

## MILADY STANDARD COSMETOLOGY COURSE MANAGEMENT GUIDE CLASS SIGN-IN SHEET 11.0

SUBJECT: HAIR CARE

TOPIC: PROPERTIES OF THE HAIR AND SCALP

LESSON OBJECTIVES:

Upon completion of the lesson, the student will be able to:

1. Name and describe the structures of the hair root.
2. List and describe the three layers of the hair shaft.
3. Describe the three types of side bonds in the cortex.
4. List the factors that should be considered in a hair analysis.
5. Describe the hair growth process.
6. Discuss the types of hair loss and their causes.
7. Describe the options for hair loss treatment.
8. Recognize hair and scalp disorders commonly seen in the salon and school and know which can be treated by cosmetologists.

IMPLEMENTS, EQUIPMENT, SUPPLIES REQUIRED:

Student	Instructor	Items
x	x	<i>Milady Standard Cosmetology</i>
x	x	<i>Milady Standard Cosmetology Theory Workbook, Practical Workbook, and Study Guide: The Essential Companion</i>
x		Student notebook
x		Pens, pencils

TEACHING AIDS (Audio/visual equipment, hand outs, etc. used by Instructor):

1. Board
2. LCD Projector and *Milady Standard Cosmetology Instructor Support Slides* OR Overhead Projector and Transparencies
3. *Milady Standard Cosmetology DVD Series* and DVD player

FACILITY: Theory Classroom

TIME ALLOTMENT: 2–4 hours (adjust based on school schedule and student activities/participation)

PRIOR STUDENT ASSIGNMENT:

1. Read Chapter 11, *Milady Standard Cosmetology*

EDUCATOR REFERENCES:

1. *Milady Standard Cosmetology*
2. *Milady Standard Cosmetology Theory Workbook, Practical Workbook, and Study Guide: The Essential Companion*

INSTRUCTOR NAME	DATE TAUGHT	INSTRUCTOR NAME	DATE TAUGHT
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## NOTES TO EDUCATOR:

1. Review chapter, entire lesson plan, and *Milady Standard Cosmetology Instructor Support Slides* prior to lesson.
2. Review Learning Reinforcement ideas/activities and predetermine which are to be used.
3. Check the projector to ensure it is working properly.
4. Gather all materials and supplies needed for demonstrations prior to starting class.
5. Have students sign in for class and document attendance based on school's procedure.
6. During the Instructor preparation time and while students are entering and getting settled for the class, have the first *Milady Standard Cosmetology Instructor Support Slide* containing the inspirational quote projected (or write it on the board or flip chart). This will help get instructors and students into the appropriate mind-set for learning and for the day.
7. The information found in this lesson correlates to the information found in LP9.0 of *Milady Standard Cosmetology Course Management Guide*, 2008 edition.

## LEARNING MOTIVATION (WHY?)

The hair is a part of the body and, like every other part, it must be cared for and nourished. Just as you replenish body fluids after extended exercising or illness, you must also replenish the needed nutrients for healthy hair. With all the various styling tools and chemicals used on the hair today, it is constantly at risk of damage. It is essential that, as a hairdresser, you fully understand the importance of caring for the hair and scalp.

Clients may spend great quantities of time and money on other parts of their body, but tend to neglect their hair. They may feel they don't have the time to undergo certain necessary treatments or they may reject the professional stylist's recommendation for treatment. That is why it is so important for the professional cosmetologist to gain the client's respect and trust. You will be expected to know what is best for a client's hair and the best possible procedure to achieve the desired results. In addition, you will need to know *how* to successfully recommend the needed treatments to your clients.

As stylists, you must believe in what you are doing and be sincere in your recommendations before you can expect to convince your client. Never suggest products or services that are not truly needed by the client. In time you will develop the skills and underlying judgment to analyze the client's hair and scalp and encourage the best possible treatment. That's why it is so important for you to have a thorough knowledge of the hair, its structure, and its growth, and to stay abreast of products and treatments to maintain hair in a healthy state. The study of hair is technically called *trichology*, and that is the focus of our lesson today. Hair has two primary purposes: the first being protection of the head from heat, cold, sun, injury, and so on. The other, of course, is adornment, and that's where we come in as professionals in the cosmetology industry.

**Inspirational thought for the day:**

*"Any fact facing us is not as important as our attitude toward it, for that determines our success or failure. The way you think about a fact may defeat you before you ever do anything about it. You are overcome by the fact because you think you are."*

—Norman Vincent Peale

## PRESENTATION OF THE SKILLS AND/OR INFORMATION LESSON PLAN 11.0

### SUBJECT OUTLINE

### IN-DEPTH NOTES

(Information to share during presentation)

#### I. TRICHOLOGY AND HAIR

##### A. HAIR DEFINITION

*Trichology* is the scientific study of hair, its diseases, and care. The term is derived from the Greek words *trichos*, meaning "hair," and *ology*, meaning "the study of." The hair, skin, and nails are known collectively as the *integument*, which is the largest and fastest growing organ of the body.

A slender, threadlike filament of protein keratin which is an appendage or outgrowth of the scalp and body

##### B. HAIR PARTS

The mature hair strand is divided into two parts. That part of the hair located below the surface of the scalp

###### 1. Hair root

That portion of the hair that projects above the epidermis

###### 2. Hair shaft

We are what we eat. A healthy diet is helpful to have healthy hair.

##### C. HEALTHY HAIR

###### 1. Proper nutrients required

Twenty amino acids make up hair. The body produces only 11 of the 20. The remainder must come from diet.

###### 2. Amino acids

Proteins like meat, fish, eggs, and dairy products are good sources of these amino acids, as are food combinations like peanut butter and bread, rice and beans, and beans and corn.

###### 3. Proteins

##### D. STRUCTURE OF HAIR ROOT

The tubelike depression, or pocket, in the skin or scalp that contains the hair root

###### 1. Follicle

Hair is found over entire body except on the soles of feet and palms of hands.

