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RAT

CLASSIFICATION

KINGDOM ; ANIMALIA

PHYLUM ; CHORDATA

CLASS ; MAMMALIA

ORDER ; RODENTIA

FAMILY ; Muridae

GENUS ; Rattus

SPECIES ; norvegicus

FEATURES FOR KINGDOM

> Has eyes for sight

> Has mouth and teeth for holozoic nutrition

> Has limbs/ legs for locomotion.

FEATURES FOR PHYLUM

> Has Incisor teeth (bone)

> Has pentadactyl limbs

> Has post anal tail

FEATURES FOR CLASS.

> Body covered by fur/skin covered by hairs

> Posses nipples/ teats which bear outlets of mammary glands

> posses external earlobes/ external ears/ pinnae

> Posses external genitalia/external reproductive pores/scrotal sac/penis/clitoris/vulva/vigina opening.

Note Internal Mammalian features include;

> possession of heterodont teeth (A set of different types of teeth) only Incisors are seen externally; Dental formula; $I\frac{1}{1}C\frac{0}{0}PM\frac{0}{0}M\frac{3}{3}$

> possession of a diaphragm

FEATURES FOR ORDER

> Limbs with digits having claws; claws are hard, curved, pointed and sharp

HABITAT

Terrestrial environment in burrows

SEX IDENTIFICATION

MALE;

> Has the scrotum/scrotal sac; scrotal sac is swollen/bulge sac-like, elongated/long with short/long scanty hairs; are two with a depression in the middle

> Has a penis; penis is long/elongated, covered by retractable/loose sheath/prepuce which is cylindrical, solid with short scanty hair and a slit-like aperture at the tip.

FEMALE;

- Has vulva/genital opening/vagina/opening; vulva is a wide slit-like opening.
- Has nipples/teats. A teat is a small projection, pointed, short cylindrical and smooth.
- Has clitoris; clitoris is a small projection/swelling/bulge/protrusion, clindrical, solid with small opening at the tip and short scanty hair

GENERAL ADAPTATIONS OF THE RAT TO SURVIVE IN IT'S ENVIRONMENT

- Has large expanded ear lobes to increase the surface area for trapping sound waves for easy hearing.
- Eyes are dorso-laterally located midway the head for a wide field of view.
- Tail is long, solid/hard and flexible for easy lashing of enemies.
- Body is covered by thick fur except the lower surface of the hand and feet to insulate the animal against heat loss for temperature regulation; Thick fur also reduces water loss from the animal.
- Claws are also elongated. are hard, sharp and pointed for firm grip on the rough surface/digging tunnels/protection against predation/holding food.
- Incisor teeth are hard, long and curved inwards/chisel shaped for easy butting of food or defense by butting the enemy.

> Whiskers are long and stiff for easy detection of the diameter of the burrow;
> Mouth is ventrally located for easy ingestion of food.
> Has open nostrils for easy breathing / easy smelling.
> Body is streamlined and flexible to easily enter the burrows.
> Has sole pads to reduce noise making when moving for easy escape.
> Head is covered with little fur to reduce insulation of the sensory organs
> Head tapers anteriorly with a triangular / cone shape providing a streamlined shape reducing air resistance for easy locomotion / for easy entrance into the burrows.
> Head is covered with little fur to reduce insulation of the sensory organs

EXTERNAL ANATOMY

Anatomically a rat is divided into head and trunk (thoracic and abdominal) region. It also has a neck and a tail. A neck connects the head to the body trunk.
Body trunk is a central body part or region onto which the head is attached via the neck, fore limbs attached anteriorly, Hind limbs attached posteriorly and tail also attached at the rear end.

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STRUCTURES ON THE HEAD

(i) PINNAE;

Are two/a pair; funnel shaped ie expanded outwards/at the top and narrows at the base.

Location; Are dorso-laterally located at the posterior end of the head and posterior to eyes.

Adaptation;

- Has scanty/little fur to promote heat loss.
- Has many blood capullaries close to inner surface of the skin to encourage heat loss.

Note; Also branching pattern of blood vessels enables a rich nutrient supply to the pinna tissue.

- Funnel shaped to direct sound waves into the auditory canal for easy hearing and to increase it's sensitivity to sound.
- Large to increase the surface area for collection of the sound waves
- Pinnae are also erect to maintain a posture that enables reception of sound waves and direct them into the external auditory meatus.

(ii) Lips;

Has two lips ie upper and lower lip. Upper lip splits into two medially by a cleft called philtrum which extends into nostrils. Philtrum exposes the upper incisors to gnaw food. The lower edge is flap-like to hold food in diastema during

feeding

The rhinarium are between the nostrils and are moist, hairless and shiny. Lower lip is not divided and hairy.

