

Laboratory 1

Anatomical Planes and Regions

Goals:

- Define the anatomical position, including the application of the terms right and left.
- List and correctly use the major directional terms used in anatomy.
- Identify the major anatomical planes and sections.
- List and describe the location of the major anatomical regions of the body.
- Describe the cavities in the human body and name the major organs are present in each.
- Describe the location of the four abdominopelvic quadrants and the nine abdominopelvic regions and list the major organs located in each.

1. Anatomical Position:

If you stand on your head, are your feet above or below your head? Would answering that your feet are above your head be a meaningful description of the position of your feet?

For directional terms in anatomy to make sense, we must have a frame of reference. This reference position is called the **ANATOMICAL POSITION**. In the anatomical position, the human body is erect, feet slightly apart, face and toes facing forward and arms to the side with palms facing forward and thumbs pointing away from the body.

- Stand in the anatomical position. Is it a natural position to stand in? If not, what is not comfortable about it?

2. Directional Terms:

Right and Left

Right or left in anatomical terms refers to the right and left of the subject, not the observer.

- Place your hands on each side of the piece of paper or computer screen you are reading this on. DO NOT cross your arms! Your right hand is this → way and your left hand is this ← way.

- Look at the image in Figure 1. Notice that his right hand is on your left side and that his left hand is on your right side.

Superior and Inferior

Superior means above and refers to the direction that is toward the head. The top of the head is the most superior part of the human body. Inferior means below and refers to the direction that is towards the feet. The most inferior part of the human body is the bottom of the feet.

Anterior and Posterior

Anterior means toward the front of the body. The nose is anterior to the sinus cavities. **Posterior** means toward the back of the body. The spine is posterior to the chest.



Figure 1. A body in the anatomical position.

Dorsal and Ventral

Dorsal is from the Latin *dorsum* meaning back. Ventral is from the Latin *venter* meaning belly. Hence the dorsal side is the back side and the ventral side the belly side. In humans, dorsal and posterior can be used interchangeably as can ventral and anterior. The exception to this is in the human brain where neuroanatomists assume we are walking on all fours.

Note that in non-biped animals, anterior and ventral are **NOT** synonymous! Think of anterior/posterior as nose/tail and dorsal/ventral as back/belly (Figure 2).

