

Dissection of a Rat Notes

Skills to be tested may include:

1. Carrying out instructions for dissection, displaying, drawing and labeling dissections.
2. 2. Performing simple physiological experiments, recording and interpreting the results.
Examples include enzyme action from parts of the body such as liver, stomach and duodenum.

General requirement

1. Before attempting to answer any question ensure that you have understood the question.
2. Even if you think you know the systems required in the question and you have theoretical diagrams, please carry out the instructions and draw an original diagram
3. 3. Your drawings should be as original as possible and a representation of your dissection and NOT what you ought to have seen.

Drawings

Remember that examiners mark the drawings and not the dissection, thus ensure that your drawing is the correct representation of your dissection.

Qualities of a good diagram

- ▶ Should have a title.
- ▶ Should have a magnification.
- ▶ Should be drawn in pencil and neat; avoid rubbing or use a white rubber.
- ▶ The drawing should have an outline
- ▶ The drawing should be proportional, i.e. parts drawn to relative sizes.
- ▶ Avoid ambiguities. If a structure crosses or pass under one another, indicate this clearly or it may be assumed that they join.

Good diagrams can be achieved by continuous practice

Classification

Note that;

1. When stating the "taxa" spellings are very important, examiners do not mark wrong spellings
2. 2. When giving reasons to justify the taxa; use only those that are observable external features.

Kingdom-Animalia

Characteristics

1. A rat has mouth for heterotrophic nutrition; this distinguishes it from plants that make their food.
2. A rat is multicellular; this distinguishes it from protista that mostly unicellular such as amoeba
3. A rat limbs for locomotion; this distinguishes it fungi that are multi cellular and heterotrophic but not mobile.

Phylum: Chordata

1. Has strong strengthening rod felt/back bone.
2. It is bilaterally symmetrical
3. Has a brain case/skull.

Other animals in phylum chordata include fish, amphibian, birds and reptiles

Class- Mammalia

Characteristics

- ▶ Body covered by fur/hair
- ▶ Possess external ear lobes/pinnae
- ▶ Presence of vaginal opening and teats in female or scrotum and prepuce in male

EXTERNAL FEATURES

- ▶ *Terms used to describe the topography of an animal include:*
 - Dorsal – back side,
 - Ventral – front side,
 - Anterior – head side,
 - Posterior – away from the head.

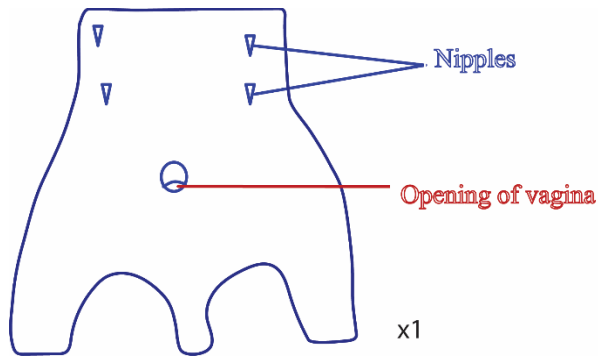
Identification of the sex of the rat

This depends on whether you are dealing with a male or female rat.

Female rat

- has teats or nipples leading to mammary glands.
- has a vaginal opening.

A drawing of the structures used to identify a female rat



Note that

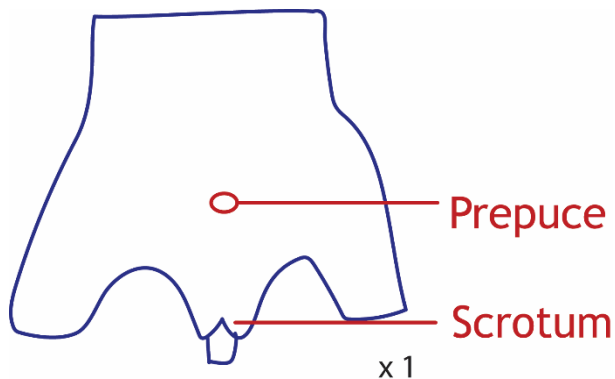
* Terms like mammary glands, vagina and anus are not correct*

- ▶ We do not see mammary glands we see teats leading to mammary glands.
- ▶ We do not see vagina we see an opening to the vagina
- ▶ We do not label the anus because it is not used to identify the sex of a rat.

Male rat

- A male rat has prepuce covering the penis.
- And a scrotal sac or scrotum covering the testis.

A drawing of the structures used to identify a male rat



Note that

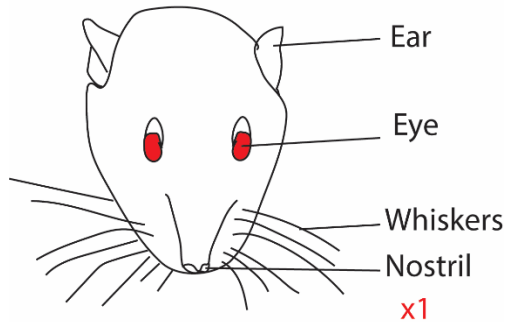
- Terms like sack, suc, suck, testes are not correct because they are wrong spellings.
- Testis is also not correct because we don't see testis but the scrotum covering the testis.

