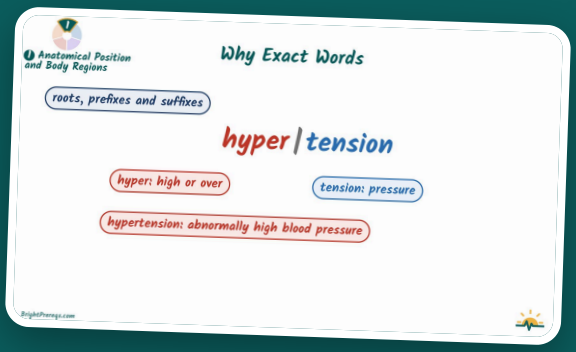
BRIGHT BEATS ANATOMY AND PHYSIOLOGY · STUDY SHEET

Anatomical Terms: Positions, Directions, Planes, Body Cavities and Medical Imaging

Body Basics · Video code **AN1**



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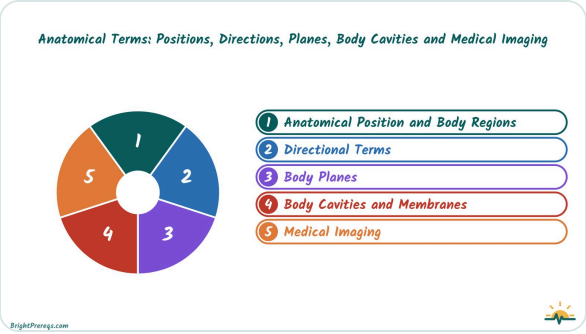
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In this video

1 Anatomical Terms: Positions, Directions, Planes, Body Cavities and Medical Imaging
2 Part 1: Anatomical Position and Body Regions
3 Why Exact Words
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1 Anatomical Terms: Positions, Directions, Planes, Body Cavities and Medical Imaging



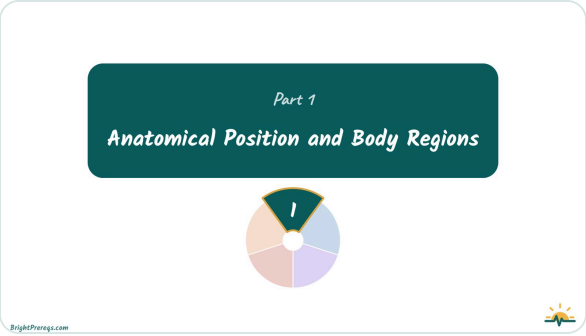
Anatomy and physiology, body basics. Anatomical terms: positions, directions, planes, body cavities and medical imaging.

How do health care providers name exactly where something is in the body, and how do they see inside it?

Five parts follow: position and body regions; directions; planes; body cavities; and medical imaging.

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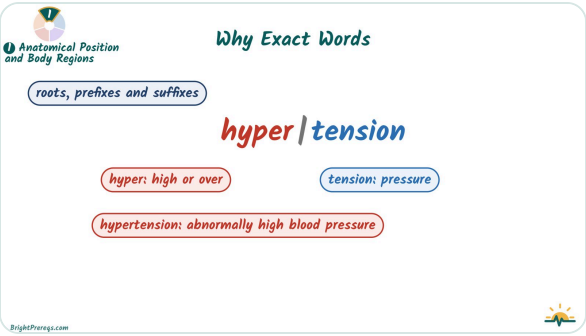
2 Part 1: Anatomical Position and Body Regions



Part 1: anatomical position and body regions, the body's map.

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3 Why Exact Words



Health care uses exact words for the body. They are not meant to confuse. They make each description precise, and they reduce medical errors.

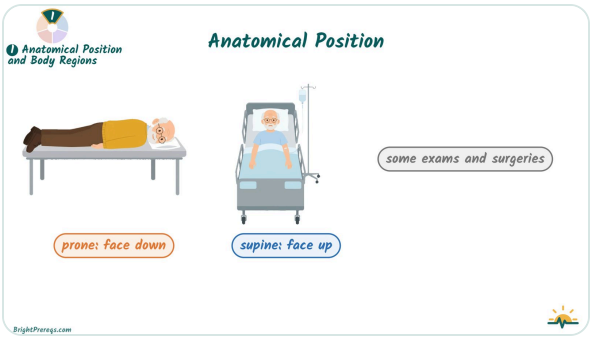
Take a scar "above the wrist." Is it on the forearm, or at the base of the hand? On the palm side, or the back? Exact terms answer that.