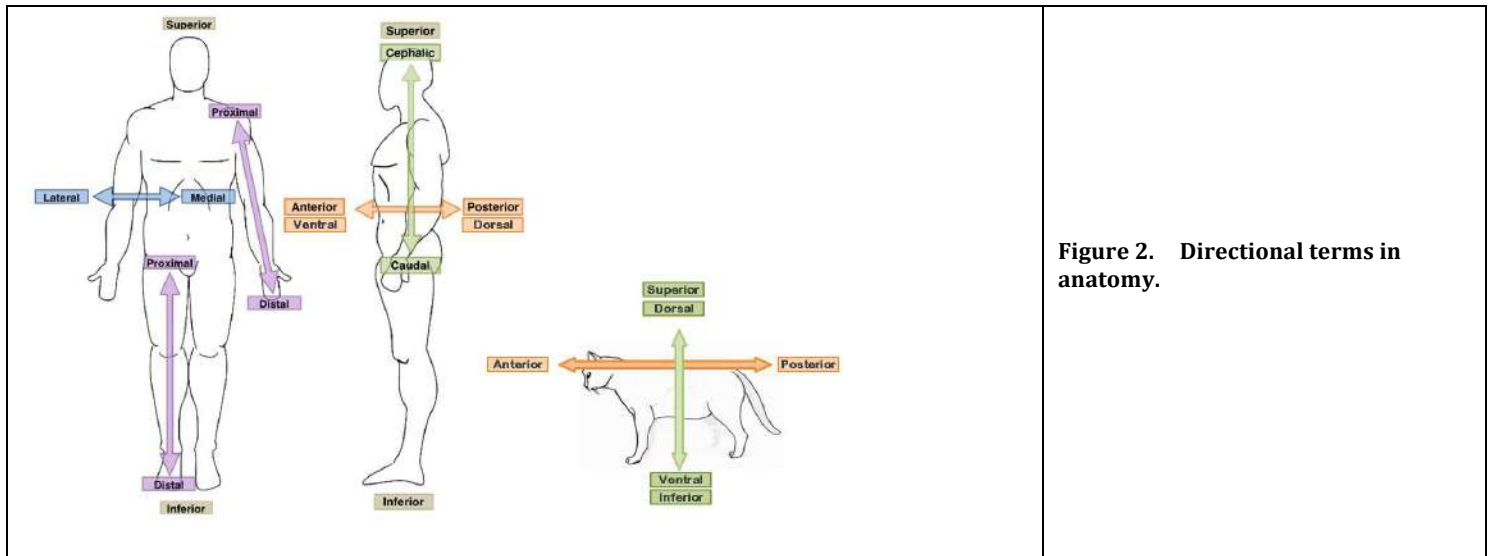


Figure 2. Directional terms in anatomy.

Lateral and Medial

Medial describes structures that are toward the midline of the torso. Lateral describes structures that are away from the midline. The nose is medial to the ears whereas the ears are lateral to the nose.

Distal and Proximal

These terms are preferred over superior/inferior when referring to areas on the appendages. Distal refers to structures that are further from the attachment point of the limb to the trunk (shoulder or hip). Proximal describes structures that are nearer to the attachment point of the limb to the trunk. The fingers are distal to the elbow whereas the elbow is proximal to the wrist.

Superficial and Deep

Superficial and deep are used to describe the relative closeness of a structure to the body surface. Superficial indicates that a structure is closer to the surface whereas deep indicates that it is further away. The skin is superficial to the muscles whereas the bones are deep to the muscles.

- Practice using directional terms to describe the relationship of different parts of the body.
- An online activity to help with this can be found here:

<http://www.wisc-online.com/Objects/ViewObject.aspx?ID=AP15305>.

3. Planes of the Body

Anatomical planes are imaginary flat surface drawn through a body. These planes are useful in discussing human anatomy since to easily view internal structures, we must make either make a cut or take an image (e.g. x-rays) along one of these planes.

Sagittal plane. Sagittal planes divide the body vertically into right and left parts. The **midsagittal plane**, also called the median plane, is a sagittal plane that divides the body down the middle into equal right and left sections.

Frontal plane. The frontal plane, also called the **coronal** plane, divides the body vertically into anterior and posterior sections. Frontal planes are at a 90° angle to sagittal planes.

Tranverse plane. Transverse planes are perpendicular to the longitudinal axis of the body and divide the body into superior and inferior sections.

Oblique plane. Oblique refers to any plane that is not parallel to one of the other three planes. Oblique planes are at an angle and often more difficult to get one's anatomical bearings.

- Look at available sections and images. Determine if the anatomical plane of each.
- Discuss which organs or body parts could be divided by each type of section.

4. Body Regions

The body is divided into two major regions:

Axial includes the head, neck, spinal column and trunk;

Appendicular includes the **pectoral girdle** (shoulder), arm, **pelvic girdle** (hips), and legs.

The axial region is subdivided into the **cephalic** area (head), **cervical** area (neck), **thoracic** area (chest), **abdominal** area, **pelvic** area, and **dorsum** (back). These can be further divided as shown below.