The Head

- **Shape:** It is pear shaped
- *Adaptation of the shape:*

It gives the animal a streamline body for easy movement.

Frontal View of the Head



Structures on the Head

Ear

Location: - The ear is dorso-laterally located on the head, i.e. it is at the junction between the dorsal and lateral side of the head.

Function: for hearing

Structure: - The ear is less hairy (to increase heat loss on a hot day)
- The Ear has a broad and funnel-shaped pinna (to collect sound waves).

Whiskers

Location: on the lateral sides of the anterior part of the head

Function: sensitive to touch

Structure : they are long stiff hairs

Adaptations to their function

- ▶ Long to sense far obstacles and estimate size of burrow.

Eyes

Location: - Dorso-laterally located on the head. To provide a large angle vision or a wide field of view)

Nostril

Location: the nostrils are anteriorly located on the head. (to detect smell and direction of food and predator).

Structure: - the nostrils are open comma shaped holes for letting in and out air.

Mouth

Location: on ventral and anterior side of the head.

Adaptations:

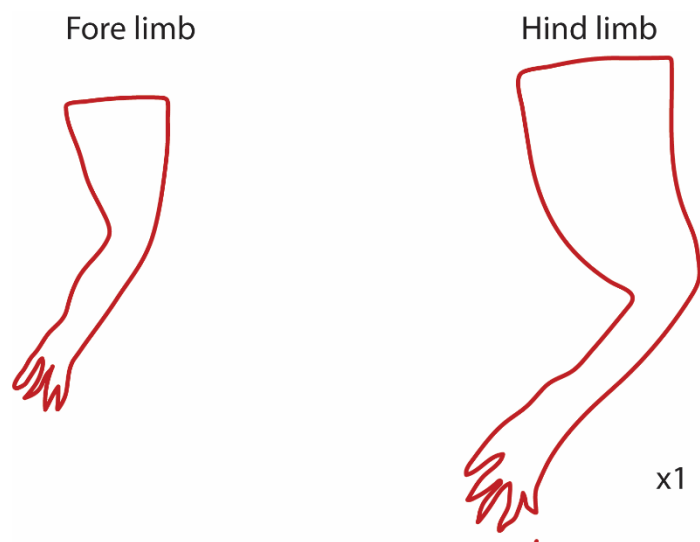
- has teeth (to bite and chew food).
- has tongue (to taste food).
- has tongue (to taste food).

Limbs

Note that:

- the hind limbs are longer and more muscular than the fore limbs.
- The hind limb has five digits whereas the fore limb has four digits.

A drawing of fore and hind limbs to the same magnification

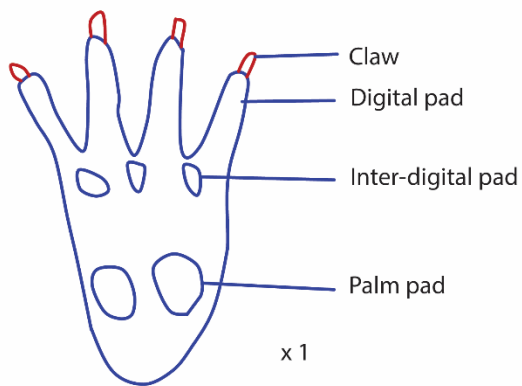


Differences between fore and hind limbs	
Fore limb	Hind limb
Has four digits	Has five digits
Short	Long
Less muscular	muscular

Fore foot

The hind foot has four digits, each digit has a claw, and a digital pad. There are inter digital pad between the digits and two sole pads.

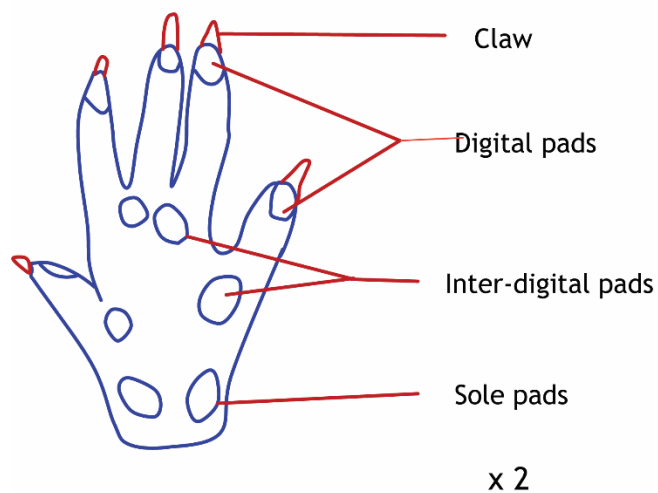
A drawing of the ventral side of the fore limb



Hind foot

The hind foot has five digits, each digit has a claw, and a digital pad. There are inter digital pad between the digits and two sole pads.

