Rat Dissection Marking Key

Component		Possible Mark	Your Mark
External Structures: Part A: Mouth and Nose	#2	1	
	#3	1	
Eyes	#3	1	
	#4	1	
	#5	3	
Facial Hair	#2	3	
Part B: The trunk	#1	1	
	#2	1	
	#3	1	
	#4	2	
	#5	1	
	#6	1	
	#8	3	
Internal Structures Part A: Overview	#13	1	
Part C: Digestive System	#3	3	
	#4	1	
	#5	1	
	#7	1	
Thoracic Cavity:	#4	1	
Abdominal Cavity:	#4	2	
	#6b	2	
	c	2	
	#7b	1	

Part D: Excretory System **follow directions but no written observations are required		
Part E: Respiratory System #7	1	
Part F: Reproductive System ** follow directions but no written observations are required		
Part G: Circulatory System #4	2	
#6	2	
Follow up questions #1	2	
#2	2	
#3	3	
#4	2	
#5	2	
#6	2	
#7	1	
#8	2	
#9	1	
#10	2	
#11	2	
#12	1	
#13	2	
#14	2	
#15	1	
#16	1	
#17	2	
#18	1	

Activity

10.2 Examining the external features of the rat

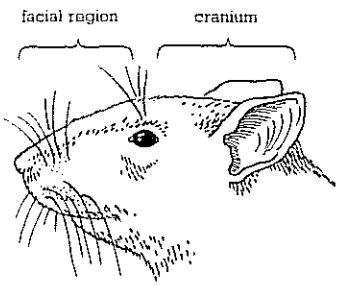


Fig. 3a *Head of a rat.*

Materials

- rat
- forceps
- hand lens
- wax-lined dissecting tray

CAUTION
If you are using a preserved specimen, rinse it under tap water to reduce preservative fumes, then drain before examining.

Method

Part A (The head)
The head consists of two main regions—the face and the cranium, with no distinct separation between the two.

Mouth and nose

1. Examine the mouth and nose. The mouth is bordered by a pair of lips covered with hair. The upper lip, from lip to nose, is partially divided, or cleft, in the middle. The **nostrils** are located within a very flexible nose.
2. *Can you suggest a reason for the type of body covering on the nose?* (HINT: Keep in mind the function of the nose.)
3. *Where are the nostril openings located on the nose?*

Fig. 3b *Nictitating membrane.*

Eyes

1. Examine the eyes. The eyes are bordered by a pair of movable upper and lower lids without eyelashes.
2. Separate the eyelids by holding each with forceps. Use a hand lens to observe the small membrane in the inner corner of the eye. This is the **nictitating membrane.** In larger mammals, such as the dog or cat, this membrane acts as a third lid to cover the eye below the eyelids.
3. Use a hand lens to examine your partner's eye. *How has the nictitating membrane been modified in the human eye?*
4. Examine the rat's lower eyelid in the inner corner with a hand lens. You should see a small pin-point opening on the lid's surface. Compare this with your partner's eye. This opening in humans is the **tear duct.** *Can rats cry?* Explain your answer.

5. *Where are the rat's eyes located in the head? What range of vision would the rat have? Could it see the end of its nose?* Compare this to the human range of vision.

Ears

1. Examine the ears. The ears have a flexible external broad flap of skin called the **pinna** extending outward from the head. At the base of the ear, a small portion of elastic cartilage supports this outer fold, giving it a funnel-shaped appearance. These "funnels" trap sound waves and direct them into the **auditory channel**.

Facial hair

1. Examine the long, flexible hairs, called **whiskers**, on either side of the rat's cheeks close to the nose. These enable the sense of smell and touch to be combined in rats.
2. Look for other facial sensory hairs, which are longer than the body hair, in the area of the chin, above the eyes, and at the front and base of the ears. *What would be the function of the sensory hairs on the chin, above the eyes, and at the base of the ears?*

Part B (The trunk)

The trunk has two regions—the **thorax** and the **abdomen**. It is separated from the head by a short neck. The rat has hair uniformly distributed in a dense pattern over its entire body, except for the feet, tail, and inner part of the pinna. Each hair root is located in a pit or depression, called a **follicle**, in the skin. Outside the follicle is the hair shaft. Attached to the hair follicle is a set of muscles which, when contracted, can make the hair shaft stand on end. You saw in Chapter 7 that human hair can also stand on end.

IT'S A FACT ...
Many animals have hair that can stand on end. For example, an angry male dog raises his hackles and makes his fur bristle when confronted by another male dog.

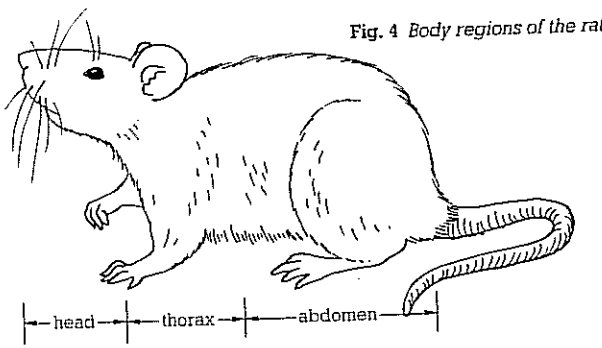


Fig. 4 *Body regions of the rat.*

IT'S A FACT ...
Human males have a limited degree of retractability of the testes (i.e., they are able to bring the testes closer to the body wall but not inside the body cavity). Retraction may occur when exposed to extremely cold environments.

