Hairdressing science
Products, equipment and their use

Trainer requirements to teach this session

For this session you will need the following:

- Slide GH19.3.1a
- Slide GH19.3.1b
- Handout GH19.3.1 (2 pages)
- Handout GH19.3.2 (2 pages)
- Slide GH19.3.2
- Handout GH19.3.3
- Research GH19.3.3
- A range of styling and finishing products
- Handout GH19.3.4
- Handout GH19.3.5
- Activity GH19.3.5
- Handout GH19.3.6
- Activity GH19.3.6
- A range of non-conventional setting items
- Handout GH19.3.7
- Handout GH19.3.8
- Handout GH19.3.9
- Learner Check Session 3

Trainer notes

The session will cover:

3.1. **The effects of humidity on hair**

3.2. **The physical effects of styling on the hair structure and how the incorrect application of heat can affect the hair and scalp**

3.3. **The physical effects of styling and finishing products on the hair and how they work to maintain the style**

3.4. **Why hair should be allowed to cool prior to dressing out**

3.5. **The range of products, tools and equipment available for styling and dressing hair and the suitability of specific products and equipment for use with different hair types and for achieving different effects**

3.6. **The types of non-conventional items that may be used when setting hair and the effects they can create**
3.7. The manufacturers' instructions relating to the use of the specific styling and finishing products in your salon

3.8 The effects of backcombing and back brushing on the hair structure

3.9 The potential effects on the hair structure of using and securing added hair and accessories
3.1. **The effects of humidity on hair**

Ref: Slide GH19.3.1a

Show the slide and explain the structure of the hair, by saying that the structure is quite complex.

Speak about:

- how amino acids form polypeptide chains that twist together to form protofibrils, microfibrils and macrofibrils to form a hair
- the polypeptide chains' spiral shape is called an alpha-helix (plural is helices)
- hair is made up of 50% carbon, 21% oxygen, 18% nitrogen, 7% hydrogen and 4% sulphur
- salt linkages are weak bonds and are easily broken by acids and alkalines
- there are many hydrogen bonds but these are the weakest of all the bonds
- the way the hydrogen, salt and disulphide bonds are positioned to hold the structure together and to prevent the alpha helices from straightening

Ref: Slide GH19.3.1b

Show the slide and remind learners that the physical effects of styling on the hair structure are:

- hydrogen bonds are broken and reformed into a new position until the hair is made wet

Ref: Handout GH19.3.1 (2 pages)

Tell learners (or remind them if they have covered this area of learning at Level 2) that hair is hygroscopic – it will absorb moisture from wherever it can get it, including from the air.
Explain that it does this in the same way that blotting paper soaks up moisture – by capillary action. This means that the moisture is passed through the structure of the material from cell to cell.

Tell learners that humidity is the amount of moisture in the air.

Explain that porosity is the speed at which hair will absorb moisture. Explain that hair that has low porosity will absorb moisture slowly. The cuticle will be firmly placed around the hair shaft and so the entry of any liquid is slowed down. If the hair is porous it will absorb moisture quickly because the cuticle will be open (possibly due to damage).

Explain what happens when moisture is absorbed into the hair:

- the cuticle opens slightly and the hair swells slightly
- in curly hair the cuticle opens slightly, the hair swells and shrinks in length
- the hair can stretch further because the hydrogen and salt bonds break
- if the hair is not dried under tension into a stretched position, the hydrogen and salt bonds will revert to their normal, unstretched pattern

Ask learners which types of hair are most likely to be porous.

The answers should include:

- chemically treated hair
- hair that has been damaged by chlorine in swimming pools
- hair that has been physically damaged by too much heat, rough handling
- hair that has been damaged by the environment – sun, wind

Tell learners that hair that is unstretched is in the alpha keratin state while stretched hair is in the beta keratin state.
3.2. *The physical effects of styling on the hair structure and how the incorrect application of heat can affect the hair and scalp*

Recap on Handout GH19.3.1 to confirm the learners’ understanding of hair structure:

- polypeptide chains link together to form fibrils that make up the hair and disulphide, salt and hydrogen bonds hold the structure together

**Ref: Handout GH19.3.2 (2 pages)**

Explain to learners that hair in its normal state is not stretched and that this state is called alpha keratin.

