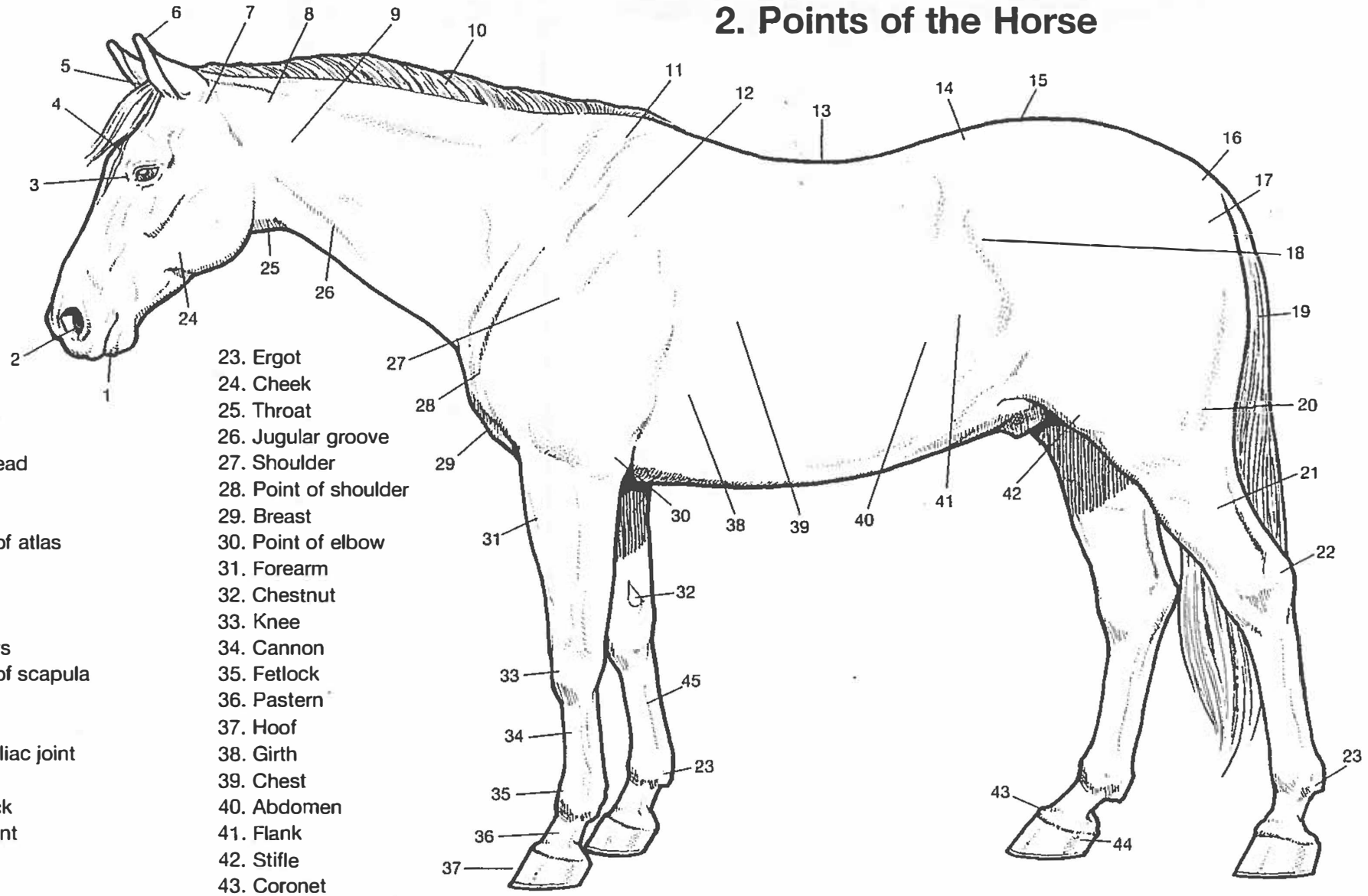
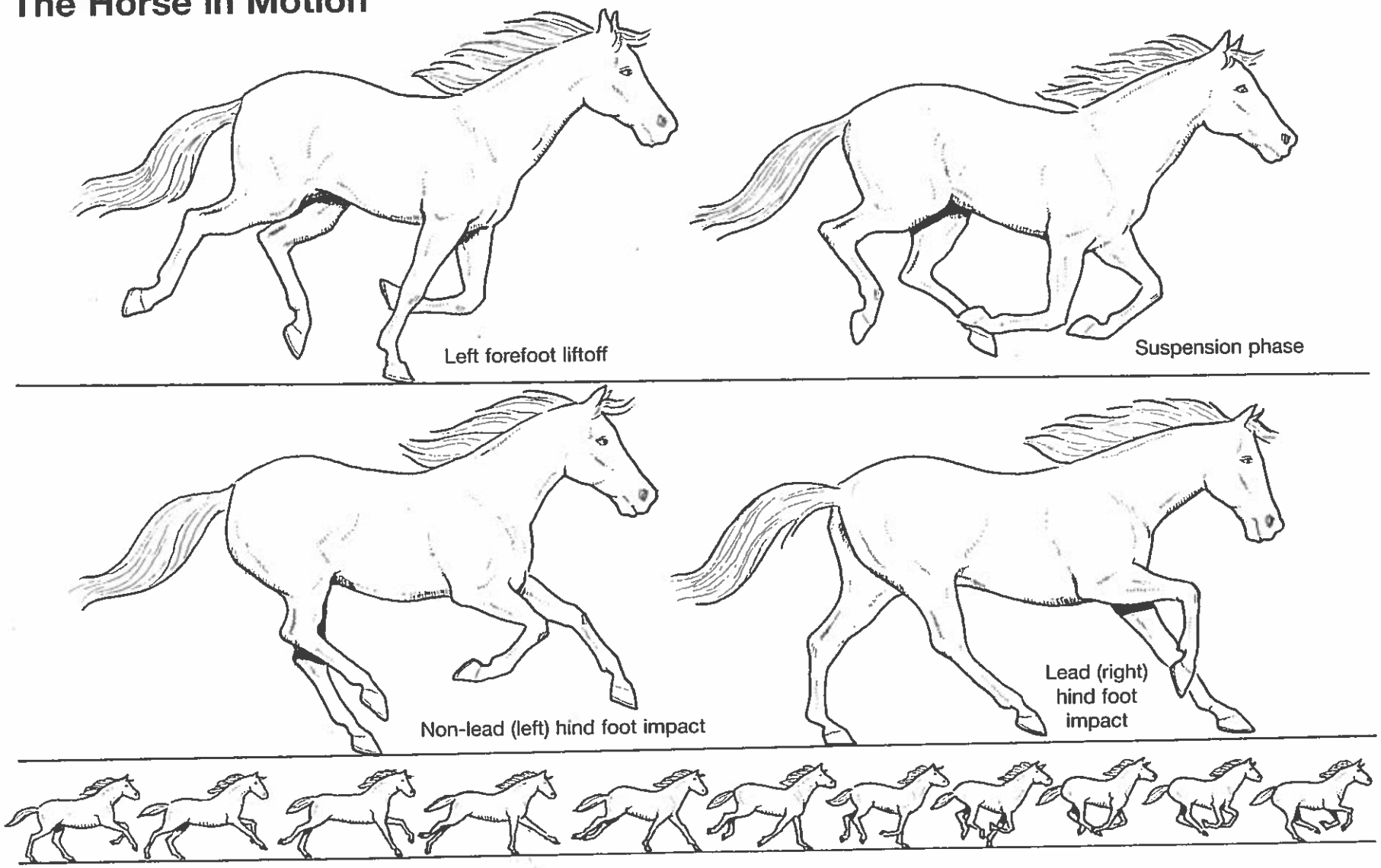
2. Points of the Horse



1. Lips
2. Nostril
3. Eye
4. Forehead
5. Poll
6. Ear
7. Wing of atlas
8. Crest
9. Neck
10. Mane
11. Withers
12. Back of scapula
13. Back
14. Loins
15. Sacroiliac joint
16. Dock
17. Buttock
18. Hip joint
19. Tail
20. Thigh
21. Gaskin
22. Point of hock
23. Ergot
24. Cheek
25. Throat
26. Jugular groove
27. Shoulder
28. Point of shoulder
29. Breast
30. Point of elbow
31. Forearm
32. Chestnut
33. Knee
34. Cannon
35. Fetlock
36. Pastern
37. Hoof
38. Girth
39. Chest
40. Abdomen
41. Flank
42. Stifle
43. Coronet
44. Heel
45. Flex tendons

The points of the horse are the external features that make up the horse's conformation, or shape. Knowledge of the points of the horse is vital for a real understanding of the animal. Experts acquire this knowledge by visual examination and physical touch. By feeling the point of the shoulder and other associated features, for instance, it is possible to establish what the angle of the shoulder is and whether it is correctly conformed. No one feature should be out of proportion with the others.

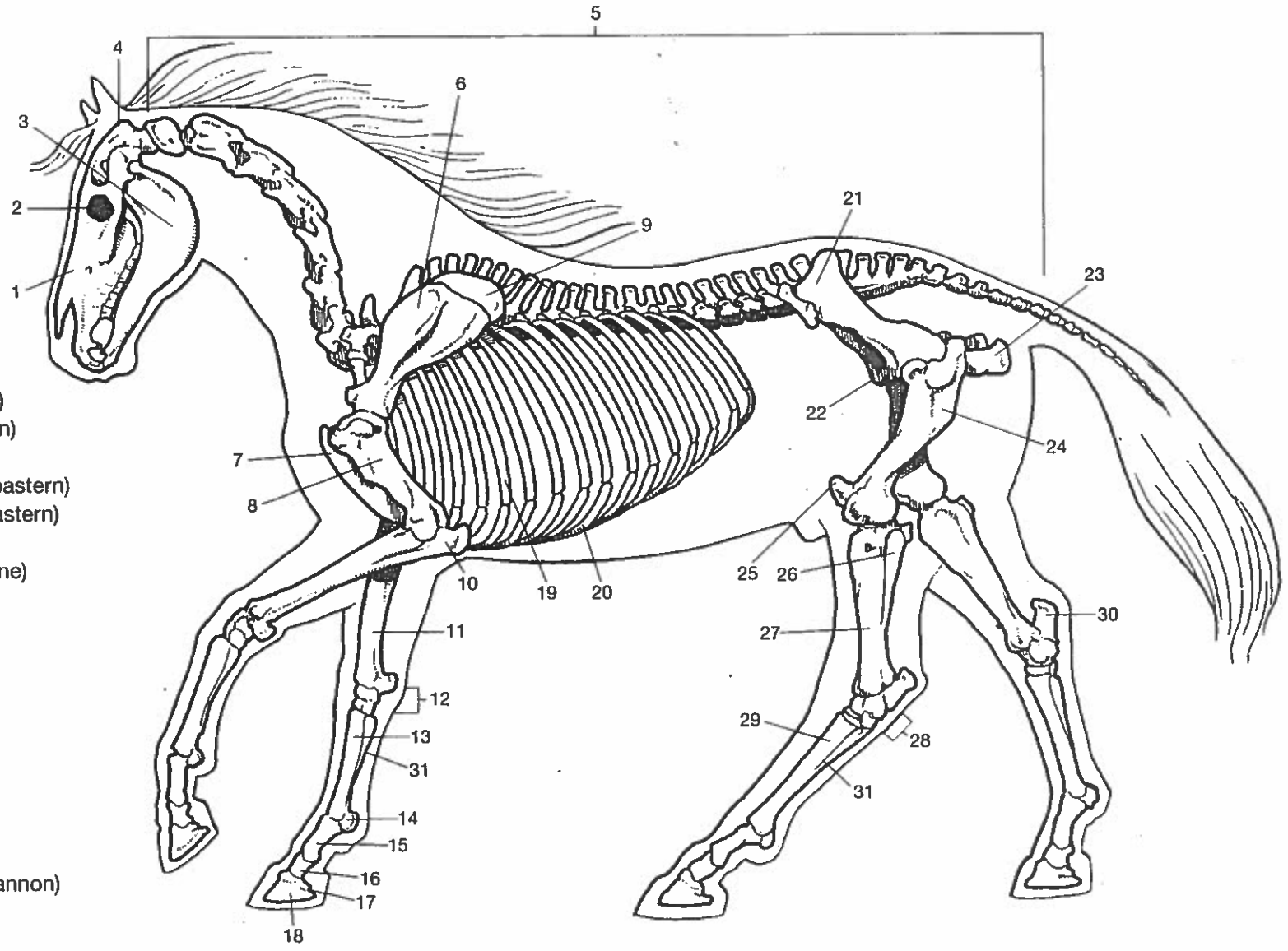
6. The Horse in Motion



The horse has four natural gaits: walk, trot, canter, and gallop. The illustration shows the final and fastest gait—the gallop. The gallop consists of a rapid four-time step sequence, which varies according to the horse's speed. The left and right sides move in different manners, with one side leading, and the other side trailing. The four limbs move individually and in the following sequence of footfalls: non-lead hind foot, lead hind foot, non-lead forefoot, lead forefoot. One feature of the gallop is the suspension phase, when all four legs are off the ground. For years, people weren't sure if this actually happened, until a series of photographs taken in the nineteenth century by Edweard Muybridge proved conclusively that the horse was completely airborne for an instant during its stride. The suspension phase allows the horse to recover its equilibrium and to get its hind feet under the body. During the gallop there is one suspension phase per stride.