DID YOU KNOW ...?
Mammals other than rats have structures arising from the epidermis, such as hooves, horns, and, in the case of humans, nails.

Other structures located in the skin are fat cells, oil and sweat glands, nerve endings and fibres, and blood vessels.

1. Lay the rat on its back (dorsal surface), and locate the pairs of nipples or **teats** on the thorax and abdomen. These are the external openings of the **mammary glands**. *How many nipples or teats does the rat have?*
2. *Do both male and female rats have teats?*
3. *What function do the mammary glands serve in the male rat?*

Most mammals have distinctly separate anal and urogenital openings. In the female rat, the **vaginal opening** is in front of (anterior to) the **anal opening** at the base of the tail. A third opening, called the **urethral opening**, may be located closer to the abdomen than the vaginal opening. In the male rat, the penis is located on the mid-line of the lower abdomen and in front of (anterior to) a large pouch, the **scrotum**, which contains two **testes**. The tail is well developed, flexible, and extremely long in relation to the rest of its body.

4. Measure the length of the tail and the body (from the tip of the nose to the base of the tail). *What is their relative proportion?*
5. Examine the tail with a hand lens. Only a few body hairs exist between the reptile-like scales of skin. *Why does the rat have so few hairs on its tail?*
6. Examine the rat's feet. The rat walks on its toes, unlike humans who walk on the entire sole of the foot, except for the raised arch. The rat's feet are covered with tough, reptile-like scales. *What function is served by the absence of fur?*
7. Examine the round pads of epidermis on the sole of each foot. These provide grip and cushion the bones of the feet as the rodent moves.
8. *How many digits or toes are there on the front and back feet? What structure is at the end of each toe? What function does it serve?*

Follow-up

1. State the regions of the body.
2. How are the ears structurally adapted for trapping sound waves?
3. Describe the body covering in various regions of the rat's body, and explain how it helps the rat survive.

Activity

10.4 Examining the internal structures of a rat

Fig. 11 *Rat prepared for dissection.*

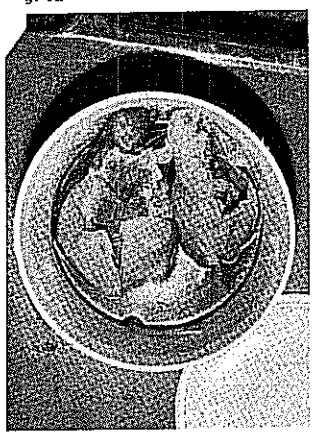
Materials

- bone shears
- probe
- 2 pairs of forceps
- dissecting tray (wax-lined)
- large scissors
- 2 pieces string, 0.5 m each
- fine scissors
- dissecting needles or string
- scalpel
- hand lens or stereo dissecting microscope
- goggles
- disposable rubber gloves
- T-pins
- plastic garbage bag or pail

CAUTION

- Perform your dissection in a well-ventilated room.
- Wear safety goggles.
- Tie back long hair.
- Rinse the animal under tap water before beginning.
- Wear disposable gloves at all times.
- If preserving fluid touches your skin, rinse thoroughly with soap and water.
- Wear a lab coat or apron to prevent preservative fluid stains on clothing.
- Roll up long sleeves.

g. 12

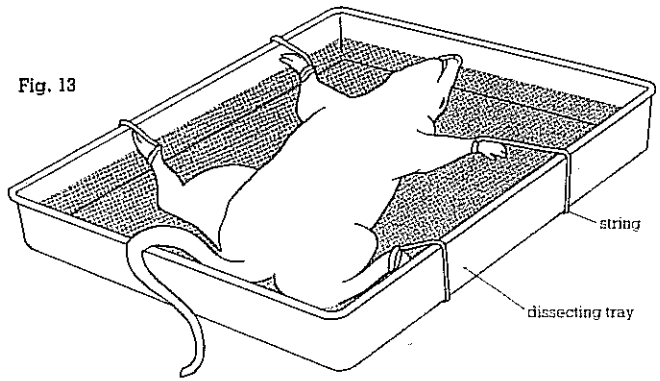


Part A (Overview)

Method

1. Wash the rat carefully and thoroughly under cold, running water.
2. Lay the rat on its back in a clean dissecting tray.
3. Spread the legs laterally as far apart as possible.
4. Using a piece of strong string, 0.5 m in length, tie a knot around the left wrist of the forelimb.
5. Using a second piece of string, tie a knot around the ankle of the left hind leg.
6. Run both strings underneath the dissecting tray, and tie them tautly around the opposite wrist and ankle respectively (see figure 13).

Fig. 13



NOTE: When finished dissecting for the day, untie the knots on one side of the body and lift the rat by the strings from the tray. Re-use the strings for the duration of the lab.

Between dissection periods, replace the flaps of skin over the body and fasten in place with dissecting needles or string. This prevents dehydration of interior tissues, as well as facilitating storage, since the body is a neat package with all internal organs inside. Package the rat in a plastic garbage bag or plastic pail.