###### a. Distribution

The follicle grows downward from the epidermis into the dermis, where it surrounds the dermal papilla. More than one hair can grow from a single follicle.

###### b. Growth

The lowest area or part of a hair strand, it is the thickened, club-shaped structure that forms the lower part of the hair root. The lower part of the bulb fits over and covers the dermal papilla.

###### 2. Hair bulb

A small, cone-shaped elevation located at the base of the hair follicle that fits into the hair bulb; it contains the blood and nerve supply that provides the nutrients needed for growth.

###### 3. Dermal papilla

## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)*

4. Arrector pili

5. Sebaceous glands

## E. STRUCTURE OF HAIR SHAFT

1. Cuticle

2. Cortex

3. Medulla

## II. CHEMICAL COMPOSITION OF HAIR

## A. KERATINIZATION

## B. 90 PERCENT PROTEIN

1. Long chains of amino acids

These are minute, involuntary muscle fibers in the skin inserted in the base of the hair follicle. Fear or cold causes them to contract, which makes the hair stand up straight, resulting in goose bumps.

These are the oil glands of the skin and are connected to the hair follicles. The sebaceous glands secrete an oily substance called sebum, which lubricates the hair and skin. See Figure 11-1 in the *Milady Standard Cosmetology* textbook.

**ACTIVITY:** Ask for volunteers to come up and write in the various parts of the hair structure on a previously prepared flip chart or the Milady Chart. There are three main layers of the hair shaft. See Figure 11-2 in the *Milady Standard Cosmetology* textbook.

The outermost layer of the hair; it consists of a single, overlapping layer of transparent, scale-like cells that overlap like shingles on a roof. A healthy, compact cuticle layer is the hair's primary defense against damage. See Figure 11-3 in the *Milady Standard Cosmetology* textbook.

The middle layer of hair; it is a fibrous protein core formed by elongated cells containing melanin pigment. About 90 percent of hair weight comes from the cortex. Protein structures located in the cortex provide hair elasticity. Changes resulting from chemical services occur in the cortex. See Figure 11-4 in the *Milady Standard Cosmetology* textbook.

The innermost layer; it is also referred to as the pith of the hair. It is composed of round cells. Very fine and naturally blond hair may not even have a medulla. Thick coarse hair and beard hair always contain a medulla.

Hair is composed of protein that grows from cells originating within the hair follicle.

The process during which newly formed cells in the hair mature; they fill up with keratin, move upward, lose their molecules, and die. The hair shaft is a nonliving fiber composed of keratinized protein.

Amino acids are made up of five elements.

## SUBJECT OUTLINE

IN-DEPTH NOTES  
(Information to share during presentation)

## C. COHNS ELEMENTS

1. Carbon: 51 percent
2. Oxygen: 21 percent
3. Hydrogen: 6 percent
4. Nitrogen: 17 percent
5. Sulfur: 5 percent

## D. AMINO ACIDS

1. Linked like pop beads
2. Peptide (or end) bonds
3. Polypeptide chain
4. Helix

## E. SIDE BONDS OF THE CORTEX

1. Hydrogen bond
2. Salt bond
3. Disulfide bond

See Table 11-1.

## Units of structure that build proteins

A chemical bond that links two amino acids is called a peptide bond or end bond.

A long chain of amino acids linked by peptide bonds; they intertwine around each other in a spiral shape called a helix.

Proteins are long, coiled complex polypeptides made of amino acids. The spiral shape is created when polypeptide chains intertwine around each other. See Figure 11-5 in the *Milady Standard Cosmetology* textbook.

The middle layer of hair is made up of millions of polypeptide chains. They are cross-linked like a ladder by three different types of bonds. The side bonds hold the keratin fibers in place and account for hair's strength and elasticity. See Figure 11-6 in the *Milady Standard Cosmetology* textbook.

A hydrogen bond is a physical side bond that is easily broken by water or heat. They are weak individually, but because there are so many, they account for about one-third of the hair's strength.

A salt bond is another weak, temporary cross-link that can be broken by changes in pH. They are easily broken by strong alkaline or acidic solutions and account for about one-third of the hair's overall strength.

This is a chemical bond that joins the sulfur atoms of two neighboring cysteine amino acids to create cystine. Disulfide bonds are stronger and account for one-third of the hair's strength. They are not broken by heat or water. Permanent waves break disulfide bonds and reform with thio neutralizers. Hydroxide chemical hair relaxers break disulfide bonds and convert them to anthionine bonds when the relaxer is rinsed from the hair.

**ACTIVITY:** Create a matrix on the board or flip chart containing five rows and five columns (like Table 11-2). List the headings of Table 11-2 across

## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)*

## F. HAIR PIGMENT

1. Melanin
  - a. Eumelanin
  - b. Pheomelanin
2. Natural hair color
3. Gray hair

## G. HAIRCOLOR VS. HAIR COLOR

## H. WAVE PATTERN

1. Straight hair
2. Wavy hair
3. Extremely curly hair

the grid in the first row. In advance of the class, prepare 20 post-a-notes containing the terms or phrases found in the remaining four rows of the grid. Have students close their books and ask for volunteers to come to the front of the class and select one term or phrase and place it appropriately on the grid. Reward those who answer correctly.

All natural hair color is the result of pigment located within the cortex.

The tiny grains of pigment in the cortex that give natural color to hair

Provides brown and black color to hair

Provides natural hair colors from red and ginger to yellow-blond tones

Is the result of the ratio of eumelanin to pheomelanin, along with the total number and size of pigment granules

Caused by the absence of melanin; it grows in exactly the same way as pigmented hair but without the melanin pigment.

*Hair color* (two words) refers to the color of hair created by nature. *Haircolor* (one word) is the term used in the beauty industry to refer to artificial hair-coloring products.