(iii) EYES;

Description of the eyes;

Are two/pair, small and bean shaped with hairy eye lids and nictating membrane which broad and transparent located in the interior corner of the eye.

NOTE; Nictating membrane can be drawn across the eye for protection.

LOCATION; Are dorso-laterally located midway the head, anterior to the external ears.

NOTE; Their location provides a wide field of view.

(iv) External nares / Nostrils

Description:

Are two/a pair, narrow openings, curved/coma shaped surrounded by smooth skin; Are anteriorly located on the head

Adaptations;

- Nostrils are open to allow entry of chemical substances.
- Are anteriorly located on the head for easy smelling and breathing thus sensitive to smell when when the trunk is concealed from predators in burrows

(v) Mouth.

Location; Mouth is ventrally located at the anterior end of the head below the nostrils.

Adaptations;

- Hard plate is ridged roof to prevent food from falling out of the mouth. It's also hard for manipulation of hard/coarse food.
- Upper surface of the molars is broad to increase the surface area for crushing food
- Incisor teeth are protruding, hard, long, curved inwards/chisel shaped, pointed and sharp for easy cutting of food and defense by biting the enemy.

Note,

- ✓Each jaw has a pair of incisors, lower incisors are longer than upper incisors
- ✓Smooth plate is a smooth region posterior to the hard plate on the roof of buccal cavity.
- ✓Hard palate separates the nasal cavity from oral cavity.
- Tongue is long for easy rolling of food during chewing/easy swallowing
- Tongue is muscular/thick to manipulate food for easy swallowing
- Tongue is broad/flat to increase surface area for rolling/increase surface area for exposing taste buds
- Tongue is also flexible for easy rolling of the food.
- Tongue also has a large base to increase the surface area for firm attachment

(vi) Vibrissae / Whiskers.

Whiskers are many, brittle/stiff, large of varying length arranged in rows along the sides of the anterior end of the head.

Adaptations;

- Are numerous increasing the surface area for sensitivity/detection
- Whiskers are stiff to determine width of the burrow/for increased sensitivity
- Whiskers are of varying length increasing the chances of detection/sensitivity
- Whiskers being long and brittle makes it easy to detect changes in pressure when entering holes/burrows and therefore makes the animal sensitive to slightest touch.

FEATURES ATTACHED ON THE BODY TRUNK (THORAX AND ABDOMINAL REGION)

These features include limbs (fore and hind limbs), male external genitalia (scrotum and penis), tail and neck.

FORE LIMBS.

Description;

Fore limb is short and stout, less muscular/small in size, segmented with four well developed digits and the fifth is greatly reduced to a small stub, has a short hairless sole with many pads (6)

Each digit has a hard, curved, elongated, sharp, pointed claws.

Adaptations

- Fore limbs are short and stout to absorb shock on landing
- Are segmented for flexibility during locomotion
- Sole has got many pads (6) to reduce noise making when moving for easy escape
- Has hard, curved and pointed claws for defense by scratching the enemy / digging burrows / firm grip on the rough surface during locomotion.

HIND LIMBS;

DESCRIPTION

Hind limb is long, segmented, more muscular. Sole has long foot, with five well developed digits of varigible length. Each digit has a sharp, curved, hard, pointed, elongated, sharp claws. dorsal side of the sole has got sparse fur and ventral surface is hairless with many sole pads

Adaptations;

- Hind limbs are long and muscular to generate a greater propulsive force for fast movement to escape the enemies.
- Have hard, curved, elongated and pointed claws for defense / digging burrows and firm grip on the rough surface.
- Hind limb is jointed for flexibility during locomotion.

- Has a hairless sole for heat loss
- Foot has many sole pads that reduce the noise during locomotion.

SIMILARITIES BETWEEN FORE LIMBS AND HIND LIMBS.

- Both have claws, smooth sole, digits, sole pads.

DIFFERENCES

FORE LIMBS	HIND LIMB
Have short digits / toes	Have long digits / toes.
Have four well developed digits	Have five well developed digits
Less muscular	More muscular
Short sole / sole has a small surface area	Long sole / sole has a large surface area
It short	It's long.

Note; The hind limb is long, almost twice the length of the fore limb inorder to generate a greater / stronger propulsive force during locomotion

OR

The fore limb is short, almost half the length of the hind limb inorder to absorb shock during landing.

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TAIL

LOCATION; Attached to the rare/posterior end of the body trunk.

DESCRIPTION;

Tail is long, solid/hard, flexible, tapers posteriorly, covered by rows of closely packed scales.

Adaptations;

> Tail is long to provide balance to the body during locomotion and also lashing disturbing organisms.

> Tapers posteriorly to reduce on its weight/reduce resistance during locomotion

> Has closely packed rows of scales for protection against physical injuries and reducing water loss

> Tail is also segmented for flexibility while whipping the enemy.