Tell them that it becomes beta keratin when it is stretched, for example, when styled.

Remind them that wet hair or heated hair stretches further than cool, dry hair.

Explain that this is because the heat or the moisture has broken some salt and hydrogen bonds so the ‘springs’ of the polypeptide chains can be lengthened.

**Ref: Slide GH19.3.2**

Show the slide and state that, when hair is styled it is stretched by rollers, rik-rak rods, chopsticks, fingers or other styling items and, if it is dried into the stretched position, the hydrogen and salt bonds that have been broken reform into new positions.

Tell them that they will stay in this new position until the hair again becomes damp or very hot.

Emphasise the importance of understanding this.

Tell learners that hair is hygroscopic – it absorbs moisture from:

- the air
- steamy bathrooms
- the rain
- sweat from the scalp
Explain that this is enough to allow the hydrogen and salt bonds to break again and, when the hair dries, because it is not under tension (being stretched), the bonds will go back to their natural, unstretched state.

**Summary**

- when hair is in its natural, unstretched state, it is alpha keratin
- when hair is wet and stretched slightly while styling it becomes beta keratin
- if the hair is dried into this stretched shape it remains beta keratin until it becomes wet again when it reverts to its normal, unstretched shape and goes back to being alpha keratin
- when the hair is dried into a stretched shape it keeps this shape because the hydrogen and the salt bonds reform into a different pattern

Tell learners to be aware of the dangers of applying heat incorrectly, it can:

- cause hair breakage
- discolour the hair
- singe the hair
- scorch the hair
- burn the scalp

Emphasise that they must not apply heat for too long in the same place or too close to the scalp.

Explain that:

- white or bleached hair becomes yellow
- chemically treated hair may fade
- African Caribbean hair becomes reddish

...if too much heat is applied to the hair.

3.3. *The physical effects of styling and finishing products on the hair and how they work to maintain the style*

Point out to the learners that it is important to consider the physical effects of styling and finishing products on the hair because when these products are used they must benefit:

- the hair
- the scalp
- the style
Remind learners that when hair is in alpha keratin it is in an unstretched state.

When the hair is stretched and dried it takes the shape of the styling tool. It then becomes beta keratin because the hydrogen and salt bonds have been broken and the hair has been stretched and dried into a new position. Tell them that it will stay in beta keratin until it becomes wet, damp or hot again.

Explain that when the hair does become wet, damp or hot the same bonds break again and, providing the hair is not stretched, they will revert to their natural positions and the hair will return to the alpha keratin state.

Explain that this means that it goes back to its natural shape and that can be straight, curly or wavy.

Re-state that hair is hygroscopic. Say that this means that it absorbs moisture. Remind learners that if hair is porous it will absorb moisture faster than hair which is not porous.

Explain that the reason for this is that the cuticle is raised from the surface of the hair shaft so the moisture can enter into the cortex more easily. Tell learners that if a barrier is applied the absorption of the moisture can be slowed down. This means there is a delay in the return of the hair to the alpha keratin state, thus allowing the style to remain for a longer time.

Say that setting, dressing and finishing agents provide this protection from moisture.

They create a sheath over the hair shaft that prevents the absorption of moisture or reduces the speed at which it is absorbed. This means that the bonds stay in their new positions, the hair stays in the stretched position and the style lasts longer.
Tell learners that there is a wide range of products on the market.

For example:

- lotions
- gels
- sprays
- mousses
- waxes

Say that many of these products have the ability to do one or more things to benefit the hair but that their priorities are to help the style to hold longer and to make the hair look and feel good.

**Suggestion** Have a range of products for the learners to look at.

**Summary**

Tell learners that the physical effects of styling, dressing and finishing products are to:

- protect the hair from humidity
- hold the hair in place
- condition the hair
- make the style last longer

**Ref: Research GH19.3.3**

Remind learners about the vast array of products that are available to aid the length of time the hairstyle will stay in shape.