Refers to the shape of the hair strand and is described as straight, wavy, curly, or extremely curly; wave pattern is the result of genetics and racial background. Theoretically, it is now believed that natural curl is the result of one side of the hair strand growing faster than the other side, causing the long side to curl around the short side.

NOTE: The descriptions found in items one and two are no longer in the text. See Figure 11-9 in the *Milady Standard Cosmetology* textbook.

Can be any type without regard to texture or density; it can be fine or coarse, dense or thin. It has a fairly regular and uniform diameter along a single strand. Cross-sections of straight hair are usually round.

Cross-sections are usually oval and have a fairly regular and uniform diameter along a single strand.

It grows in long twisted spirals. Cross-sections are flat and vary in shape and thickness along their length. Compared to straight or wavy hair, which tends to possess a fairly regular and uniform diameter along a single strand, extremely curly hair is fairly irregular, exhibiting varying diameters along

## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)***III. HAIR GROWTH****A. TYPES OF HAIR**

1. Vellus
2. Terminal hair

**B. GROWTH CYCLES OF HAIR**

1. Anagen
2. Catagen
3. Telogen

**C. HAIR GROWTH MYTHS**

1. Clipping, shaving, trimming, and cutting makes hair grow faster.
2. Scalp massages increase hair growth.

a single strand. Some extremely curly hair will coil like a phone cord. Coiled hair is usually fine. Extremely curly hair often has low elasticity, breaks easily, and has a tendency to knot on the ends. Gentle scalp manipulations, conditioning shampoo, and a detangling rise help minimize tangles.

Formerly known as lanugo, this is short, fine, downy, unpigmented hair covering most of the body except the palms and soles of the feet. Women normally retain 55 percent more vellus hair than men.

Long, thick, pigmented hair found on the scalp, legs, arms, and bodies of males and females; it is coarser than vellus hair and, with the exception of gray hair, it is pigmented.

See Figure 11–18 in the *Milady Standard Cosmetology* textbook.

This is the growing phase. Average growth is about 2 inches (5 cm) per month. 90 percent of hair is growing at one time. It grows for a period from two to six years. The duration of hair life is affected by gender, age, type of hair, heredity, nutrition, and health.

Scalp hair grows faster on women than men. It grows faster between the ages of 15 and 30 and slows sharply after age 50.

This is the transition phase that ends the growth phase and lasts only one to two weeks. The follicle canal shrinks and detaches from the dermal papilla. The hair bulb disappears and the shrunken root end forms a rounded club. Less than one percent of the scalp hair is in the catagen phase at any one time.

This is the resting phase. After catagen, the follicle begins a three to six month phase of resting. About 10 percent of hair is in telogen phase at one time. After telogen, the cycle begins again. The entire growth cycle repeats itself every four to five years.

**FACT:** These have no effect on hair growth.

**FACT:** There is no evidence to indicate this is true. Minoxidil and Finasteride are the only treatments that have been proven to increase hair growth and are approved for that purpose by the FDA.

## SUBJECT OUTLINE

## IN-DEPTH NOTES

(Information to share during presentation)

3. Gray hair is coarser and more resistant than pigmented hair.
4. The amount of natural curl is determined by racial background.
5. Hair with a round cross-section is straight; hair with an oval cross-section is wavy; hair with a flat cross-section is curly.

FACT: Other than lack of pigment, gray hair is exactly the same as pigmented hair. It is not resistant because it is gray, and is not more resistant than the pigmented hair on the same person's head.

FACT: Anyone of any race can have straight or extremely curly hair.

FACT: Cross-sections of straight hair tend to be round and curlier hair tends to be more oval, but cross-sections of hair can be almost any shape, including triangular; the shape of the cross-section does not always relate to the amount of curl or the shape of the follicle. The number of disulfide bonds in the strand determines the amount of curl.

Natural shedding of hair accounts for normal daily hair loss. Recent measurements indicate that the average rate of hair loss is closer to 35 to 40 hairs per day.

Abnormal hair loss is called alopecia. The most common types are androgenic alopecia, alopecia areata, and postpartum alopecia. Over 63 million people in our country suffer from abnormal hair loss.

A recent study showed that, compared to men who had hair, bald men were *perceived* as having a number of characteristics.

By both sexes

By about five years

Women try to hide it from everyone, including their doctor.

Women feel helpless and less attractive.

CAUSE: A combination of heredity, hormones, and age causes progressive shrinking or miniaturization of terminal hair, converting it to vellus hair. It is

## IV. HAIR LOSS

## A. EMOTIONAL IMPACT - HOW PERCEIVED BY OTHERS

1. Less physically attractive
2. Less assertive
3. Less successful
4. Less personably likeable
5. Older

## B. MEN WITH SEVERE HAIR LOSS

1. Negative social and emotional effects
2. More preoccupation with baldness
3. Make effort to conceal or compensate for hair loss

## C. WOMEN WITH HAIR LOSS

1. Devastating
2. Causes anxiety

## V. TYPES OF ABNORMAL HAIR LOSS

## A. ANDROGENETIC ALOPECIA



## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)*

1. Affects 40 million men in the U.S.
2. Affects 20 million women in the U.S.

known as male pattern baldness in men. Figure 11–9 in the *Milady Standard Cosmetology* textbook.

It can begin as early as the teen years and is frequently seen by age 40 percent. By age 35, almost 40 percent of men and women show some degree of loss. The gene can be inherited from either side of family.

## B. ALOPECIA AREATA

Sudden loss of hair in round or irregular patches; it may occur on the scalp or anywhere else on the body. It is highly unpredictable and affects almost five million people in the U. S.

1. Immune system attacks hair follicles
2. Begins with one or more small, bald patches
3. Occurs in males and females of all ages and races
4. Scalp shows no sign of inflammation
5. No obvious signs of skin disorder or disease

Can progress to total scalp hair loss (alopecia totalis) or complete body hair loss (alopecia universalis)

Can begin in childhood

## C. POSTPARTUM ALOPECIA

See Figure 11–20 in the *Milady Standard Cosmetology* textbook.