Cephalic region

Frontal – forehead

Orbital – around the eyes

Nasal – near the nose

Otic – in the ear area

Buccal – cheek area

Occipital – back of head

Thoracic region

Sternal – area of the breast bone, or sternum

Axillary – underarm area

Pectoral – chest area to either side of sternal area

Abdominal region

Umbilical – area around the belly button

Pelvic region

Inguinal – groin area

Genital – area containing the sex organs

Dorsum

Scapular – shoulder blade area

Vertebral – spinal area

Lumbar – lower back area, below the ribs, above the hips

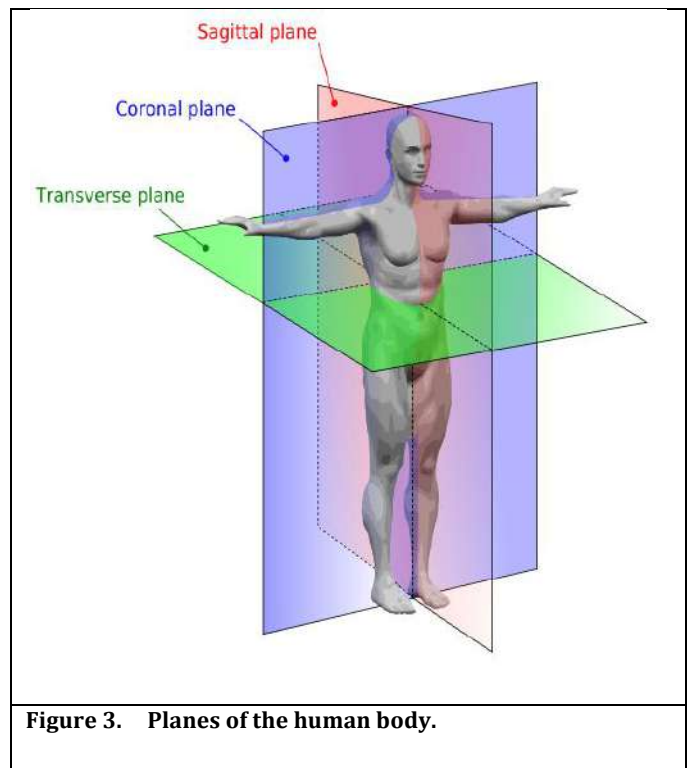


Figure 3. Planes of the human body.

Sacral – area between the hips

Gluteal – buttocks

The appendicular region is composed of the pectoral girdle, arm, pelvic girdle, and legs.

Arm and Pectoral Girdle

Acromion – point of the shoulder

Brachial – upper arm

Olecranon – posterior of elbow

Antecubital – anterior of elbow

Antebrachial – forearm

Carpal – wrist

Manus – hand

Palmar – palm

Digital – fingers or toes (on the foot)

Leg and Pelvic Girdle

Coxal – hips

Femoral – thigh

Patellar – anterior of knee

Popliteal – posterior of knee

Crural – calf of leg

Pedal – foot

Plantar – sole of foot

- Practice naming different body regions. Quiz each other in your group.