> Scales are anteriorly attached and overlaps posteriorly to allow heat loss.

> Also has short, stiff scanty hair for increased sensitivity to touch.

> Hairs also emerse between the scale to encourage heat loss.

TASK; Describe the attachment and pattern of arrangement of scales;

The anterior end of the scales are attached; posterior end is free; are arranged close to each other; anterior scales overlaps posterior scales; in rows;

NOTE; 1. Tail is long and almost half the length of the body plus the tail for support / balance to the animal / enable it maintain raised head / drive away other organisms / predators / defense.

2. The skin covers entire body and offers protection allover the body against mechanical injuries, entry of parasites and heat loss.

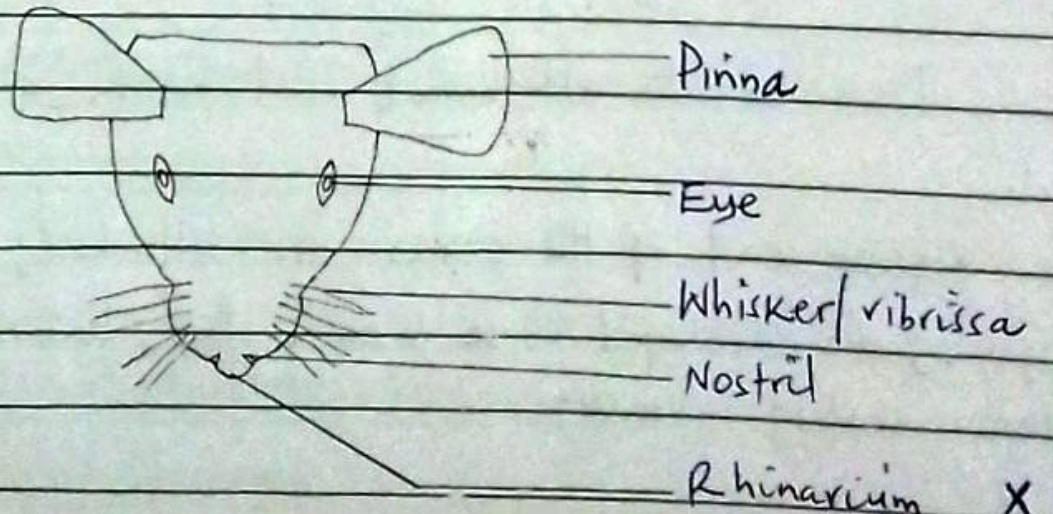
ANUS.

In females, it's most posterior aperture, at the base of the tail seen by lifting the tail but in males, it's most posterior aperture, hidden by over hanging scrotum, seen by lifting the tail.

Adaptation;

It's an aperture, to allow discharge of faecal materials.

A DRAWING SHOWING STRUCTURES WITHIN THE DORSAL VIEW OF THE HEAD



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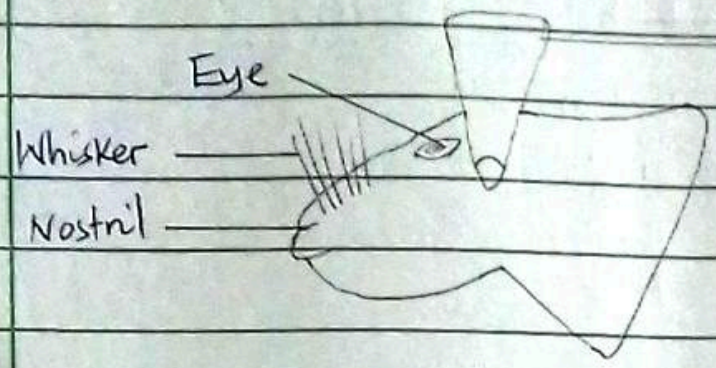
A DRAWING SHOWING LATERAL VIEW OF THE HEAD



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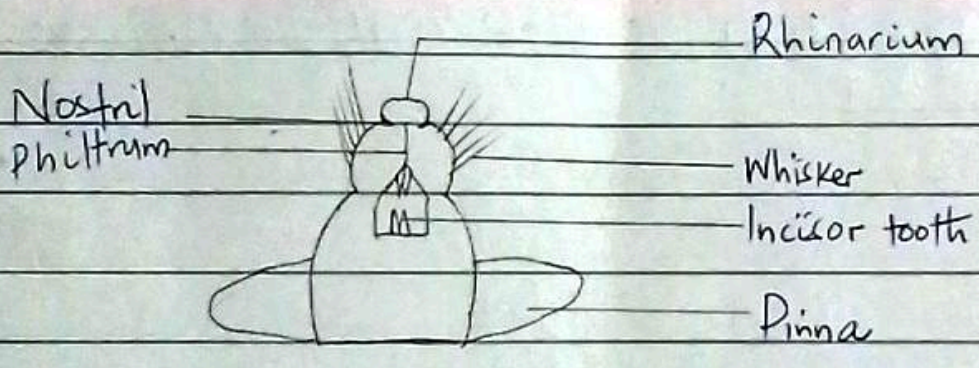
A DRAWING SHOWING VENTRAL VIEW OF THE HEAD