Ventral view of hind foot



Adaptation of the feet to their functions

- Has claws (for burrowing, grabbing food, scratching enemy).
- Toes are joined and spread (for stability).
- Has soft pads (for firm grip on a slippery floor, and also to reduce sound during movement).

Structure for defense

1. Teeth (for biting the enemy).

Adaptations of teeth for their functions: they are sharp and strong

2. Claws (for scratching the enemy)

Adaptations of claws for their functions: they are sharp and strong

3. Tail – (beating the enemy)

Adaptations: It is long and muscular to inflict pain.

Adaptation of the rat to its ecology

Anything that enable the rat to live a successful is given as an adaptation to its ecology

- ✚ Has large dorso-ventral eyes for effective sight for food and enemy.
- ✚ Has nostrils to detect smell of food and enemy.
- ✚ Has hair to reduce water and heat loss
- ✚ Has legs for locomotion.
- ✚ Has tail same size as the body for balancing and defense.
- ✚ Has claws for digging burrow, grip and hold food
- ✚ Has vibrissae/whiskers that are sensitive to touch.
- ✚ Has ears for detecting sound waves.
- ✚ Has thick long and strong hind limbs for propulsion.
- ✚ Has nictating membrane to wash off foreign particles from eyes.

Internal structures

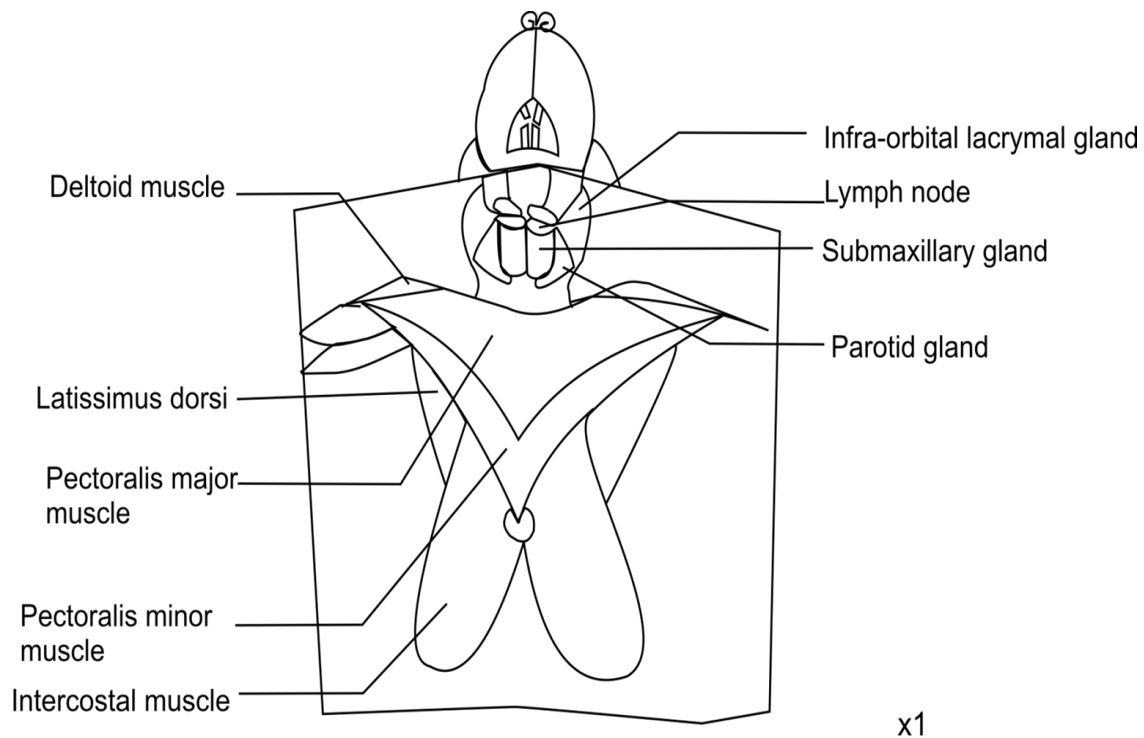
Note that:

1. The rat is dissected upside down; .in this position your right is its left and vice- versa
2. During marking the teachers mark the drawing but not the dissection; therefore, endeavor to make the right drawing.

