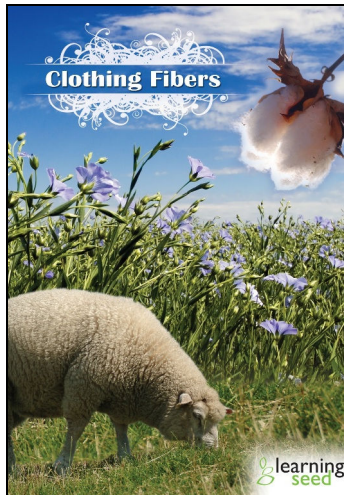


Clothing Fibers



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Clothing Fibers

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Closed Captioning

This program is closed-captioned.

Summary

We don't usually think about fibers. It is doubtful balloonists think about what fibers their balloon fabric is made of. But that's what keeps them in the sky. The balloon is made of the fiber nylon.

What is a fiber? It's the basic building block of fabric. Fabric is made of yarns woven or knitted together...and yarns are made of threads of fiber twisted together.

The fuzz on a tennis ball is crucial to speed and spin. That fuzz is made of wool, polyester, and nylon fibers. So is the nylon sail of a windsurfer. And we know clothing is made of fibers.

Cotton shirts help keep tennis players cool in the heat. That net is also a fiber. A businessman might produce high tech integrated circuits, but his suits are still made from sheep's wool. And one might wear wool, cotton, nylon, and polypropylene to stay warm while active. Each of us uses over sixty pounds of textile fibers a year.

There are two types of fibers: natural and synthetic. Natural fibers start as a plant growing in the ground or as animal protein. Cotton, wool, linen, and silk are the most used natural fibers. Synthetic fibers are manufactured from chemical compounds. Nylon, polyester, and acrylic are the most common.

Fibers

The properties of fibers determine how we use particular fabrics. These properties include physical structure, chemical composition, and molecular arrangement.

Most natural fibers are called staple fibers. They are short enough to be measured in inches or centimeters.

Manufactured fibers are called filaments. They are long, continuous strands and are measured in yards or meters. Silk is the only natural fiber that may be called a filament.

The size or thickness of a fiber will affect how it performs and feels. Large, thick fibers are crisp, rough and stiff. They resist crushing.

Fine, or thin fibers are soft and pliable.

Natural fibers do not have a uniform size, but manufactured fibers can be made uniform. The shape of the fiber will affect its luster, hand, and texture. Luster is the way light is reflected from the fabric's surface. For formal wear, we may want a lustrous fabric. The drape of a fabric is how it falls. We might want a fabric that glides over the body. We might choose a fabric for its texture. Natural fibers have more texture than manufactured fibers. Comfort is also important in choosing fabric.

Turn-of-the-20th-century swimming suits were made of wool, a hydrophilic fiber. That means the wool absorbs water and becomes heavier. Jump in the water wearing those suits and you would have to be a pro just to stay afloat.

Synthetic fibers don't absorb moisture - they are hydrophobic. They act as a "wick" and carry water to the next layer of clothing to evaporate. Manufactured fabrics such as Lycra and spandex make much more suitable swimwear.

Cotton

Growth

Cotton is a seed fiber, meaning the fiber grows from seeds. It is perhaps the most important of all fibers.

The wild cotton plant was domesticated in Asia, Africa, and South America nearly six thousand years ago. Ancient Egyptians made fine cloth at least four thousand years ago. Their hand-spun cotton was as fine as today's best. Today, cotton is grown on 77 million acres in over 80 countries – anywhere the growing seasons are long and hot. Cotton grows on bushes that are three to six feet high. Its flowers last for five to seven days.

The boll is a seedpod about the size of a golf ball. It begins to grow after the flowers drop off. Inside are 7 or 8 seeds, and attached to them are the cotton fibers. Each seed may have as many as twenty-thousand fibers – that's as many as one hundred fifty thousand individual fibers in each boll!

Cotton is threatened by the boll weevil. It's a beetle feeds on bolls and the blossoms. Each year the weevil causes around two hundred million dollars of damage to the cotton crop in the US alone. So cotton is treated with insecticides, often by airplanes.

Harvesting

Cotton was once harvested by hand, often by slave labor or tenant farmers. As recently as 1965, over a fourth of the U.S. cotton crop was picked by hand. Today, harvesting cotton is highly mechanized.

Harvesting machines called strippers and pickers efficiently remove the cotton, while leaving the plants undisturbed. Spindle harvester, also called a picker, has drums with spindles that pull the cotton from the boll in one or two rows at a time. Even a one row mechanical picker can do the work formerly done by 40 hand pickers.

In stripper harvesting, the stripper moves along rows of plants, passing them between revolving rollers or brushes that pull off the cotton. Strippers also pull twigs and leaves with the cotton.