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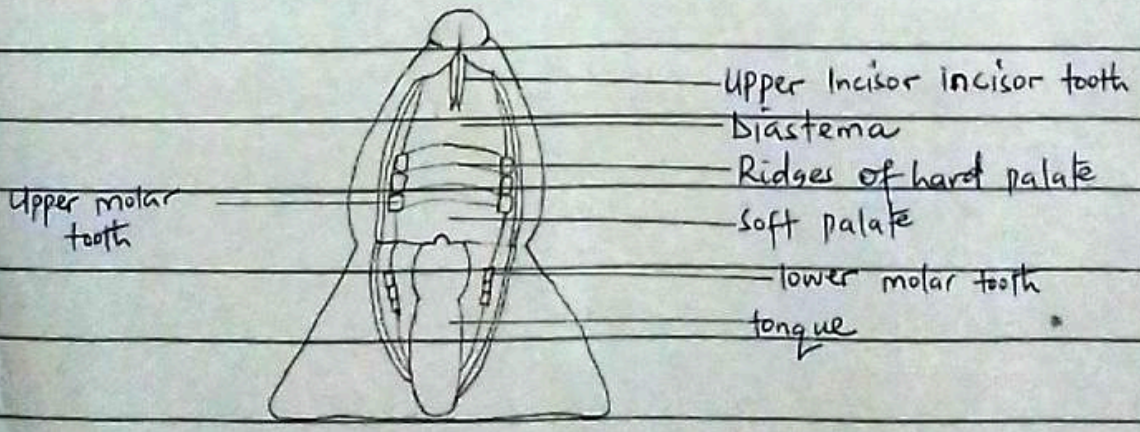
A DRAWING SHOWING STRUCTURES IN THE ORAL CAVITY OF A RAT.



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A DRAWING SHOWING VENTRAL VIEW OF THE FOOT OF THE HIND LIMB OF A RAT

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A DRAWING SHOWING VENTRAL VIEW OF THE FORE LIMB OF THE RAT

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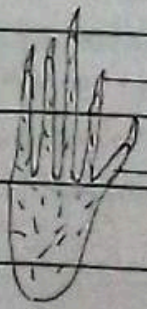
A DRAWING SHOWING DORSAL VIEW OF THE FOOT



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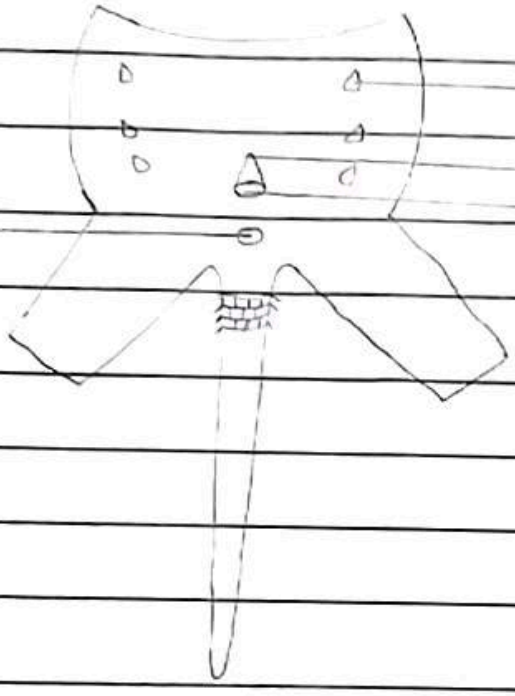
A DRAWING SHOWING VENTRAL POSTERIOR ABDOMINAL REGION AND THE TAIL (FEMALE)



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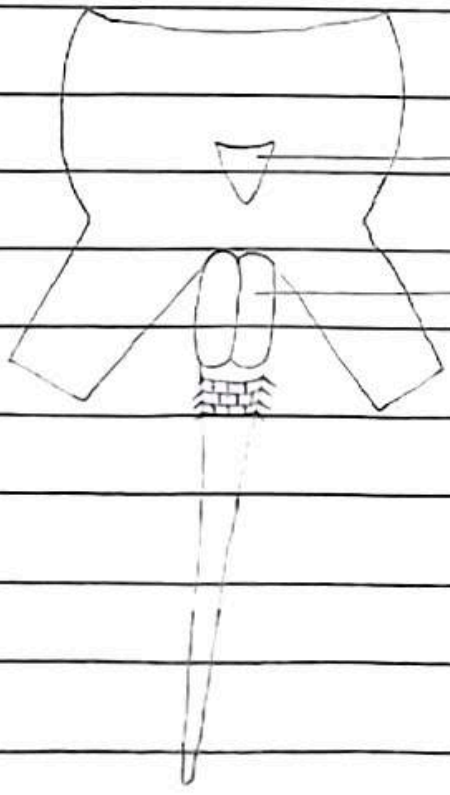
MALE