Most of these terms come from ancient Greek and Latin. Those languages are no longer spoken every day, so the meanings of the words do not change.

The terms are built from roots, prefixes and suffixes. In hypertension, "hyper" means high or over, and "tension" means pressure. Hypertension is abnormally high blood pressure.

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4 Anatomical Position



Every term assumes one standard position, called the anatomical position. It is the body's map, the way a map always has north at the top.

The body stands upright, feet at shoulder width and parallel, toes forward. The arms are held out to each side, with the palms facing forward.

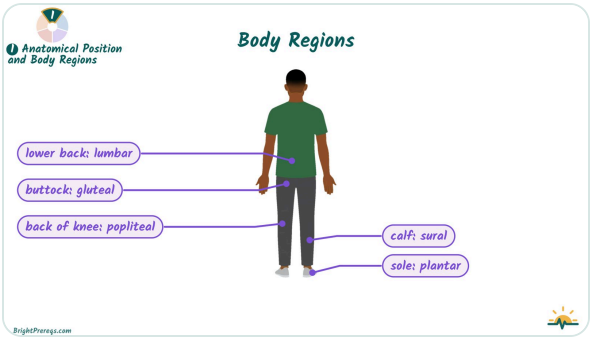
The terms are used as if the body is in this position, however it is really placed, so there is less confusion. A scar on the front of the wrist is on the palm side, even when the hand lies palm down on a table.

A body lying down is prone or supine. Prone is face down. Supine is face up. These words describe the position for some exams and surgeries.

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5 Body Regions



Each region of the body has its own term, more exact than everyday words. The map runs from the head down, the front first, then the back.

Down the middle of the body, the head is the cephalic region, and the neck is the cervical region. The chest is thoracic, the belly is abdominal, and the navel is umbilical.

Down the upper limb, the armpit is axillary. The arm, the brachial region, is only the upper arm.

The front of the elbow is antecubital. Below the elbow is the forearm, the antebrachial region, not the "lower arm." The wrist is carpal.

Down the lower limb, the thigh is the femoral region. The leg, the crural region, is only the part between the knee and the ankle. The foot is the pedal region.

On the back, the lower back is lumbar, and the buttock is gluteal.

The back of the knee is popliteal, the calf is sural, and the sole of the foot is plantar. Head to foot, front and back: each region has its own term.

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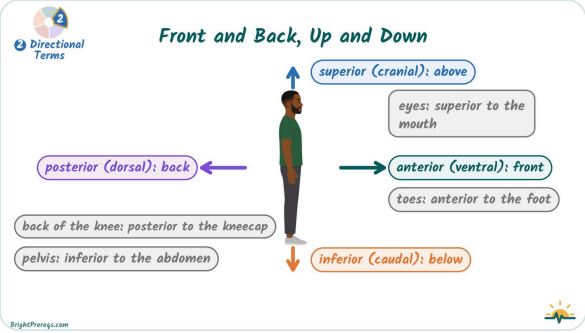
6 Part 2: Directional Terms



Part 2: directional terms, where one part lies compared with another.

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7 Front and Back, Up and Down



Directional terms say where one structure is compared with another. They come in pairs.

Anterior, also called ventral, means toward the front. The toes are anterior to the foot.

Posterior, also called dorsal, means toward the back. The back of the knee is posterior to the kneecap.

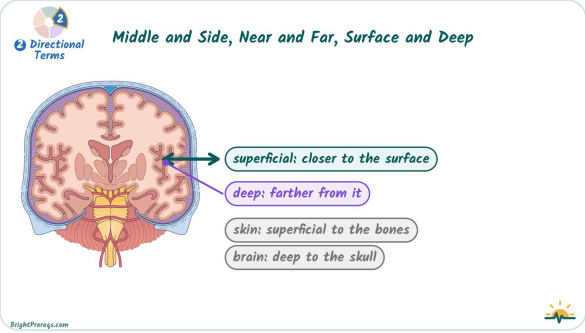
Superior, also called cranial, means above. The eyes are superior to the mouth.