Temporary hair loss at conclusion of pregnancy; the growth cycle generally returns to normal within one year after the baby is delivered.

## D. HAIR LOSS TREATMENTS

1. Minoxidil

Topical medication applied to the scalp twice daily; it is proven to stimulate hair growth. It is sold over the counter in two strengths: 2 percent regular and 5 percent extra strength; there are no known negative side effects.

2. Finasteride

Oral prescription for men only; the side effects include weight gain and loss of sexual function.

NOTE: Place emphasis on correct pronunciations.

## VI. DISORDERS OF THE HAIR

## A. CANITIES

Definition: Technical term for gray hair

CAUSE: Loss of natural pigment in hair

1. Congenital canities
2. Acquired canities

Exists at or before birth; it occurs in albinos mostly, and occasionally in persons with normal hair.

Due to old age; the onset may occur prematurely in early adult life. CAUSE: worry, anxiety, nervous strain, prolonged illness

## B. RINGED HAIR

Alternating bands of gray and dark hair

## C. HYPERTRICHOSIS

Also known as hirsuties, it is superfluous hair; it is characterized by the growth of terminal hair in

## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)*

## D. TRICHOPTILOSIS

areas of the body that normally only grow vellus hair. TREATMENT: Tweeze or remove by depilatories, electrolysis, shaving, or epilation.

## E. TRICHORRHEXIS NODOSA

Split hair ends. TREATMENT: Conditioning to lubricate and soften ends; cutting

## F. MONILETHRIX

Knotted hair; this is a dry, brittle condition including formation of nodular swellings along the hair shaft. The hair breaks easily, which creates a brushlike spreading of fibers along the hair shaft. TREATMENT: Softening the hair with conditioners and moisturizers

## G. FRAGILITAS CRINIUM

Beaded hair; the hair breaks between the beads or nodes. TREATMENT: Scalp and hair conditioning

Brittle hair which causes splitting. TREATMENT: Hair and scalp conditioning

**ACTIVITY:** Write technical terms on the board, flipchart, or write-on transparency and have students pronounce them out loud as a group.

Natural shedding of horny scalp scales occurs regularly and should not be mistaken for dandruff. The average person sheds about 11 pounds (5 kg) of "dead" skin each year.

## VII. DISORDERS OF THE SCALP

## A. DANDRUFF

Pityriasis, or small white scales that usually appear on the scalp and hair. Dandruff is characterized by excessive proliferation, shedding, and accumulation of surface cells. Recent research confirms that dandruff is *not* contagious.

## 1. Pityriasis capitis simplex

Dry type; it is characterized by an itchy scalp and small white scales attached to the scalp or scattered loosely in the hair. CAUSE: Current research confirms that dandruff is caused by a fungus called *malassezia*. It is present on all human skin, but develops dandruff when it grows out of control.

TREATMENTS: Use of mild or mediated shampoos, scalp treatments, regular scalp massage, daily use of antiseptic scalp lotions, and mediated scalp ointments

## 2. Pityriasis steatoides

Greasy or waxy type; scales become mixed with sebum, causing them to stick to the scalp in patches; medical treatment is advisable.

## B. FUNGAL INFECTIONS

## 1. Tinea

The technical term for ringworm; it is caused by vegetable parasites and is highly contagious. It begins with a small, reddened patch of little blisters; refer to a physician.

## 2. Tinea capitis

Ringworm of the scalp; it is characterized by red papules or spots at the opening of hair follicles; it causes hair to break.

## SUBJECT OUTLINE

## IN-DEPTH NOTES

(Information to share during presentation)

### 3. Tinea favosa

Honeycomb ringworm; it is characterized by dry, sulfur-yellow, cup-like crusts on the scalp called scutula; give off odor; scars from favus are pink or white, shiny bald patches. It is *very* contagious and should be referred to a physician.

## C. ANIMAL PARASITIC INFECTIONS

### 1. Scabies (itch mite)

Highly contagious, scabies is caused by itch mite. Vesicles and pustules form from the irritation of the parasites or form from scratching the affected area.

### 2. Pediculosis capitis

This is a contagious condition caused by head lice infesting the hair and scalp; itching occurs and resultant scratching can cause an infection. Refer to a physician.

## D. STAPHYLOCOCCI INFECTIONS

### 1. Furuncle or boil

An acute staphylococci infection of a hair follicle that produces constant pain; it produces a pustule perforated by a hair. Refer to a physician.

### 2. Carbuncle

This is an inflammation of the subcutaneous tissue caused by staphylococci; it is similar to a furuncle but larger. Refer to a physician.

## VIII. HAIR AND SCALP ANALYSIS

### A. HAIR TEXTURE

#### 1. Coarse

Hair analysis is performed by observation, using the senses of sight, touch, hearing, and smell. The four most important factors to consider are texture, porosity, elasticity, and density. Other factors include the natural growth pattern and the degree of oiliness or dryness.

The thickness or diameter of the individual hair strand (compare a thin rope to a thick rope or a piece of thread to a piece of yarn)

Has the largest diameter; stronger than fine hair; usually requires more processing time and may be resistant to processing. See Figures 11–8 through 11–10 in the *Milady Standard Cosmetology* textbook.

#### 2. Medium

The most common and is considered normal; it does not pose any special problems. It is thinner than coarse hair and thicker than fine hair.

#### 3. Fine

The smallest diameter and is more fragile; fine hair is easier to process but more susceptible to damage.

**ACTIVITY:** Have students clip an individual hair strand from different areas of the head on several different student volunteers. Have them hold the strand securely with one hand while feeling it with the thumb and forefinger of the other hand. Have them describe the different feel between coarse hair and fine hair, and so forth.

