

4-H MEMBER MANUAL

CAT PHYSIOLOGY

Suggested for Unit 3



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Compiled by Mary C. Smith, Auburn 4-H leader. Contents reviewed by Roy J. Hostetler, former Extension Veterinarian.

CAT PHYSIOLOGY

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LESSON 1—INTRODUCTION

A knowledge of the cat's body and how it functions is important to every cat owner and will prove useful in the pet's daily care. It will also be helpful when giving the veterinarian needed information and in the treatment of cat ailments and injuries.

Hair

First of all, the hair or fur serves as insulation against heat and cold. Hair also protects the cat against insect bites, stings, thorns, and other dangers and annoyances.

The cat raises its hair, particularly the hair along its neck and spine, as a protective device when frightened or threatened. With its hackles raised, the cat assumes a wary and defiant position. Back arched, tail hairs bristling, muscles tensed, it turns itself broadside. In this attitude, the cat appears larger and more ferocious to its attacker.

Cats shed their hair according to climatic conditions and their state of health. Hair is shed naturally year-round, especially in the spring and fall. Excessive shedding is a warning signal of possible disease, poor diet, parasites, or overheating. Therefore, it is important to pay attention to the condition of your cat's hair.

Skin

The cat's skin is made up of an outer layer, the epidermis, and an inner layer, the dermis. The

epidermis consists of four sublayers, with the innermost providing for the regeneration of skin cells.

While the cat's skin is somewhat waterproof, it is not impermeable. That is, certain oils and medicines can be absorbed through the skin. This should be kept in mind when you use any insecticides or medications on a cat's skin. A toxic substance may prove fatal if absorbed through the skin.

The cat's skin contains sweat glands. The cat also has sweat glands in the pads of its feet. Little is known about the purpose of these glands, but the sweat glands in the skin do help regulate the body temperature. The cat is cooled by radiation of heat rather than by inner cooling, which is how the human body temperature is regulated.

Cats also have glands in their skin that are connected with the hair follicles, known as sebaceous glands. They secrete an oily substance known as sebum that solidifies when exposed to the air. It coats the hairs, thus protecting the fur and making it glossy. In a healthy state, the cat's skin is always elastic and pliable, with the ability to regenerate at a rapid pace.

Skeleton

The cat's skeleton is not so different from the human skeleton. The cat has more bones—230 as opposed to 206—but many are identical to those in the human being. Cats have 13 ribs, humans have 12. Most cats have no clavicles (collarbones).

Their forelegs are attached directly to the shoulder blades or scapula. The cat has from 18 to 23 coccygeal vertebrae. On the inside of its forepaws the cat has dewclaws, which serve no apparent function.

The body of the skeleton consists of the skull, ribs, spinal column, forelegs, and hind legs. The spinal column is composed of the atlas, the axis, and the cervical, thoracic, lumbar, and coccygeal vertebrae. The skull is attached to the spinal column at the atlas. The front or foreleg consists of the scapula or shoulder blade, humerus, radius, ulna, carpus or wrist, metacarpus, and digits. The hind leg consists of the femur, tibia, fibula, tarsus or hock, metatarsus, and digits.

The cat's skeleton serves as a strong framework and, under normal conditions, provides protection for the vital organs. The design of the skeleton explains the cat's particular freedom of movement. The cat moves by advancing the forelegs and hind legs on one side, then the forelegs and hind legs on the other.

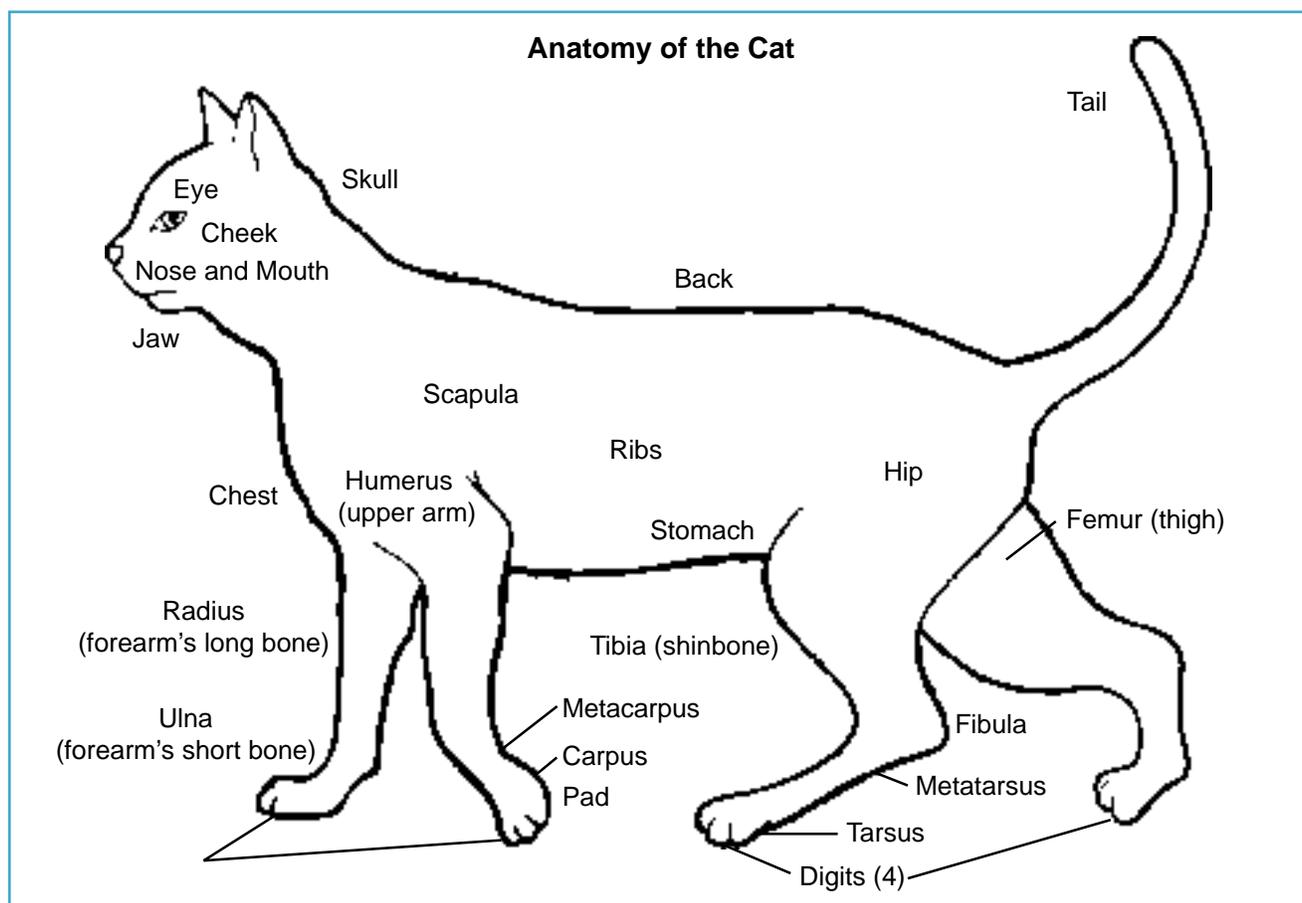
Unfortunately, motor vehicle accidents kill or injure many cats each year. Most frequently broken are the ribs, bones of the forelegs and hind legs, and the pelvis.

Muscular System

The cat's muscles are tough and well-coordinated and help to make the cat an agile hunter. Basically, the cat's muscles are geared for walking, running, leaping, and twisting. Because of their unusual musculature, cats are extremely nimble. The cat's muscular control and skeletal flexibility enable it to right its body during a fall with incredible speed—a trick which is unique to cats.

Sense of Smell

The cat's olfactory nerves, those concerned with its sense of smell, are not as sensitive as those of some other animals, but are quite adequate. Cats can scent people, animals, and other objects at a considerable distance, but they do not rely on this sense as much as other animals do during hunting.



