The heart

Quick Revision

The heart is a muscular organ that is pyramid shaped. It's made up of:

1) four chambers - which are separated by vertical septa - and they are:
   * the right atrium.
   * the right ventricle.
   * the left atrium.
   * the left ventricle.

2) a base.
3) an apex.
4) four surfaces which are:
   * anterior: sternocostal surface.
   * posterior: diaphragmatic surface.
   * right side.
   * left side.

**The heart also contains a coronary groove, anterior to it are both of the atriums, and posterior to it are both of the ventricles.**
How to know the right atrium from the left one?

We can't differentiate between the two atriums anteriorly, we can only do that posteriorly, from the base side. The superior vena cava opens into the upper part of the right atrium, and the inferior vena cava opens into the lower part of the right atrium. If you draw a line between them, you will have the right atrium right to it, and the left atrium left to it.

How to know the right ventricle from the left one?

1-We differentiate between the ventricles anteriorly. Since the anterior interventricular artery is anterior to the heart, the right ventricle is right to it, and the left ventricle is left to it.

2-On the diaphragmatic aspect of the heart there is the posterior interventricular artery. Left to it there is the left ventricle. And right to it there is the right ventricle.
Now we’re going to talk about the chambers of the heart. 
beginning with right side.

**first: the right atrium.**

Contents of the cavity: 
*a posterior wall of which is very smooth, and called sinus venrum.*

*anterior wall of it is very rough, and named atrium proper. 
it’s rough because it has muscular ridges. 
those muscular ridges are called musculi pectinati.*

and there is an interatrial septum which separates between the two atriums. 
this interatrial septum contains a fossa which is called "fossa ovalis".

There are four openings in the posterior wall of the right atrium which are:  
1) superior vena cava.  
2) inferior vena cava.  
3) tricuspid opening, guarded by the tricuspid valve, it is between the right atrium and the right ventricle.  
4) the coronary sinus opening.  
(the coronary sinus drains most of the blood from the heart wall, it opens into the right atrium.)

*Q* how to find the coronary sinus opening in the lab?  
this opening is located in between the inferior vena cava and the tricuspid opening in the right atrium.
Second: right ventricle.

-the blood flow in the heart is like this:
right atrium ➔ right ventricle ➔ left ventricle ➔ left atrium.

*External features:
1) it is a part of the sternocostal surface of the heart and forms 2/3 of it.
2) It is also a part of the diaphragmatic surface, and forms only 1/3 of it.

according to the blood flow, the right ventricle is anteriorly divided into two parts:

1) the in flow part:
which is the rough part.
it’s the part that the blood flows in. It’s full of muscular ridges, those ridges make its surface rough.
that’s why we say that the inflow part is rough.
those muscular ridges are called trabeculae carneae.

-the trabeculae carneae has different types, some are large, some are small.

* The largest type of the trabeculae carneae is called: papillary muscle. It’s attached by its base to the ventricular wall.
but its apices (the upper side of it) is free, and is connected by a tendeneous fibers which are very thin, those tendaneous fibers are called chordae tendineae.
and the function of the chordate tendineae is supporting the tricuspid valve.

2) the out flow part.
which is the smooth part.
the out flow part is called the infudibulum.
when the right ventricle contracts it will push the blood into the pulmonary trunk. and the blood will flow into the out flow part.

(It’s called infundibulum because it’s carrying the blood from a wide area into a small area)
inflow part, is rough.
Out flow part is smooth.
why??

*the inflow part is rough to decrease velocity of the inflow blood.
but the out flow part is smooth to increase the velocity of the outflow blood.

**the inflow part of the ventricle is the major part of the right ventricle, so being muscular
will increase the surface area of the muscles which will increase the contraction of the
muscles, and that in turn will increase the velocity of the blood so that it reaches the lungs
faster.
Now let's begin with the left side.
(the left side of the heart is exactly the same as the right side of it with just little differences)

**Third: the left atrium.**

It has the same external features as the right atrium, except that:
* it has a process called left auricle. (anteriorly)
* It forms the greater part of the base of the heart.(posteriorly)
* four pulmonary veins open through the posterior wall of it,
  two of the veins are on the right side of it (one superior and the other is inferior)
  and the two other veins are on the left side of it (one superior and the other inferior)

-similar to the right atrium, it has a cavity, and the posterior wall of the cavity is smooth
  and also named sinus venrum.
  and the anterior wall of the cavity is rough and called atrium proper.

the openings are:
1) four pulmonary veins.
2) the mitral opening, which is guarded by the mitral valve and it's for the transition with
   the left ventricle.
**Forth: The left ventricle.**

*External features:*
1) It forms 1/3 of the sternocostal surface.
2) It forms 2/3 of the diaphragmatic surface.