## SUBJECT OUTLINE

## IN-DEPTH NOTES

*(Information to share during presentation)*

## B. HAIR DENSITY

1. Low
2. Medium
3. High
4. Average – 2,200 hairs per square inch
5. Blond – 140,000
6. Brown – 110,000
7. Black – 108,000
8. Red – 80,000

Measures the number of individual hair strands on 1 square inch (2.5 square cm) of the scalp

Thin hair

Average or normal number of hairs per square inch (2.5 cm)

Dense or thick hair (a high number of hairs on the head)

An average head of hair contains about 100,000 individual hair strands. The number varies by hair color.

## C. POROSITY

1. Low porosity
2. Average porosity
3. High porosity

The ability of the hair to absorb moisture; it is directly related to the condition of the cuticle layer. See Figures 9–12 to 9–14 in the *Milady Standard Cosmetology* textbook.

Considered resistant; requires more alkalinity in solutions

Normal hair; chemical services will normally process as expected

Overly porous; often the result of overprocessing. It is damaged, dry, fragile, and brittle. Chemical services require less alkaline solutions with a lower pH to prevent additional overprocessing.

**ACTIVITY:** Have students pair up and check the porosity of one another's hair by taking a strand of hair from four different areas of the head: the front hairline, the temple, the crown, and the nape. Have them hold the strand securely with one hand while sliding the thumb and forefinger of the other hand from the end to the scalp. If the hair feels smooth and the cuticle is compact, dense, and hard, it is considered resistant. If the strand ruffles or they feel roughness, the hair is considered porous. If it feels very rough, dry, or breaks, it is considered overly porous. Have students discuss results.

## D. ELASTICITY

1. Normal elasticity
2. Low elasticity

The ability of the hair to stretch and return to its original length without breaking. It indicates the strength of the side bonds that hold the hair's individual fibers in place.

Will stretch up to 50 percent of its original length when wet

This hair is brittle and breaks easily; it will not hold a curl. It is the result of weak side bonds, probably as a result of overprocessing.

## SUBJECT OUTLINE

IN-DEPTH NOTES  
(Information to share during presentation)

## E. HAIR GROWTH PATTERNS

## 1. Hair streams

## 2. Whorl

## 3. Cowlick

## F. DRY HAIR AND SCALP

1. Appears dull, dry, lifeless
2. Avoid frequent shampooing

## G. OILY HAIR AND SCALP

1. Clarifying shampoos
2. Well-balanced diet
3. Exercise
4. Regular, frequent shampooing

**ACTIVITY:** Have students pair up and check the elasticity of one another's hair by wetting a few hairs and taking an individual strand from four different areas of the head as in the porosity test. Have them hold a single strand of wet hair securely and pull it (either a part or from the scalp). If the hair stretches and returns to its original length without breaking, it has normal elasticity. If it breaks or fails to return to original length, it has low elasticity. Have students discuss results.

Hair flowing in the same direction; it is the result of follicles sloping in the same direction. Two streams flowing in opposite directions create a natural part.

Hair that forms a circular pattern, as on the crown. A tuft of hair that stands straight up; they can be found anywhere but are more noticeable on the hairline.

Caused by inactive sebaceous glands; aggravated by dry winter or desert climate

Also avoid strong soaps, detergents, or products with high alcohol content.

Caused by overactive sebaceous glands; characterized by greasy buildup on scalp and oily coating on hair

Good personal hygiene. Avoid strong soaps, detergents, or products with high alcohol content.

## SUMMARY AND REVIEW

We have learned that trichology enables the professional cosmetologist to better understand both the physical and microscopic properties of the hair. In order to give your clients the best possible consultative services, you must be able to recognize those conditions of the hair and scalp needing treatment. We've also learned that properly practicing proper disinfection procedures that are approved by your oversight regulatory agency will prevent spread of diseases. Let's review.

### LET'S REVIEW:

1. Name and describe the five main structures of the hair root.

**Answer:** The five main structures of the hair root are:

- Hair follicle: the tube-like depression or pocket in the skin or scalp that contains the hair root
- Hair bulb: the thickened, club-shaped structure that forms the lower part of the hair root
- Dermal papilla: the small, cone-shaped elevation located at the base of the hair follicle that fits into the hair bulb. It contains the blood and nerve supply that provides nutrients for hair growth
- Arrector pili muscle: tiny, involuntary muscle fiber in the base of the hair follicle; causes goose bumps
- Sebaceous glands: oil glands in the skin connected to hair follicles; secrete an oily substance called sebum that lubricates the hair and skin

2. Name and describe the three layers of the hair shaft.

**Answer:** The three layers of the hair are:

- Cuticle: outermost layer of hair consisting of overlapping layers of transparent, scale-like cells that look like shingles on a roof
- Cortex: the middle layer of fibrous protein core formed by elongated cells containing melanin pigment
- Medulla: the innermost layer composed of round cells; it is quite common for very fine and naturally blond hair to lack a medulla layer.

3. Explain the process of keratinization.

**Answer:** As newly formed cells in the hair mature, they fill up with keratin, move upward, lose their nucleus, and die.

4. What are polypeptide chains?

**Answer:** Polypeptide chains are long chains of amino acids linked by peptide bonds. Polypeptide chains are cross-linked like the rungs on a ladder by three different types of side bonds. These side bonds hold the polypeptide chains in place and account for the incredible strength and elasticity of human hair.

5. List and describe the three types of side bonds. Indicate whether they are strong or weak and why.

**Answer:** The three types of side bonds are:

- Hydrogen bonds: a physical side bond that is easily broken by water or heat. They are weak individually, but because there are so many, they account for about one-third of the hair's strength.
- Salt bonds: another weak, physical cross-link side bond between adjacent polypeptide chains. They are easily broken by strong alkaline or acidic solutions and account for about one-third of the hair's overall strength.
- Disulfide bonds: a strong chemical side bond. The disulfide bond joins the sulfur atoms of two neighboring cysteine amino acids to create one cystine. The cystine joins together two polypeptide strands like rungs on a ladder. There are far fewer disulfide bonds than the physical bonds, but they are stronger and account for about one-third of the hair's overall strength.