Fastidious about odors, they dislike many of the same smells that humans do. They will try to cover up disagreeable smells.

Most cats have a particular fondness for catnip, a member of the mint family. It is believed that they are excited by the smell. Some authorities believe that the odor of catnip stimulates the cat sexually. Catnip is harmless and you can give your cat as much of this “feline snuff” as it wants. It may enjoy nibbling on the leaves of a catnip plant, or playing with a catnip-stuffed toy. Some cats are not affected by catnip, some become just quietly excited, others roll, purr, and growl in ecstasies of delight.

Sense of Taste

The cat’s tongue is long and flat, with almost parallel sides. It tapers slightly in front and somewhat more in the back of the mouth. The upper surface of the tongue is covered with rasplike *papillae* which enable the cat to scrape every piece of meat off a bone or to lick its coat clean. The tongue is covered with taste buds, particularly at the tip and at the back of the throat. These taste buds react to chemical stimuli to produce sensations of acidity, sweetness, bitterness, and saltiness.

Words to Remember

Dermis: Inner layer of skin.

Epidermis: Outer layer of skin.

Hair or fur: Slender, threadlike outgrowths of an animal’s skin.

Impermeable: Allows nothing to pass through.

Regenerate: Regrow.

Sebum: Oily substance secreted from skin glands that coats cats’ hairs.

Skeleton: Framework of bones that provides support and protects the vital organs.

Vertebrae: Bones and segments that make up the spinal column.

Questions: Lesson 1—Skin, Hair, Skeleton, Muscles, Smell, Taste

1. The outermost part of the cat’s body is called what?
2. Name at least two functions of a cat’s hair.
3. What are the two layers of skin?
4. What does impermeable mean?

5. Where are the cat’s sweat glands located?
6. Name the major bones in a cat’s body.
7. What are a cat’s muscles designed for?
8. What organ is used for smelling?
9. What is the name for the nerves in the nose?
10. What is the primary organ of taste?
11. What are the rasplike protrusions on the tongue?
12. Describe the function of the taste buds.

LESSON 2—VISION, HEARING, RESPIRATORY SYSTEM

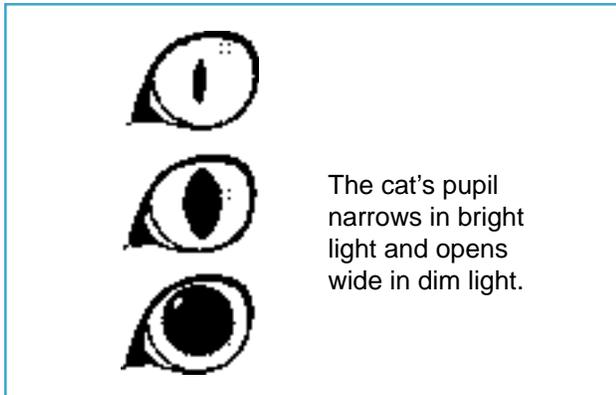
Vision

Cats have exceptional eyesight. Particularly in the early evening and at night, they see better than humans. Most cats can see kinds of light, such as ultraviolet, that are invisible to humans. In the course of their development the ability to see at night while hunting was favored over the ability to see colors during the day. As far as scientists have been able to tell, cats are more or less colorblind.

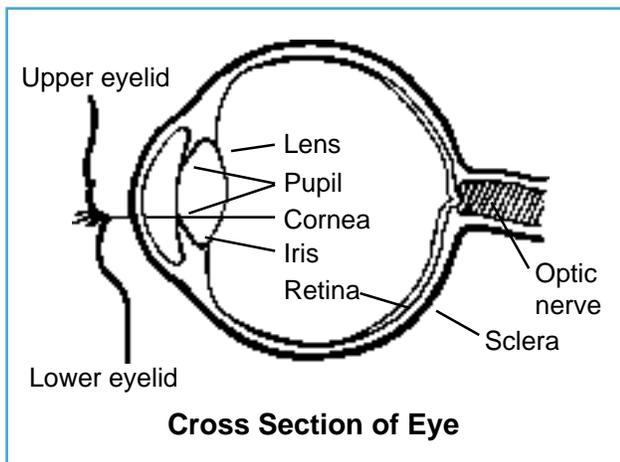
One phenomenon of cat vision is the *tapetum lucidum*, or “eye shine,” the glowing of cats’ eyes in the dark. A layer of iridescent cells at the back of the eyeball reflect the light, which adds to the cat’s ability to see at night.

The cat’s eyes are not complicated organs, but are strong and durable. The eyes appear as large, round globes or orbs, with a transparent covering known as the cornea. Around the cornea is a ring of white, shiny tissue called the sclera. The *nictating membrane*, or third eyelid, is located in the lower part of the cat’s eye. This eyelid serves as protection for the eye. Cats have partial vision through the third eyelid, and often use it as protection when fighting or when traveling through dense underbrush. Intestinal disorders and internal parasites can cause the nictating membrane to appear, so it can also be a valuable diagnostic aid.

In the center of the eye is the *pupil*. It is actually a hole which expands or contracts to let in the right amount of light. When exposed to bright light, the pupils contract into linear slits. In darkness they open very wide to allow in as much light as possible (see illustration). The colored part of the eye which surrounds the pupil is the *iris*. It acts as a shutter, to regulate the size of the pupil.



Behind the pupil is the *lens*, which focuses images on the back of the eyeball. It is composed of strong, crystallike fibrous tissue. Light rays passing through the lens are bent to rest on a very sensitive area on the back of the eye, the retina. The retina receives light and images. It is richly lined with nerves. Images are transmitted to the brain by way of the *optic nerve*.



Words to Remember

Cornea: Transparent covering of the eye.

Iris: Colored part of the eye, around pupil, which regulates pupil size.

Lens: Crystallike fibrous tissue behind the pupil which bends light rays to focus on the retina.

Nictating membrane: Third eyelid; strong, protective membrane.

Optic nerve: Carries images to the brain.

Pupil: Hole in the center of the eye through which light rays pass.

Retina: Receives and transmits images to the brain.

Sclera: White, shiny tissue around the cornea.

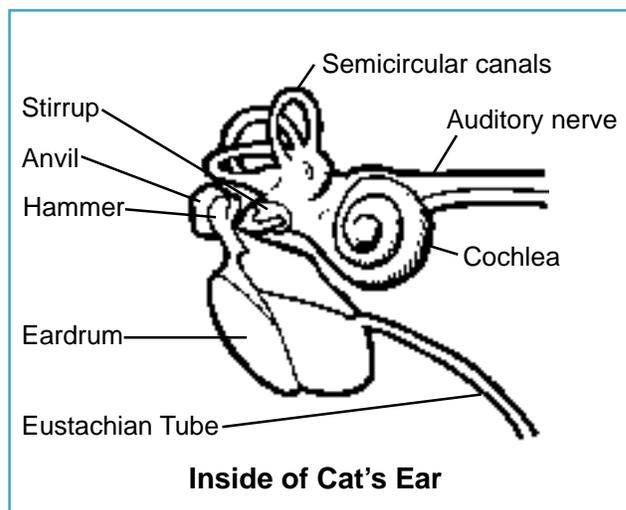
Hearing

Cats are exceedingly sensitive to sound; their range of hearing extends well above and below the range of human hearing. It is probable that the cat has a keener sense of hearing than most dogs, since it depends more upon sight and hearing than smell when hunting.

Cats, like all four-legged animals, have cupped ears which serve as receptors and conductors of sound. When listening, the cat will move its head this way and that, turning its ears in the direction of the sound. The sound travels down through the outer ear canal, which is fitted with small knobs or protuberances.