Inferior, also called caudal, means below, toward the tail end of the spine. The pelvis is inferior to the abdomen. Front and back, above and below: each direction comes with its pair.

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8 Middle and Side, Near and Far, Surface and Deep



Medial means toward the middle of the body. Lateral means toward the side. The big toe is the medial toe, and the thumb is lateral to the fingers.

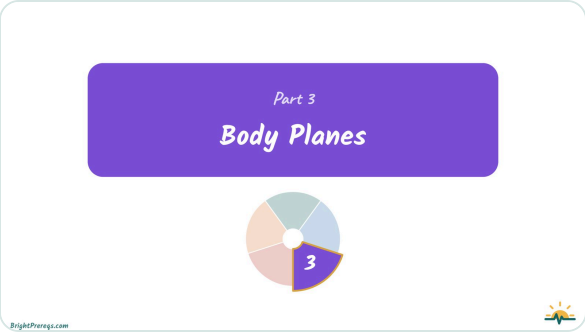
Proximal and distal are used for the limbs. Proximal means nearer to where the limb joins the trunk. Distal means farther away.

So the upper arm is proximal to the forearm, and the leg is distal to the thigh.

Superficial means closer to the surface. Deep means farther from it. The skin is superficial to the bones, and the brain is deep to the skull. Medial and lateral, proximal and distal, superficial and deep: three more pairs.

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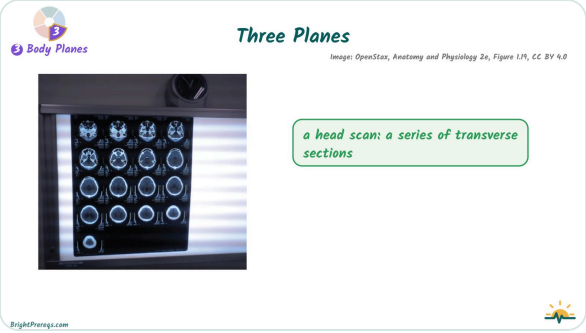
9 Part 3: Body Planes



Part 3: body planes, the flat cuts a body or a scan is made along.

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10 Three Planes



A section is the flat surface left when a structure is cut through. Scanners make virtual sections of living bodies, called scans.

A scan makes sense only if you know the plane it was made along. A plane is an imaginary flat surface through the body. Three planes are used most.

The sagittal plane divides the body into right and left. Straight down the middle, it is the midsagittal, or median, plane. Off to one side, it is a parasagittal plane.

The frontal plane divides the body into a front part and a back part. It is also called the coronal plane, from the Latin word for crown.

The transverse plane divides the body across, into upper and lower parts. Its pictures are called cross sections.

An oblique plane cuts at an angle. It is not parallel or perpendicular to the other three.

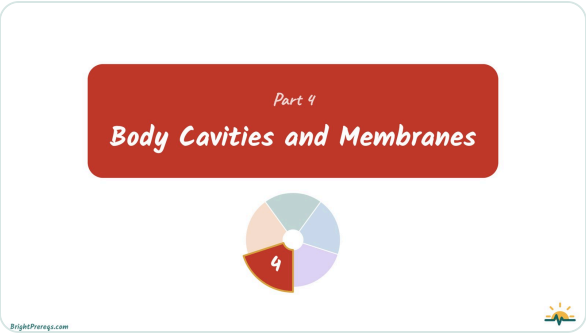
A scan of the head can be shown as a series of transverse sections. Every scan is read by the plane it was made along.