Explain that many clients can be confused by the choice and often waste money on unsuitable styling and dressing aids. Furthermore, some clients fail to maintain the condition of the hair between salon visits, due to lack of salon education.

Learners should be asked to design a leaflet to inform and advise clients about the following:

- how setting, dressing and finishing agents affect the hair
• specific products that are suitable for different hair types
• advise the client about the health & safety issues surrounding the product
• provide advice relating to the use of heated styling tools and equipment
• state the effects of the application of too much heat to the hair and scalp

**NOTE:** Remind learners that the leaflet should be written in non-technical language and encourage them to include some simple diagrams.

### 3.4. Why hair should be allowed to cool prior to dressing out

**Ref: Handout GH19.3.4**

Explain to learners that some of the salt and hydrogen bonds will be broken by wetting and heating the hair and state that, if they want the style to last, they must dry the hair under tension so that the bonds can reform in a new pattern.

Emphasise that, because heat as well as water causes the bonds to break, the hair should be held under tension until it cools. Tell them that, if they do this, they will allow the bonds to set into their new shape. Explain that, if they take the tension off while the hair is still warm, the bonds will reform in their natural, unstretched, alpha keratin shape.

Tell learners that they don't have to waste a lot of time in letting the hair cool. They can do this by switching the heat setting of the hair dryer to 'cool' and blow the cool air over the hair. Alternatively, they could allow the client to sit and relax for a few minutes until the hair is cool when they come out from under the overhead dryer.

Explain that, if learners use heated tools such as tongs or straighteners, they should avoid disturbing the hair while it cools by allowing it to cool naturally.
State that the main reason why hair should be allowed to cool before finishing the dressing is:

- to allow the curl to harden into its new position for a longer lasting style

Ask learners whether the hair is in alpha or beta keratin when it is wet but nor stretched

It is in alpha keratin – only stretched hair is in beta keratin, irrespective of whether it is wet or dry.

3.5. The range of products, tools and equipment available for styling and dressing hair and the suitability of specific products and equipment for use with different hair types and for achieving different effects

Ref: Handout GH19.3.5

Explain to learners that each salon will have its own preferences about which products, tools and equipment to use.

Tell them that, as a rough guide, salons will normally have sufficient materials to allow its staff to deal with the different hair types and different styling techniques.

Styling and finishing products

Tell learners that, as a guide, these should consist of:

- mousse
- setting and styling lotions
- styling gel
- wax
- dressing creams
- finishing gel
- sprays
Styling and finishing tools

Suggest that these should include:

• rollers, clips, pins, non-conventional setting tools
• a range of brushes designed to achieve different effects
• a range of combs

Styling and finishing equipment

Indicate that this may comprise of:

• hand-held hairdryers
• heated styling tools (tongs, hot brushes, straighteners, etc)
• overhead dryer or infrared dryer

State that the salon is likely to provide the larger, more expensive equipment such as overhead and infrared dryers and many salons are equipped with hand-held hairdryers.

Emphasise that stylists are expected to provide their own styling tools, for example, combs, brushes, etc.

Ref: Activity GH19.3.5

Ask learners to complete the activity by completing the chart with examples of the tools, products and equipment they have available to use in their own salons.

Alternatively, ask learner to design their own chart using IT.

3.6. The types of non-conventional items that may be used when setting hair and the effects they can create

Ref: Handout GH19.3.6

Tell learners that there are only two restrictions on their use of non-conventional items for setting hair.

• the first is that they must remain within the bounds of the Health & Safety at Work Act
• the second is their own imagination
Explain that the effects that can be created will be determined by the shape of the setting item.

For example:

- to achieve curls they must use a cylindrical setting tool, for example, rollers or pin curls
- to achieve a flat waving movement then they must keep the hair close to the head and set the waves using a comb and their fingers
- to achieve a zigzag effect, they must wind the hair around formers in a figure of eight

Point out to learners that they must become creative if they want to deviate from the norm, to create a shape that is unusual and innovative.

Ref: Activity GH19.3.6

Hold a brainstorming session with learners to find out how many non-conventional setting items they can think of.