The outer ear tapers and narrows near the cat's skull, then turns upward and inward, ending in a delicate membrane known as the eardrum. The eardrum is the only mechanism for hearing located in the outer part of the ear. The rest of the hearing faculties are protected within the skull.

Beyond the eardrum are three small, delicate bones: the *hammer*, *anvil*, and *stirrup*. The names describe the shapes of the bones which function to transmit sounds into a section of the inner ear known as the cochlea. The cochlea, a snail-shaped canal, contains the *auditory nerve* which relays sound messages to the brain. Near the cochlea are three horseshoe-shaped tubes known as the *semicircular canals*. They contain fluid and function to maintain the cat's excellent sense of balance.



Connecting the middle ear to the throat is the *Eustachian tube*. Its main purpose is to equalize pressures. Without this safety device, the eardrum would be ruptured when subjected to great pressure. When pressure is exerted on its ears, a cat swallows and sticks out its tongue.

Words to Remember

Anvil: One of three small bones in the middle ear which transmits sound to the cochlea.

Auditory nerve: Relays sound messages to the brain.

Cochlea: Snail-shaped canal that contains the auditory nerve.

Eardrum: Membrane in the ear which turns sounds into sound waves.

Eustachian tube: Connects ear and throat; equalizes pressure.

Hammer: One of three small bones in the middle ear which transmits sound to the cochlea.

Semicircular canals: Contain fluid; essential to cat's balance.

Stirrup: One of three small bones in the middle ear which transmits sounds to the cochlea.

Respiratory System

The respiratory system functions primarily to transfer oxygen from the air to the blood, and to remove carbon dioxide from the blood and carry it out to the air. Oxygen is vital to the body's maintenance. Carbon dioxide is a waste product of the maintenance process. The cat breathes in air through its nose and mouth. A tube extends from the throat into the cat's chest and branches into two other tubes, known as *bronchial tubes*, one of which connects to each lung. The lungs are located on each side of the chest. The bronchial tubes branch into smaller tubes, *bronchioles*, and finally into *air sacs*. Each air sac is enclosed by a network of blood capillaries. At this point, oxygen is absorbed into the blood, and carbon dioxide is passed out of the blood.

All mammals have a partition which divides the chest cavity, separating the lungs from the other internal organs. In the cat, this membrane is very thin and allows both lungs to collapse if one side is injured. The respiratory system also aids in regulating the body temperature.

Words to Remember

Air sacs: Sac enclosed by blood capillaries which allows gases to escape or be absorbed.

Bronchial tubes: Tubes which connect the throat and the chest, through which air passes.

Bronchioles: Small tubes which carry oxygen and carbon dioxide through part of the lungs.

Lungs: Respiratory organs located in chest which function to transfer oxygen into the blood and remove carbon dioxide from the blood.

Questions: Lesson 2—Sight, Hearing, Respiratory System

1. What is another name for the *tapetum lucidum*?
2. What is the cornea?
3. What is the white, shiny tissue around the cornea?
4. What is the name of the cat's third eyelid?
5. What is the pupil?
6. What is the colored ring around the pupil?
7. What does the lens do?
8. What receives and transmits images?
9. What might the appearance of the third eyelid indicate?
10. What is the function of the optic nerve?
11. What is the only hearing mechanism located in the outer ear?
12. What are the names of the three little bones behind the eardrum?
13. What is their function?
14. What is the cochlea?
15. What relays sound messages to the brain?
16. What do the semicircular canals contain?
17. What is the function of the semicircular canals?
18. What is the Eustachian tube?
19. Where are the lungs located?
20. What connects the throat and the chest?
21. What do the bronchioles and the air sacs do?

LESSON 3—CIRCULATORY AND DIGESTIVE SYSTEMS

Circulatory System

The cat is a warm-blooded animal with an intricate circulatory system.

- **Heart and Blood Vessels**—Blood nourishes the cat's body. It transports nutrients and oxygen to the body cells, collects wastes from the cells, and carries the wastes to the organs of excretion. At the core of this complex system is the four-chambered heart, a hollow, muscular organ. It receives blood from the veins and pumps it through the arteries to all different parts of the body.

Impure blood is carried into the heart by the *anterior* and *posterior vena cavae*, two large veins.

The heart contracts in a squeezing motion, forcing the blood into two large arteries, the anterior and posterior aortas. One aorta carries impure blood to the lungs. There, the blood releases carbon dioxide, picks up oxygen, and circulates again to the heart. From there it is pumped through the aorta to all parts of the cat's body, to distribute oxygen and pick up waste material.

- **Blood**—Blood is composed of cells suspended in a special fluid called plasma. In the plasma float the red blood cells, which contain a chemical known as *hemoglobin*, which functions in oxygen distribution. Hemoglobin is a pigment which gives blood its characteristic red color.

The blood also contains *white corpuscles* of different size and number. By surrounding impurities and microbes that enter the blood, the white corpuscles act to fight infection. Another constituent of blood are the platelets, small oval bodies which play a part in causing the blood to clot or coagulate.

- **Spleen and Lymph Nodes**—The *spleen* is a long, narrow organ, purplish in color, situated behind the stomach. The cat's spleen averages three to four inches in length. It functions to store blood and to destroy old blood cells.

Lymph nodes, located at different points along the blood route, also act as filtering devices. Their function is to purify the blood by destroying bacteria, viruses, and other alien matter. *Lymph*, the fluid discharged by the lymph glands, is circulated by muscular activity and intestinal action.

Words to Remember

Anterior and posterior aortas: Circulate blood through body and lungs.

Anterior and posterior vena cavae: Veins which carry blood to the heart.

Blood: Fluid in body that carries nourishment and oxygen to body cells, and carries waste products away from cells.

Lymph nodes: Filtering devices located along the blood route.

Plasma: Fluid part of the blood.

Red blood cells and hemoglobin: Function in the distribution of oxygen and carbon dioxide; hemoglobin gives blood its red color.

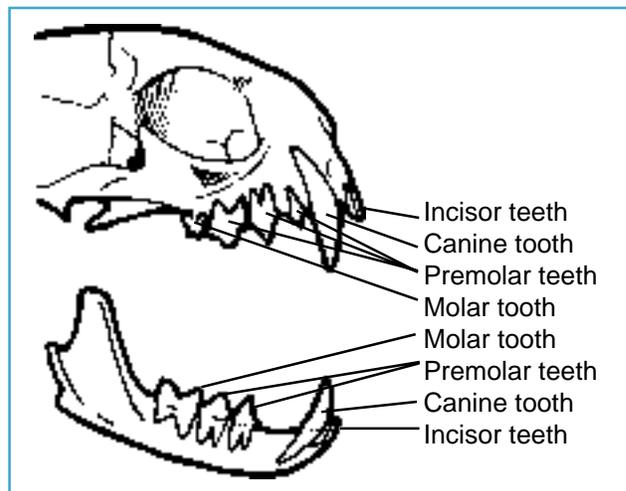
Spleen: Organ which stores blood and destroys old blood cells.

White corpuscles: Cells in blood which function to fight infection.

The Digestive System

The cat's digestive system is comprised of the mouth, teeth, tongue, esophagus, stomach, pylorus, small intestine, large intestine, liver, pancreas, and rectum. All of these organs work to process the food a cat eats. They change it into a usable form that is distributed by the blood. What is not utilized is passed out of the body.