6. Name and describe the two types of melanin responsible for natural hair color.

**Answer:** The two types of melanin responsible for natural hair color are:

- Eumelanin: provides brown and black color to hair
- Pheomelanin: provides natural hair colors from red and ginger to yellow/blond tones

7. Name and describe the two types of hair and their locations on the body.

**Answer:** The two types of hair and their locations are:

- Vellus, or lanugo, hair is short, fine, and downy. Vellus hair is not pigmented and almost never has a medulla. On adults, is found in places that are normally considered hairless, except the palms of the hands and soles of the feet.
- Terminal hair is the long, coarse hair found on the scalp, legs, arms, and body. It is coarser than vellus hair and, with the exception of gray hair, it is pigmented.

8. What are the three phases of the hair growth cycle? What occurs during each phase?

**Answer:** The phases of hair growth and what occurs during each phase are:

- Anagen, or growth phase: when the new hair is produced
- Catagen or transition phase: the brief transition period between the growth and resting phases of a hair follicle
- Telogen or resting phase: the final phase in the hair cycle and lasts until the fully grown hair is shed

9. What is the reason for normal daily hair loss?

**Answer:** Normal daily hair loss is the natural result of the three phases of the hair's growth cycle. The growth cycle provides for the continuous growth, fall, and replacement of individual hair strands.

10. What are the most common types of abnormal hair loss?

**Answer:** The most common types of abnormal hair loss are:

- Androgenic alopecia: the result of genetics, age, and hormonal changes
- Alopecia areata: when hair falls out in round patches or baldness in spots
- Postpartum alopecia: experienced at the conclusion of a pregnancy

11. What are the only two approved hair loss treatments?

**Answer:** The only two approved hair loss treatments are minoxidil and finasteride.

12. Name the two main types of dandruff. Can either one be treated in the salon?

**Answer:** The two main types of dandruff are:

- Pityriasis capitis simplex: This type of dandruff can be treated in a salon with the use of mild or medicated shampoos, scalp treatments, regular scalp massage, daily use of antiseptic scalp lotions, and medicated scalp ointments.
- Pityriasis steatoides: This type of dandruff must be referred to a physician.

13. Which hair and scalp disorders cannot be treated in the salon?

**Answer:** The types of hair and scalp disorders that cannot be treated in the salon are tinea capitis, tinea favosa, carbuncles, pediculosis capitis, scabies, and furuncle.

14. What four factors about the hair should be considered in a hair analysis?

**Answer:** The four factors that should be considered in a hair analysis are: texture, porosity, elasticity, and density.

### LEARNING REINFORCEMENT IDEAS AND/OR ACTIVITIES

1. Have students complete Chapter 11 of the *Milady Standard Cosmetology Theory Workbook*, *Practical Workbook*, and *Study Guide: The Essential Companion*.
2. Have students complete review and final testing with *Milady Standard Cosmetology Online Licensing Preparation*.
3. Invite a physician who specializes in hair loss as a guest speaker and have students write a report on his or her presentation.
4. Have students work in pairs and analyze each other's hair and scalp condition and recommend treatment and explain why they have chosen such treatment and/or products.
5. Using a microscope, have students view the cuticle layer of their hair and determine its form.

6. Have students role-play consulting with clients about various hair and scalp conditions. Remind them of the sensitivity required when referring a client to a physician for a condition that cannot be treated in the school or salon.
7. Have students cut pictures from magazines of what appear to be different hair types (dry, brittle, frizzy, oily, etc.) and then list the type of corrective treatment they would recommend for that hair type. (An alternative activity to this would be for the students to actually collect hair swatches of various hair conditions and make a chart listing corrective treatments, etc.).
8. On the lines below, write any activities, assignments, or ideas that have been used effectively with this lesson in order to aid other instructors who may use this lesson plan in the future:

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## TEST—CHAPTER 11—PROPERTIES OF THE HAIR AND SCALP

1. The study of hair is known as:
  - a) histology
  - b) trichology
  - c) bacteriology
  - d) dermatology
2. The body can produce \_\_\_\_\_ of the 20 amino acids that make up hair and your diet must include the remaining essential amino acids.
  - a) 7
  - b) 9
  - c) 11
  - d) 13
3. A mature strand of human hair is divided into two principal parts known as the:
  - a) follicle and cuticle
  - b) hair root and follicle
  - c) hair shaft and follicle
  - d) hair root and hair shaft
4. A tube-like depression, or pocket, in the skin or scalp that encases the hair root is called the:
  - a) follicle
  - b) bulb
  - c) dermal papilla
  - d) arrector pili
5. A thickened, club-shaped structure that forms the lower part of the hair root is called the:
  - a) follicle
  - b) bulb
  - c) dermal papilla
  - d) arrector pili
6. A small, cone-shaped elevation located at the bottom of the hair follicle is called the:
  - a) lower follicle
  - b) bulb
  - c) dermal papilla
  - d) arrector pili
7. A small involuntary muscle attached to the underside of a hair follicle is the:
  - a) arrector pili
  - b) bulb
  - c) dermal papilla
  - d) arrector pili
8. Oil glands of the skin, connected to the hair follicles, are known as:
  - a) sudoriferous glands
  - b) endocrine glands
  - c) lymph glands
  - d) sebaceous glands
9. Hair is composed of cells arranged in three layers which are:
  - a) outer, inner, central
  - b) cuticle, cortex, medulla
  - c) cuticle, inner root, medulla
  - d) cortex, medulla, dermis