Suggestion Have a range of non-conventional setting items for the learners to look at. Discuss the effects they could achieve.

3.7. The manufacturers’ instructions relating to the use of the specific styling and finishing products in the salon

Ref: Handout GH19.3.7

Emphasise to learners the importance of reading and following manufacturers’ instructions for the use of styling and finishing products.

Explain that some people can be allergic to even, relatively mild, products. They may contain perfume or lanolin (a known sensitiser) that has an adverse reaction when it comes into contact with their skin.
Say that, although it is not general practice to skin test any of these products, they must ensure to ask the client, during the consultation, if they have any known or suspected allergies to the ingredients in the products that they intend to use.

**Exercise**  
Ask learners to gather the manufacturers’ instructions for the styling and finishing products that are used in their salons. Request them to compile these into a concise portfolio that can be held in their salons for reference by new or junior members of staff. Tell them to present the portfolio to the group before placing it in the salon.

### 3.8 The effects of backcombing and back brushing on the hair structure

**Ref Handout Gh19.3.8**

Explain to learners that when hair is backcombed or back brushed the comb or the bristles of the brush catch the cuticles and push them back against their normal direction of growth.

Say that the effect that this creates is to tangle the hair – some hair in a section is pushed right back almost to the roots, other hair is pushed half way down the length of the hair, while the remaining hair is hardly pushed back at all.

State that, by doing this, the hair can be made to look abundant - the stylist can create volume, even in fine hair, that is impossible to achieve by any other means.

Tell learners that the backcombing and back brushing should be a very controlled action - it is not a case of just knotting up or tangling the hair.

For certain types of dressings, backcombing and back brushing can make the hair more easily managed and it helps to secure grips, pins and some ornamentation more firmly. This happens because the pins or grips are placed into the backcombing or back brushing and cannot easily slide out.
Point out that on some hair types (especially very fine or very straight hair) it is virtually impossible to get grips, pins or ornamentation to hold without the backcombing or back brushing; the grips, pins or ornamentation would simply slide out.

However, point out that although backcombing and back brushing can assist a stylist to achieve some dressings, learners must not forget the damaging effect that these processes have on the hair.

Backcombing and back brushing roughens the cuticle to create volume but if too much is done or if it is done too often, it can break the cuticle. This results in dull, dry hair that looks unhealthy and drab.

3.9 The potential effects on the hair structure of using and securing added hair and accessories

Ref: Handout GH19.3.9

Explain to learners that when a client has her hair done in a style that is dressed or pinned up, she expects it to stay in place for a few hours.

Say that if the stylist does not fix the hair firmly into place it will soon become loose and stray hairs will escape from the dressing, the client is likely to try to put them back in place and this disturbs the dressing further and it drops.

Tell the learners that the stylist may use:

- grips
- pins
- clasps
- bands
- added hair
- other fastening devices......to keep the hair in place.

Or they may apply:

- holding sprays
- gels
- other holding aids
When attaching grips and pins into the dressing learners must be aware of the damage to the hair and scalp that can be caused. The scalp may be scratched or grazed and the cuticle of the hair may be broken. Sharp edged pins or grips can penetrate to the cortex and through the hair shaft.

If too much holding spray and other products are used or if they are used too often it will result in the hair becoming dry and brittle. The cuticle will be damaged because the spirit in these products evaporates very quickly and takes moisture out of the hair.

Emphasise that, if learners are not very careful when securing added hair and accessories, they can:

- damage the cuticles
- cause fragilitis crinium (split ends)
- cause trichorrhexis nodosa (swollen, broken hair shaft)

Learners should always use securing items that have cushion tips – tiny blobs of plastic that cover any sharp points or edges.

Tell learners that sometimes clients wear their hair up over a long period of time. The stylist should advise the client of the possible consequences of doing this.

Wearing the hair up for a long time can cause:

- dry scalp
- sensitive scalp
- traction alopecia (hair loss)

Say that if excessive tension is placed on the hair it can damage not only the hair but also the scalp.

Now use the Learner Check for Session 3 to check the understanding of the learners.

Use Research GH19.3 to encourage independent learning.
1. What is the basic material from which human hair is made?