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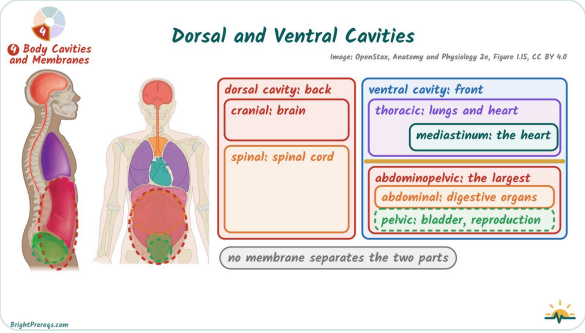
11 Part 4: Body Cavities and Membranes



Part 4: body cavities and membranes, the spaces that hold the organs.

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12 Dorsal and Ventral Cavities



The two largest spaces in the body are the dorsal cavity, at the back, and the ventral cavity, at the front. They hold and protect delicate organs.

The ventral cavity also lets organs change size and shape. The lungs, heart, stomach and intestines can expand and contract without pressing on the organs around them.

The dorsal cavity has two parts. The cranial cavity holds the brain. The spinal cavity, also called the vertebral cavity, holds the spinal cord. The two are one continuous space, just as the brain and spinal cord are one continuous structure.

The bones of the skull and spine protect them. So does cerebrospinal fluid, a colorless fluid made by the brain, which cushions the brain and spinal cord.

The ventral cavity has two parts too. The upper part, the thoracic cavity, is enclosed by the rib cage. It holds the lungs and the heart.

The heart sits in the middle of the chest, in the mediastinum. The diaphragm forms the floor of the thoracic cavity.

Below the diaphragm is the abdominopelvic cavity, the largest cavity in the body. Its upper part, the abdominal cavity, holds the digestive organs.

Its lower part, the pelvic cavity, holds the urinary bladder and the organs of reproduction. No membrane separates the two parts. Back and front, each split in two: cranial and spinal, thoracic and abdominopelvic.

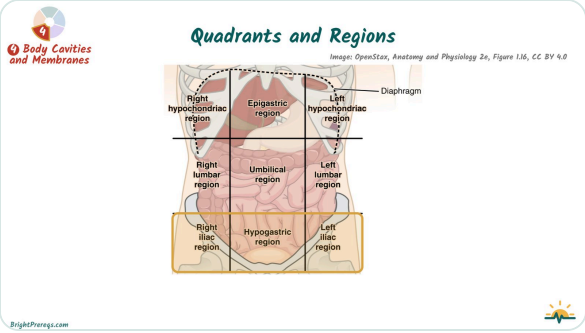
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13 Quadrants and Regions



To say clearly where belly pain or a lump is, health care providers divide the abdominopelvic cavity into four quadrants or nine regions.

The quadrants are the simpler way, and are used more often. One line runs across and one runs down, and they cross at the navel, the umbilicus.

That makes the right upper quadrant, the left upper quadrant, the right lower quadrant and the left lower quadrant.

Right and left always mean the body's own right and left, as in the anatomical position. Pain low on the right side of the belly is in the right lower quadrant.

Each has a short form, said as letters: R U Q, L U Q, R L Q and L L Q.

For the nine regions, two lines run across: one just under the ribs, and one just above the pelvis. Two lines run down from the middle of each collarbone.

Across the top are the right hypochondriac, epigastric and left hypochondriac regions. Across the middle, the right lumbar, umbilical and left lumbar. Across the bottom, the right iliac, hypogastric and left iliac.

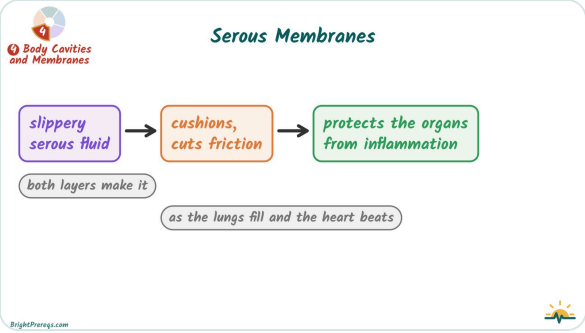
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14 Serous Membranes



The chest and abdominal cavities are lined with thin serous membranes, which cover the walls and the organs. Each membrane has two layers.

The parietal layer lines the wall of the cavity. The visceral layer covers the organs, the viscera. Between them is a very thin space filled with fluid.