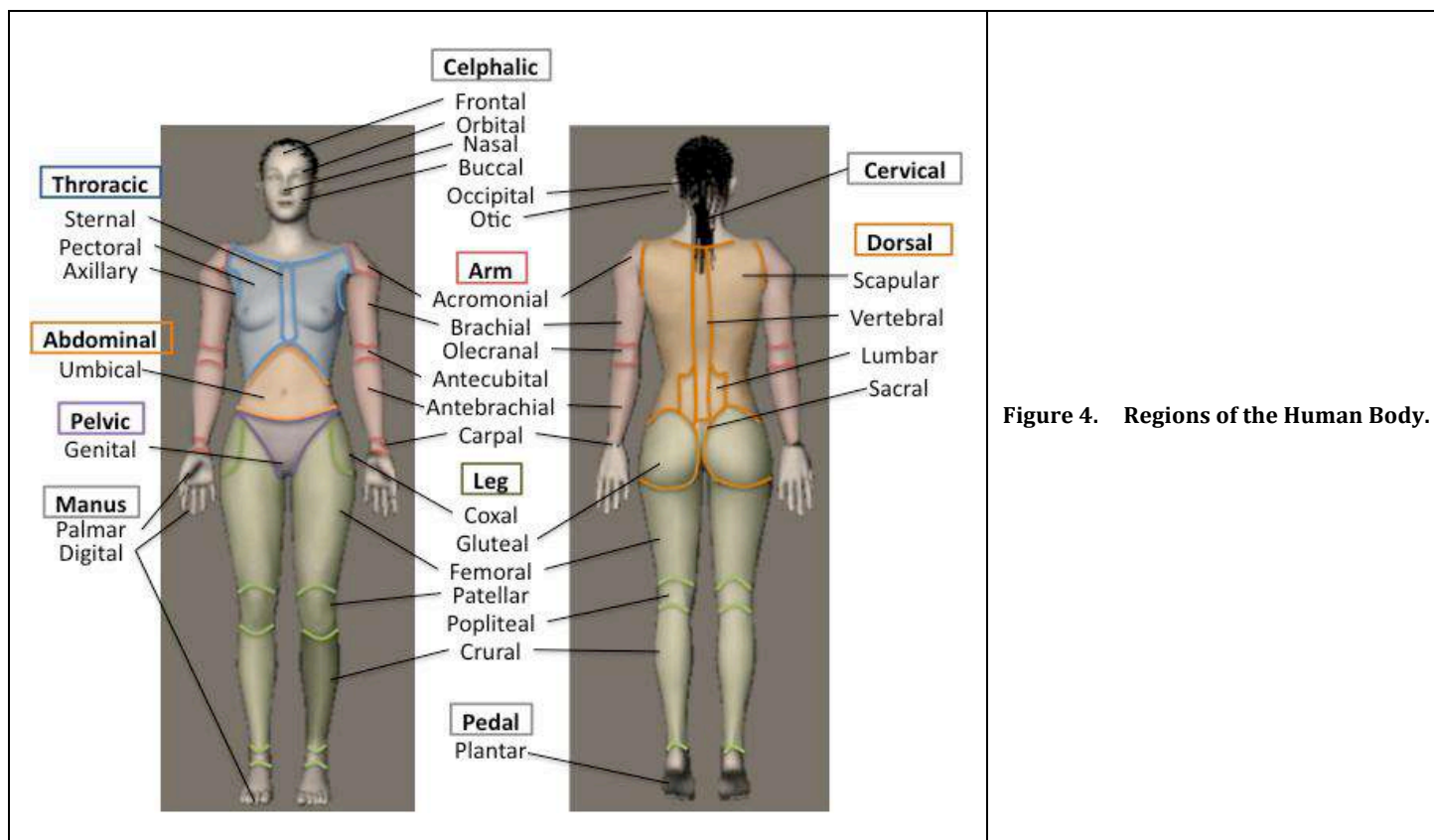


Figure 4. Regions of the Human Body.

5. Body Cavities

The two major body cavities are the **dorsal cavity** and the **ventral cavity**.

Dorsal Cavity

The dorsal cavity is subdivided into the **cranial cavity** and the **vertebral cavity**. The cranial cavity is within the skull and houses the brain. The cranial cavity is contiguous with the vertebral cavity. The vertebral cavity is within the bones of the spine (vertebrae) and is home to the spinal cord.

Ventral Cavity

The ventral cavity has two major subdivisions: the superior **thoracic cavity** and the inferior **abdominopelvic cavity**.

The thoracic cavity is within the rib cage with the inferior border being the

diaphragm. It houses the heart and lungs. It is comprised of the two **pleural cavities**, the **pericardial cavity**, and the **mediastinum**. The paired pleural cavities surround the lungs. In between, is the pericardial cavity which surrounds the heart and the mediastinum that contains the esophagus, trachea, and thymus.