2. What shape do the polypeptide chains take?

3. Hair is described as being hygroscopic. What does this mean?

4. Define ‘humidity’.

5. What is the function of the hydrogen bonds in the hair?

6. What effect can the incorrect application of heat have on the scalp?

7. What causes hair in the beta keratin state to revert to the alpha keratin state?

8. What is the main reason why hair should be allowed to cool before finishing a dressing?

9. What is the main reason for using styling and dressing products?

1. Hair is made from proteins called amino acids

2. The polypeptide chains take the shape of a spiral or spring – an alpha helix

3. When something is hygroscopic it means that it absorbs moisture

4. The definition of ‘humidity’ is the speed at which moisture is absorbed

5. The hydrogen bonds prevent the loops of the polypeptide chain spirals being stretched too far

6. Too much heat will burn the scalp

7. Hair in beta keratin will revert to alpha keratin when it becomes wet or very hot

8. The main reason for allowing hair to cool before finishing a dressing is to allow the curl to harden into its new position for a longer lasting style

9. The main reason for using styling and dressing products is to coat each hair in a substance that will prevent or reduce the speed of absorption of moisture
Learner Check

10. Name four types of styling and dressing products in use in your salon.

11. What is the effect of backcombing and back brushing on the hair structure

10. Any four of:
   • mousse
   • setting and styling lotions
   • styling gel
   • wax
   • dressing creams
   • finishing gel
   • sprays

11. Roughens the cuticle to create volume
Hairdressing science
Products, equipment and their use

Trainer Summary

3.1. The effects of humidity on hair

Recap the following with the learners:

- hair is hygroscopic – it absorbs moisture
- hair in its normal state is alpha keratin
- hair that has been wet or heated, stretched and dried into the stretched position is in beta keratin
- hydrogen and salt bonds break easily and change their position when hair is stretched
- the new position is retained until the hair is wet or heated again when it reverts to its normal, alpha keratin, state

3.2. The physical effects of styling on the hair structure and how the incorrect application of heat can affect the hair and scalp

Remind learners that:

- hair that is stretched around a roller or brush changes shape because the hydrogen and salt bonds change their position
- they stay in the new position until the hair is made wet, damp or hot again
- when too much heat is applied it can discolour, scorch, singe or break hair and it can burn the scalp

3.3. The physical effects of styling and finishing products on the hair and how they work to maintain the style

Recap the effects:

- porous hair absorbs moisture faster than non-porous hair
- styling and finishing products cover the hair so they protect it from humidity, make the style last longer, hold the hair in place and condition the hair
3.4. **Why hair should be allowed to cool prior to dressing out**

Remind learners that heat can break the salt and hydrogen bonds and that the hair must be held in tension until it is cool to allow it to ‘harden’ in its new position.

3.5. **The range of products, tools and equipment available for styling and dressing hair and the suitability of specific products and equipment for use with different hair types and for achieving different effects**

Tell learners again that the types of products, tools and equipment available to them are decided by their salon but should include:

- styling and finishing products
- tools like rollers, clips, brushes, combs
- equipment such as dryers

Remind learners that their suitability is dependent on the hair type and the desired effect.

3.6. **The types of non-conventional items that may be used when setting hair and the effects they can create**

Remind learners of the list of non-conventional items that they compiled during the brainstorming session.

3.7. **The manufacturers’ instructions relating to the use of the specific styling and finishing products in your salon**

Reiterate the importance of reading and following manufacturers’ instructions because even styling and finishing products can cause allergic reactions in some people.

3.8 **The effects of backcombing and back brushing on the hair structure**

3.9 **The potential effects on the hair structure of using and securing added hair and accessories**
Research GH19.3
Set a date for the completion of the research project.
Hairdressing science
Products, equipment and their use

Key/Core Skill Opportunities

There will be an opportunity to promote discussion when covering:

GH19.3.1 The type of hair likely to be porous
GH19.3.6 When brainstorming the non-conventional setting items

There will be an opportunity to use IT:

Activity GH19.3 If the learner designs and produces their own chart
Research GH19.3 When the learner designs the client advice leaflet