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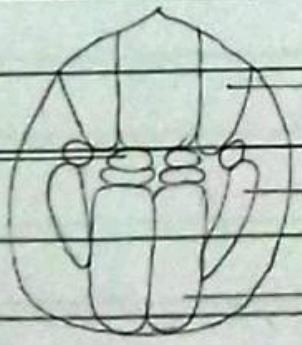
BODY SYSTEMS OF A RAT

NOTE; Superficial structures are visible structures exposed on the body wall after removing the skin eg Neck glands masseter/jaw muscles (found in the head) pectoral muscles, neck muscles, shoulder muscles (Deltoid muscle), Intercostal muscles, abdominal muscles, thigh muscles, preputial glands, femoral nerves and femoral veins

TARGET BODY SYSTEMS OF A RAT INCLUDE;

Respiratory system
Digestive system
Urinogenital system
Excretory system.
vascular system/ circulatory system.

A DRAWING SHOWING HEAD MUSCLES AND NECK GLANDS OF A RAT FROM THE VENTRAL VIEW



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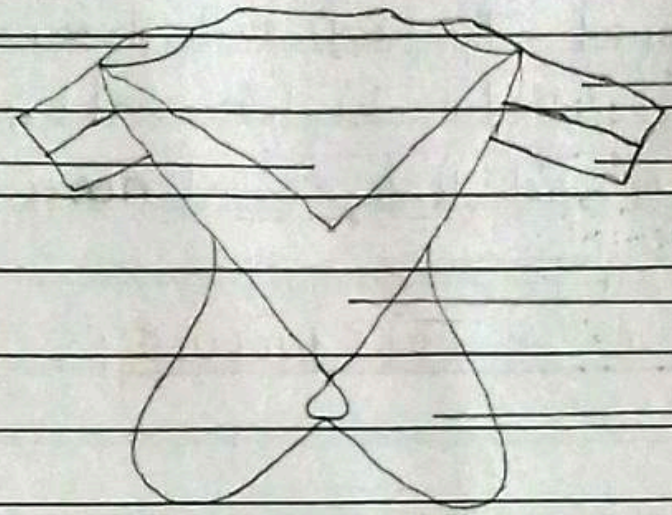
A DRAWING SHOWING THORACIC MUSCLES AND UPPER FORE LIMB MUSCLES FROM VENTRAL VIEW.



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NOTE;> Thoracic muscles include deltoid muscles, pectoralis major, pectoralis minor and intercostal muscles.

> Xiphoid cartilage is not a muscle, It should be only labelled when the question is targeting superficial struction of the thorax

> chest muscles include pectoralis minor and pectoralis major

> Biceps and Triceps are not part of thoracic muscles

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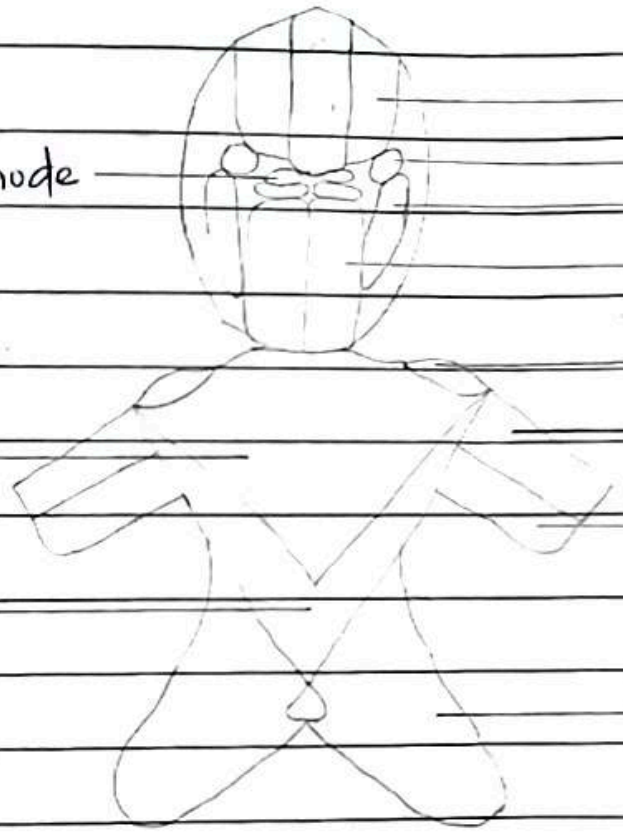
A DRAWING SHOWING HEAD MUSCLES, NECK GLANDS, THORACIC MUSCLES AND UPPER FORE LIMB MUSCLES OF A RAT FROM THE VENTRA VIEW.