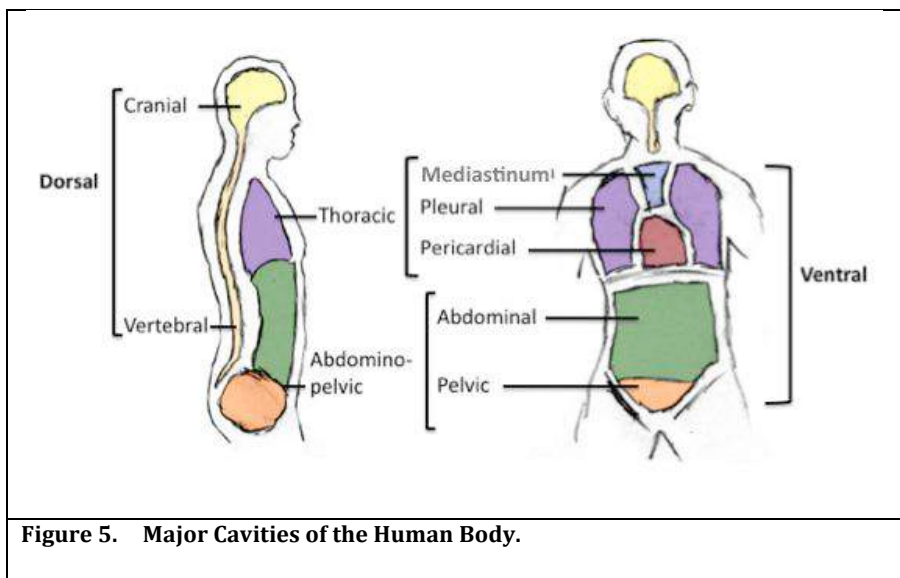


Figure 5. Major Cavities of the Human Body.

The abdominopelvic cavity also has two major subdivisions: the **abdominal cavity** and the **pelvic cavity**. The abdominal cavity is inferior to the thoracic cavity and superior to the pelvic cavity. It contains the digestive organs, the spleen and the kidneys. The pelvic cavity is bounded by the bones of the pelvis and contains the reproductive organs, rectum and urinary bladder.

- Locate each major body cavity on a model.
- Identify the major organs in each major body cavity. The torso models are useful for this.
- Find the anatomical features that mark the separation of each body cavity.

6. Regions of the Abdominopelvic Cavity

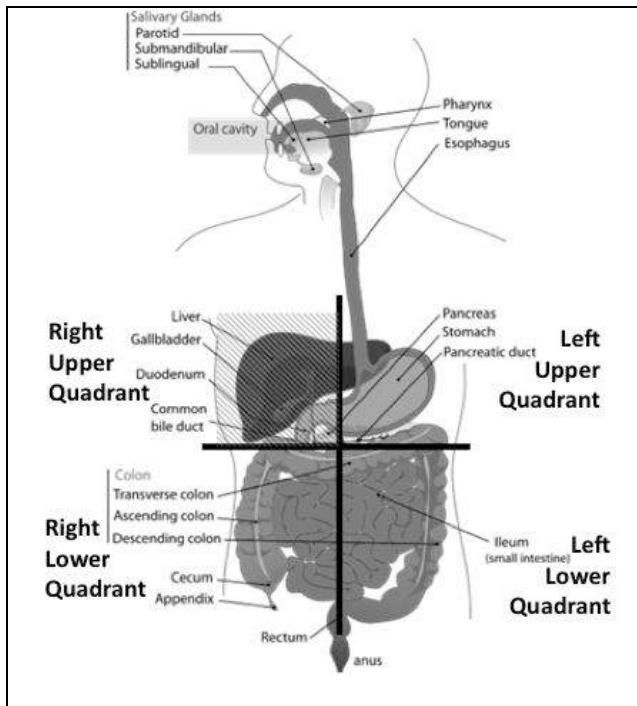


Figure 6. Four Quadrants of the Abdominopelvic Cavity..