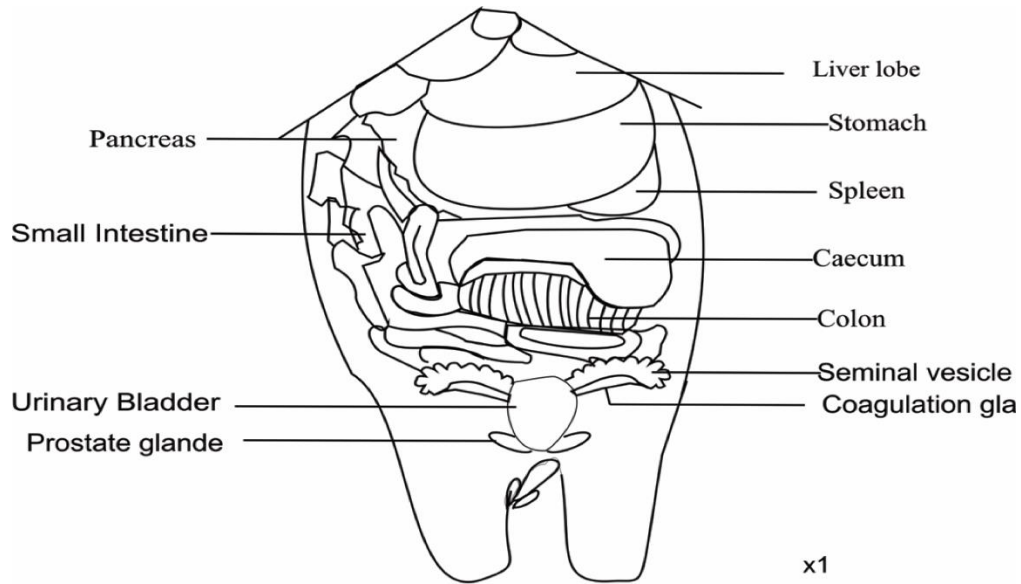
Common question

1. Remove the skin from the specimen to expose the glands and muscles on the ventral side of the neck and the chest region and draw.

A drawing of the glands, muscles and structures in the neck and chest region

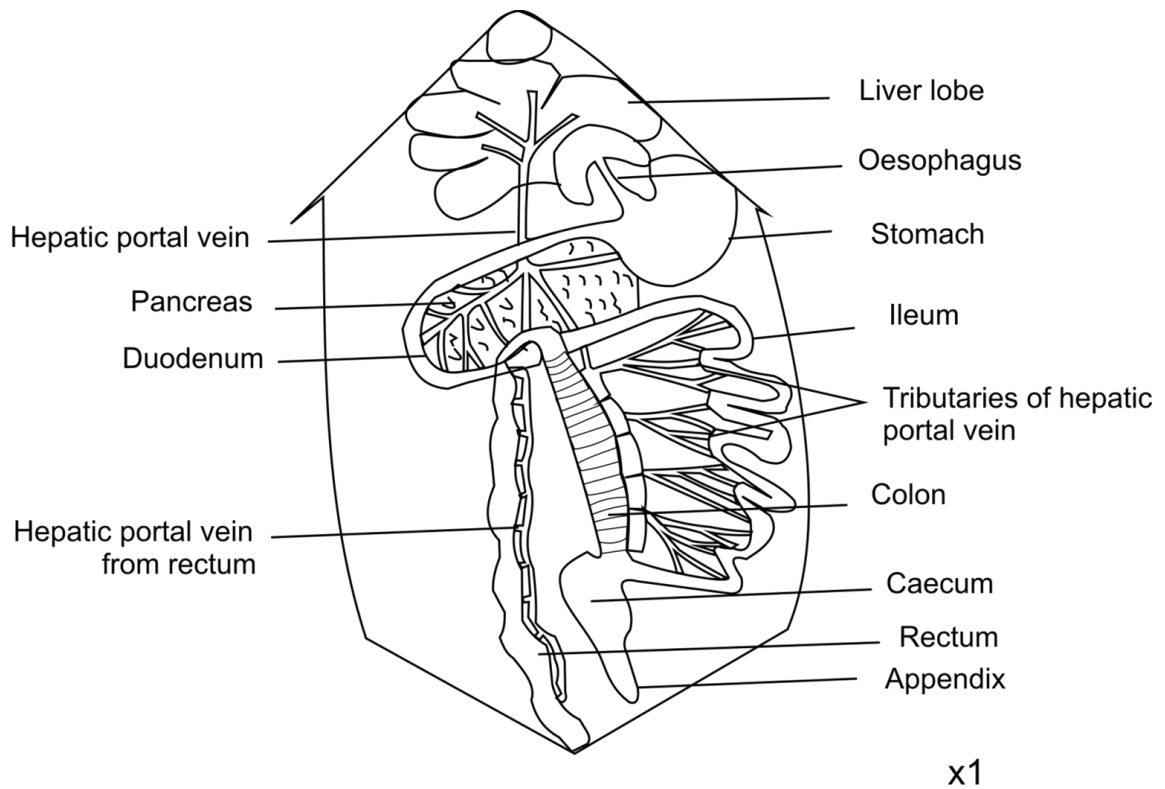


2. Open the abdomen, expose and draw the visceral structures in undisturbed form and draw.
A drawing of abdominal structures of male rat in undisturbed form.