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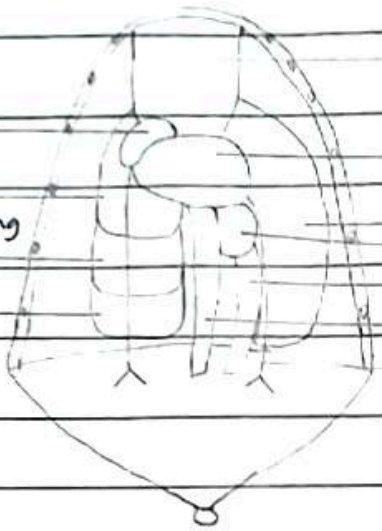
A DRAWING SHOWING STRUCTURES WITHIN THE THORAX IN SITU / UNDISPLACED STATE.



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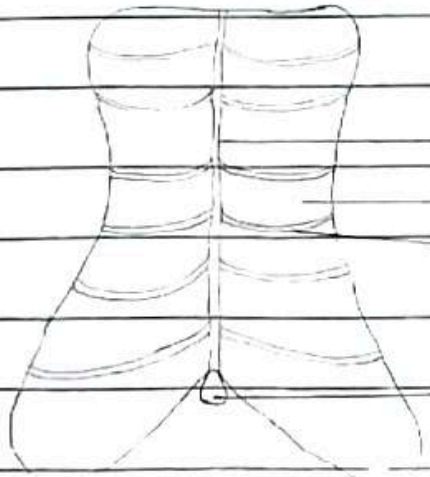
NOTE; ✓ Right lung has four lobes while left lung is unlobed
✓ Lungs being pink in colour indicates a rich supply of capillaries.
✓ Organs found in the thoracic cavity include thymus gland, heart (covered by pericardium) lungs, branchial tubes, oesophagus, phrenic nerve, posterior venacava, diaphragm separates thoracic cavity from abdominal cavity.

A DRAWING OF A RIB CAGE



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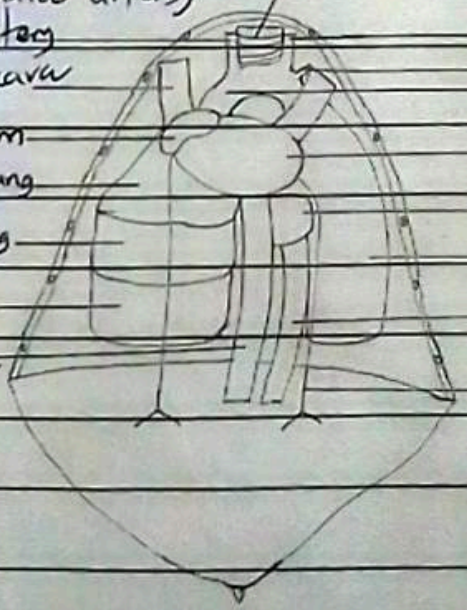
NOTE; ✓Arat has 13 pairs of ribs. 7 pairs are false ribs and 6 pairs are true ribs dorsally attached to the thoracic vertebrae and curves ventrally attaching to the sternum.

True ribs attach to the sternum but false pairs attach to the ribs a head of them.

✓ The coelom is the body cavity within which the viscera (internal organs) are located.

✓ Visceral region is made up of the thoracic and abdominal region and all organs are found in these respective regions.

A DRAWING SHOWING STRUCTURES WITHIN THE THORACIC REGION IN SITU WHEN THYMUS GLAND IS REMOVED.



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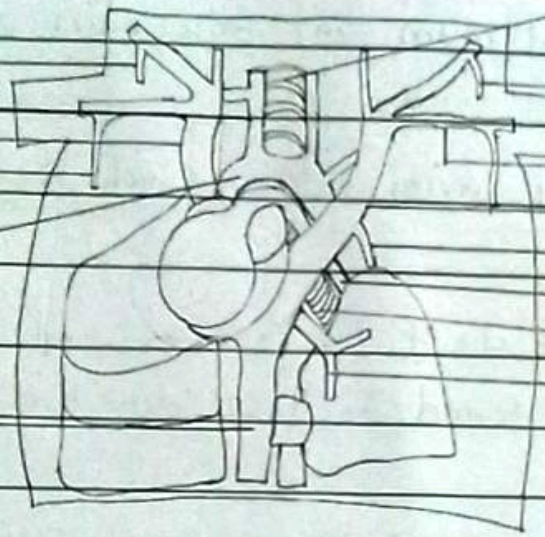
A DRAWING SHOWING BLOOD VESSELS WITHIN THE LOWER NECK REGION AND THORACIC REGION WITH THE HEART DISPLACED TO THE RIGHT INCLUDING THE RESPIRATORY TRACT