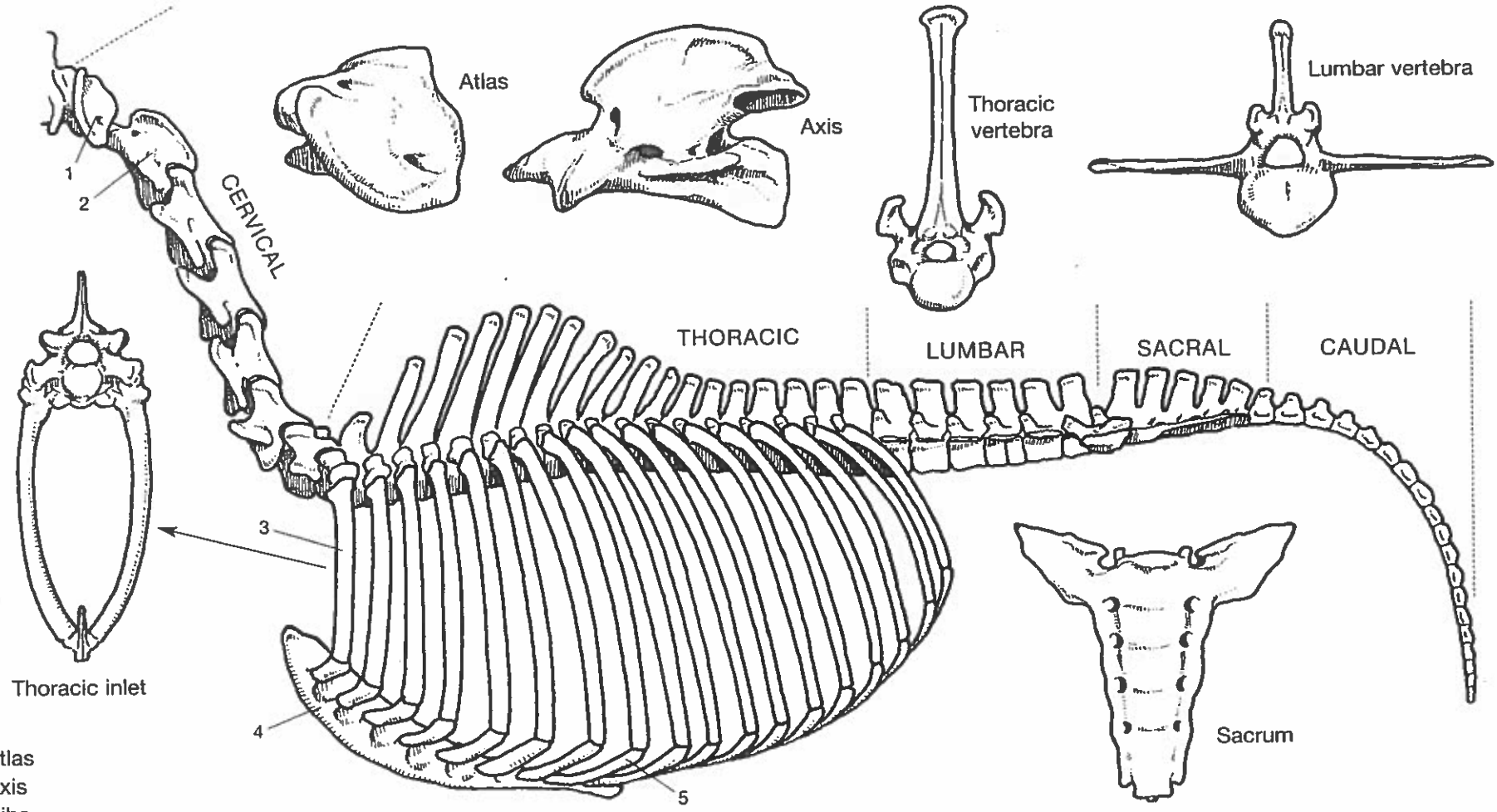
7. The Skeleton of the Horse

1. Skull
2. Orbit of eye
3. Mandible
4. Poll
5. Vertebral column
6. Scapula
7. Sternum
8. Humerus
9. Scapula cartilage
10. Ulna
11. Radius
12. Carpal bones (knee joint)
13. Metacarpal bone (cannon)
14. Sesamoid bone
15. Proximal phalanx (long pastern)
16. Middle phalanx (short pastern)
17. Distal sesamoid bone
18. Distal phalanx (pedal bone)
19. Ribs
20. Costal cartilages
21. Ilium (pelvis)
22. Pubis
23. Ischium
24. Femur
25. Patella
26. Fibula
27. Tibia
28. Tarsal bones (hock joint)
29. Metatarsal bone (hind cannon)
30. Os calcis (point of hock)
31. Splint bone



The skeleton is the framework of bones and other hard structures that support and protect the horse's soft tissues and vital organs. There are 205 bones in the normal adult horse skeleton, although some variation is possible, e.g. six or seven hock bones, and anywhere from fifteen to twenty-one tail vertebrae. There are twenty bones in each forelimb and twenty in each hind limb; they form the basis for locomotion and keeping them in good condition is of great importance in maintaining the health of the horse.

8. The Vertebral Column

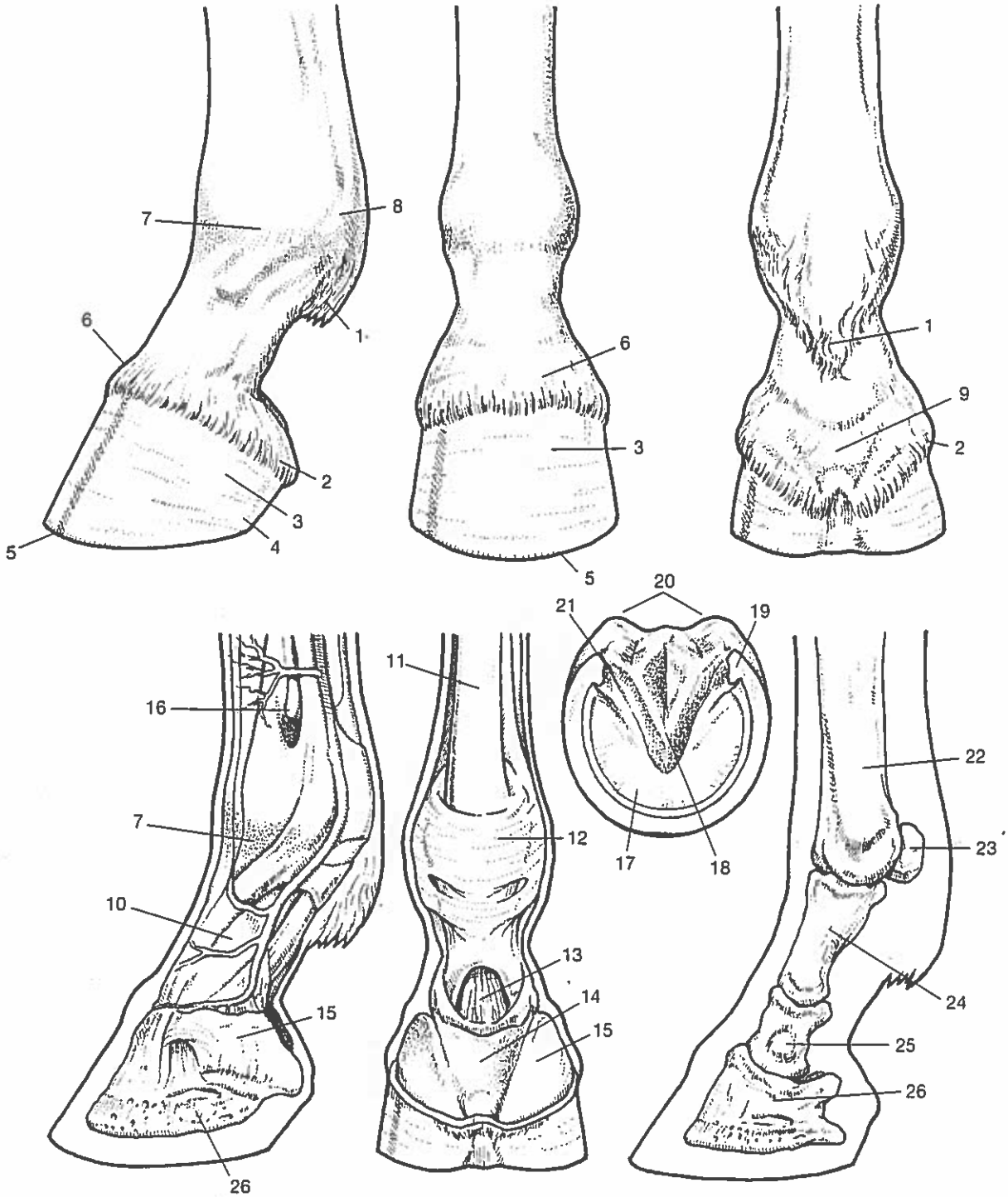


1. Atlas
2. Axis
3. Ribs
4. Sternum
5. Costal cartilages

The horse has fifty-four bones in the vertebral column, arranged as follows: cervical, or neck vertebrae (7); thoracic, or chest vertebrae (18); lumbar, or loins vertebrae (6); sacrum, or croup bone (5) vertebrae fused to form a single bone); coccygeal, or tail vertebrae (18). However, the tail vertebrae can vary from fifteen to twenty-one. In addition, the horse has eighteen ribs on each side. Eight ribs are attached directly to the sternum by individual cartilaginous extensions. Ten false ribs are attached by cartilage to the posterior sternum. Cervical stenotic myelopathy (wobbler syndrome) causes spinal cord compression and is a common and devastating disease in horses. Most prevalent in thoroughbred and quarter horse males, it produces a loss of control in the hindquarters when the horse is walking or turning.

17. The Foot

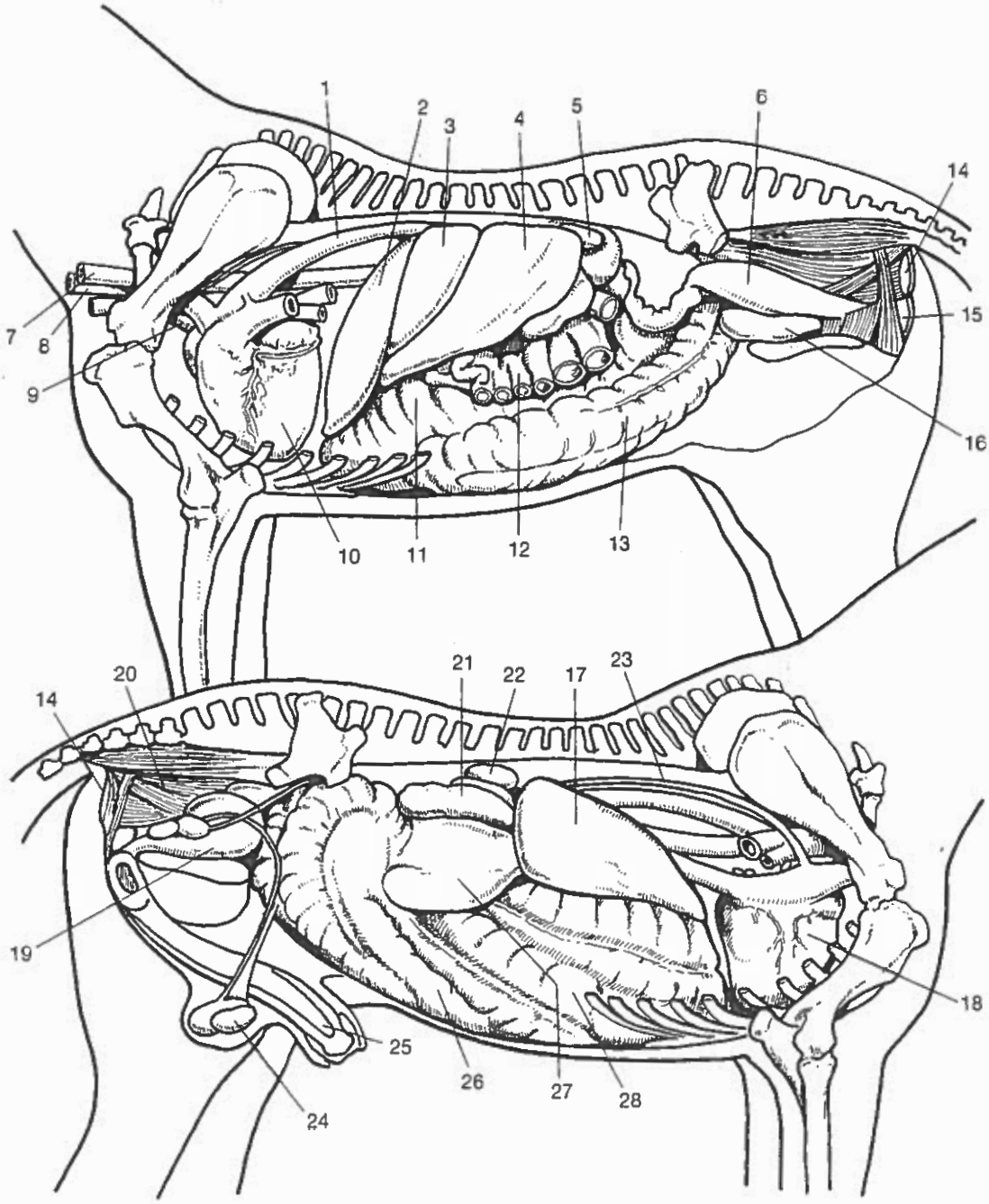
Proper condition of the legs and feet are crucial to the health and soundness of a horse, for major problems can develop in these parts of the horse's anatomy. It is essential to regularly check the condition of the horse's feet.



1. Fetlock tuft
2. Peripole
3. Wall
4. Heel
5. Toe
6. Coronet
7. Fetlock joint
8. Site of lateral digital vein and artery
9. Interbulbar furrow
10. Sesamoid bone
11. Flexor tendon
12. Ligament of fetlock
13. Deep flexor tendon
14. Plantar cushion
15. Lateral cartilage
16. Metacarpal bone
17. Sole
18. Frog
19. Angle of wall
20. Bulb of heels
21. Collateral groove
22. Metacarpal bone (cannon)
23. Sesamoid bone
24. Proximal phalanx (large pastern)
25. Middle phalanx (small pastern)
26. Distal phalanx (pedal bone)

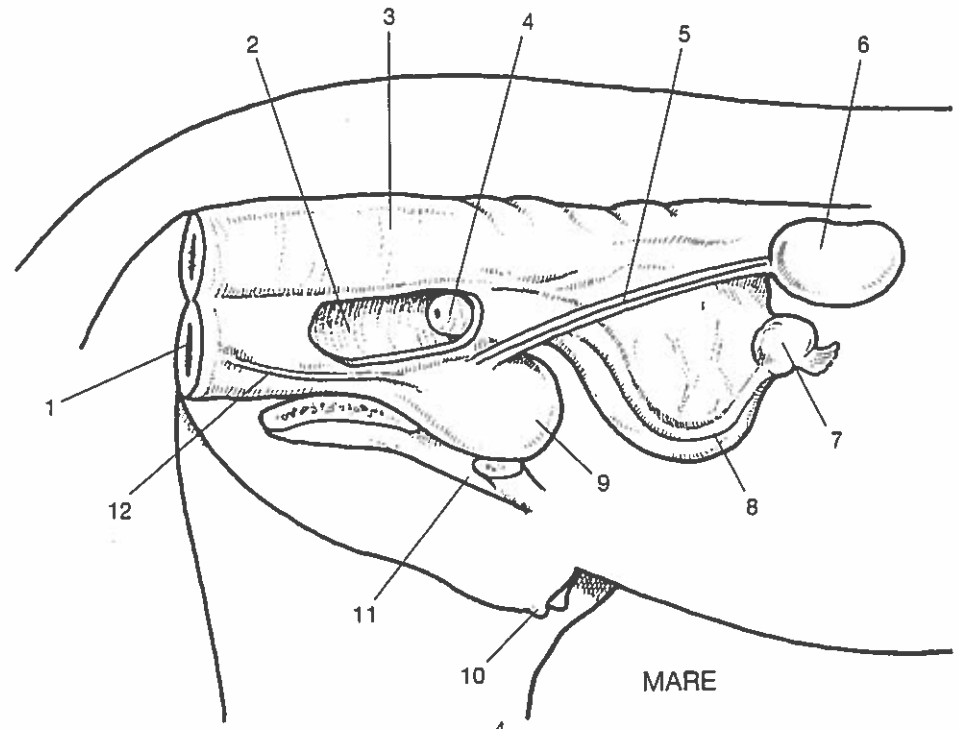
20. The Internal Organs of the Horse

Most of the horse's internal organs work in the same way as those of other mammals. The liver is the animal's largest organ, weighing an average of 11lbs. Its secretion of bile is delivered directly to the duodenum by the bile duct, since the horse lacks a gall bladder for storing bile. The stomach of the horse is very small for the animal's size. The illustration shows the left side of a mare and the right side of a stallion.