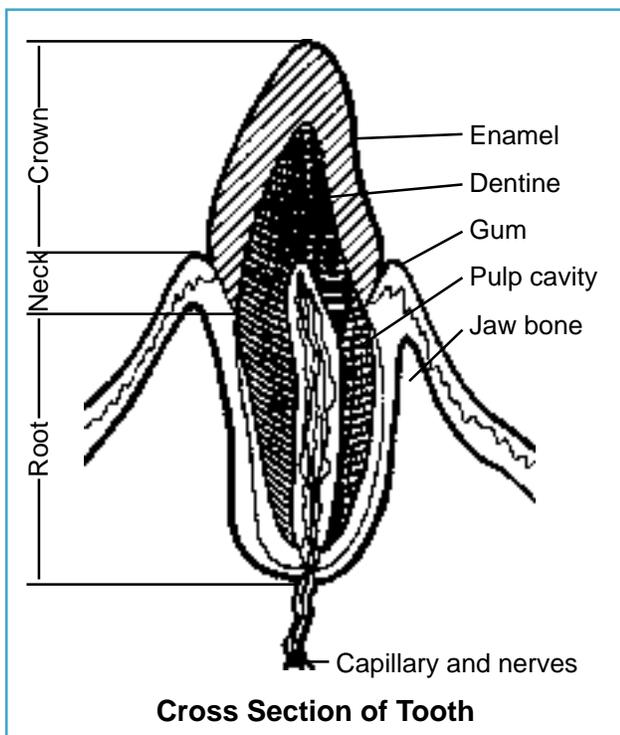
- **Mouth**—The cat's mouth is the doorway to the digestive system—the opening through which it takes in food. Its lips hold in food and retain saliva. The tongue is rough and covered with hooklike appendages. A cat uses its tongue to lap up liquids and to scrape food off bones, etc.



- **Teeth**—Cats have 30 permanent teeth. A first set of 26 teeth, the milk teeth, fall out when the cat is between five and seven months old and are quickly replaced by the permanent teeth. Its permanent teeth are made up of 12 incisors, 4 canines, 10 premolars, and 4 molars. The ability to hold and tear food is essential to a cat, which is why it has mainly incisors and canines.

The *crown* is the part of the tooth visible above the gums. Below the gums lies the root. At least half of each canine tooth grows below the gum line. The roots of all permanent teeth are strong and deeply imbedded.

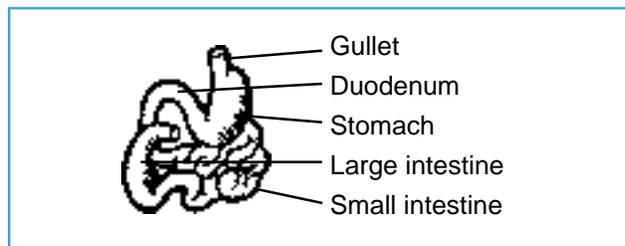
Enamel covers the crown and neck of each tooth. Inside each tooth is the *pulp*, which houses the nerves and *blood vessels*. Although they rarely develop cavities, cats do develop trouble involving the nerves and pulp.



- **Esophagus**—The esophagus, or gullet, is a strong, elastic tube which carries food from the mouth to the stomach. It may become infested with worms, although it is not often subject to disease.
- **Stomach**—The cat's stomach, a saclike organ with elastic walls, has a comparatively large

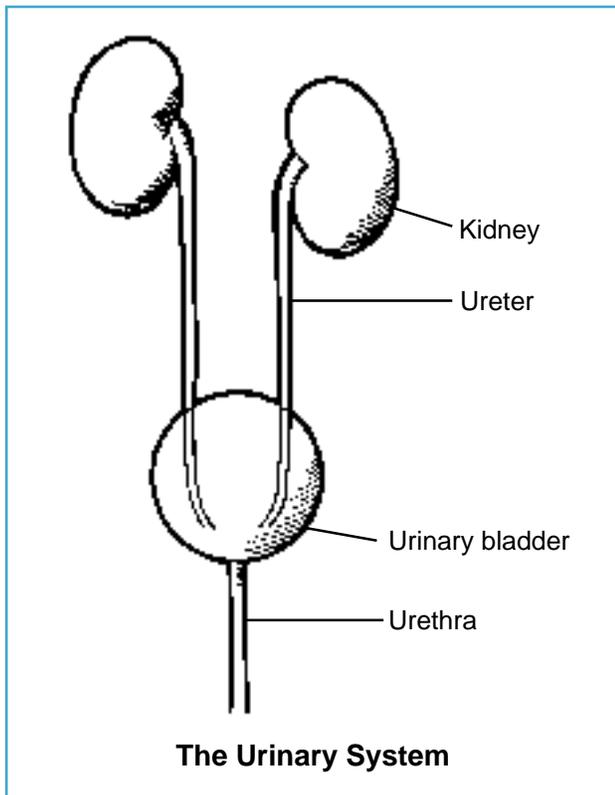
capacity for food storage. In the stomach, some of the early stages of digestion take place; acid liquids help to break down proteins and fats.

- **Small intestine**—The *pylorus*, a valve surrounded by muscle located at the bottom of the stomach, regulates the passage of food from the stomach into the duodenum, the first section of the small intestine. *Bile* is produced by the liver and stored in the *gall bladder*. As needed, it flows into the duodenum to break down fat into tiny globules. Other digestive substances called enzymes are secreted into the intestines from the *pancreas*. The small intestine itself secretes substances which first convert starches into dextrin, then break them down into glucose. After all food has been broken down into a usable form, it is absorbed into the bloodstream in the last section of the small intestine.



- **Liver**—The liver is the largest organ in the cat's body, situated in front of the stomach on the right side of the body. Among its many functions are the manufacture of bile and urea, destruction of bacteria, and regulation of sugar utilization.
- **Pancreas**—In addition to producing juices that aid in digestion, the pancreas regulates the utilization of sugar in conjunction with the liver. The pancreas is located near the stomach. The *islets of Langerhans* are located in the pancreas. Their function is to produce insulin which helps the body use sugar. Diabetes is the condition which results from the lack of insulin.
- **Large intestine**—After food has passed through the small intestine, and nutrients have been absorbed into the bloodstream, what remains is deposited in the large intestine. There, large amounts of water are absorbed and much bacterial action occurs to break down unused material. Wastes are then excreted through the *rectum* and *anus*.

- **Urinary system**—The important organs of the cat's urinary system are the *kidneys, ureter, bladder, and urethra*. Liquids are filtered through the kidneys, which are located on either side of the body in the lumbar region. Liquid wastes are passed through the ureters to the bladder where they are stored. They are then discharged through the urethra, a tube connecting the bladder and the exterior of the body.



Words to Remember

Bile: Fluid made by the liver and stored in the gall bladder; secreted into the duodenum where it breaks down the fat.

Bladder: A sac which serves as a receptacle for liquid wastes.

Crown: Visible part of the tooth.

Dentine: Inner part of the crown.

Duodenum: First section of the small intestine where much digestion takes place.

Enamel: Hard, protective, outer covering of the tooth.

Ureters: Tubes which connect kidneys and bladder.

Urethra: Tube which connects bladder and exterior of body.

Esophagus: Strong, elastic tube connecting mouth and stomach.

Kidneys: Filtering organs of the urinary system.

Large intestine: Last part of digestive system where wastes are processed and stored.

Liver: Largest organ in the body; makes bile and urea, destroys bacteria, and helps regulate sugar utilization.

Mouth: Doorway to digestive system.

Pancreas: Manufactures insulin, functions in sugar utilization.

Pylorus: Valve surrounded by muscle at bottom of the stomach; connects stomach and duodenum.

Root: Part of the tooth located below the gum line; holds tooth in place.

Small intestine: Tubes into which food passes from the stomach; process of digestion is completed; nutrients are absorbed into the blood stream.

Questions: Lesson 3—Circulatory and Digestive Systems

1. The mouth, teeth, esophagus, stomach, pylorus, and intestines belong to what system?
2. How many teeth does an adult cat have?
3. What is the visible part of the tooth called?
4. What covers the crown and neck of the tooth?
5. What are the four inner parts of the tooth?
6. What part of the tooth lies under the gum?
7. What is the tube which connects the mouth and stomach?
8. What is the function of the stomach?
9. What is the largest organ in the cat's body?
10. Which two organs function in the utilization of sugar?
11. What is the main function of the large intestine?
12. What are the two organs that filter liquid wastes?
13. What is one function of the blood?
14. What carries the impure blood to the heart?
15. What is the fluid of the blood called?
16. What surrounds impurities that enter the blood?
17. What is the function of the platelets?
18. What is the main function of the spleen?
19. What are the other filtering devices along the blood route?
20. What is hemoglobin?