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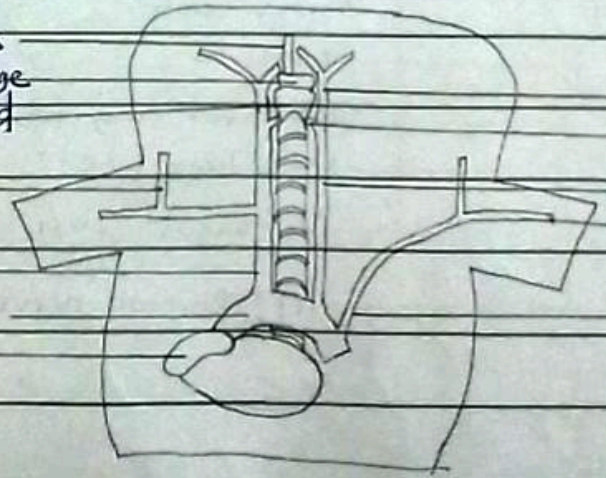
A DRAWING SHOWING BLOOD VESSELS SUPPLYING BLOOD TO THE HEAD REGION, THORACIC REGION AND FORE LIMB WITH THE HEART UNDISPLACED INCLUDING THE RESPIRATORY TRACT AND ASSOCIATED STRUCTURES.



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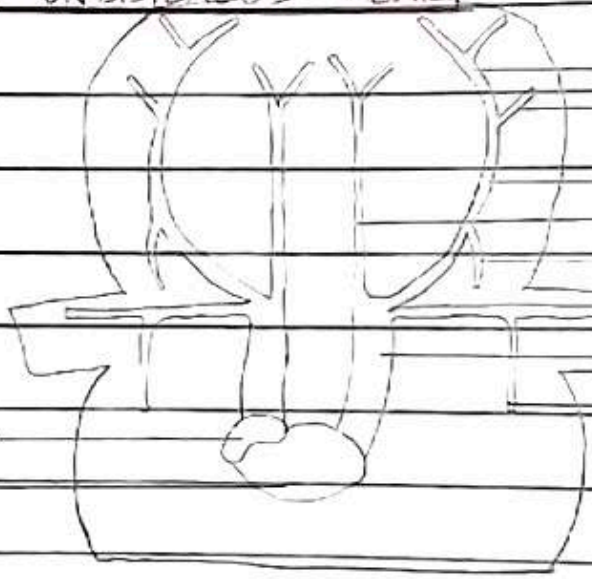
A DRAWING SHOWING BLOOD VESSELS DRAINING BLOOD FROM HEAD REGION NECK REGION, THORACIC WALL AND FORE LIMBS BACK TO UNDISPLACED HEART



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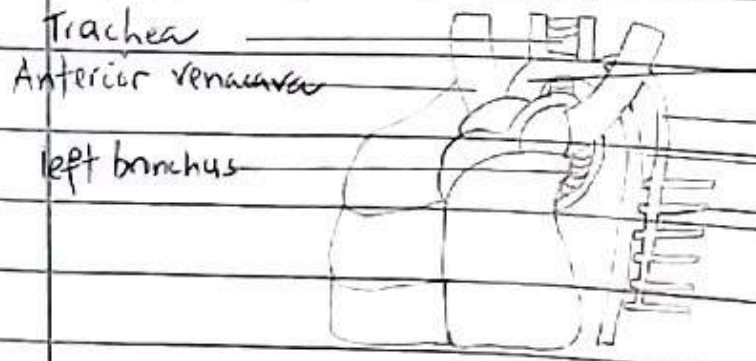
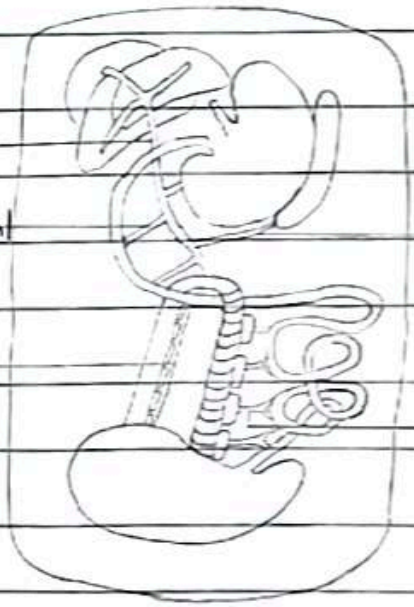
NOTE; With the heart and the left lung lobe displaced to the right, the following structures are displaced within the thorax.