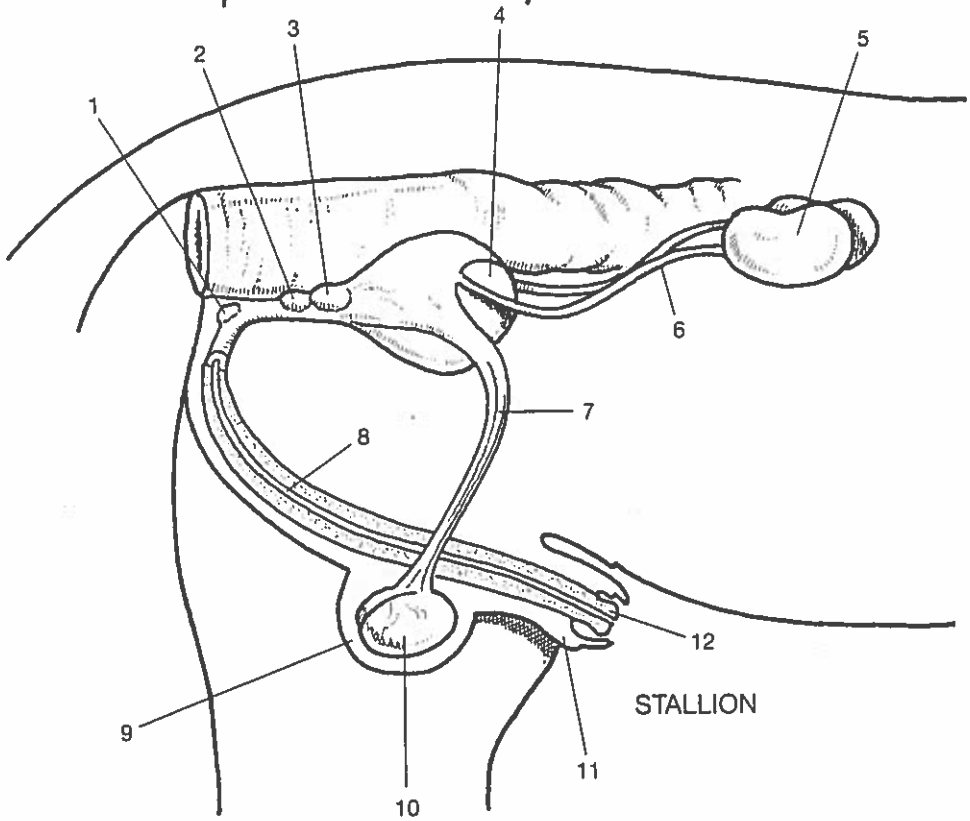


1. Aorta
2. Left lobe of the liver
3. Stomach
4. Spleen
5. Left kidney
6. Body of the uterus
7. Esophagus
8. Trachea
9. Left vagus nerve
10. Left ventricle of the heart
11. Left dorsal colon
12. Small intestine
13. Left ventral colon
14. External anal sphincter
15. Vulva
16. Urinary bladder
17. Right lobe of liver
18. Right ventricle of heart
19. Urinary bladder
20. Rectum
21. Descending duodenum
22. Right kidney
23. Azygos vein
24. Right testicle
25. Body of penis
26. Lateral caecal band
27. Dorsal sac of caecum
28. Right ventral colon

28. The Reproductive System



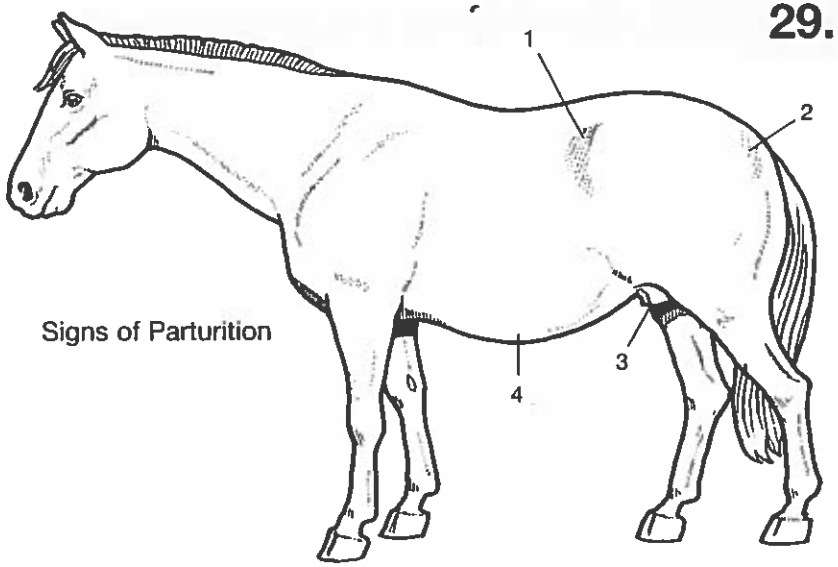
1. Vulva
2. Vagina
3. Rectum
4. Cervix
5. Ureter
6. Right kidney
7. Right ovary
8. Uterus
9. Bladder
10. Teat
11. Floor of pelvis
12. Urethra

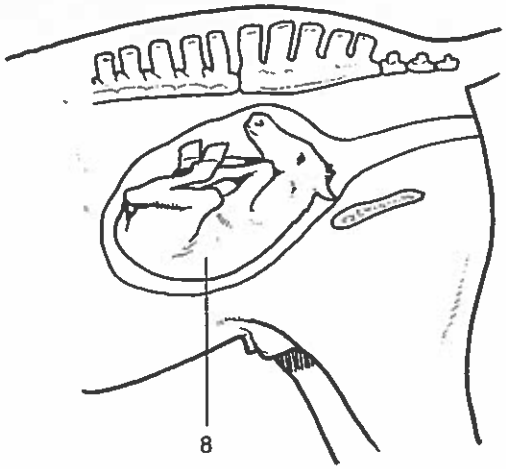


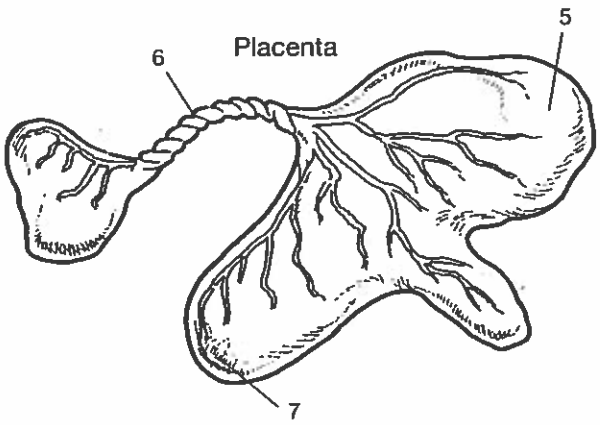
1. Bulbourethral gland
2. Prostate
3. Seminal vesicle
4. Bladder
5. Kidneys
6. Ureter
7. Sperm duct
8. Urethra
9. Scrotum
10. Testes
11. Sheath
12. Penis

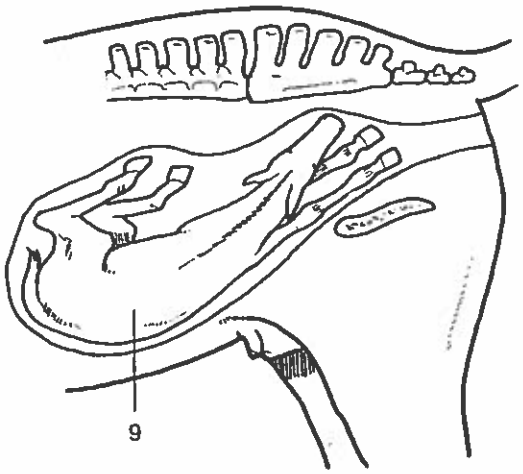
The genital organs of the mare consist of two ovaries and oviducts or fallopian tubes, the uterus, cervix, vagina, and vulva. The ovaries are responsible for producing the female sex cell, i.e. the egg, or ovum. The stallion's sex organs consist of two testes (housed in the scrotum) in which spermatozoa are produced; collecting ducts which connect with the urethra after traveling in the spermatic cord with arteries and veins; the accessory glands comprising the prostate, seminal vesicles, bulbourethral gland, and penis. The penis is housed in the prepuce or "sheath."

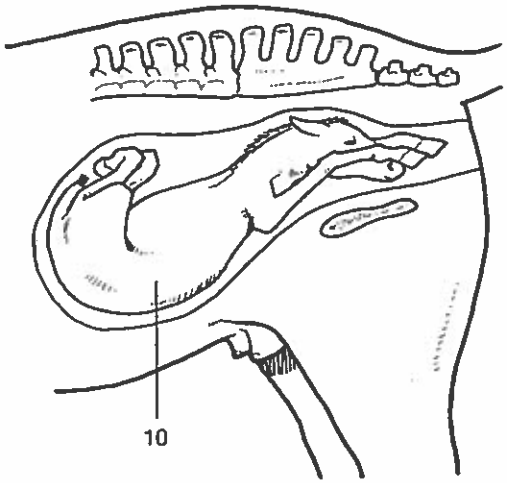
29. Foaling







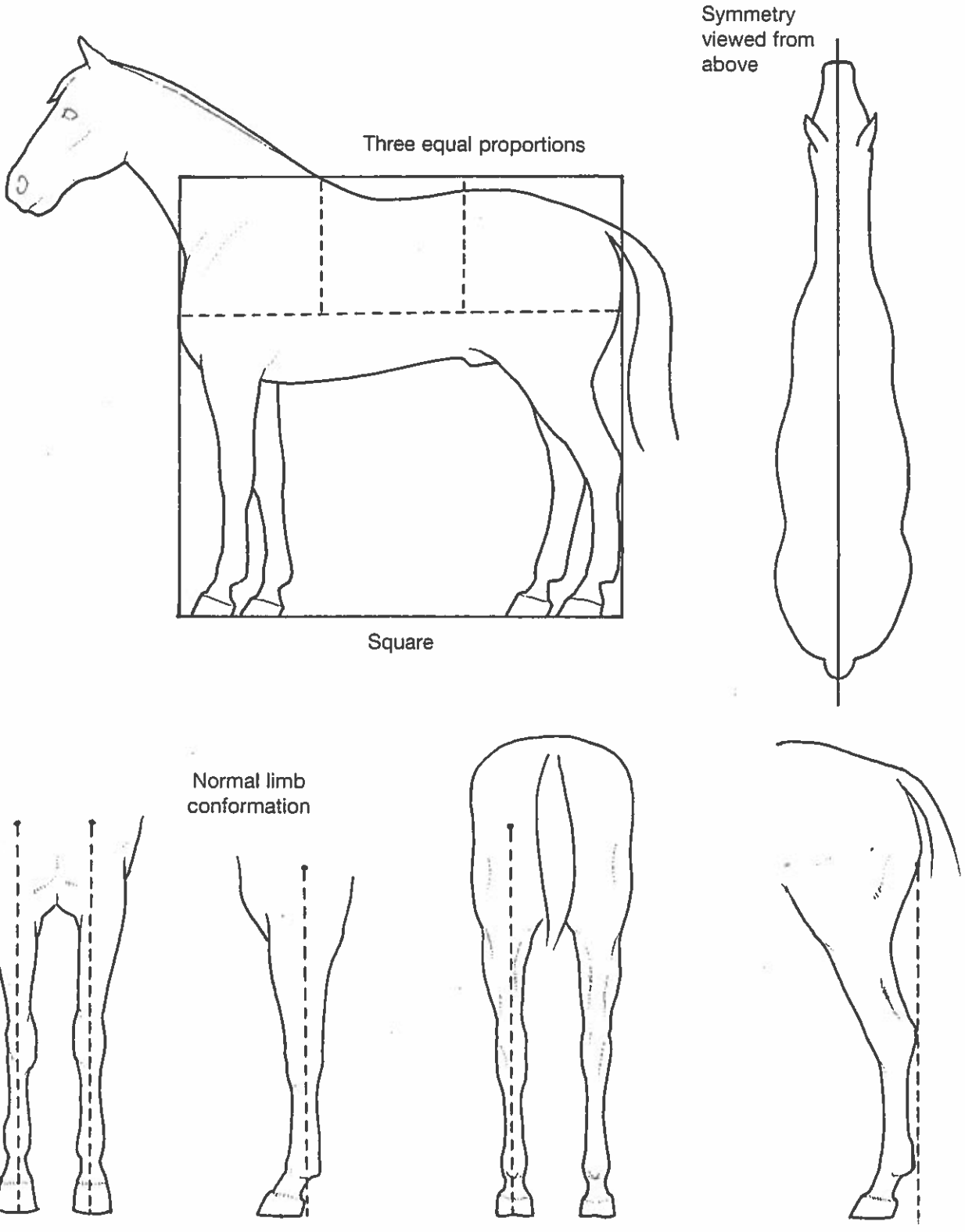




1. Paralumbar fossa sinks
2. Softening and relaxation of muscles and ligaments around tailhead
3. Waxing of teats
4. Enlarged abdomen
5. Allantoamnion
6. Umbilical cord
7. Cervical star
8. Position of foal during late pregnancy
9. First stage of labor: foal twists so that head, neck, and chest are in the proper position
10. As the second stage of labor progresses, forelegs and head enter the pelvic girdle, followed by the chest

The length of gestation (duration of pregnancy) in the mare is eleven months. There are several signs of impending parturition (the process of giving birth): enlarged and dropped abdomen, sinking in at the paralumbar fossa, relaxation and softening of the muscles and ligaments adjacent to the tailhead, filling of the udder with colostrum, and "waxing" of teats due to excessive secretion by oil glands at openings. These signs usually occur around forty-eight hours before parturition.

30. Conformation



A horse's conformation is its overall makeup and shape, as determined by its skeletal outline. What constitutes ideal conformation varies according to the work the horse is required to do. Allowing for these variations, basic guidelines can be used when looking for desirable conformation. These relate to proportion: if a horse is correctly proportioned, it will be better balanced and more able to perform its allotted tasks than a horse with less harmonious proportions. A poor or average conformation warns of the likelihood of sub-optimal performance, risk of injury, and reduced durability.

AXIAL SKELETON

1. **Skull**
2. **Mandible**
3. **Hyoid bone**
4. **Vertebral column**
5. **Ribs**
6. **Costal cartilages**
7. **Sternum**

APPENDICULAR SKELETON

FORELIMB

8. **Scapular cartilage**
9. **Scapula**
10. **Humerus**
11. **Radius**
12. **Ulna**
13. **Carpal bones - 7 or 8**
14. **Metacarpal bones - 3**
    (3rd Mc = cannon bone)
15. **Proximal sesamoid bones - 2**
16. **Proximal phalanx**
    (First phalanx or P1)
    (Plural = phalanges)
17. **Middle phalanx**
    (Second phalanx or P2)
18. **Distal sesamoid bone**
    (Navicular bone)
19. **Distal phalanx**
    (Third phalanx or P3)
    (Coffin bone or pedal bone)

HINDLIMB

20. **Ilium** } Fused to form
21. **Pubis** } the hip bone
22. **Ischium** } **(os coxae)**
23. **Femur**
24. **Patella**
25. **Tibia**
26. **Fibula**
27. **Tarsal bones - 6**
28. **Metatarsal bones - 3**

Digital bones of the hindlimb are named the same as those of the forelimb, nos. 16 - 19.

There are 205 bones in the horse's skeleton. Thirty-four, including 3 auditory (hearing) ossicles in each temporal bone, are in the skull. The twenty bones in each forelimb and the twenty in each hindlimb are of great importance in health and disease, since they form the basis for locomotion.

