improve their work product before final submission to the atlas.

Finally, each student will receive a copy of the atlas to be "published" digitally or in print.

# HAPS Learning Outcomes/Goals

Soft Body Systems: Standard Thorax Organs is designed to align with the following Learning Goals as identified by the Human Anatomy and Phyisiology Society for undergraduate education.

1. Develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and physiology.

2. Recognize the anatomical structures and explain the physiological functions of body systems.

# Next Generation Science Standards

Soft Body Systems: Standard Thorax Organs correlates to the following aspects of the next generation science standards and can be presented in a way that promotes three - dimensional learning.

**HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**

| Science & Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) | Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2) | **Systems and System Models** Models (e.g. physical, mathematical, computer models) can be used to simulate systems and interactions -- including energy matter and information flows -- within and between systems at different scales. (HS-LS1-2) **Structure and Function** Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different componenets, and connections of components to reveal its function and/or solve a problem. |