*The cavity.*
- Similar to the right ventricle,
- It contains two parts:
  1) Inflow part. (rough, because it contains muscular ridges which are the *trabeculae carneae*.)
  2) Outflow part. (smooth)
- This part is called the vestibule of the aortic (*aortic vestibule*).

**Remember that the outflow part of the right ventricle is called the infundibulum.**

*Relations:*
- If you take a cross section of the heart and remove the coronary groove, you’ll see two large openings.
- On the right side is the tricuspid opening,
- On the left side is the mitral opening.
- The pulmonary trunk is anterior to the ascending aorta.
- The ascending aorta turns around the pulmonary trunk and goes to the right side of it.

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*pulmonary valve*

*aortic valve*

*mitral valve*

*tricuspid valve*
conduction of the heart

there are three types of the muscles:
*skeletal muscles: for movement.

*smooth muscles: Smooth muscles are found in the hollow parts of the body. They are arranged in layers with the fibers in each layer running in a different direction which makes the muscle contract in all directions.

*cardiac muscles: similar to the smooth muscles, but modified.

-the cardiac muscles form the two atriums and ventricles of the heart.

-some fibers of the cardiac muscles are modified fibers, and those are called (Purkinje fibers) which are specialized for initiation, conduction and maintenance of the cardiac rhythm.

*Q* Where are those specialized cardiac muscles located?

1- Sinoatrial (SA) node
*site: anterior and (below) lateral to the opening of the superior vena cava, in the wall of the right atrium.

*function: initiates the heart beat. (pacemaker)

2- Atrioventricular (AV) node
*site: right side of the lower part of the inter atrial septum.

*function: (conduction) from the AV node the cardiac impulse is conducted to the ventricles.

3- Atrioventricular (AV) bundle
It will continue from the fibers of the AV node.
It will give to branches at the interventricular septum which are :
*the right AV bundle, which will go to the right ventricle.
*the left AV bundle , which will go to the left ventricle.
Arterial supply of the heart

The arterial supply of the heart is provided by the right and the left coronary arteries.

1) the right coronary artery.

*Origin: the ascending aorta.

*course: situated between the pulmonary trunk and the right auricle. it will pass in the right coronary groove between the right atrium and the right ventricle, then it continues posteriorly, then at the end of it it will give us branches.

*branches: the most important one is the posterior interventricular artery. and all of them supply the right ventricle and the right atrium.

2) the left coronary artery

very short artery, 1cm.

*Origin: the ascending aorta.

* course: between the pulmonary trunk and the left auricle.

* divisions:
- anterior interventricular artery.
- circumflex artery.
Venous drainage.

-Most blood from the heart wall drains into the right atrium, through the coronary sinus.

-Coronary sinus is in the coronary groove between the base and the diaphragmatic surface.

***remember that it will open into the right atrium between the opening of the inferior vena cava and the tricuspid opening.

-receives all venous drainage of the heart as:

*great cardiac vein: accompanies the anterior interventricular artery.
then accompanies the circumflex artery, until it drains the blood into the coronary sinus.

*middle cardiac vein: accompanies the posterior interventricular artery, until it drains the blood into the coronary sinus.

*small cardiac vein (not imp.)

Nerve supply of the heart

The heart is innervated by sympathetic and parasympathetic innervations.

1- Sympathetic innervation: Stimulates heart rate (tachycardia), happens when you're under stress or feeling afraid.
coronary vasodilatation

2- Parasympathetic innervations: Slows heart rate (bradycardia)
Coronary vasoconstriction.
Superior mediastinum.

-it has many contents: Esophagus, Trachea, Arch of Aorta, Big branches of Aortic arch, Brachiocephalic (innominate) veins, Upper half of superior vena cava, Phrenic nerves, Vagi nerves.

it's made up of layers, which are from posterior to anterior:

1) tubal layers: esophagus, and trachea.
2) arterial: the aorta and its branches.
3) venous layer.

**Esophagus:**

length: 10 inches, 25 cm.

begins: from the vagus opposite to c6.

ends: passes through the diaphragm through a special opening and continues to the stomach.

relations:
posteriorly: vertebral column
anterior: the superior part: trachea
the inferior part: the heart
right side: right lung.
left side: superior part: the left lung.
    inferior part: descending thoracic aorta.

blood supply: aorta.

"The beauty of life lies in having dreams, The beauty of dreams lies in having faith"
Dr. Rouwand Abdulw'd.

Sorry for any mistakes,
remember to check the slides 😊