10. The cortex contains coloring matter in the form of minute grains of \_\_\_\_\_, or pigment.
  - a) medulla
  - b) albino
  - c) melanin
  - d) marrow
11. Long, coarse, pigmented hair found on the scalp, legs, arms, and body is known as:
  - a) vellus hair
  - b) lanugo hair
  - c) terminal hair
  - d) stationary hair
12. All hair follicles have the same structure and cycle through the same three phases, which are:
  - a) anagen (growing), catagen (transitional), rologen (resting)
  - b) anagen (growing), bacagen (transitional), telogen (resting)
  - c) allergen (growing), catagen (transitional), telogen (resting)
  - d) anagen (growing), catagen (transitional), telogen (resting)
13. Hair that forms a circular pattern is called a:
  - a) hair stream
  - b) cowlick
  - c) whorl
  - d) rotary
14. Hair texture refers to the \_\_\_\_\_ of the hair.
  - a) thickness or diameter
  - b) thickness or softness
  - c) length and thickness
  - d) density and fineness
15. The ability of the hair to absorb moisture is called:
  - a) elasticity
  - b) porosity
  - c) texture
  - d) resistant
16. The ability of the hair to stretch and return to its original form without breaking is called:
  - a) texture
  - b) porosity
  - c) wiriness
  - d) elasticity
17. The loss of hair in round or irregular patches without inflammation is called:
  - a) androgenetic alopecia
  - b) telogen effluvium
  - c) alopecia areata
  - d) traumatic alopecia
18. The technical term for hair that is in a dry, brittle condition including formation of nodular swellings along the hair shaft is:
  - a) trichoptilosis
  - b) trichorrhesis nodosa
  - c) hypertrichosis nodosa
  - d) monilethrix

19. The chemical bond that joins amino acids to each other is called a \_\_\_\_\_.  
a) peptide bond  
b) polypeptide bond  
c) COHNS bond  
d) cystine bond
20. Normal hair contains \_\_\_\_\_ percent of the element carbon.  
a) 6  
b) 17  
c) 21  
d) 51
21. Normal hair contains \_\_\_\_\_ percent of the element oxygen.  
a) 6  
b) 17  
c) 21  
d) 51
22. Normal hair contains \_\_\_\_\_ percent of the element hydrogen.  
a) 6  
b) 17  
c) 21  
d) 51
23. Normal hair contains \_\_\_\_\_ percent of the element nitrogen.  
a) 6  
b) 17  
c) 21  
d) 51
24. As newly formed cells mature, they fill up with a fibrous \_\_\_\_\_ then move upward, lose their nucleus, and die. This process is called keratinization.  
a) protein  
b) melanin  
c) sebum  
d) tissue
25. A side bond that is easily broken by strong alkaline or acidic solutions is a called \_\_\_\_\_ bond.  
a) a hydrogen  
b) a disulfide  
c) an ionic  
d) a keratin
26. \_\_\_\_\_ is the tiny grains of pigment in the cortex that give natural color to the hair.  
a) protein  
b) melanin  
c) sebum  
d) tissue
27. Pheomelanin provides natural hair colors from \_\_\_\_\_ to yellow and blond tones.  
a) platinum and silver  
b) brown and maroon  
c) brown and black  
d) red and ginger

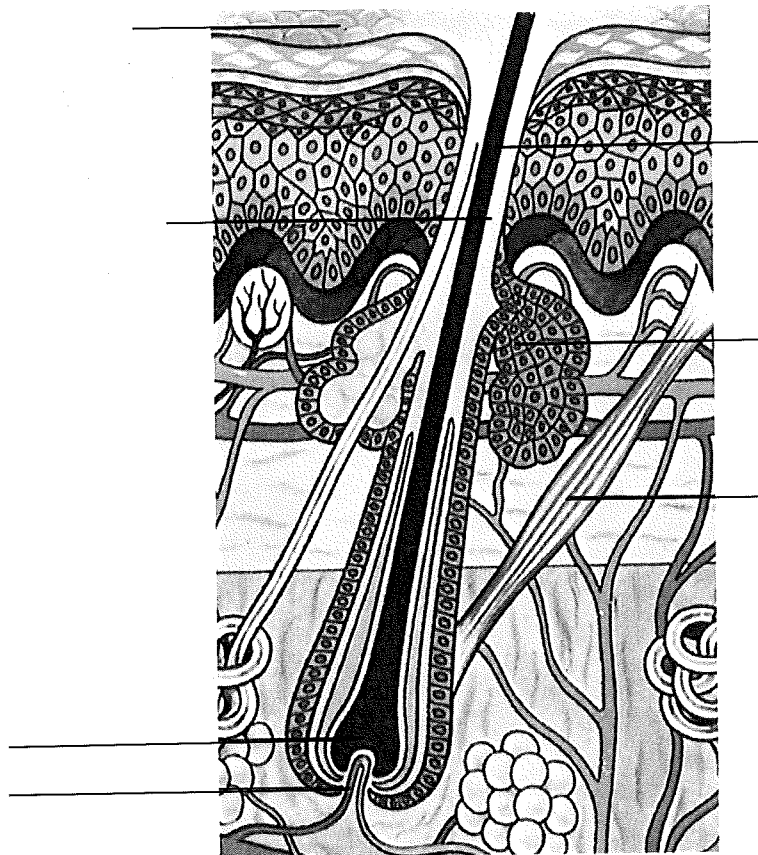
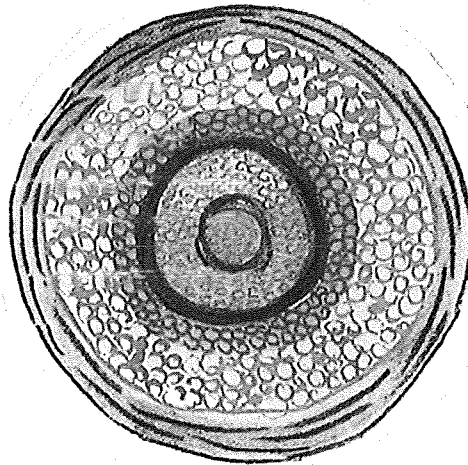
28. The shape of the hair strand, described as straight, wavy, curly, or extremely curly, is known as \_\_\_\_\_.  
a) texture  
b) density  
c) porosity  
d) wave pattern
29. The thickness or diameter of the individual hair strand is called \_\_\_\_\_.  
a) texture  
b) density  
c) porosity  
d) elasticity
30. The number of individual hair strands on one square inch of the scalp indicates \_\_\_\_\_.  
a) hair texture  
b) hair density  
c) hair porosity  
d) hair elasticity
31. Short, fine, downy, unpigmented hair is known as \_\_\_\_\_ hair.  
a) terminal  
b) dense  
c) vellus  
d) dry
32. \_\_\_\_\_ is a topical medication that is applied to the scalp twice daily and has been proven to stimulate hair growth.  
a) minoxidil  
b) finasteride  
c) rogain  
d) antiseptic
33. \_\_\_\_\_ is an oral prescription medication for hair loss that is available to men only.  
a) minoxidil  
b) finasteride  
c) rogain  
d) antiseptic
34. The technical term for gray hair is:  
a) hypertrichosis  
b) ringed hair  
c) trichoptilosis  
d) canities
35. The technical term for split ends is:  
a) hypertrichosis  
b) ringed hair  
c) trichoptilosis  
d) canities
36. The technical term for beaded hair is:  
a) monilethrix  
b) fragilitas crinium  
c) trichorrhesis nodosa  
d) hypertrichosis