LESSON 4—REPRODUCTIVE SYSTEM

Cats are fertile animals. A female may produce two or three litters of kittens a year, which is one reason for the large number of stray, unwanted cats. Female cats go into heat during which time they are interested in mating and can conceive (get pregnant) if they do mate. A female can mate with more than one male. Periods of heat last a few days. Rolling, stretching, rubbing, crying, and yowling characterize a female cat in heat. If the cat does not mate and conceive, the cycle will be repeated in a few months.

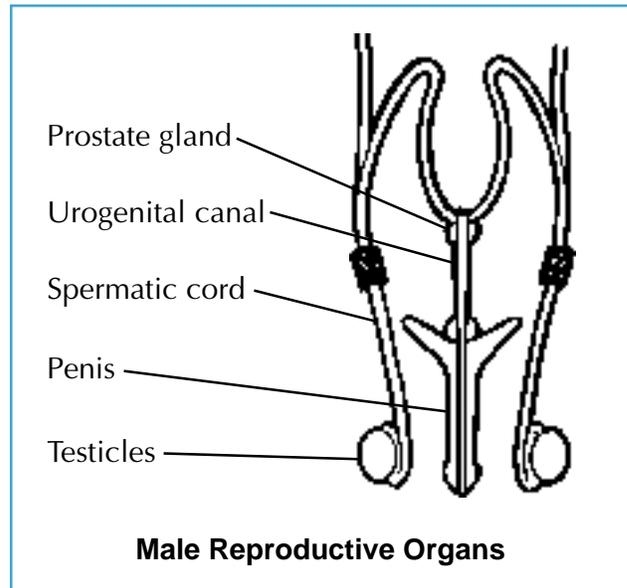
It is possible to prevent a female cat from becoming pregnant. You can keep her in the house, isolated from any tomcats (unneutered males—see “Male Reproductive Organs”) during her heat. Or, you can have her spayed (neutered). Spaying is a surgical procedure which involves removal of the female reproductive organs. The operation is usually performed at age six to seven months, although it can be done successfully later on, after a cat has had kittens. After being spayed, a cat is no longer interested in mating, nor is she able to conceive.

Many cat owners choose to have their pets neutered. This is done to prevent the birth of unwanted kittens, and also to make male cats more suitable house pets. Neutering a male cat involves surgical removal of the testicles. A neutered male no longer shows interest in mating. Unneutered, a male tends to get into many fights, and will mark his territory by spraying urine on walls, both inside and out. The odor is enduring and unpleasant.

Male Reproductive Organs

The tomcat’s organs of reproduction are the *penis*, *scrotum*, *testicles*, and *prostate gland*. A male cat has two testicles which are suspended in a sacklike structure, the scrotum, outside of its body. The testicles produce and store sperm, which is the seed that fertilizes the eggs produced by the female. Testosterone, a hormone which is essential to the male’s sexual development and activity, is also produced by the testicles. The prostate gland produces *seminal fluid*, which transports the sperm.

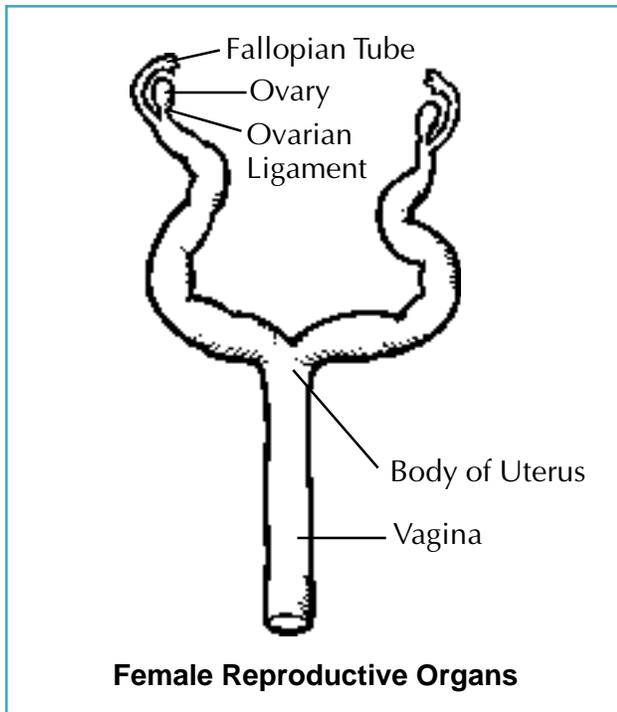
When two cats mate, the male mounts the female and inserts his penis into her vagina. This act of copulation ends after the male ejaculates seminal fluid into the female’s vagina. The sperm in the seminal fluid then swim up through the vagina into the uterus, and fertilize the egg or eggs in the uterus.



Female Reproductive Organs

The external parts of the female reproductive system consist of the *vagina* and the *vulva*. The vulva are the lips of the vagina, located just below the anus. The vagina connects the outer and inner parts of the reproductive system. During copulation, it serves as the passageway for the tomcat’s penis. It is also the birth canal through which kittens pass as they are born.

The *ovaries*, *cervix*, *uterus*, and *fallopian tubes* make up the inner reproductive system. The cervix is the opening of the uterus which connects the vagina and uterus. The female cat has two ovaries located in the front of the abdomen, just behind the kidneys. Ova, or eggs, are formed in the ovaries and released into the fallopian tubes, which join the ovaries with the uterus. If the eggs are fertilized by male sperm they implant into the walls of the uterus and develop into kittens. Unless a female mates, no ova are released into the fallopian tubes.



Words to Remember

Cervix: Opening to the uterus, which connects vagina and uterus.

Copulation: The mating act of the male and female which results in fertilization of egg by sperm.

Fallopian tubes: The tubes connecting the ovaries with the uterus.

Fertilization: Union of egg and sperm, necessary for egg to develop into a kitten.

Heat: Period during which female can mate and get pregnant; a time when she shows a strong interest in mating with male cats.

Ova: Eggs produced by the ovaries.

Ovaries: The bodies in the female cat's reproductive system which form the eggs or ova.

Penis: Male reproductive organ which is used in copulation.

Prostate gland: Produces the seminal fluid.

Scrotum: Saclike structure which holds the testicles.

Seminal fluid: Fluid produced by prostate gland which transports the sperm; during copulation, seminal fluid is ejaculated through the male's penis into the female's vagina.

Spay or neuter: Surgical removal of female's internal reproductive organs or male's testicles.

Sperm: Seed produced by the male, stored in the testicles, which fertilize the eggs or ova.

Testicles: Manufacture and store sperm; manufacture testosterone.

Testosterone: Hormone produced by the testicles, essential to male's sexual development and activity.

Uterus: Female internal reproductive organ where eggs are fertilized, and where fertilized eggs develop into kittens.

Vagina: Connects outer and inner female reproductive systems; passageway for tomcat's penis during copulation; canal through which kittens pass as they are being born.

Vulva: External part of female reproductive organs.

Questions: Lesson 4—Reproductive System

1. Can a female mate with more than one male during a heat period?
2. Name the different organs of the female reproductive system.
3. What are the different parts of the male reproductive system?
4. How many litters of kittens can a female cat produce in a year?
5. What are some of the characteristic behaviors of a female cat in heat?

LESSON 5—CARE OF THE PREGNANT CAT AND KITTENS

Nothing contributes more toward a healthy litter of kittens than good care during the mother's pregnancy. If she is in good health at the time of mating, her pregnancy should pose no problem. Early in her pregnancy, begin to feed her vitamin and mineral supplements, treat any skin conditions, eliminate parasites, and make sure that she is in good health.