Picture a fist pushed into a soft balloon. The balloon wraps the fist in two layers, the way the membrane wraps the heart.

There are three. The pleura surrounds the lungs. The pericardium surrounds the heart. The peritoneum surrounds several organs in the abdominopelvic cavity.

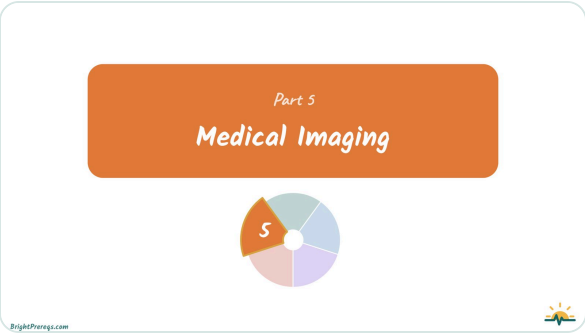
Both layers make a thin, slippery serous fluid. It cushions the organs and cuts friction when they move, as the lungs fill and the heart beats.

So less friction protects the organs from inflammation.

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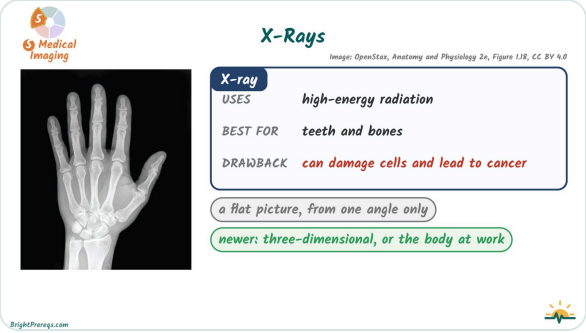
15 Part 5: Medical Imaging



Part 5: medical imaging, seeing inside the body without surgery.

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16 X-Rays



For a long time, the inside of a living body could not be seen without surgery. That changed in 1895, with the first X-ray picture, of a hand.

An X-ray is high-energy radiation. The rays darken a plate behind the patient. Soft tissues slow them only a little and show up gray. Bone blocks most of the rays and shows up light. So X-rays are best for hard parts, such as teeth and bones.

It is still the workhorse of imaging for broken bones and for dentistry.

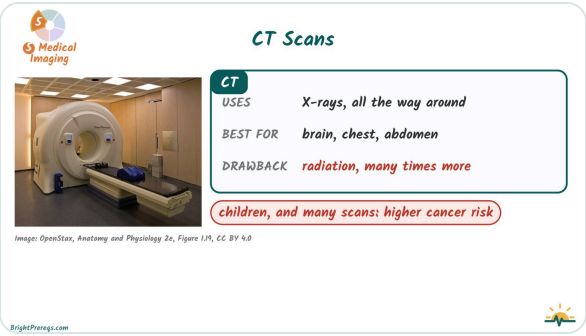
The drawback is that X-rays can damage cells and lead to cancer. Shielding and limiting exposure lower the risk for the patient and the operator.

An X-ray is a flat picture, from one angle only. Newer methods use computers to build three-dimensional images, or to show the body at work.

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17 CT Scans



Tomography means imaging by sections. In computed tomography, or CT, the patient lies on a moving table while the scanner circles all the way around, taking X-rays.

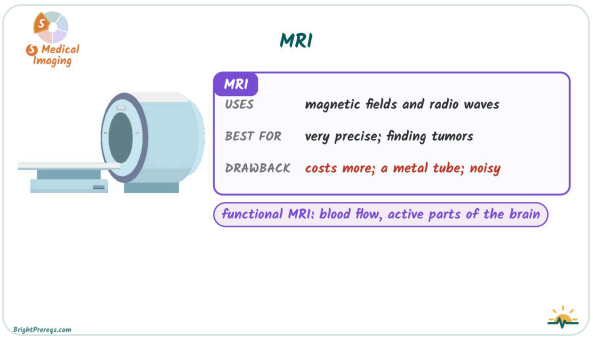
As X-rays pass through the body, they are absorbed or reflected at different levels, and a computer puts them together into slices. CT is especially good for soft tissues, such as the brain and the organs of the chest and abdomen. It can measure a mass down to a millimeter.