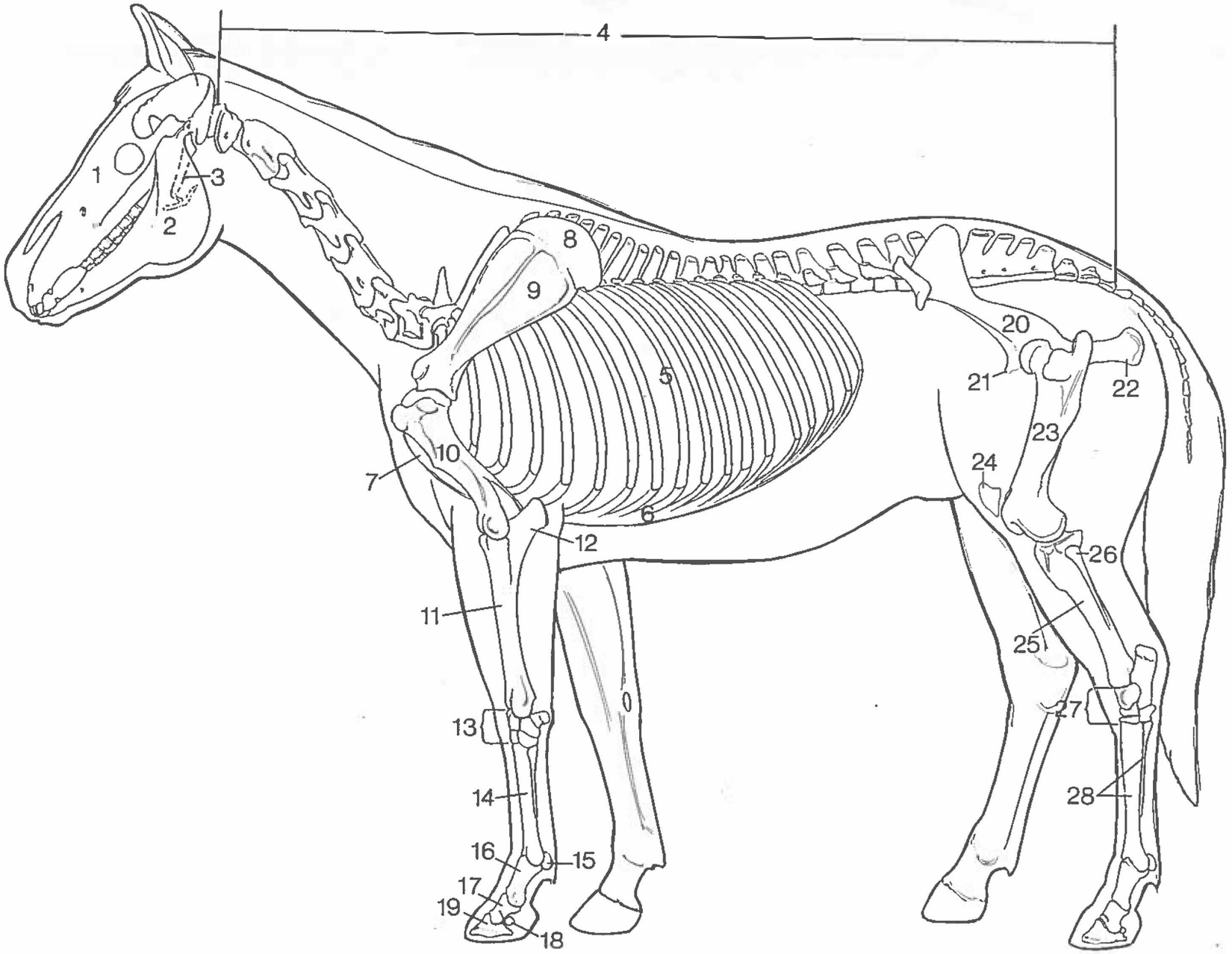


Plate 6

SURFACE OF THE HOOF

Plate 24

Figure 1. Side of the hoof

Coronet	**Toe**	Regions of the hoof wall
Skin	**Quarter**	
Periople	**Heel**	

The **coronet** is the junction of the skin and the soft horn of the **periople.** The coronary band is a deeper region. Notice that the **periople** widens over the **heel.**
Hoof and foot are not the same! The hoof (like your fingernail) is a highly cornified (horny) epidermal structure lacking in blood vessels and nerves. The foot includes the hoof and underlying corium (dermis), skin between the bulbs of the heels, digital cushion, distal phalanx and its cartilages, distal end of the middle phalanx, navicular bone, coffin joint, ligaments, tendons, vessels and nerves.

Figure 2. Ground (solar) surface of the hoof
Notice that the hoof of the hindfoot, B., is narrower and more pointed than the hoof of the forefoot, A.
Half of the ground surface of the wall of the hoof of the forefoot has been trimmed. On the untrimmed half, the **epidermal ("insensitive") laminae, el,** of the **internal layer** of the wall blend with the thick **middle layer.** These layers may also be seen on the trimmed half.
Identify the **white line,** the soft white horn at the junction of the wall and the sole. Leave the white line uncolored.
The **angle of the wall** continues into the **bar.**
On the **frog** identify the **apex**, a., and the **central groove**, c. The **frog** blends with the **bulbs of the heels.**
On each side, a **collateral groove** separates the frog from the bar and the sole.

Thrush is a chronic infection of the frog in which dark, foul-smelling dead tissue occurs in the central and collateral grooves. It can penetrate the horny epidermis into the underlying dermis. Dirty, damp stables and paddocks, inadequate cleaning of the hoof, and improper shoeing and hoof trimming can lead to thrush. A bacterium, Fusobacterium necrophorum, is usually present in the affected tissues.

Figure 1

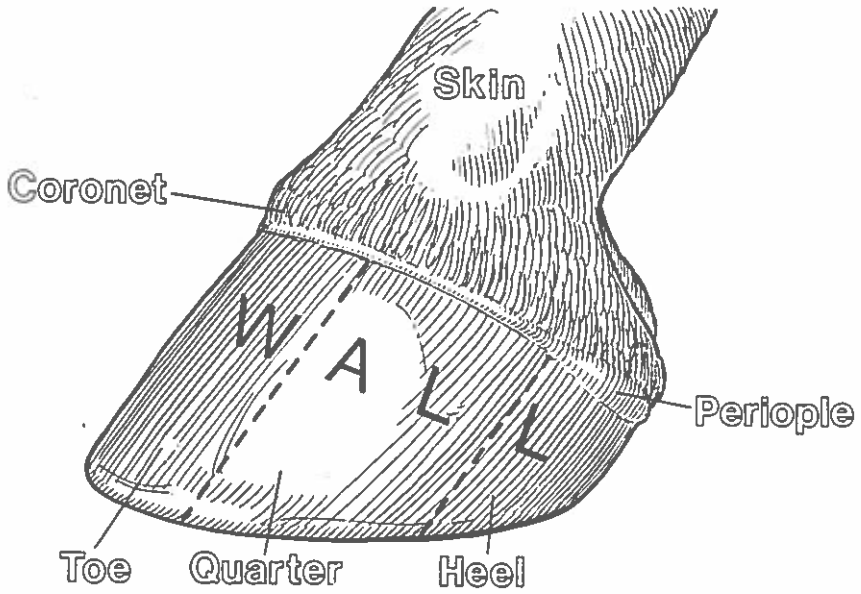
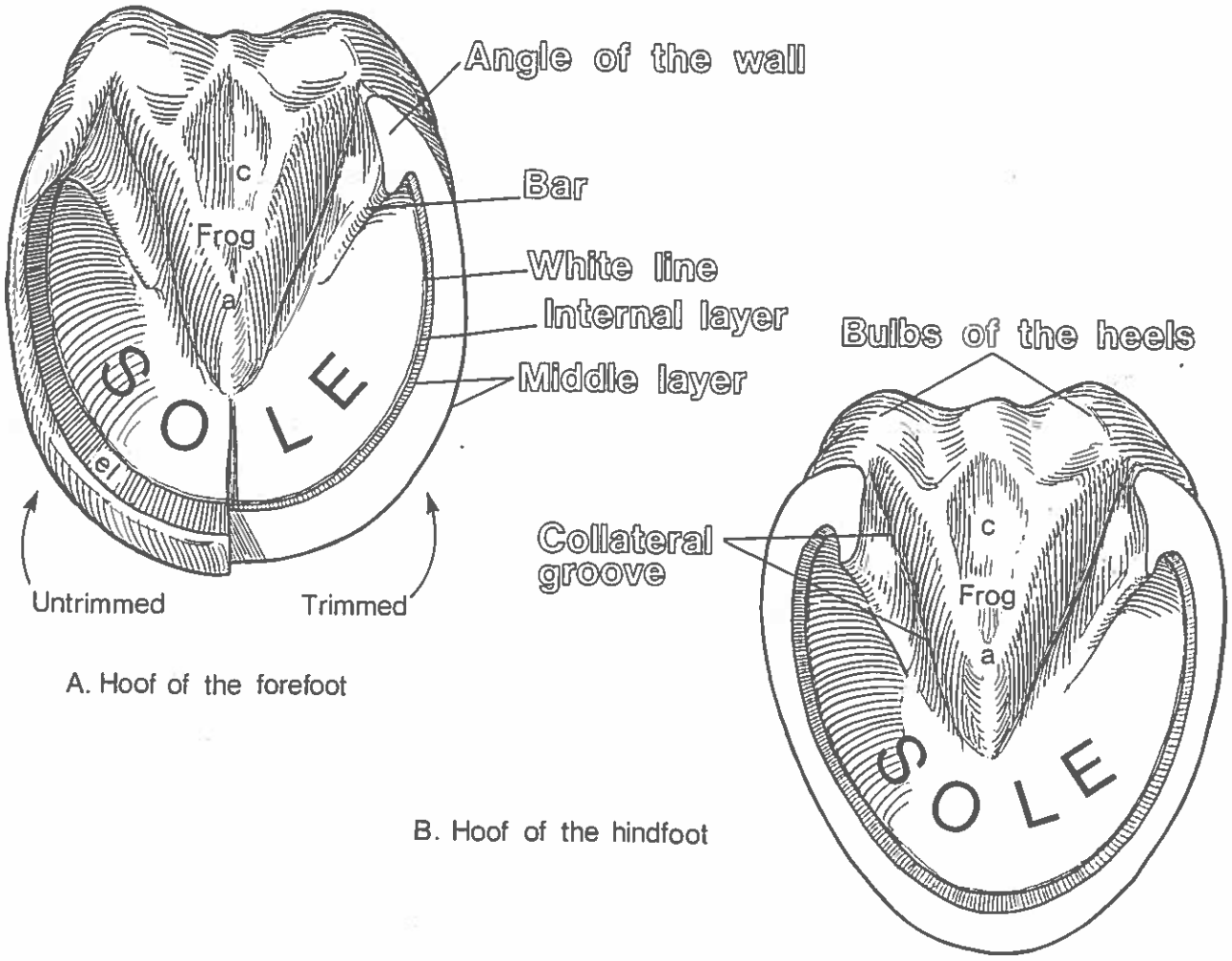


Figure 2



A. Hoof of the forefoot

B. Hoof of the hindfoot

Figure 1. Insertion of deep digital flexor tendon. Palmar view. Identify and color the following structures:

Deep digital flexor tendon
Navicular bone
Collateral sesamoidean ligament Meets opposite ligament - dashed line.
Navicular bursa (podotrochlear bursa) - stippled

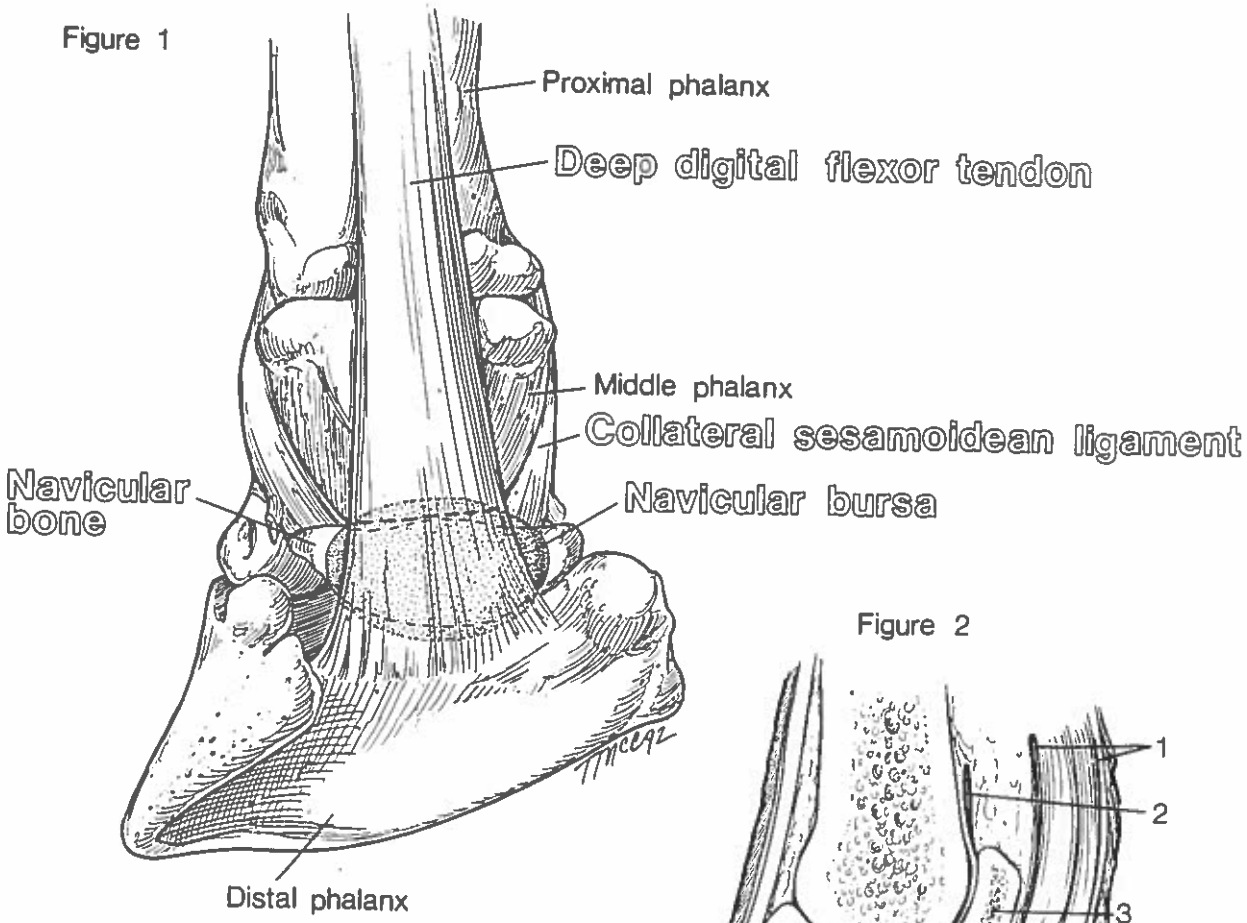
Notice the course of the deep digital flexor tendon over the navicular bone with the navicular bursa forming a cushion between the tendon and the navicular bone. Identify the dashed line indicating the outline of the navicular bone and the dotted line indicating the extent of the navicular bursa.

Figure 2. Parasagittal section through the digit.