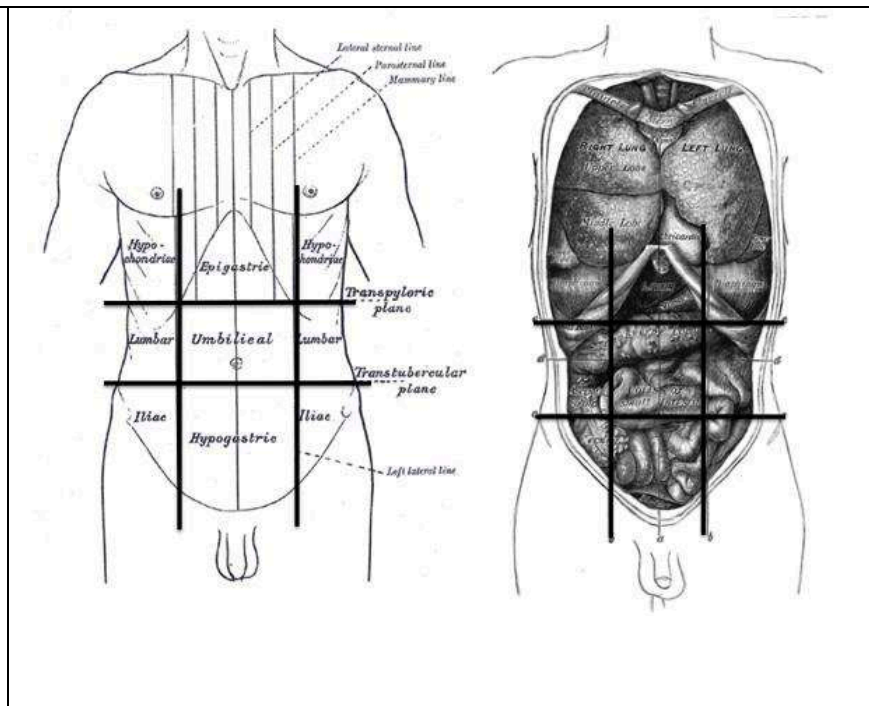


Figure 7. Nine Regions of the Abdominopelvic Cavity.

The abdominopelvic cavity can be divided into four quadrants: **right upper quadrant**, **left upper quadrant**, **right lower quadrant**, and **left lower quadrant**. The quadrants are defined by bisecting the abdomen with a midsagittal plane and a transverse plane through the belly button.

The abdominopelvic cavity can also be divided into nine regions. The two sagittal planes in this division scheme are located at the middle of the clavicle (collarbone). The two transverse planes are the transpyloric plane, at the level of the pylorus of the stomach, near the lower rib, and the transtubercular plane at the upper crest of the pelvic bone. The **umbilical** region is in the middle, in the area surrounding the belly button. On either side of the umbilical region is the **right** and **left lumbar** regions. The **epigastric** and **hypogastric** regions are above and below the umbilical region, respectively. The **right** and **left hypochondriac** areas are to either side of the epigastric area while the **right** and **left iliac** area are to either side of the hypogastric area.

Activity:

- Using torso models, identify the four abdominopelvic quadrants.
- List the organs present in each quadrant.
- Identify the nine abdominopelvic regions.
- Using torso models, list the organs present in each of the nine regions.

Attribution of images used in this document:

Figure 1. Zygotebody.com, retrieved May 7, 2012 from <http://zygotebody.com/#nav=1.37,81.5,250>.

Figure 2. Osteomyoamare. (2010). [A sketch of the human body in the in anatomical position]. WikimediaCommons, retrieved May 7, 2012 from http://commons.wikimedia.org/wiki/File:Anotomical_Position_Sketch.png.

Figure 3. YassineMrabet. (2010). [Human anatomy planes signature]. WikimediaCommons, retrieved May 7, 2012 from http://commons.wikimedia.org/wiki/File:Human_anatomy_planes_signatures.svg.

Figure 4. Green, P. (2012). [Regions of the human body]. Tacoma Community College. with MakeHuman software. (<http://www.makehuman.org/>)

Figure 5. Green, P. (2012). [Major cavities of the human body]. Tacoma Community College.