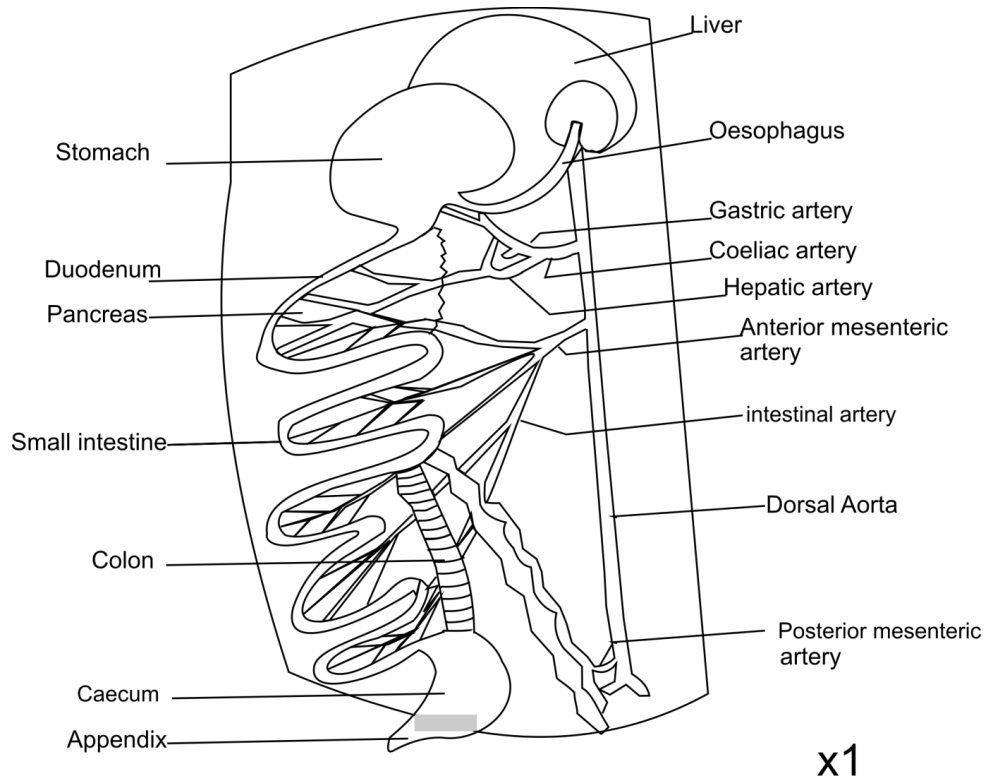
3. Expose blood vessels that drain the digestive system and draw.

A drawing of blood vessels that drain the digestive system.



4. Expose blood vessels that supply the digestive system and draw.

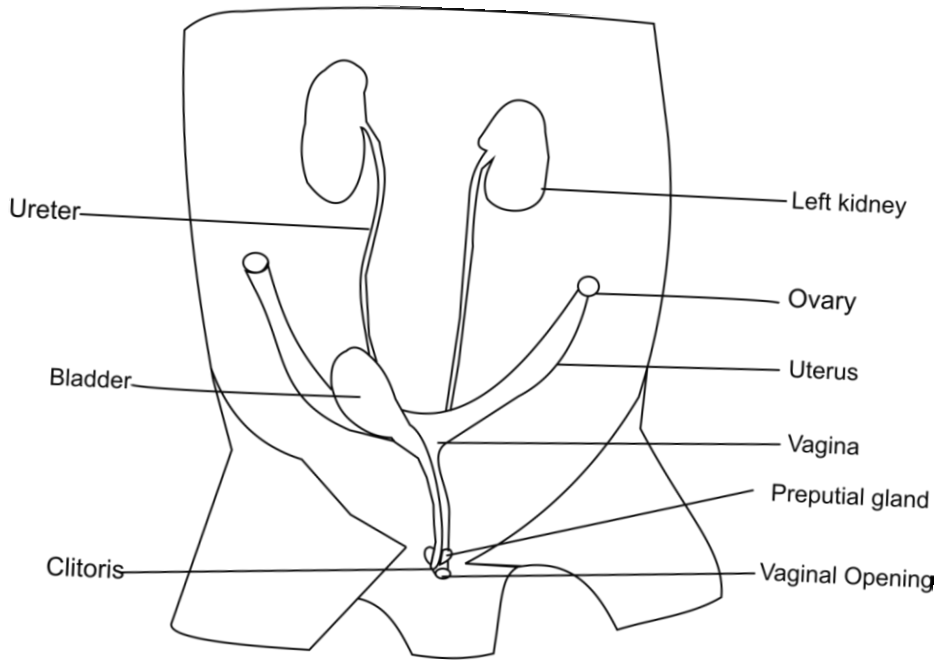
A drawing of blood vessels that supply the digestive system



5. Remove the structures responsible for digestion and strip off any unnecessary tissue to expose the urinogenital system. Carefully; observe the system and make a large clearly labelled drawing.