1.- 1'. Limits of digital sheath
2. Palmar recess of fetlock joint capsule
3. Proximal sesamoid bone
4. Distal sesamoidean ligaments
5. Superficial digital flexor tendon
6. Deep digital flexor tendon
7. T ligament
8. Proximal pouch of coffin joint capsule
9. Navicular bone
10. Digital cushion
11. Navicular bursa
12. Impar ligament of navicular bone
13. Dorsal pouch of coffin joint capsule
14. Common digital extensor tendon

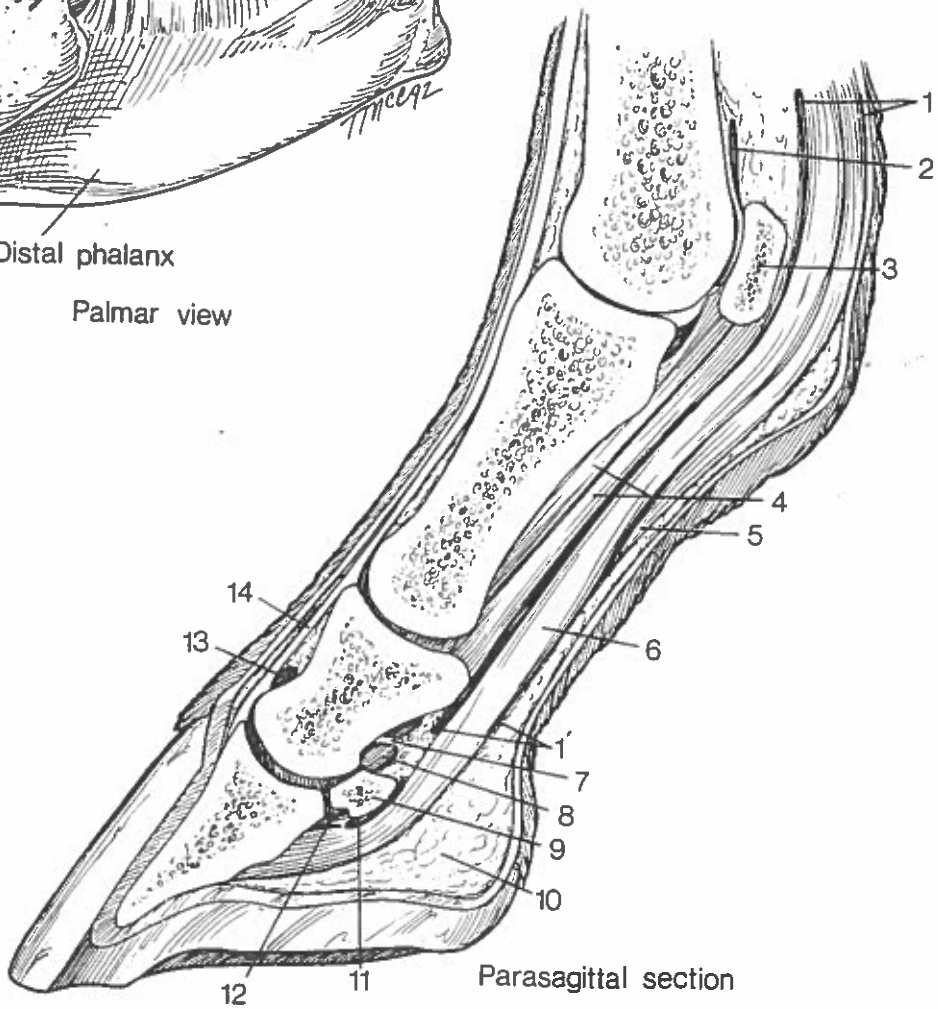
Navicular disease is a progressive, degenerative condition of the navicular bone, also affecting the navicular bursa and overlying deep digital flexor tendon. This condition occurs mainly in the forefeet. Upright conformation of the digit, small feet, improper shoeing, exercise on a hard surface, and very demanding work are thought to cause and aggravate the condition. Off and on lameness and shifting and pointing of the forefeet are common signs of the disease.

Figure 1



Palmar view

Figure 2



Parasagittal section

FORELIMB CONFORMATION

Plate 39

Color the dashed lines from P (proximal) to D (distal). Arrows indicate **offset knees.**

A line dropped from the point of the shoulder (middle of the shoulder joint) bisects a **normal forelimb.**

Base-narrow (B-n) conformation causes the lateral wall to land first, bear most of the weight and wear faster. The medial wall should be trimmed to level the foot.

In base-wide (B-w) conformation more weight falls on the medial side (inside) of the foot where it lands first, causing the medial hoof wall to wear faster. The lateral (outside) wall should be trimmed to level the foot.

Offset knees (bench knees) place greater strain on the medial small metacarpal (splint) bone, often leading to "splints" (inflammation of the interosseous ligament and the splint bone).

Undesirable gaits resulting from abnormal conformations:

Winging - **Toe-out conformation** usually causes the forefoot to break over the medial side of the toe and arc to the inside.

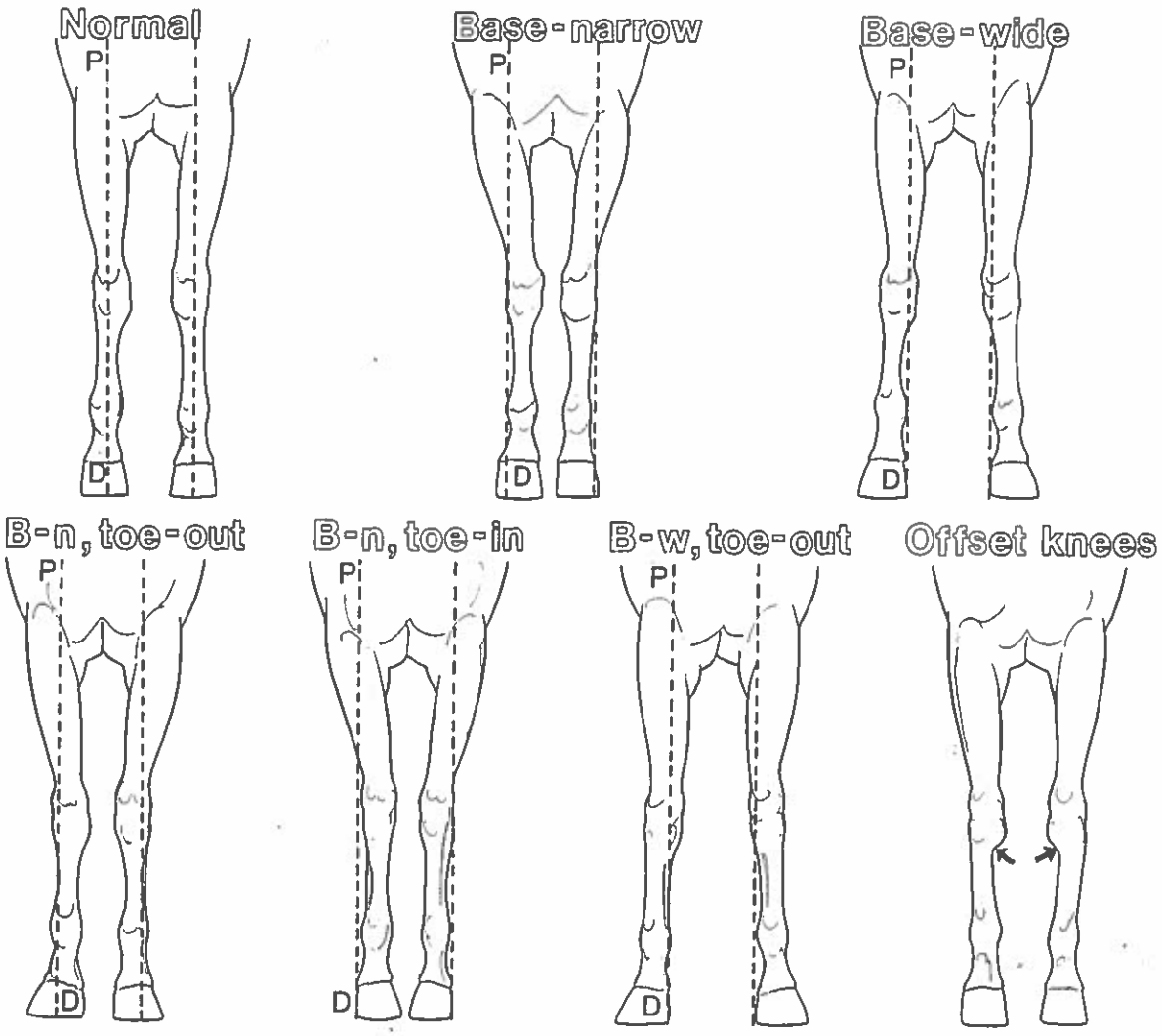
Paddling - **Toe-in conformation** usually results in the forefoot swinging to the outside as it leaves the ground.

Plaiting - In **base-narrow, toe-out conformation** one forefoot travels inward to land cranial to the other forefoot, causing more locomotion problems than other abnormal conformations.

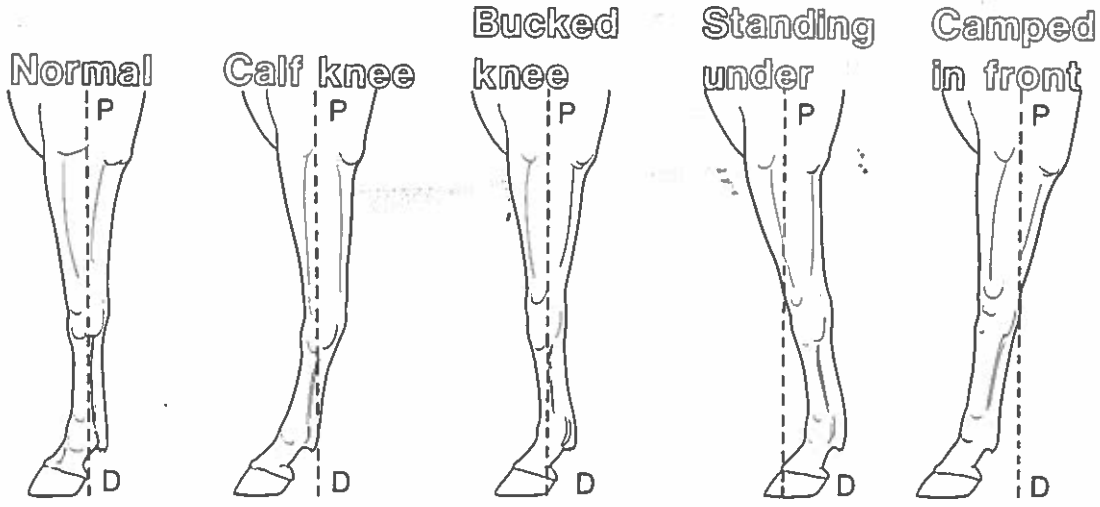
In a lateral view of a **normal forelimb,** a line dropped from the tuber of the scapular spine bisects the limb as far as the fetlock and continues distad just caudal to the heel.

Calf knees (palmar deviation of the carpal joints) puts great strain of the ligaments associated with the palmar aspect of the carpus and increases compression on the dorsal aspect of the carpal bones. Chip fractures of the third, intermediate and radial carpal bones and the distal end of the radius may occur.

Cranial views of forelimbs



Lateral views of forelimbs



Color the dashed lines from P (proximal) to D (distal). Caudally, a line dropped from the point of the ischiadic tuber ("pin bone") bisects a **normal hindlimb.**

Base-narrow behind conformation places heavy stress on the structures on the lateral side of the hindlimb. Even if the forelimbs are normal, this abnormal hindlimb conformation can cause interference between forelimbs and hindlimbs. "Bowlegs" are frequently associated with this conformation.

In **cow-hocked** conformation, hindlimbs are base-narrow to the hocks and base-wide from the hocks to the feet. Excessive strain is placed upon the medial side of the hock, possibly contributing to the development of bone spavin.

In a lateral view of a **normal hindlimb,** a line dropped from the ischiadic tuber extends along the caudal surface of the metatarsus.

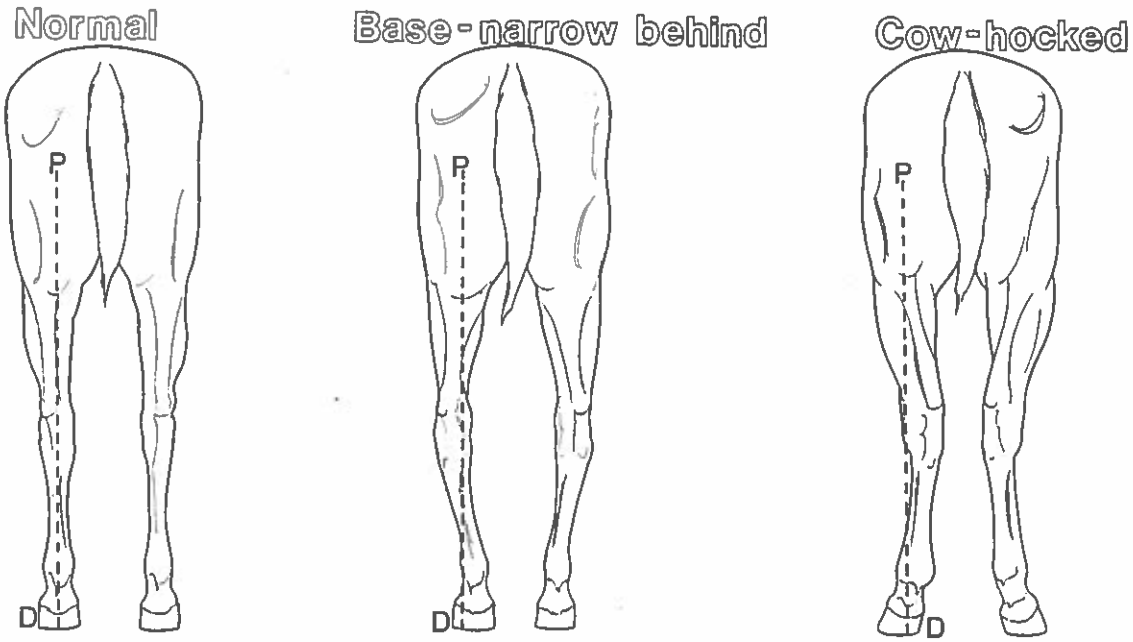
In both **standing under behind** and **sickle hock,** the metatarsus and digit are aligned well forward of the normal position.

Sickle hocks place a heavy strain on the long plantar ligament that attaches to the calcaneus, fourth tarsal bone and fourth metatarsal bone of each hock. The constant strain can cause curb, a painful inflammation and thickening of the long plantar ligament.

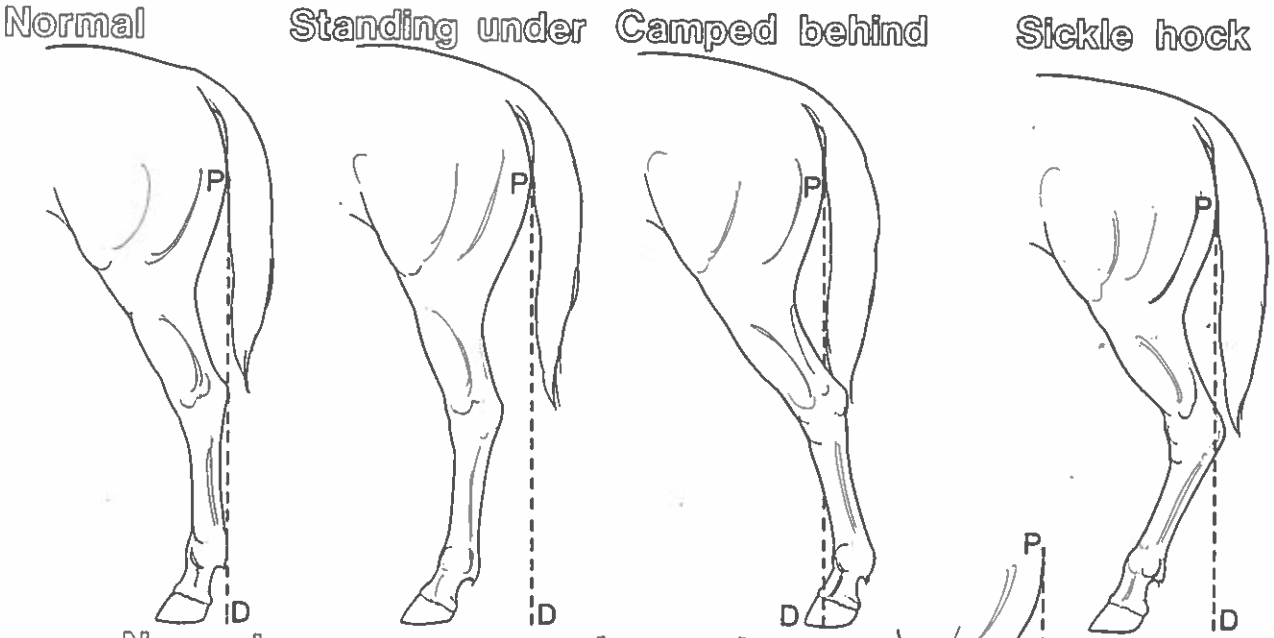
Too straight behind conformation may be prone to developing bog spavin and upward fixation of the patella, causing the patella to ride up and lock over the medial ridge of the trochlea of the femur.