Figure 6. Villareal, M. (2008). [Digestive system diagram]. WikimediaCommons, retrieved May 7, 2012 from <http://commons.wikimedia.org/wiki/File:RLQlabeled.PNG>.

Figure 7. Gray, H. (1918). [Nine regions of the abdominopelvic cavity] from Gray's Anatomy, 20th ed.

Figure 8: Green, P. (2012). [Human figure]. Tacoma Community College, with MakeHuman software. (<http://www.makehuman.org/>) .

Figure 9: National Library of Medicine. (2003). [Color cryosections]. Visible Human Project, retrieved May 7,2012 from <http://www.nlm.nih.gov/research/visible/photos.html>.

Figure 10: National Library of Medicine. (2003). [Specimen from the Visible Male Human]. Visible Human Project, retrieved May 7,2012 from <http://www.nlm.nih.gov/research/visible/mri.html>

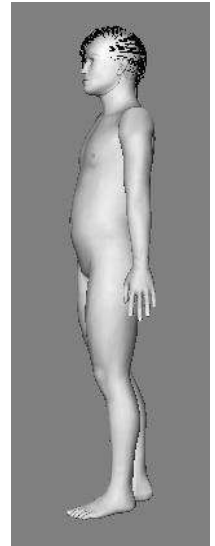
Laboratory 1

Anatomical Terms

Name: _____

Section: _____

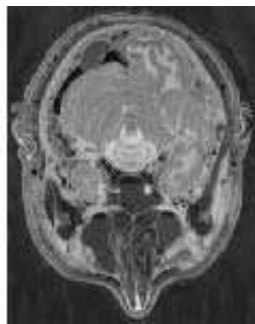
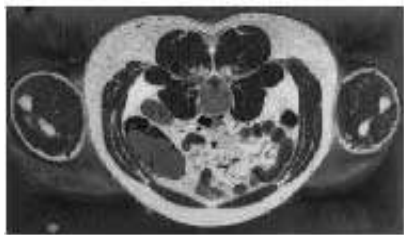
1. Is this image in the anatomical position? Why or why not?



2. Fill in the blank with the proper directional term for each statement below.

- A. The sternal area is _____ to the dorsum.
- B. The head is _____ to the feet.
- C. The brain is _____ to the eyes.
- D. The pelvic cavity is _____ to the thoracic cavity.
- E. The lungs are _____ to the heart.
- F. The elbow is _____ to the wrist.
- G. The ribs are _____ to the lungs.
- H. The hips are _____ to the shoulders.
- I. The popliteal region is _____ to the patellar region.
- J. The pedal area is _____ to the femoral area.