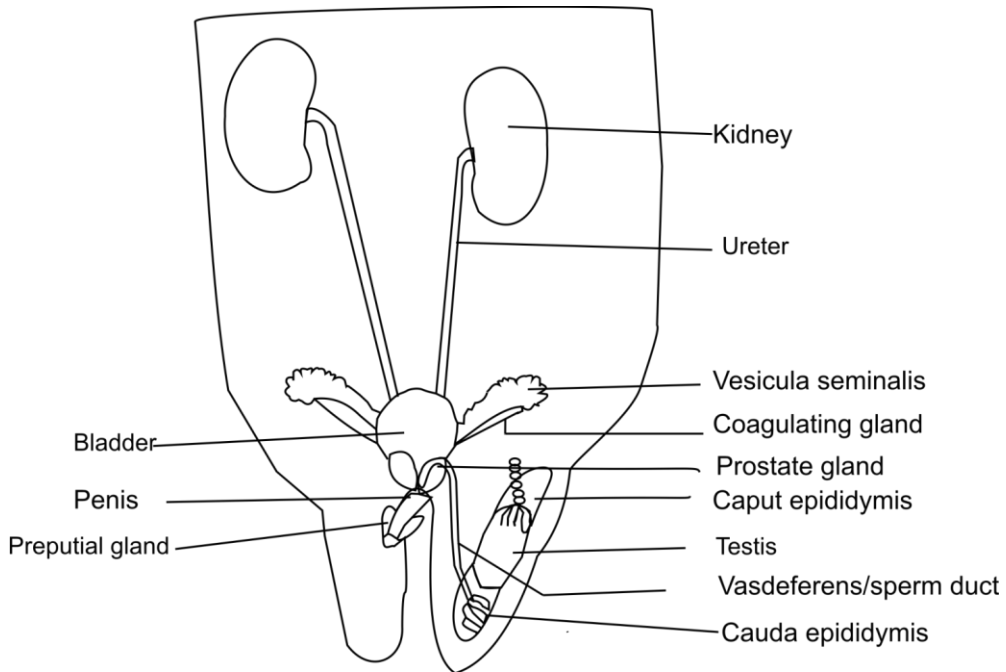
This depends on whether you are dealing with female or male rat.

A drawing of urinogenital system of a female rat



x1

A drawing of urinogenital system of male rat



x1

Structures exclusively for excretion include:

- Kidney, ureter and bladder.

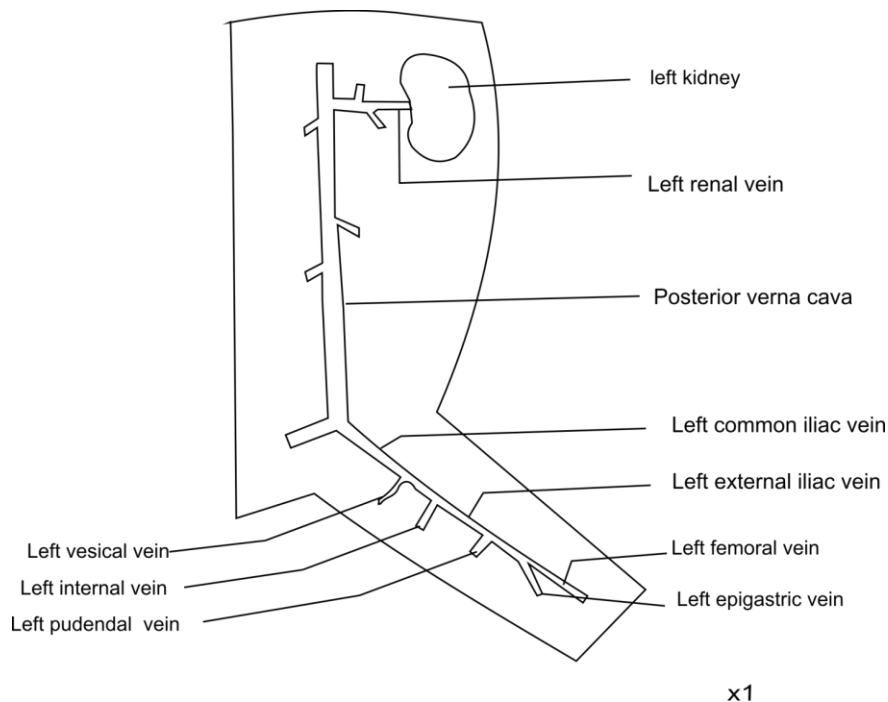
Structures exclusively for reproduction include:

- **Male: Testes, vas deferens and prostate gland.**
- **Female: Ovary, Oviduct, uterus and vagina.**

In some question you may be required to label only structures responsible for excretion or structure for reproduction. Do not mess up.