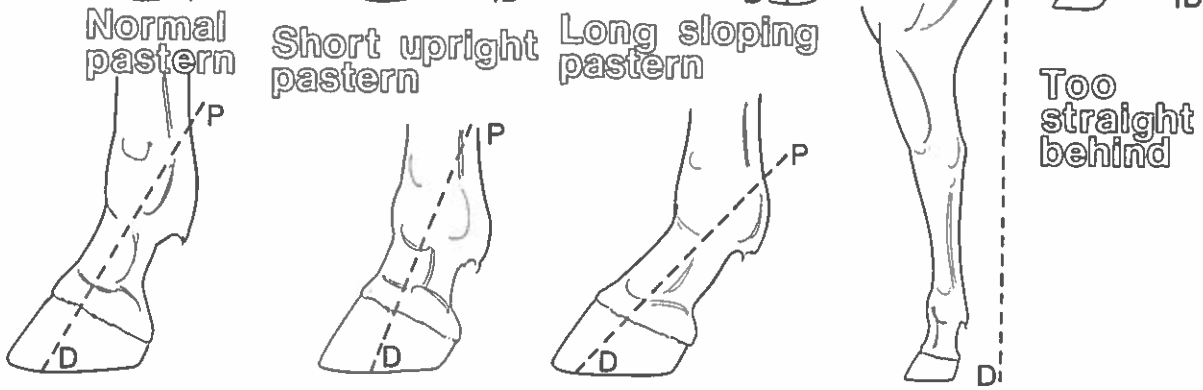
Short upright pasterns may predispose injuries of the fetlock joint, ringbone (inflammation and excess bone formation) of the pastern joint and navicular disease. These problems occur more commonly in the fetlock joint, pastern joint and coffin joint of the forelimb.

Caudal view of hindlimb



Lateral view of hindlimb





Identify the teeth on the drawings.

Average Eruption Times:

Deciduous Teeth. Smaller. Neck between crown and root.

Cement worn away over crown, exposing white enamel.

Di1(central) - Birth or first week
Di2 (intermediate) - 4 to 6 weeks
Di3 (lateral) - 6 to 9 months

Dp2, Dp3, Dp4 — Birth or first 2 weeks

Permanent Teeth. Larger. No neck. Newly erupted crown covered with yellowish cement. In wear 6 months after eruption.

I1 - 2 1/2 years	P1 (wolf tooth) - 5 to 6 months	
I2 - 3 1/2 years	P2 - 21/2 years	M1 - 9 - 12 months
I3 - 4 1/2 years	P3 - 3 years	M2 - 2 1/2 years
C - 4 1/2 to 5 years	P4 - 4 years	M3 - 3 1/2 to 4 years

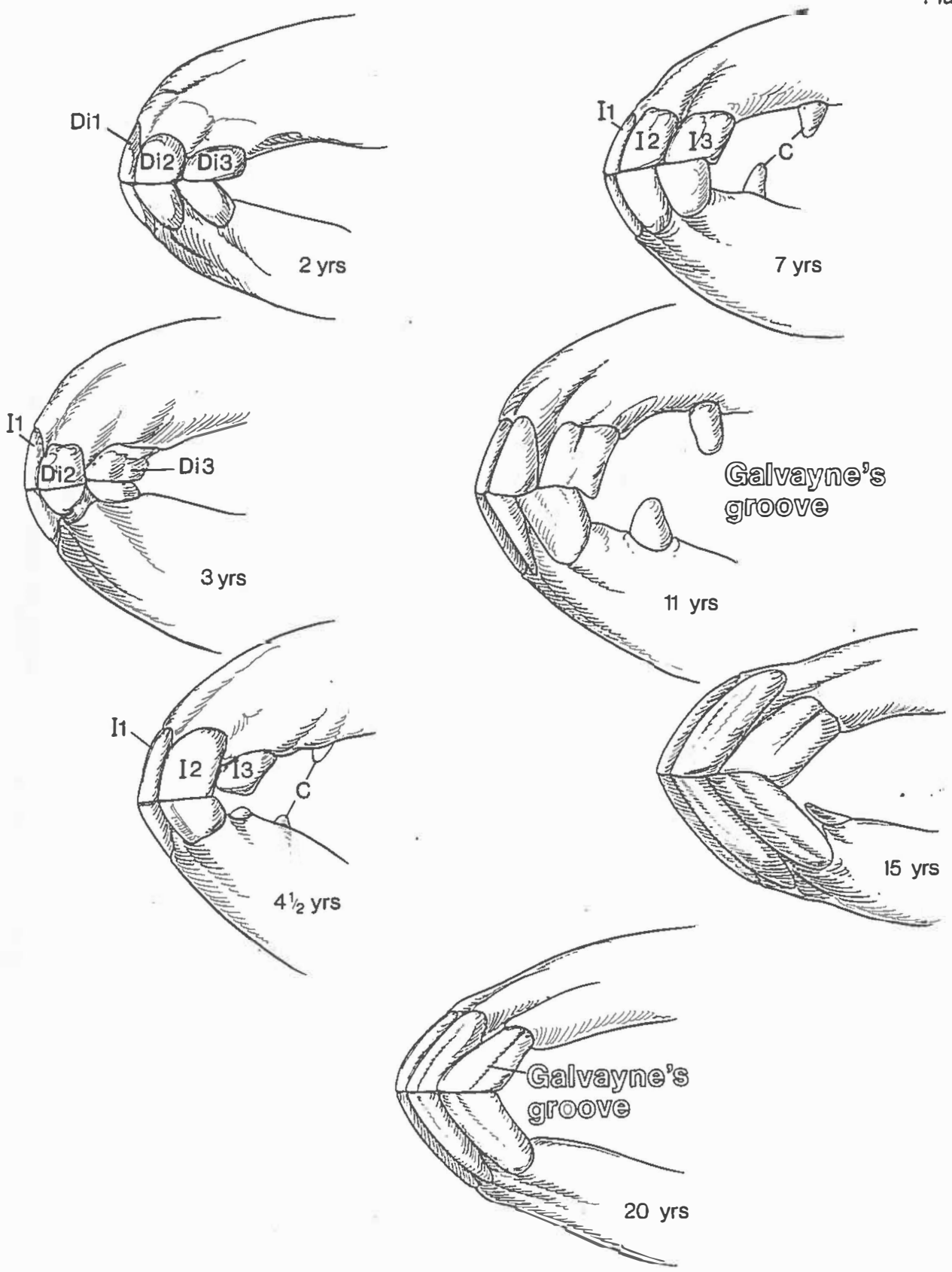
Progressive appearance of incisor teeth:

Changes in lower incisors unless otherwise indicated.

See Plate 48 for changes on the occlusal surfaces.

1 year - Di1 & Di2 in wear; Di3's not in contact.
2 years - Di1& Di2 level; Di3 in wear.
21/2 years - I1s erupt; in wear at 3.
31/2 years - I2s erupt; in wear at 4.
41/2 years - I3s erupt; in wear at 5.
5 years - Cs erupted; I1and I2 level; full mouth.
6 years - I1 cup gone
7 years - I2 cup gone; hook on upper I3.
8 years - I3 cup gone; dental star on I1.
9 years - I1 round; dental star on I2.
10 years - I2 round; **Galvayne's groove** appears on upper I3.
13 years - Small enamel spots on incisors
15 years - I1 triangular; dental stars round.
17 years - I2 triangular; enamel spots gone.
20 years - **Galvayne's groove** to occlusal surface.

The lateral profile angle of incisors becomes more acute with age. Notice changes in the profile from 7 to 20 years.


Di1
Di2
Di3
2 yrs
I1
I2
I3
C
7 yrs
I1
Di2
Di3
3 yrs
Galvayne's groove
11 yrs
I1
I2
I3
C
4½ yrs
15 yrs
Galvayne's groove
20 yrs

LARGE INTESTINE

Plate 52

Figure 1. Schematic drawing of the isolated large intestine viewed from the right with parts slightly separated.

Identify the major parts of the large intestine.

Arrows indicate movement of ingested feed toward the rectum.

Cecum - receives the ileum, last part of the small intestine.

Large (ascending) colon.

1. **Right ventral colon**
2. **Sternal flexure**
3. **Left ventral colon**
4. **Pelvic flexure**
5. **Left dorsal colon**
6. **Diaphragmatic flexure**
7. **Right dorsal colon**

Transverse colon - narrows as it leads from the large colon to the small colon.

Small (descending) colon - more folded in the living horse.

Rectum - continues caudad from the brim of pelvis, ending at the anus.

H = sacculations (haustra) of the large intestine.

T = longitudinal bands (taeniae coli) consisting mainly of smooth muscle.

Figure 2. Openings (orifices) in the base of the cecum.

A **sphincter** of smooth muscle surrounds the **ileal orifice,** providing a valve-like action.

The **cecocolic orifice** leads into the right ventral colon.

Colic (abdominal pain) has many causes. Impaction (obstruction) by feed, meconium (a foal's first stool) or foreign bodies is one cause of colic. Impaction is most likely to occur where the intestine narrows: **ileal orifice, pelvic flexure** or beginning of the **transverse colon.**

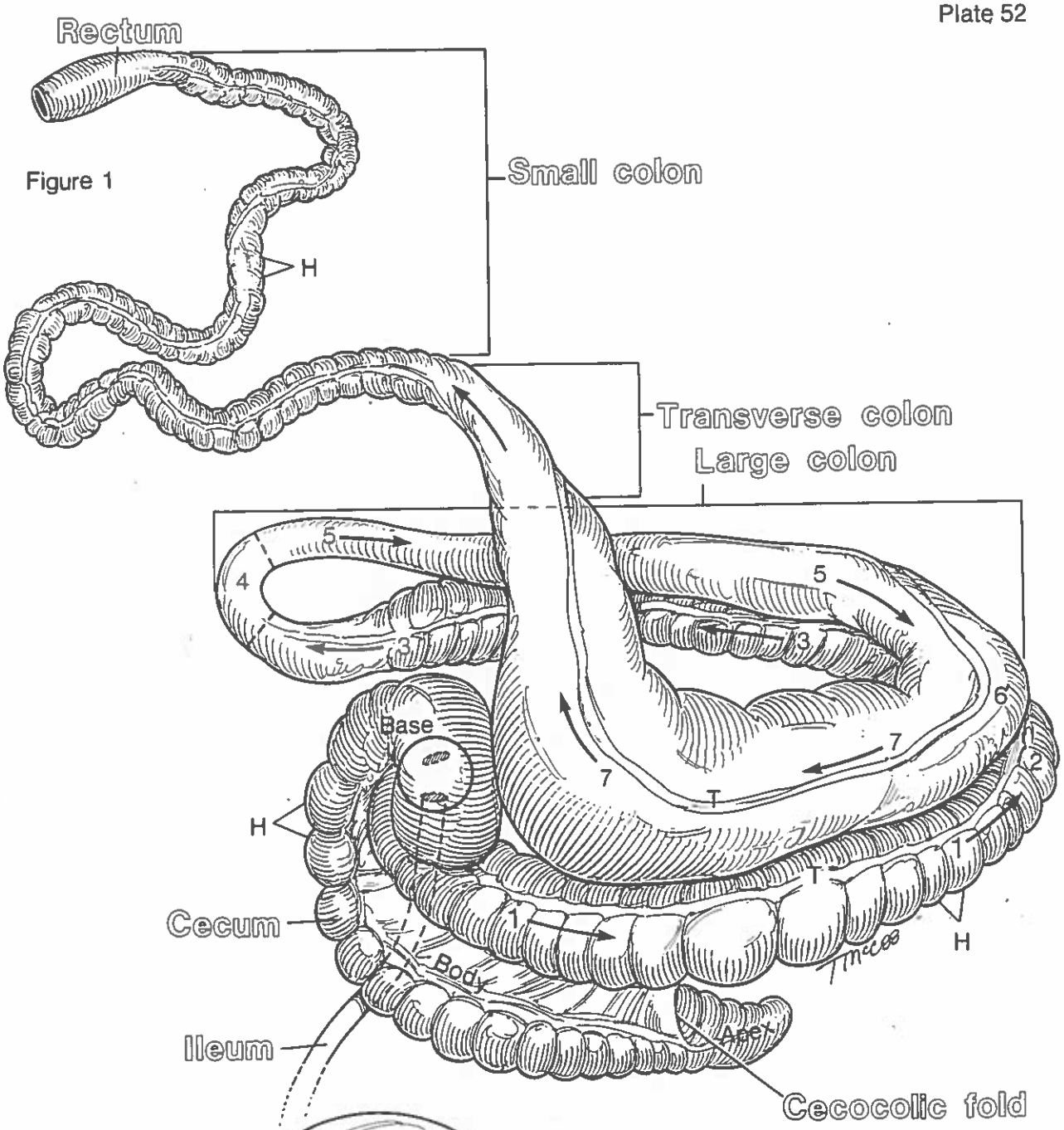
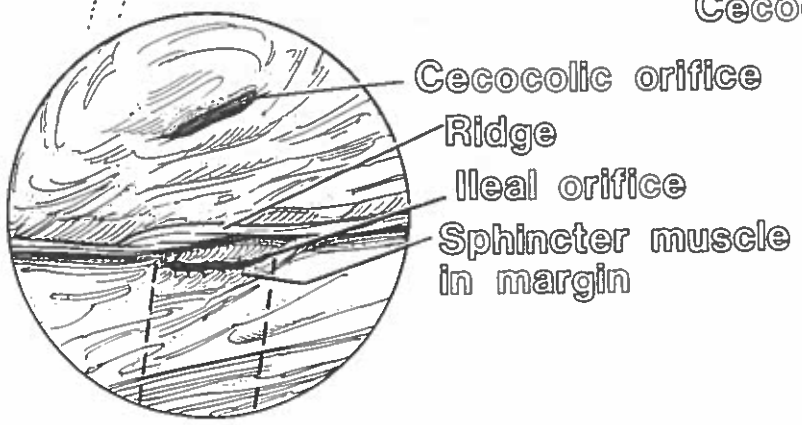

Rectum
Figure 1
Small colon
H
Transverse colon
Large colon
5
4
3
5
3
6
7
7
T
Base
H
1
T
Cecum
1
Body
H
Ileum
Apex
Cecocolic fold

Figure 2


Cecocolic orifice
Ridge
Ileal orifice
Sphincter muscle
in margin

IN SITU POSITIONS OF ABDOMINAL ORGANS

Plate 55

Figure 1. Positions of organs related to right wall of abdomen.
Figure 2. Positions of organs related to left wall of abdomen.

Identify the organs indicated.