A DRAWING SHOWING STRUCTURES IN THE ABDOMINAL REGION IN UNDISPLACED STATE / INSITU

A DRAWING SHOWING BLOOD VESSELS DRAINING BLOOD FROM ALIMENTARY CANAL AND THE SPLEEN BACK TO THE LIVER LOBES TURNED UPWARDS.



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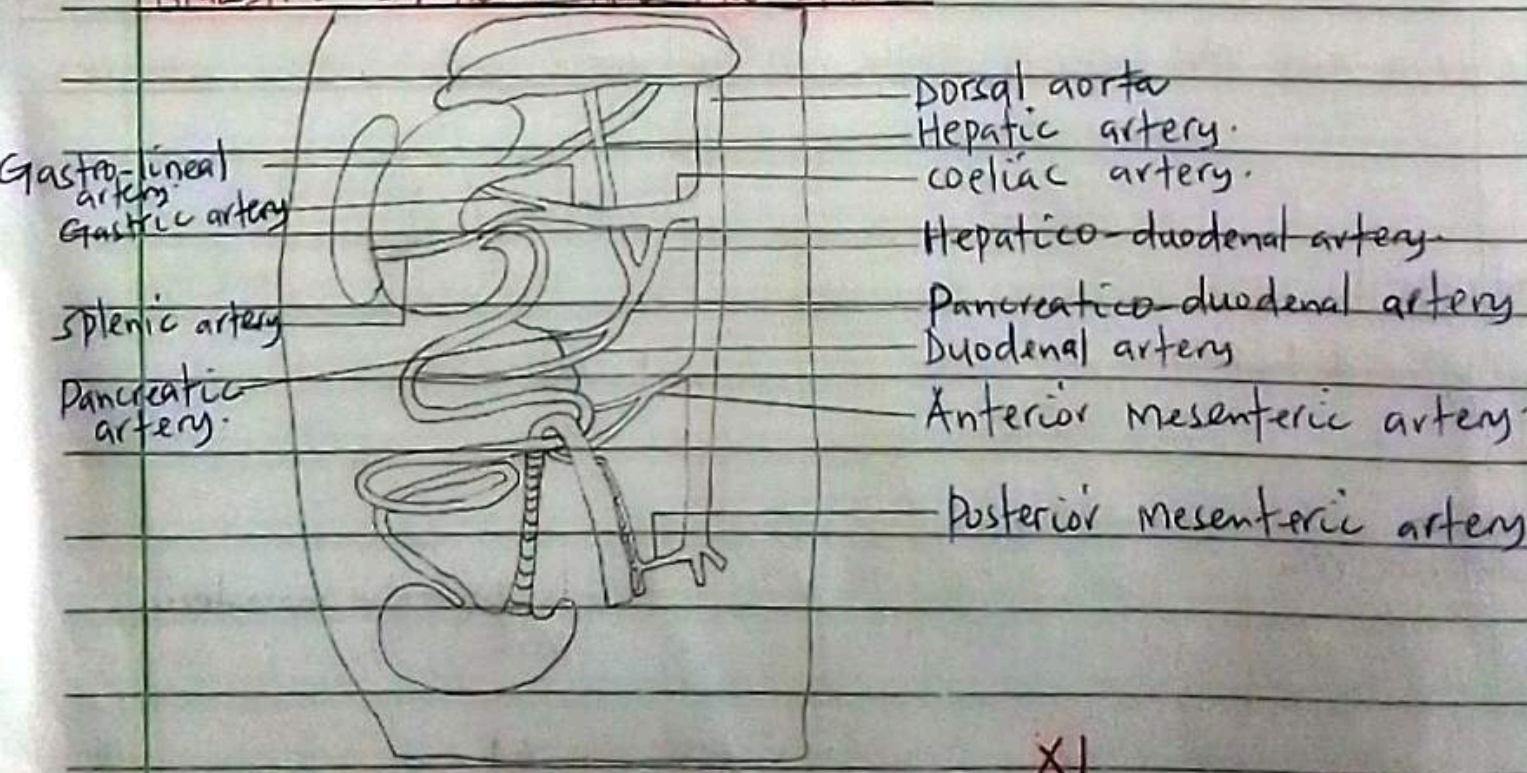
NOTE;> The Inner lining of the pylorus stomach is folded and smooth. The folds Increase the surface area for digestion and absorption of digested food, Folds also allows distension of the stomach to Increase surface area for food storage.

The wall of pylorus is thick/opaque enabling the stomach to thoughly mix up the food with gastric juice

> The lining of cardiac stomach is smooth and not folded. The wall of cardiac stomach is thin and transparent

Stomach wall has many blood capillaries to Increase the surface area for absorption of digested food.

A DRAWING SHOWING BLOOD VESSELS SUPPLYING BLOOD TO DIGESTIVE SYSTEM AND THE SPLEEN.



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