37. A scalp condition characterized by red papules or spots at the opening of hair follicles is:
- a) tinea capitis
  - b) tinea favosa
  - c) pediculosis capitis
  - d) scabies
38. A contagious condition caused by a parasite infesting the hair and scalp is:
- a) tinea capitis
  - b) tinea favosa
  - c) pediculosis capitis
  - d) scabies
39. An acute staphylococci infection of a hair follicle that produces constant pain is:
- a) carbuncle
  - b) tinea
  - c) scabies
  - d) furuncle
40. The infestation of the hair and scalp with head lice is known as:
- a) alopecia areata
  - b) tinea capitis
  - c) pediculosis capitis
  - d) scabies

## TEST—CHAPTER 11—PROPERTIES OF THE HAIR AND SCALP ANSWER KEY

- |       |       |       |
|-------|-------|-------|
| 1. b  | 15. b | 29. a |
| 2. c  | 16. d | 30. b |
| 3. d  | 17. c | 31. c |
| 4. a  | 18. b | 32. a |
| 5. b  | 19. b | 33. b |
| 6. c  | 20. d | 34. d |
| 7. a  | 21. c | 35. c |
| 8. d  | 22. a | 36. a |
| 9. b  | 23. b | 37. a |
| 10. c | 24. a | 38. c |
| 11. c | 25. c | 39. d |
| 12. d | 26. b | 40. c |
| 13. c | 27. d |       |
| 14. a | 28. d |       |

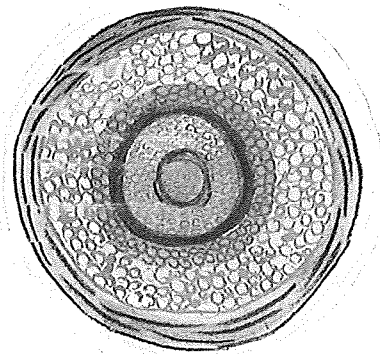
# STRUCTURE OF THE HAIR ROOT



## LP 11.0, T-1

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## STRUCTURE OF THE HAIR ROOT



Epidermis or outer  
layer of the skin

Hair follicle

Hair root

Sebaceous or  
oil gland

Arrector pili  
muscle

Hair  
bulb

Dermal  
papilla

**LP 11.0, T-2**



## ● MILADY STANDARD COSMETOLOGY COURSE MANAGEMENT GUIDE CLASS SIGN-IN SHEET 12.0

**INSTRUCTOR NAME:** \_\_\_\_\_

**DATE TAUGHT:** \_\_\_\_\_

**SUBJECT:** GENERAL SCIENCES

**TOPIC:** BASICS OF CHEMISTRY

**LESSON OBJECTIVES:**

Upon completion of the lesson, the student will be able to:

1. Explain the difference between organic and inorganic chemistry.
2. Explain oxidation-reduction (redox) reactions.
3. Discuss the different forms of matter: elements, compounds, and mixtures.
4. Explain the difference between solutions, suspensions, and emulsions.
5. Explain pH and the pH scale.

**IMPLEMENTS, EQUIPMENT, SUPPLIES REQUIRED:**

Student	Instructor	Items
x	x	<i>Milady Standard Cosmetology</i>
x	x	<i>Milady Standard Cosmetology Theory Workbook, Practical Workbook, and Study Guide: The Essential Companion</i>
x		Student notebook
x		Pens, pencils

**TEACHING AIDS** (Audio/visual equipment, handouts, etc. used by Instructor):

1. Board
2. LCD Projector and *Milady Standard Cosmetology Instructor Support Slides* OR Overhead Projector and Transparencies
3. *Milady Standard Cosmetology DVD Series* and DVD player

**FACILITY:** Theory Classroom

**TIME ALLOTMENT:** 1–2 hours (adjust based on school schedule and student activities/participation)

**PRIOR STUDENT ASSIGNMENT:**

1. Read Chapter 12, *Milady Standard Cosmetology*

**EDUCATOR REFERENCES:**

1. *Milady Standard Cosmetology*
2. *Milady Standard Cosmetology Theory Workbook, Practical Workbook, and Study Guide: The Essential Companion*

Student Signatures	Student Signatures

(If more space is needed, use reverse side of form.)

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