The average gestation period—the time from mating to the birth of kittens—is from 61 to 63 days. It is not unusual for a cat to deliver her kittens a few days before or after this period. However, if the gestation period lasts longer than 67 days, and if you are certain of the breeding date, consult a veterinarian. The cat may be having some trouble, or may be undergoing a false pregnancy.

False Pregnancy

A false pregnancy is a condition in which the female displays physical and emotional signs of pregnancy, but is not carrying kittens. The cat's breasts swell and produce milk. Her abdomen is distended. She eats more and gains weight, and continually works at preparing a nest for the kittens she expects, but is not to have. The symptoms usually appear after the cat has gone out of heat and may persist for several months. You will have to wait a month or so before you can determine whether or not the cat is pregnant. After a month, you can check for signs of kittens by gently feeling through her abdominal wall for lumps. As a true pregnancy progresses, the kittens, which feel like lumps in the cat's abdomen, grow. Although she will manifest most other signs of pregnancy, a cat with a false pregnancy will not have any apparent lumps.

If your cat has a false pregnancy, you will have to cater to her peculiarities. Tranquilizers may help calm a cat that is constantly meowing, working on a nest, or mothering old shoes or other objects. False pregnancies can recur. While the cat can mate and bear kittens, there is no way of knowing if and when a false pregnancy might happen again. Spaying (the removal of the cat's reproductive organs—see Lesson 4) will eliminate the condition.

Prenatal Care

The cat should be given a health examination early in her pregnancy. Examine her for fleas, lice, and ticks, and keep her free from other pests. Have a veterinarian examine a stool specimen for signs of worms or other internal parasites. Remember, roundworms and hookworms can be transmitted to the fetuses. Worming is not advisable after the second week of pregnancy, however, since there is danger of aborting the fetuses. If your cat shows signs of worms later in the pregnancy, do not worm her until after the kittens are born. The kittens can be wormed at eight to ten weeks of age.

The pregnant cat is hungry most of the time, especially in the later stages. Feed her well without overfeeding her. After the first month, two or three meals a day will suffice. She should receive

her regular ration plus milk and a vitamin and mineral supplement. Additional calcium is important, as pregnancy drains the mother cat's body reserves of calcium (see *eclampsia*, next lesson).

As her pregnancy continues to progress, the cat will become more and more inactive and will lie about. Leave her alone as this is perfectly normal. Around the eighth week of pregnancy, milk usually appears in the cat's breasts. The breasts will swell and may become hard and caked, and the cat will show signs of discomfort. She will constantly lick her breasts in an effort to relieve the pressure. If her breasts are dry or caked, apply olive or mineral oil.

As the time for her delivery draws near, the cat will become very restless, wandering around and scratching at her bed. Keep an eye on her as she may decide to have her kittens in some secluded place, such as a cellar, garage, or even in an old barrel, box, drawer, or other such out-of-the-way place. The cat may lose her appetite from 12 to 24 hours before the kittens are due. Also, her temperature will drop a degree at that stage.

Preparing for the Arrival of the Kittens

You can make some preparations for the big event. If your cat is long-haired, trim away the hair around her breasts. This will help the kittens find the nipples. Also trim the hair around the anus and vagina.

Birth

In a normal birth, all kittens will be born within two to eight hours after labor begins. If a cat continues to labor more than eight hours, something is wrong. Call your veterinarian for instructions. Also consult him or her if more than three hours elapse between kittens.

Questions: Lesson 5—Care of the Pregnant Cat and Kittens

1. How long is the normal gestation period?
2. If your cat has not given birth after the normal gestation period, how long should you wait before contacting a veterinarian?
3. Describe a false pregnancy.

4. How can you tell if a cat is pregnant?
5. Name at least two things you should do for your cat early in her pregnancy.
6. What should you do if her breasts become dry and caked?
7. In a long-haired cat, prior to delivery, fur should be trimmed from what areas?
8. In a normal birth, all kittens should be delivered in how many hours?
9. What should you do if more than three hours pass between the delivery of one kitten and the next?

LESSON 6—CARE OF THE PREGNANT CAT AND KITTENS (continued)

The Placenta

Each kitten is born encased in a transparent sac or membrane (a grayish, bulky mass), through which the kitten is visible. The membrane is attached by a cord to the placenta, or afterbirth, which should come out immediately after the kitten. The placenta, the lifeline from the mother cat, is the means by which the kitten feeds while in the uterus.

Do not become alarmed if your cat eats the placenta; this is normal. It may be her way of removing all traces of the birth, or perhaps it provides her with a temporary source of nourishment, since she will be unable to leave the newborn kittens for some time.

Try to keep count of the placentas as each one is expelled. A placenta should follow the birth of each kitten. Sometimes a placenta is retained when the cord between the fetal membrane and the placenta breaks. If the cat does not expel the placenta, it must be removed in another way. Grasp the broken cord with a clean towel and gently and slowly pull out the placenta. A retained placenta may interfere with the birth of the next kitten and, if retained after the last kitten is born, will decompose and cause infection.

As the Cat Continues Labor

Even after the first kitten is born, there is no assurance that the others will follow quickly.

Remain near the cat and if more than three hours elapse between the arrival of one kitten and the next, call a veterinarian. Tell the veterinarian when the first kitten was born, whether it was a normal or breech delivery, how long the cat has been in labor with the present kitten, and other pertinent information.

If all goes well, the kittens should be delivered and nursing within a few hours. The mother will stop laboring and panting shortly after delivering the kittens and will settle down to taking care of her family. The mother will sometimes become so involved with her kittens that she will refuse to eat. Place a saucer of warm milk near her. Some mothers have been known to go as long as 24 hours without eating. When she does want to eat she will let you know in unmistakable ways. Then feed her her regular rations fortified with vitamins and minerals. Canned or whole milk is good for a nursing cat. Keep fresh water near her at all times.

Some Possible Obstetric Difficulties

Most cats have no difficulty in delivering kittens. Obstetric troubles, when they do occur, may be caused by disease or malfunction of the reproductive system.

- **Breech delivery**— In a breech delivery, the kitten arrives hind feet first. Usually the head of a breech kitten is large and the cat has difficulty in expelling the kitten.
- **Caesarian section**—When kittens cannot be born in a normal manner they must be delivered through an incision in the cat's abdominal wall and uterus. This operation is called a Caesarian section.

The need for a Caesarian section can sometimes be anticipated early in pregnancy when the veterinarian determines either by x-rays, or by feeling, that the kittens are going to be too large to be delivered normally. Sometimes the veterinarian must perform a Caesarian to remove the remaining kittens after one or two kittens are born. A cat's uterine muscles may become overly tired, particularly if she has a long and difficult labor, making her unable to expel the kittens. Call the veterinarian if your cat labors more than eight hours.

- **Eclampsia**—Eclampsia is a serious condition that often happens to a female cat following the birth of her kittens. It is brought on by a depletion of the blood calcium. The symptoms include excessive panting, loss of appetite, a temperature above 103°F, a stilted walk, and convulsions, eventually followed by collapse and coma. There is nothing you can do. Rush the cat to the veterinarian, where she can be quickly revived by the injection of calcium gluconate into her bloodstream.

Postnatal Period

The cat will have a discharge from her vagina for a week or ten days. This discharge should be red or dark red in color. If it is greenish or greenish yellow, there is something wrong. A placenta may have been retained despite your vigilance and serious infection may result. Such an infection may cause the cat's milk to dry up and eventually lead to her death and that of her kittens. When you see a green or greenish yellow discharge, *contact your veterinarian immediately!*

Care of the Newborn Kittens

The mother and kittens should be left strictly alone for the first two or three days. Nursing kittens are very delicate, so avoid unnecessary handling. Caution children not to pick up the baby cats.