3. Indicate which anatomical plane is indicated by each image or description below. Do not use oblique as an answer.



E. Separates the stomach from the liver: _____

F. Separates the stomach from the heart: _____

G. Separates the two lungs: _____

H. Separates the pectoral and scapula areas: _____

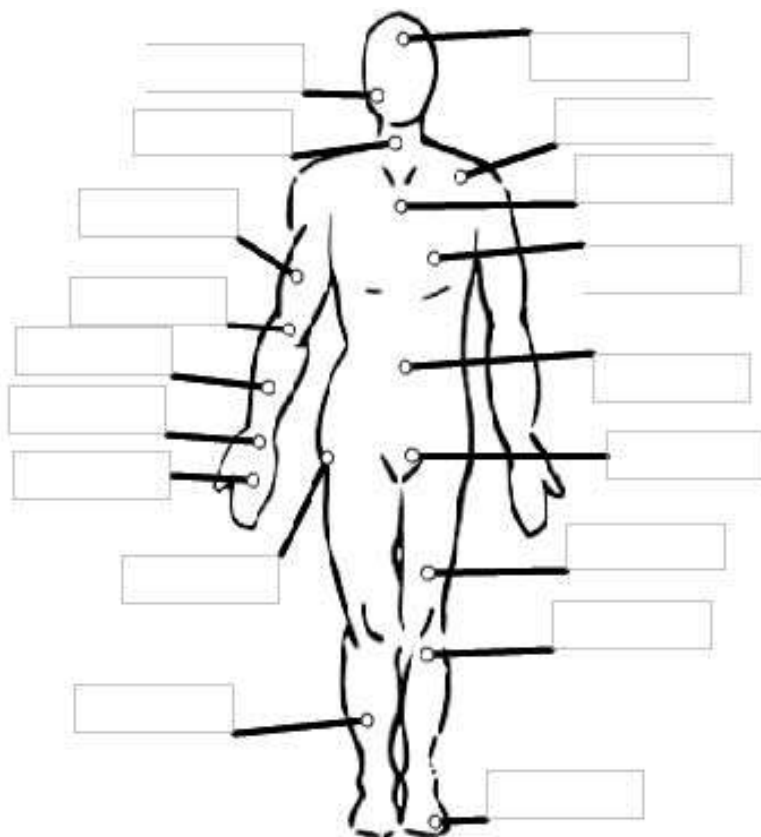
I. Separates the kidneys from the bladder: _____

J. Separates patellar from popliteal areas: _____

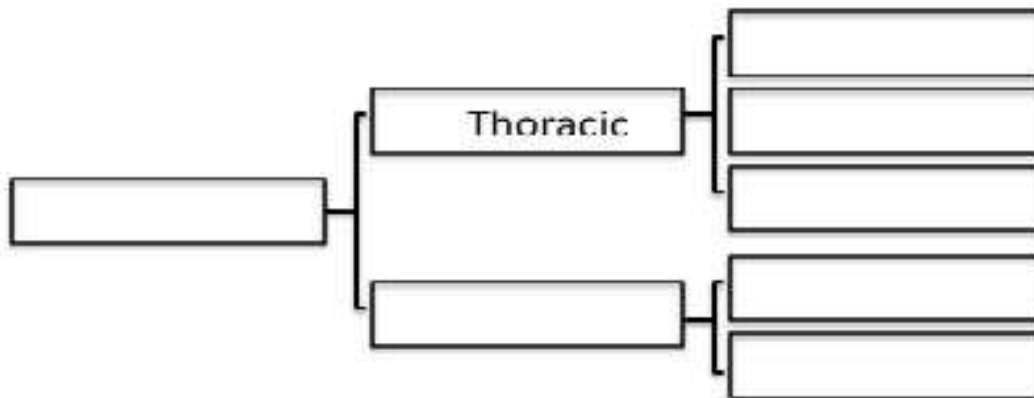
4. Label the regions of the body.

- A. Abdominal
- B. Acromonial
- C. Antebrachial
- D. Antecubital
- E. Brachial
- F. Buccal
- G. Carpal
- H. Cervical
- I. Coxal
- J. Crural
- K. Dorsal
- L. Gluteal
- M. Femoral

- N. Frontal
- O. Lumbar
- P. Olecranal
- Q. Palmar
- R. Patellar
- S. Pectoral
- T. Pedal
- U. Pelvic
- V. Plantar
- W. Popliteal
- X. Sacral
- Y. Sternal
- Z. Vertebral



5. Fill in the missing body cavities in this chart.



6. Identify in which body cavity each of the following organs is located. Be specific!

A. Heart _____

F. Kidneys _____

B. Brain _____

G. Spinal cord _____

C. Liver _____

H. Lungs _____

D. Bladder _____

I. Rectum _____

E. Esophagus _____

J. Stomach _____

7. Place the following organs located in the correct abdominal region.: liver (2 regions), stomach (2 regions), colon (ascending, transverse, descending, sigmoid, and cecum), small intestine (2 regions), and urinary bladder.

R Hypochondriac	Epigastric	L Hypochondriac
R Lumbar	Umbilical	L Lumbar
R Iliac	Hypgastric	L Iliac

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