Cellulose in feed (particularly hay and grass) is digested into absorbable nutrients by bacteria in the cecum and large colon. Gases (mainly carbon dioxide and methane) are produced as a by-product of this process. A stethoscope (or even one's ear pressed against the abdomen over parts of the large intestine) can be used to determine the presence or absence of intestinal sounds. These sounds are caused by the propulsion of gas and other fluids through the large intestine.

Horses normally produce and expel large quantities of gas. Abnormal accumulations of gas in the intestines (distension colic) may be relieved by injecting certain drugs or by giving mineral oil to help restore normal intestinal motility. A cecum greatly distended with gas may be emptied by puncturing its base through the right flank with a trocar. This instrument is a hollow metal tube with a sharp-pointed insert that is withdrawn following the puncture, allowing gas to escape. Knowing the in situ (in place) positions of organs can assist in making a diagnosis or treating a diseased organ. Keeping in mind their in situ positions helps in locating organs by a hand in the rectum.

Figure 1

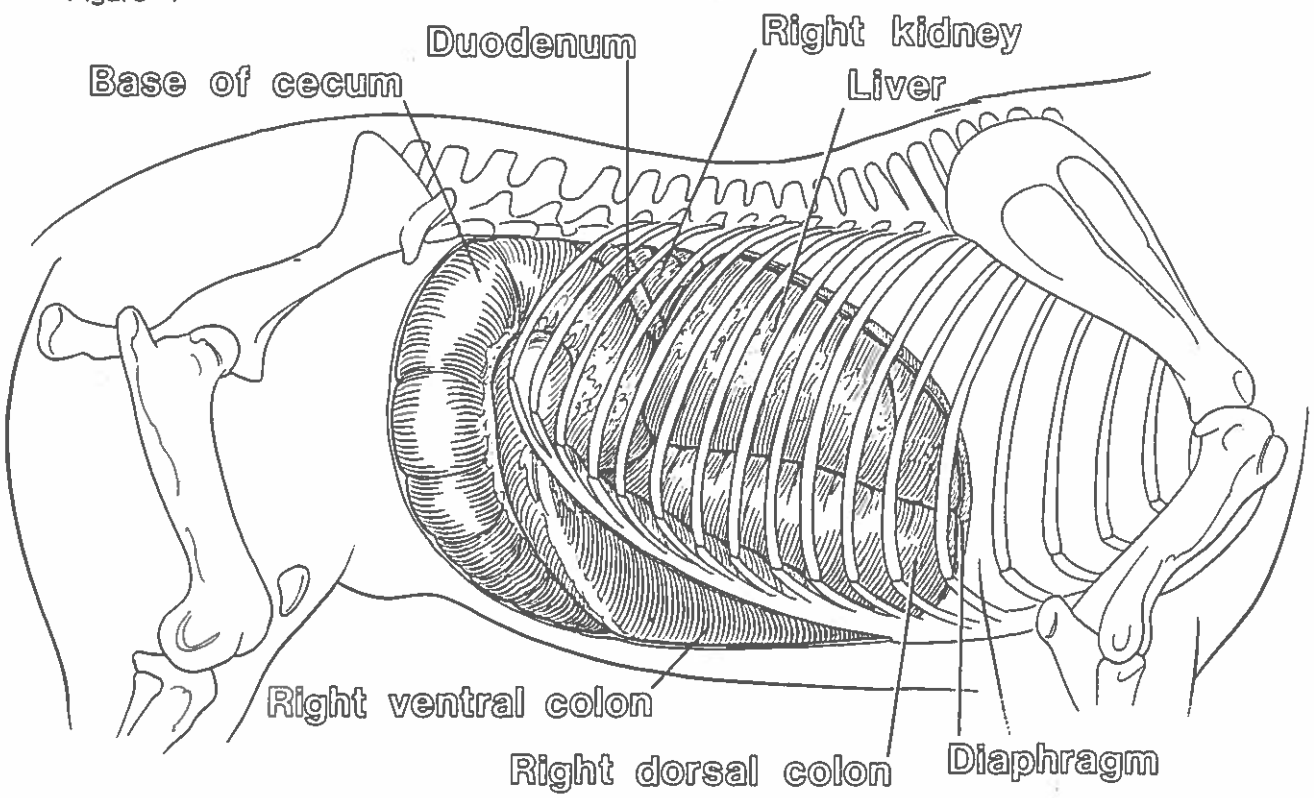
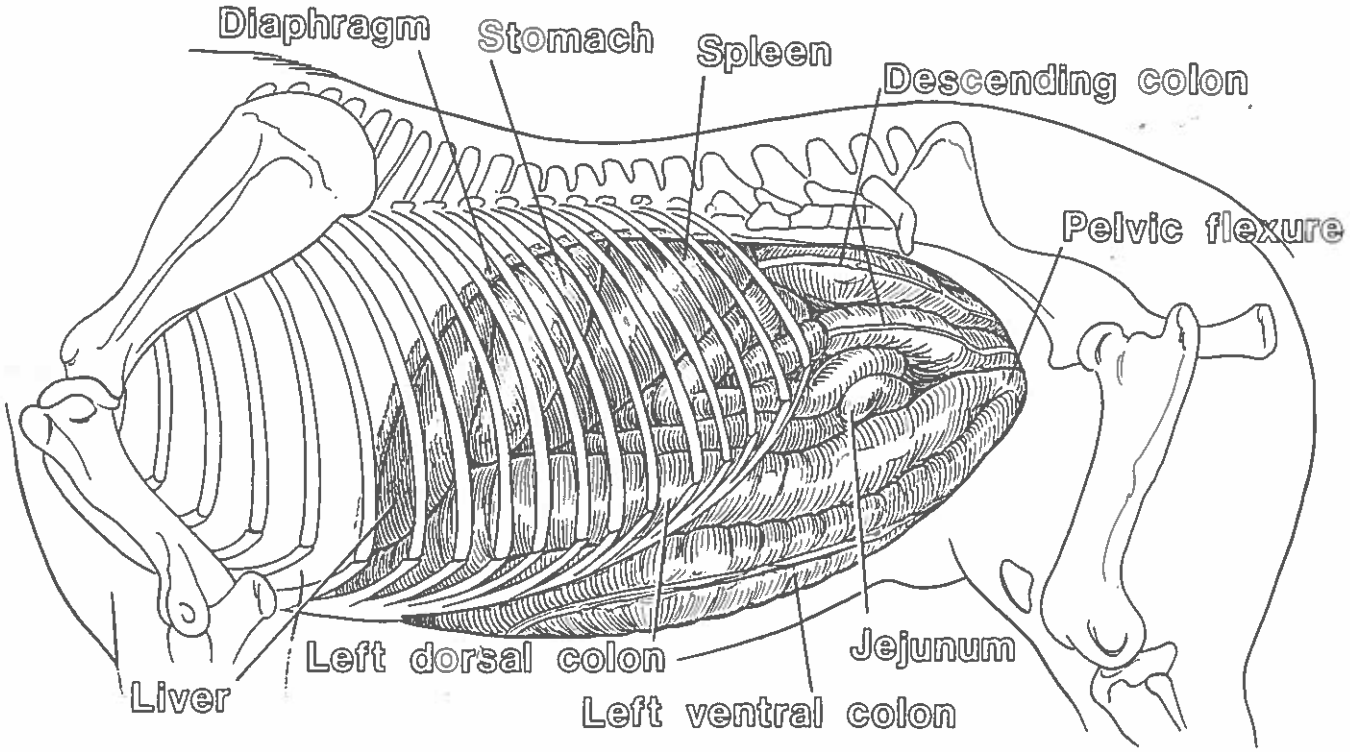


Figure 2



BODY CAVITIES AND SEROUS MEMBRANES

THORACIC, ABDOMINAL AND PELVIC CAVITIES

Diagrammatic drawing of major body cavities and serous membranes of the mare.

Peritoneum also suspends and encloses some of the male reproductive organs.

Peritoneum is divided into three continuous parts:

1. **Parietal peritoneum** - lines abdominal cavity and cranial part of pelvic cavity. (Latin, paries = walls)
2. **Connecting peritoneum** - suspends organs; double fold enclosing vessels and nerves.
   a. Mes + organ suspended: **mesentery** (Greek, mesos = middle + enteron = intestine)
   mesometrium (Greek, metra = womb)
   b. Peritoneal ligaments: suspend and support - e.g. **falciform ligament** of liver.
3. **Visceral peritoneum** - encloses a viscus (Latin, large, internal organ; plural, viscera).

The musculomembranous **diaphragm** is covered with peritoneum on the abdominal surface and pleura on the thoracic surface.

Pleurae - two continuous serous membranes, each forming a pleural sac:

1. **Parietal pleura** - lines each half of thoracic cavity.
2. Mediastinal pleura - connecting pleura on each side enclosing the mediastinum, a space containing the heart, esophagus, trachea, blood vessels, nerves, thymus, lymph nodes and ducts, connective tissue and fat.
3. **Visceral pleura** - encloses each lung.

Pericardium

1. **Visceral pericardium** - covers the heart (also called epicardium).
2. Reflection around base of heart and great vessels.
3. **Parietal pericardium** - covered by fibrous tissue and mediastinal pleura.

Serous cavities: peritoneal cavity, pleural cavity, pericardial cavity.

Potential spaces between parietal and visceral serous membranes containing lubricating serous fluids that increase in inflammation, e.g., peritonitis.

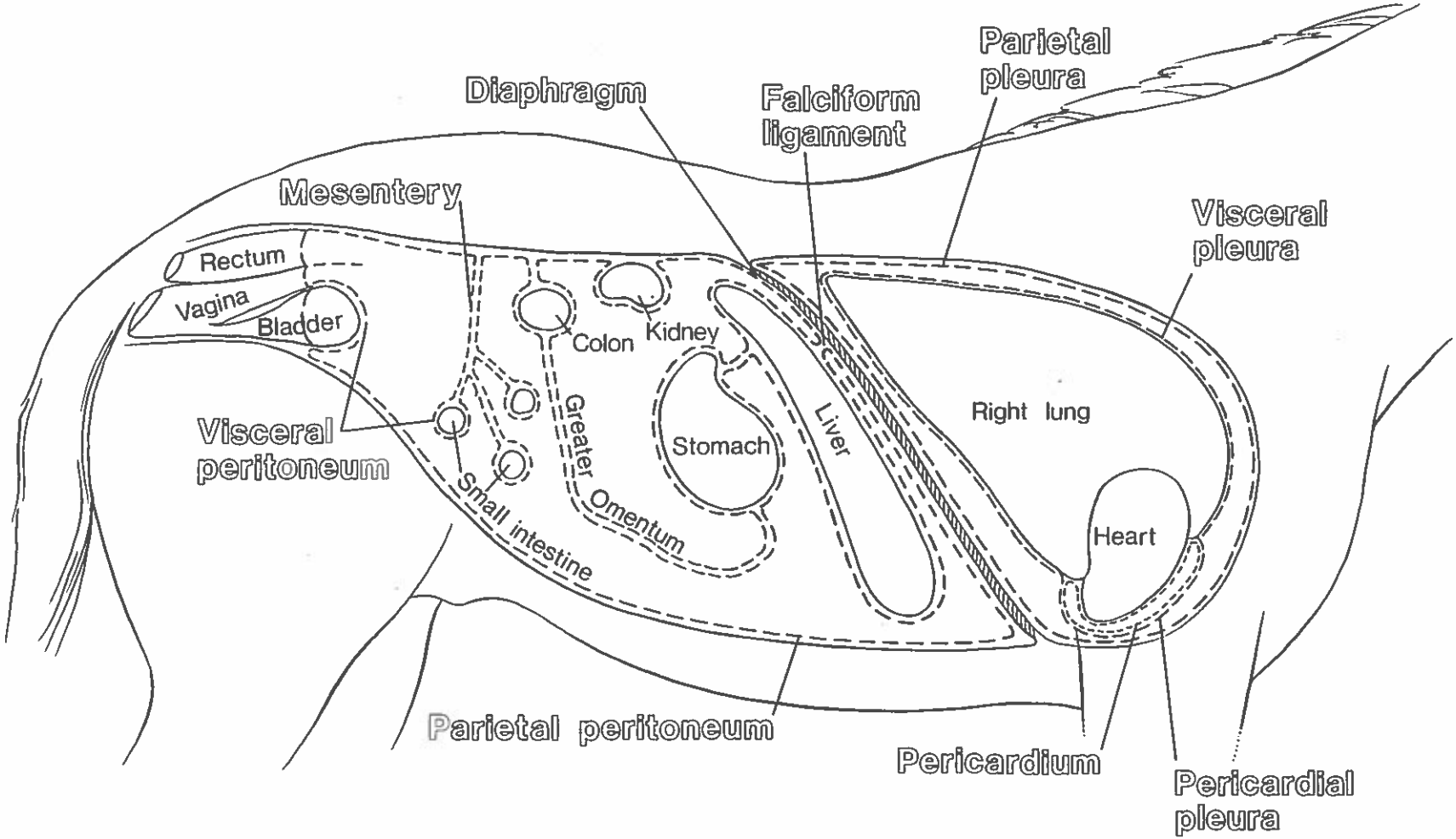

Parietal pleura
Diaphragm
Falciform ligament
Mesentery
Visceral pleura
Rectum
Vagina
Bladder
Colon
Kidney
Visceral peritoneum
Greater Omentum
Stomach
Liver
Right lung
Small intestine
Heart
Parietal peritoneum
Pericardium
Pericardial pleura

Plate 56

OVARIAN CYCLE

Plate 71

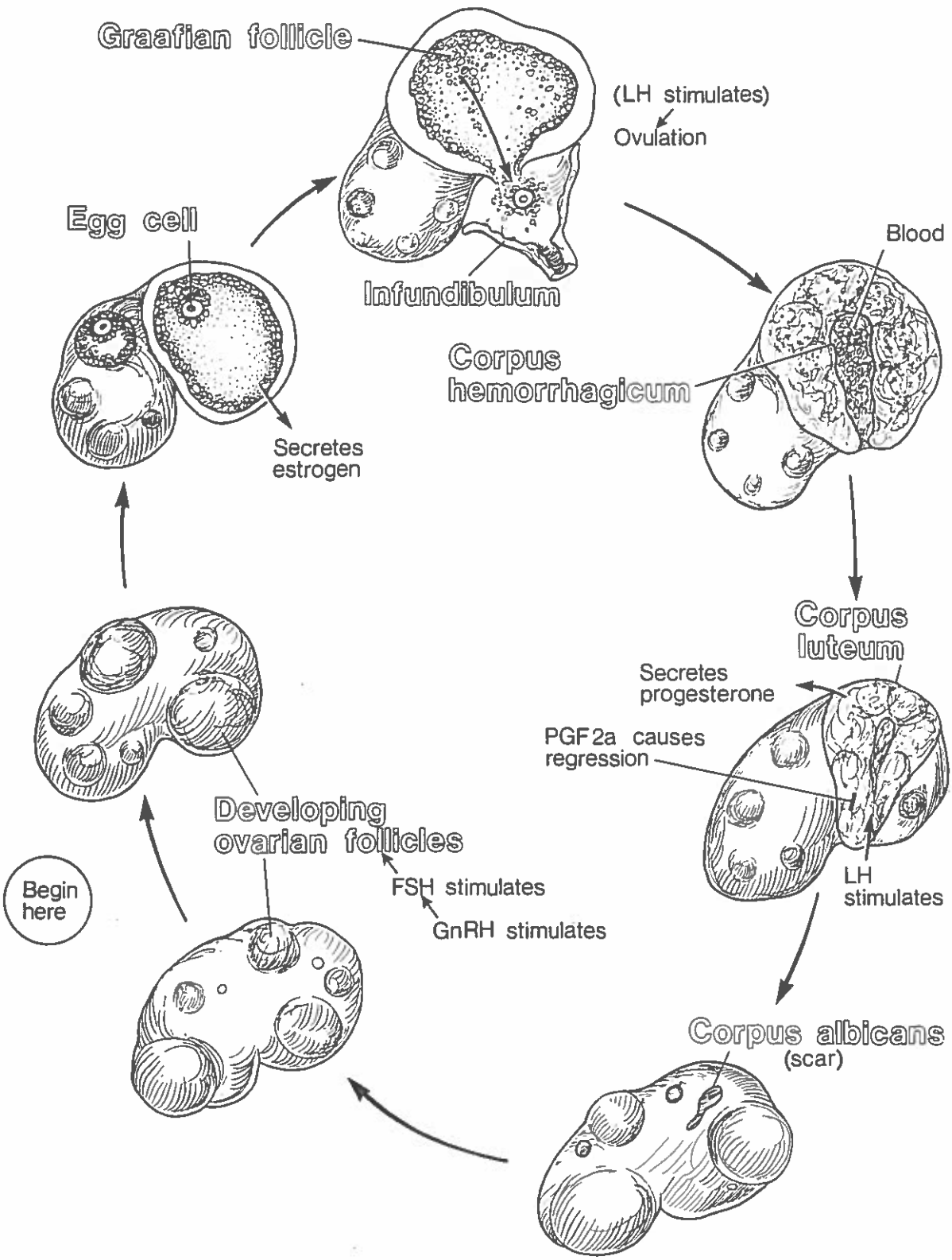
Color the open words and the structures indicated and relate the notes on the drawing to the text below.