During the first ten days of life, the physical activities of the newborn kittens are very limited. They cannot see or hear; their legs are too weak to support their bodies; and they must get around by crawling on their abdomens with a swimming motion. Baby cats will cry when they are hungry and sometimes stray from the warmth of their mother's body. Provide some barricade to prevent the kittens from getting too far from the mother.

Watch the kittens closely for the first week to make certain they are getting enough to eat. The mother's rear breasts contain the most milk and the most vigorous kittens will monopolize them. You can rotate the kittens on the rear breasts so that all get enough nourishment.

Excessive leanness, weakness, and constant crying are signs that a kitten is not getting

enough milk. Such kittens quickly become dehydrated. To check for dehydration, pinch the skin at the back of the kitten's neck with your thumb and forefinger, then quickly release it. If the animal is dehydrated, the skin will not snap back to its former position, but will remain pinched. If your mother cat does not have enough milk, or dies while nursing, you will have to bottle feed the kittens.

- **Bottle feeding**—You should have little difficulty in getting the kittens to feed from a bottle or eyedropper. Use an eyedropper, baby doll bottle, or special baby animal bottle for the first few days, and later switch to a larger bottle.

Two- or three-day-old kittens do not eat much at a feeding. An average newborn kitten consumes from about 5 to 25 drops at one feeding. Use the dehydration test to see if the kittens are getting enough of the formula. You should keep a supply of formula stocked in the refrigerator and warm any portion you feed to the kittens. If you use a commercial formula, follow the directions of the manufacturer. Clean and sterilize all utensils and bottles after each feeding. Here is a formula that has proved successful: 1/2 cup evaporated milk, 1/2 cup water, 1/10 cup light cream, and 2 drops water-soluble vitamins.

- **Weaning the kittens**—The mother will begin to wean the kittens somewhere around the fourth or fifth week. First she will reduce the number of feedings each day by spending more and more time away from them. Then she will begin to bring food to the kittens and teach them how to eat. When she begins to wean the kittens, take up the feeding yourself. Remember to introduce new foods gradually and avoid overfeeding. Finely chopped beef, baby cereals with milk, and strained baby vegetables are all excellent foods. Food should be at room temperature. When the kittens are eight weeks old, they should be totally weaned.

Remember to provide the weaned kittens with their own sleeping quarters, food and water pans, and a litterbox if one is not already available. The mother cat will take care of house-breaking her kittens.

LESSON 7—BEHAVIOR

You should handle and groom the kittens from now on. A visit to the veterinarian for distemper shots and a general checkup is in order.

Remember, it is cruel, inhumane, and illegal to abandon kittens. If you are unable to care for or find homes for the kittens, take them to your local humane society.

Words to Remember

Delivery: Passage of kittens from the uterus, through the birth canal, to the outside world.

Eclampsia: Depletion of blood calcium; serious condition which sometimes follows birth of kittens.

False pregnancy: Cat shows all of the physical and mental signs of pregnancy without actually being pregnant.

Fetus: The unborn kitten developing in the uterus.

Gestation: The time from mating to the birth of kittens.

Placenta: Lifeline from the mother to the kitten; means by which the kitten feeds while in uterus.

Pregnancy: Having a fetus or fetuses developing in the uterus.

Questions: Lesson 6—Care of the Pregnant Cat and Kittens (continued)

1. What is the placenta or afterbirth?
2. How many placentas will be delivered with the kittens?
3. Does the cat normally eat the placenta?
4. Why would you remove a retained placenta?
5. After delivery, how long might a mother cat go without eating?
6. What is a Caesarian section?
7. What is eclampsia?
8. After the kittens are born, what color is the normal discharge from the mother cat's vagina?
9. How many days should the mother and newborn kittens be left alone without handling?
10. Can newborn kittens walk?
11. How do you check for dehydration?
12. What should you use to bottle feed a kitten?
13. When will a mother cat begin to wean her kittens?
14. When can a kitten be completely weaned?
15. What are some good foods for the weaned kitten?

Intelligence

The cat is an intelligent animal, capable of learning quickly and retaining what it has learned. It also appears to exercise a certain degree of reasoning in solving problems. For example, a cat will examine a building to find out if there is more than one exit from a mouse's lair. If satisfied that a mouse can escape from no other exit, a cat will sit for hours in front of a mouse hole, waiting for its unsuspecting dinner to appear.

Although it is not easy to teach cats to perform on command, they can learn tricks. But, the process takes infinite patience. When its own welfare is involved, a cat is quick to learn. Otherwise, it is simply too aloof and independent to be brought under the same control as a dog.

Temperament

Cats' temperaments, or dispositions, vary greatly. On the whole they are inclined to be more aloof and independent than dogs. Some of them are moody, aggressive, nervous, and quick to resent any hurt or neglect. On the other hand, many cats are docile and even-tempered. Most respond well to affection, gentle handling, and pampering.

Anger

An angry cat assumes a classic pose. Ears laid back and a switching tail are early signs of irritation. When really angered, it reacts rapidly by arching its back and stiffening its body; all hairs stand on end, and the cat snarls and spits. The cat may drop into a crouch, with its tail lashing from side to side. As it prepares to fight, the ears are pressed flat against the head, mouth is partly open, fangs bared, forefeet firmly planted, claws extended.

Affection

In expressing affection, a cat is pure gentleness. It will arch its back, hold its tail stiff and straight, perk its ears, rub its head and muzzle against people and objects—purring its delight to the world. Kneading with forepaws, claws retracted, indicates pleasure and affection. A cat may also

show its affection by licking and by touching and sniffing delicately with its nose.

Courage

Cats are very courageous animals, often attacking animals twice their size, especially when their young are threatened. They will chase away large dogs, kill large birds of prey, and sometimes get badly injured in the process of protecting their young or homes.

Questions: Lesson 7—Behavior

1. What is a word for the capability to learn and retain what has been learned?
2. How would you describe a cat which had its ears laid back and whose tail was switching?
3. What is a cat displaying when it arches its back, perks its ears, rubs itself against people, and purrs?
4. A cat which attacks larger animals in defending its young or home is displaying what quality?

LESSON 8—REVIEW OF PHYSIOLOGY LESSONS

The first lesson began a study of the cat's body and how it functions. We learned that the outermost part of the cat's body is called hair or fur. Under the hair is the skin, which is composed of two layers, the epidermis and the dermis. The skin is not impermeable; medicines or poisonous substances can be absorbed (impermeable means that nothing can penetrate the skin).

Some of the major bones in the cat's body are the skull, the bone framework of the head; the spinal column, which runs down the back; the scapula or shoulders; and the ribs on the cat's sides. In the forelegs are the humerus, radius, ulna, carpus, metacarpus, and digits. The hind legs contain the femur, tibia, fibula, tarsus, metatarsus, and digits.

In the mouth is found the primary taste organ, the tongue. Small bumps that react to chemical stimuli to produce sensations of taste, called taste buds, are located on the tongue.

In the back of the cat's eye is the *tapetum lucidum*, also known as the eye shine, which aids in night vision. The pupil is the small hole in the middle of the eye which controls the amount of light let into the eye. Around the pupil is a colored ring called the iris. The sclera is the white part of the eye around the iris. Covering the whole eye is a transparent layer of cells, the cornea. Behind the pupil is the lens which bends light rays onto the back of the eye, the retina. The retina receives light and images and transmits them to the brain via the optic nerve.

A cat's ears are cup-shaped and very sensitive. Cats turn their ears in the direction of sound. The only hearing mechanism in the outer ear is the eardrum. Under the eardrum are three little bones, the stirrup, anvil, and hammer, which transmit the sound to the cochlea. The cochlea houses the auditory nerve, which carries sound signals to the brain. Also near the cochlea are three small, snail-shaped tubes known as semicircular canals, that contain fluid to help the cat maintain balance. Connecting the middle ear and the throat is the Eustachian tube. It equalizes pressures between the inner ear and the outside.