6. Expose blood vessels that drain the left kidney and left limb and draw.

A drawing of blood vessels that drain the left kidney and left hind limb



** the same question may be asked but to label blood vessels that drain the right hind limb. Since the blood vessels have similar names; the prefix 'left' or 'right' before the name of the vessels is very important.**

The rib cage

Structure: The rib cage is tubular and rigid to accommodate and protect the heart and lungs

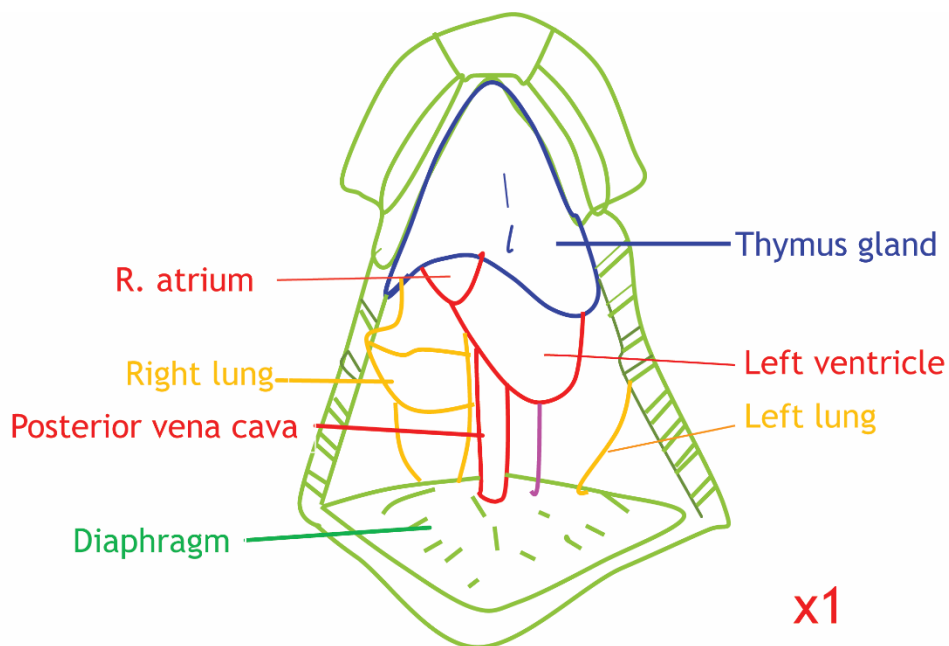
The diaphragm

Structure: it is muscular and membranous structure that separates the thoracic and abdominal cavities in mammals.

- Relaxation of the muscles create a dome shape that reduces the volume of the thorax, pushing the air out of the lungs.
 - Contraction of the diaphragm muscles flattens the dome increasing volume of the thorax (decreasing pressure) to allow air into the lungs.
7. Lift the xiphoid cartilage and cut along the lower edge of the rib cage. Tie the xiphoid cartilage, pull it back and pin it down, cut along the side wall of the thorax on both sides to remove the rib cage.

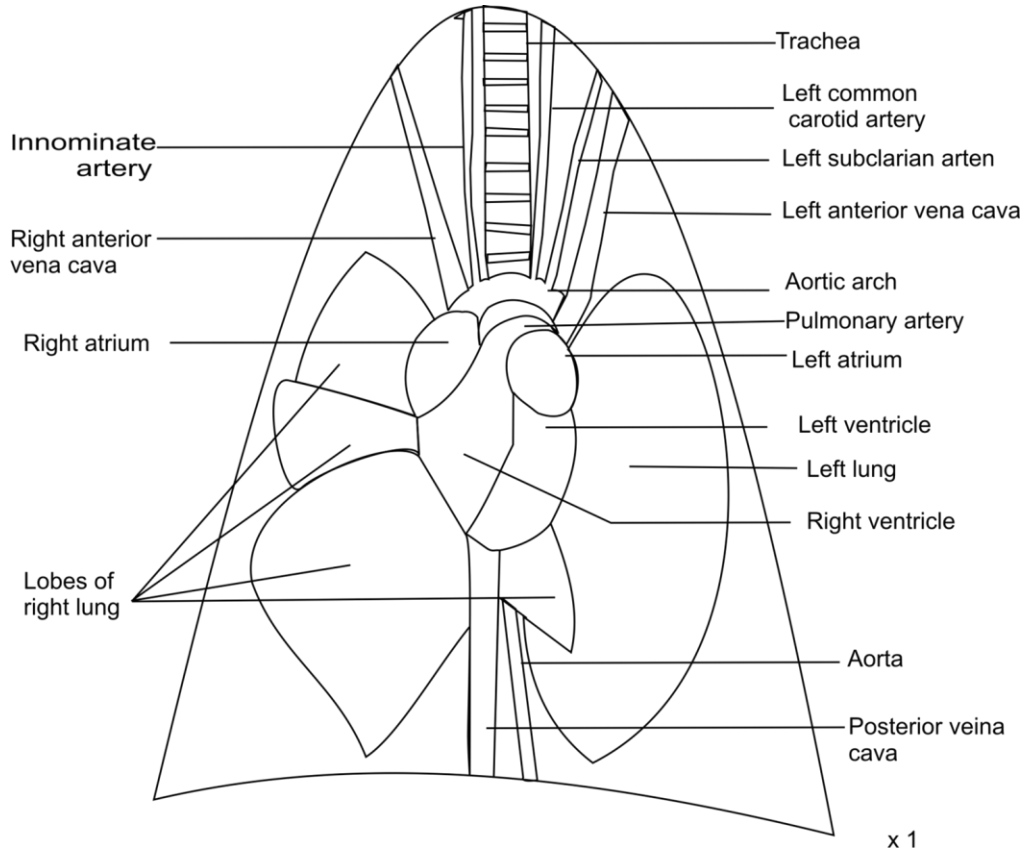
This should expose the main blood vessels, nerves, and glands in this region. Draw the structures in chest cavity undisturbed form.