Estrous cycles are recurring periods of heat (estrus) when the mare will mate with a stallion. Mares are seasonally polyestrous. They have several estrous cycles during a breeding season that lasts from April to October in the Northern hemisphere.
Duration of each estrous cycle ranges from 19 to 22 days. Ponies and donkeys have longer estrous cycles - around 25 days.
Estrus (follicular phase) usually lasts 5 to 7 days, but periods of 2 to 12 days can occur. The length of estrus appears to be repeatable for individual mares.
Ovulation (release of the egg cell) occurs 24 to 48 hours before the mare refuses to accept the stallion.
Diestrus (luteal phase) is the rest of the estrous cycle, lasting an average of 14 to 15 days.

Changes in behavior and in the functional anatomy of the reproductive tract during estrus and diestrus are stimulated by events in the **ovarian cycle**:

1. Initiation of estrous cycles is triggered by increasing periods of daylight stimulating the hypothalamus of the brain to secrete gonadotropin releasing hormone (GnRH). (Ovaries and testicles are gonads.)
2. GnRH causes secretion of follicle stimulating hormone (FSH) by the pituitary gland.
3. FSH stimulates the maturation of a **developing ovarian follicle** into a **Graafian follicle,** the source of the hormone, estrogen. FSH formation and release are decreased by inhibin produced by cells in the Graafian follicle.
4. Estrogen prepares the reproductive tract for mating and fertilization (union of the stallion's spermatozoon with the mare's ovum). Estrogen also stimulates the secretion of luteinizing hormone (LH) by the pituitary gland.
5. LH causes final development of the dominant Graafian follicle, ovulation (release of the egg cell), and formation of the **corpus luteum** (Latin, yellow body) (CL). The CL develops through the transformation of follicular cells in the site of the shortlived, bloody **corpus hemorrhagicum** that occurs in the follicle following ovulation.
6. Progesterone produced by the CL turns off sexual desire and prepares the reproductive tract for the embryo as it moves through the uterine tube to the uterus.
7. Prostaglandin F_{2a} (PGF_{2a}) produced by the uterus causes regression of the corpus luteum.
8. The **corpus albicans** (Latin, white body) is a scar at the site of the corpus luteum.

OVARIAN CYCLE



1. Horses are measured in hands
    a. 1 hand equals 4 inches. Example: a horse that is 63 inches tall is 15.3 hands.
    b. Measure from the ground to the top of the withers on the horse's back.
    c. Horses are classified according to their height:
        i. Up to 12.2 hh = small pony
        ii. 12.2-13.2 hh = medium pony
        iii. 13.2-14.2 hh = large pony
        iv. 14.2 and above = horse
2. Estimating weight of horses
    a. Horse weight prediction equation: (heartgirth x heartgirth x Body length)/330 = weight (lbs)
        i. Body length is defined as point of shoulder to point of hip
3. Vitals- review vitals with students along with normal ranges
    a. Temperature
        i. Normal = 101 degrees
        ii. Taken rectally
    b. Respiration
        i. Normal = 12-18 breaths/min.
        ii. Look at horse to determine, can also put hand in front of nostrils to feel breath
    c. Pulse
        i. Normal = 36-40 beats/min.
        ii. Can use stethoscope behind front leg or two fingers below jaw to measure
    d. Discuss reasons for an elevated pulse or respiration: exercise, sickness, injury, stress
    e. CRT-Capillary Refill Time
        i. Normal= 2 seconds or less
    f. BAR-bright, alert, responsive
    g. Digital pulse
        i. Foot
        ii. Should not be strong
    h. Mucous membranes
        i. Normal, healthy light pink color
    i. Gut Sounds
        i. gut sounds are healthy

ii. mainly on the left side (that's where the small intestine is located)

j. Skin test
   i. Check for dehydration

Activity:

- Have students get in groups of two and measure their height.
- Students should convert their height from inches to hands and determine what size horse they would be (small pony, horse, etc.)
- Have students determine their partner's pulse and respiration and compare to the normal ranges for horses
- Put sample measurements on board for students to determine approximate weights of horses with the prediction equation
- Discuss the lab activity that students will be performing next class period

Part 2. Lab Exercise

- Students will take turns measuring a horse's height, weight, and vitals.
- They will record information on a worksheet, converting height to hands and predicting weight using equation.
- They will determine if their horse's vitals are within the normal ranges and discuss any reasons for abnormalities.

Evaluation:

Worksheet
Written exam

student if they know what it is before you tell them and allow them to share any stories they have of helping an animal give birth.

Discussion

List and describe the major parts of the female reproductive tract

- The four functions of the mare reproductive system
  - Produce the female reproductive cells (eggs or ova)
  - Develop the embryo within the uterus
  - Expel the fully developed young at the time of birth or parturition
  - Produce milk for the nourishment of the young
- Primary sex organ – ovaries (2)
- Oviduct
- Uterus
- Cervix
- Vagina

List and described the major parts of the male reproductive tract

- Functions of the stallions reproductive system:
  - To produce the male reproductive cells (sperm or spermatozoa)
  - To introduce sperm into the female reproductive tract at the proper time for fertilization to occur
- Primary sex organ is the testicle (norm – 2)
  - Produces sperm
  - Produces, testosterone,
- Epididymis
- Scrotum
- Vas Deferens
- Seminal Vesicle
- Prostate gland
- Cowpers gland
- Urethra
- Penis

Describe hormones that control the reproductive process

- Testosterone - regulates and maintains the male reproductive tract in a functional state; it is also responsible for a masculine appearance as wells as a stallion's behavior
- Estrogen – primary hormone responsible for the characteristics of the female reproductive tract, including behavior
- FSH – follicle stimulating hormone
- LSH – leutenizing hormone
- Progesterone
- see Horses and Horsemanship for more details

Describe the stages of gestation

- Average gestation of mares is 336 days, range 310-370

Explains the process of parturition

- Indications include:
  - Extreme nervousness
  - Lying down and then very quickly getting back up
  - Biting at the sides and flanks
  - Switching of the tail
  - Sweating in the flanks
  - Frequent urination
- Normal presentation of the foal vs. dystocia
  - Normal – the back of the fetus is toward the back of the mare, the forelegs are extended toward the vulva with the heels of the hooves pointing down, and the nose rests between the forelegs.
  - Dystocia – breech, umbilical cord wrapped around a part of the body or legs, etc.

SUMMARY

To obtain a better knowledge of how to successfully breed horses, it is essential to know the terminology and function anatomy associated with the mare and stallion's reproductive systems. This terms and concepts will come up later in following lessons.

Evaluation

Oral or written quizzes on new vocabulary
Labeling of diagrams with brief descriptions
Word searches and Crossword puzzles on new terms

Discussion

1. **Use illustrative slides to demonstrate the major classifications and sub classifications of horse breeds.**
   The following is a list of classifications that students should be familiar with, including major characteristics.
   A. Draft- These are large horses that usually stand taller than 16 hands at the withers(1 hand= 4 inches). These horses are very muscular and are large boned, and generally used for work such as pulling heavy loads.
      1. Belgian - characterized by its usual color of chestnut with flaxen mane and tail.
      2. Shire - largest of all draft breeds
      3. Clydesdale - a fairly light draft breed made famous by Budweiser
      4. Percheron - usually black or gray, often crossed with lighter horses to make heavy riding horses.

   B. Light horses - This is what most people envision when horse is mentioned. These are, by far, the most numerous in terms of population and breed. Light horses are generally used for riding and light carriage work.
      The following horses belong in a subclass of regular light horses.
      These generally have only 3 gaits: walk, trot, canter.
      1. Quarter Horse - the most numerous breed in the U.S. made famous by cowboys and rodeos. Characterized by heavily muscled frame and angular face.
      2. Appaloosa - a versatile breed developed by the Nez Percé Indians from Spanish stock. The breed was nearly wiped out by the U.S. Calvary during the Indian Wars. Characterized by various patterns of spots.
      3. Arabian - the most ancient of all purebred light horses. This breed originated in the deserts of Arabia. Characterized by a finely chiseled face and light bone. The Arabian is known for its endurance and density of bone, which makes it a popular cross on many breeds.
      4. American Paint - this is a stock horse type (like Quarter Horses) that is characterized by its loud, splotched markings. These markings can be in any color.
      5. Standard bred - this is a light racing horse that is known for its speed at a trot or a pace. These horses race pulling sulkies.

6. Thoroughbred - a popular breed originating in Europe. Thoroughbreds are used in a variety of sports although most commonly associated with racing.
7. Morgan - An American breed developed in New England. Characterized by flashy gaits, hardiness, and versatility.

The following belong in a subclass of Gaited horses. Gaited horses are also light riding horses; but in addition to walk, trot and canter, these horses also rack, and do other fancy footwork:

1. American Saddlebred - this breed is characterized by its flashy movements both front and rear and a very high head carriage.
2. Tennessee Walking Horse - Developed by plantation owners in the south, the walking horse's movements are characterized by high steps in the front and long reaching strides in the rear.
3. Missouri Fox Trotter - a gaited horses used mostly for pleasure.
4. Paso Fino - A small Spanish horse originating in the Carribean. The Paso Fino is notable for its Paso Gait, a rapid rhythmic gait that is so smooth people are seen riding them carrying full glasses of champagne.

C. Ponies - Ponies are small horses whose height cannot exceed 14.2 hands.

1. Shetland - developed in the Shetland Isles, this is perhaps the most well known of Pony breeds. Shetland Ponies are extremely handy and, when well maintained, can live for 35 years.
2. Welsh Ponies - this is a very light pony, originating in Wales and known for its refinement. Very popular in shows, the Welsh pony is very versatile.
3. Hackney Pony - Noted for its flashy movements, the Hackney is most often seen pulling a carriage.

SUMMARY

Evaluation

Students should be tested on their knowledge of breeds of horses and their characteristics. Students should be able to identify breeds from pictures as well as describe characteristics.

Course: 02.422 Equine Science
Unit 3: Horse Anatomy Systems

Lesson 2: Functional Systems of the Anatomy

QCC:

Objectives:

1. List and discuss the functions of the nine systems of horses
2. List the major organs that makeup each system of the horse
3. List five divisions of the vertebral column
4. Identify three types of muscles and their locations in the body
5. Describe three types of joints

Teaching Time: 2 hours

References:

The Science of Agriculture: a biological approach, Ray V. Herren. Delmar Publishers. www.Agriscience.Delmar.com

Materials and Equipment:

handouts of the outlines of the different systems, pictures are better.

TEACHING PROCEDURE

Introduction and Mental Set

List and discuss the functions of the eight systems of horses

- Skeletal system – provides the frame and support for all of the other systems and organs
- Muscular system – supports and allows movement
- Respiratory system – takes oxygen from the air and places it into the bloodstream for distribution to the cells of the body.
- Circulatory system – the transportation of food nutrients, water, and oxygen is accomplished through the circulation of blood through the body; also cleanses the body by carrying toxic materials to the kidneys and sweat glands for excretion.
- Digestive system – takes the food ingested and converts it into a form that can be used.
- Nervous system – essential for all of the systems to function properly, the movements and processes have to be controlled by a central system.
- Endocrine system – secrete hormones which control vital body functions.
- Reproductive system – propagation!

List the major organs that makeup each system of the horse

- Skeletal system – long bones, short bones, irregular bones, flat bones, joints
- Muscular system – skeletal muscle, smooth muscle, cardiac muscle
- Respiratory system – nostrils, nasal chamber, pharynx, larynx, esophagus, trachea, bronchial tubes, lungs
- Circulatory system – heart, veins, arteries
- Digestive system – horses are monogastric; stomach, small intestine, small colon, large colon, cecum, rectum
- Nervous system – brain, spinal cord
- Endocrine system – adrenal gland, parathyroid glands, thyroid, pituitary
- Reproductive system – uterus, ovaries, vagina, penis, testicles, epididymis

List five divisions of the vertebral column

1. Cervical vertebrae
2. Thoracic vertebrae
3. Lumbar vertebrae
4. Sacrum
5. Coccygeal vertebrae

Identify three types of muscles and their locations in the body

- Smooth muscle – the internal organs; walls of the digestive tract, urinary tract, and other organs
- Cardiac muscle – the heart
- Skeletal muscle – largest portion of the muscles; red muscle and white muscle to control movement

Describe three types of joints

SUMMARY

Lesson 2: Horse Movement

QCC:

Objectives:

1. Identify the leg muscles that control movement
2. Describe the two phases of a stride
3. Name three factors of a gait that determine a horse's speed
4. Explain the role of conformation in the movement or performance of a horse
5. List and describe six common defects in a horse's way of going

Teaching Time:

References:

Materials and Equipment:

TEACHING PROCEDURE

Introduction and Mental Set

Discussion

Identify the leg muscles that control movement

Describe the two phases of a stride

Name three factors of a gait that determine a horse's speed

- Length
- Smoothness
- Strength

Explain the role of conformation in the movement or performance of a horse
The slope of a horses shoulder directly effects the length and smoothness of a horse's stride. If they have a steep shoulder the stride will be short and choppy and if the shoulder is sloping then the stride will be long and smoother in comparison

List and describe six common defects in a horse's way of going

1. Cross-firing – a scuffling on the inside of the diagonal fore and hind feet.
2. Forging – the striking of the forefoot by the toe of the hind foot is known as forging
3. Lameness – a defect that can be detected when the affected foot is favored when standing; in action, the load on the ailing foot is eased, and there is a characteristic bobbing of the head of the horse as the affected foot strikes the ground.
4. Paddling – throwing the front feet outward as they are picked up; predisposed in horses with toe-narrow or pigeon-toed standing positions
5. Pounding – is a condition in which there is heavy contact with the ground in contrast to the desired light, springy movement
6. Trappy – a short, quick, choppy stride; is predisposed in horses with short, straight pasterns and straight shoulders.

SUMMARY

Evaluation