The main drawback is radiation, many times more than an X-ray. Children who have CT scans, and adults who have many, are at higher risk of cancer.

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18 MRI



The next scan is magnetic resonance imaging, or MRI. It uses magnetic fields and radio waves, and no radiation. Matter in magnetic fields and radio waves gives off radio signals.

It gives very precise pictures, and it is especially good for finding tumors, because cancerous tissue gives off different signals than normal tissue.

But an MRI costs much more. The patient lies inside a metal tube, sometimes for as long as thirty minutes, and the machine is very noisy.

Even with earplugs, patients can become anxious or fearful. An open MRI does not enclose the patient completely.

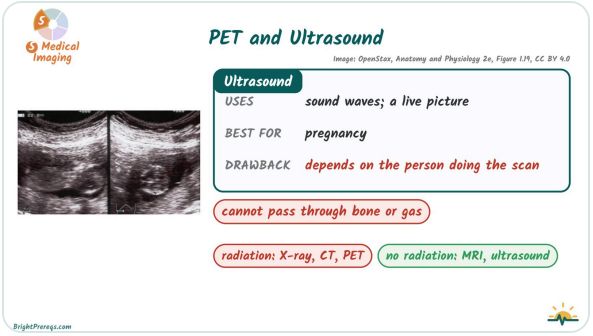
A patient with a metal implant that contains iron cannot have an MRI. The magnet can pull the implant out of place.

A functional MRI tracks blood flow, to show which parts of the brain are active.

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19 PET and Ultrasound



Another scan is positron emission tomography, or PET. A substance with short-lived radiation is given before the scan. Because the radiation is short-lived, it is fairly safe to give.

Its strength is showing the body at work, such as blood flow and how an organ uses nutrients. CT and MRI show only still pictures.

It helps find heart disease, the spread of cancer, some infections, and brain, bone and thyroid disease.

The last method is ultrasound. High-frequency sound waves go into the body, and their echoes become a live picture on a screen.

It is the least invasive of all, with no radiation, so it is used in pregnancy to follow the baby's growth.

It also shows how the heart works, blood flow in the neck, arms and legs, and gallbladder disease.

It has two drawbacks. The picture depends on the person doing the scan, and the sound cannot pass through bone or gas. Of the five methods, X-ray, CT and PET use radiation. MRI and ultrasound use no radiation.

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RECAP

To recap. Where exactly? Every term assumes the anatomical position: standing, toes forward, palms forward. Prone is face down, and supine is face up.

Directions come in pairs: anterior and posterior, superior and inferior, medial and lateral, proximal and distal, superficial and deep.

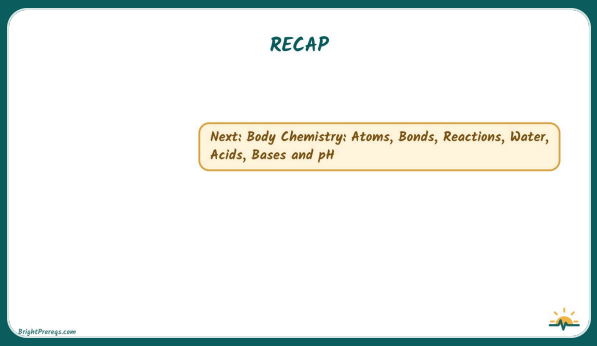
The sagittal plane divides right from left, the frontal plane front from back, and the transverse plane upper from lower.

The dorsal cavity splits into the cranial and spinal cavities, and the ventral into the thoracic and abdominopelvic cavities. The belly is mapped in four quadrants or nine regions.

The pleura, pericardium and peritoneum are serous membranes that cut friction around the organs.

How do they see inside? X-rays, CT and PET use radiation, and PET shows the body at work. MRI uses magnetic fields, and ultrasound uses sound, with no radiation.

The next video is Body Chemistry: Atoms, Bonds, Reactions, Water, Acids, Bases and pH.



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- Body Chemistry: Atoms, Bonds, Reactions, Water, Acids, Bases and pH
- Every video in the course, in order

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