The lungs are the main organ of the respiratory system. In the lungs, oxygen is transferred to the blood; carbon dioxide is removed. Connecting the mouth, nose, and chest are the bronchial tubes. They branch into smaller tubes, known as bronchioles, and finally into air sacs. The air sacs are enclosed by a network of blood capillaries that allow gases to escape and to be absorbed.

The circulatory system is made up of the heart, arteries, veins, blood, and lymph nodes. Two large veins, the anterior and the posterior vena cava, lead away from the heart. One leads to the lungs, the other to the rest of the body. Plasma is the liquid part of blood. The red cells contain a chemical known as hemoglobin which functions in oxygen distribution. Also found in the blood are white corpuscles that surround and kill impurities in the blood. Platelets cause the blood to clot.

The cat's mouth represents the first part of the digestive system. There are 30 teeth in the adult cat's mouth. The visible part of the tooth is called the crown. As protection, the crown and neck of

the tooth are covered with enamel. Inside the tooth are the dentine, pulp, nerves, and blood vessels. The root of the tooth lies under the gum.

The esophagus leads from the throat to the stomach, where digestion begins. From there food enters the small intestine at the duodenum by way of a small valve called the pylorus.

The liver, the largest organ in the cat's body, manufactures bile, regulates sugar utilization, and manufactures urea. The pancreas also regulates the body's ability to utilize sugar.

After most of the nutrients are absorbed into the blood in the last part of the small intestine, waste products pass into the large intestine. There, a great deal of water is absorbed, and wastes are stored.

On either side of the cat's body are located the kidneys, the major organs of the urinary system which filter liquid wastes. The ureters carry urine from the kidneys to the bladder where it is stored. It is eventually expelled through the urethra.

The vulva is the outermost part of the female reproductive system. It covers and protects the vagina. The vagina is a canal which connects the outer and inner reproductive organs. The ovaries produce eggs, or ova, which descend through the fallopian tubes to the uterus. If fertilized, they develop in the uterus into kittens.

The male reproductive system is composed of the testicles, prostate glands, scrotum, and penis. The testicles are located outside the body in the saclike scrotum. Sperm are manufactured and stored in the testicles. Seminal fluid, in which the sperm travel, is produced by the prostate gland. During mating, the seminal fluid is forced through the penis and is deposited in the female's vagina.

After mating, if a female becomes pregnant, she will carry her kittens from 61 to 63 days—the normal period of gestation. Sometimes a cat can have a false pregnancy; she looks and acts pregnant, but actually is not.

The pregnant cat should be wormed before or during the first two weeks of her pregnancy. Roundworms and hookworms can be transmitted to the fetuses.

At about the eighth week of pregnancy, milk will appear in the cat's breasts. If her nipples become swollen and dry, apply a little oil to them.

After labor begins, the kittens all should be delivered within eight hours. When a kitten starts to emerge, it should come out head first. Each kitten is enclosed in its own transparent sac. If in an emergency you should have to pick up a kitten, use a clean towel and both hands. Be very gentle.

The mother cat will eat the placentas after the birth of each kitten. This is normal. If she retains a placenta, she may become very sick or may die. Some kittens may be born tail end first, which is known as a breech birth. Occasionally a cat will have to have a Caesarian section, an operation to remove kittens through her abdominal wall.

After all of the kittens have been born, place a bowl of warm milk near the mother and feed her when she demands it.

Occasionally a cat will get eclampsia after her kittens are born. This is a serious condition caused by a lack of blood calcium. This can be treated by a veterinarian.

If your cat develops a green or greenish yellow discharge after the birth of her kittens, she probably has retained a placenta. Take her immediately to a veterinarian so the placenta may be cleaned out and any infection she may have can be taken care of.

Do not handle the kittens for the first ten days, unless you have to rotate them on the nipples to make sure they all get enough milk, or if you have to bottle feed them. Make sure that the kittens are in a confined area so that they do not stray too far from their mother or get lost.

Excessive leanness, weakness, and constant crying are signs of dehydration. Test for this by pinching the skin at the back of the kitten's neck. If it does not snap back into place, the animal is dehydrated and will need more milk. The average kitten nurses every hour, taking in from 5 to 25 drops of milk.

During weaning, some good foods to give a kitten are finely chopped beef, baby cereals mixed with

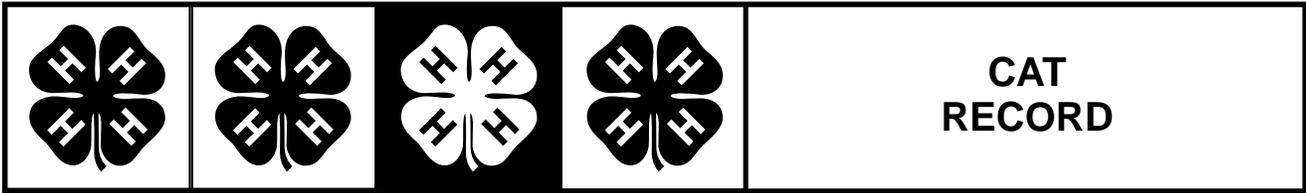
milk, and strained baby vegetables. Later on, add cat food diluted with milk and specially prepared kitten foods.

After ten weeks you should handle the kittens. Groom them daily, clip their claws as needed, and play with them to accustom them to handling. Now is the time to take them to the veterinarian for a general checkup and inoculations.

Remember that it is inhumane and illegal to abandon kittens. If you cannot care for them or find homes for them, take them to your local animal shelter or humane society.

Review Questions on Lessons 1–8

1. What is the outermost part of the cat's body called?
2. What are the two layers of a cat's skin?
3. What does impermeable mean?
4. Name the major bones in a cat's body.
5. What is the name for the nerve in the nose?
6. What is the primary organ of taste?
7. What are the small bumps in the mouth that react to chemical stimuli?
8. What is another expression for the tapetum lucidum?
9. What is the hole in the center of the eye?
10. What is the iris?
11. What does the optic nerve do?
12. What is the only hearing mechanism in the outer ear?
13. What do the semicircular canals contain and why?
14. What are the three little bones behind the eardrum called?
15. What is the function of the lungs?
16. The mouth, teeth, stomach, pylorus, and intestines belong to what system?
17. How many teeth does an adult cat have?
18. What is the visible part of the tooth called?
19. What are the crown and neck of the tooth covered with?
20. What are the four inner parts of the tooth?
21. What is the largest organ in the cat's body?
22. What is one important function of the pancreas?
23. What are the two organs that filter liquid wastes?
24. What is the function of the blood?
25. What is the fluid part of the blood?
26. What do the platelets do?
27. What is hemoglobin?
28. What is the average gestation period of a cat?
29. Can certain types of worms be transmitted from the mother to the fetuses?
30. About what time does milk appear in the breasts of the pregnant cat?
31. In a normal birth, all of the kittens will be delivered within how many hours?
32. When it is born, how does a kitten normally emerge?
33. What is each kitten enclosed in when it is born?
34. How do you pick up a newborn kitten? why?



Add this sheet to your regular 4-H Record Book. Keep all your records in one book.

Project enrollment number _____

INVENTORY: Cat supplies, equipment

BEGINNING OF THE YEAR	END OF THE YEAR
Cat _____	
Litter pan _____	
Bed _____	
Equipment _____	
Other items _____	

HEALTH RECORD: Record the shots, pills, etc., you have given your cat to keep him or her healthy.

DATE	ITEM	DATE	ITEM
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

EXPENSES: Food, veterinary services, equipment purchased, etc.

DATE	ITEM	NUMBER OR QUANTITY	VALUE	COST

SHOW AND CONTEST RECORD

DATE	SHOW	RING	PLACING	REMARKS



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