A drawing of visceral structure of the chest region in undisturbed form



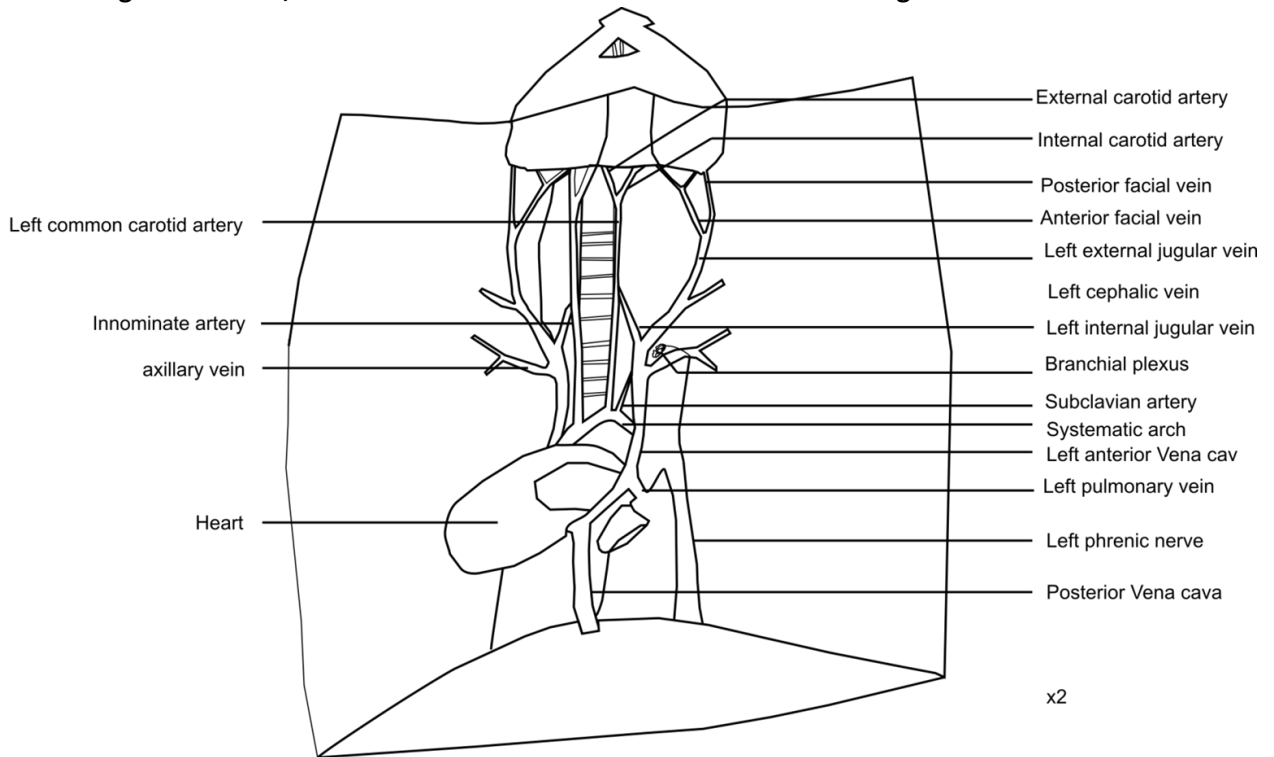
8. Expose blood vessels, and structures in the neck and chest regions, remove the thymus gland but leave the heart undisplaced and draw.

A drawing of structures in the neck and chest the heart undisplaced and, the thymus gland removed



9. Expose blood vessels, and structures in the neck and chest regions, remove the thymus gland and displace the heart to the right of the animal and draw.

A drawing of the heart, blood vessels and nerves in the chest and neck region



The Lungs

- **Colour:** Red/pink because they contain numerous blood capillaries that bring deoxygenated blood and carry away oxygenated blood maintaining diffusion gradient.

Structure: sponge-like because they contain numerous air sacs that increase surface area for gaseous exchange.

The Trachea

Structure: Cylindrical tube with rigid cartilaginous rings with interval of non-cartilaginous rings. The rings kept the trachea open when the pressure in the thorax cavity falls during expiration

The Heart

Structure:

- It is muscular with four chambers i.e. Two atriums or auricles and two ventricles.
- The wall of left ventricle is thicker than that of right ventricle.

Significance of the differences between the left and right ventricles

The walls of the left ventricle are thicker because they pump blood a long distance around the body while the right ventricles pumps blood a short distance to the lungs

Thank you

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