Cotton gins separate the fibers, called lint, from the seeds. After ginning, the cotton goes to the bale press that packs it into 480 pound bales about the size of a large refrigerator.

Classing Cotton

Cotton buyers judge cotton on the basis of samples cut from the bales.

Skilled cotton classers grade or "class" the cotton according to standards established by the US Department of Agriculture such as cleanliness, degree of whiteness, length of fiber, and fiber strength.

The classers pull a sample. They discard most of the cotton until just a pinch of well-aligned fibers remains. They measure the length of the fibers, referred to as staple fibers. Longer staple fibers are higher-grade cotton and are sold at higher prices. Long staples range from 1.1 inches to 1.4 inches long.

Properties & Uses

The fibers are sent to a textile mill where carding machines turn the fibers into cotton yarn. The yarns are woven into cloth that is comfortable and easy to wash but does wrinkle easily. Cotton fabric will shrink about 3% when washed unless pre-treated to resist shrinking.

Cotton is prized for its comfort, easy care, and affordability and is ideal for clothing, bedding, towels, and furnishings.

Review

- Cotton is a seed fiber and grows in warm climates.
- Modern harvesting of the cotton crop is highly mechanized.
- Cotton is a good choice for clothing for its comfort and easy care.

Linen

Growth

Linen is an ancient fiber. It has been found in ancient tombs, and was used in burial shrouds for Egyptian pharaohs.

Linen is a bast fiber, meaning it is obtained from the stem of a plant – in this case, the flax plant. The word linen comes from the Latin name for flax.

Flax is planted in spring. In early summer it produces blue flowers and it is harvested in late summer after the plant has reached its full height of 2 to 3 feet.

Harvesting

Harvesting flax is mostly done by hand. To preserve the length of the fiber, the entire flax plant is pulled up.

In a process called rippling, a machine removes the seeds. These seeds are used for next year's planting or are used to make other products like linseed oil. The harvested flax is then left in bundles in the field for a few weeks. This process, called retting, helps loosen the fibers from the core of the stalk. Now that the fibers are loosened, the next step is scutching – breaking and beating the flax to remove the woody stalk and bark. The flax fibers are separated into smaller bundles called hands, which are hackled, or combed, and arranged into ribbons of long fibers. Linen fibers are six to twenty inches long. This length makes linen fabric strong and smooth.

Properties & Uses

The fibers are woven into fabric, then finished by bleaching, dyeing, or printing.

Linen shares many of the advantages of cotton. It is strong yet comfortable to wear in warm weather. It is so often used for bed coverings that we call them simply - linens. It's also used in handkerchiefs, and fine fashions – everything from dresses to suits. Linen is especially popular for suits worn in tropical climates. It is also found in wall coverings, drapery and upholstery fabric. Linen is more expensive than cotton and high quality linen is considered a luxury fabric.

Review

- Linen is a bast fiber from the flax plant
- The fibers are harvested primarily by hand
- Linen is ideal for lightweight suits, table and bedclothes, and furnishings.

Wool

Growth

Wool is possibly the oldest fiber known to humans. It was one of the first fibers to be spun into yarn and woven into fabric. Wool is mostly comes from sheep but also from alpacas, camels, and goats. Australia, Eastern Europe, New Zealand, and China are major wool producers. The American woolen industry began in the Massachusetts settlements in 1630, where each household was required by law to produce wool cloth.

How is wool made? First our sheep needs to grow it!

Harvesting

Then, they need a haircut. The process is called sheering. A sheering specialist can shear 200 sheep in a day. A ewe, or female sheep, can produce up to 15 pounds of wool. A ram, or male sheep, can 20 pounds of wool. The sheared wool is called raw wool and since sheep don't take showers, it must first be cleaned.

Next, the wool is carded - that means brushing the wool to straighten the fibers. Once done by hand, these days a carding machine passes the wool through a series of rollers covered with wire bristles. The carded fibers are gently scraped into strands called roving. The roving is spun into yarn that is then woven into cloth. In the past, the task of spinning usually was the job of unmarried females - they became spinsters.

A fleece is the wool taken from a single animal in a shearing. But not all wool is equal – even when it comes from the same animal. The highest quality wool comes from the sides, shoulders, and back. The lowest quality comes from the lower legs.

Grading

Wool is graded for fineness and length. The length varies from place to place on the animal, but it mostly varies amongst sheep breeds. Australian Merino wool is 3-5 inches long. Breeds found in Texas and California produce fibers 2.5 inches long. Wool from other breeds and other animals may be as long as 15 inches.

Properties & Uses

This microscopic view shows us why wool is special. The surface is a series of overlapping scales of protein, pointing toward the tip. On the animal, this enables foreign matter to work its way out of the fleece. In a strand of yarn, it enables the fibers to lock with one another. This is the key to wool's strength.

Wool's surface repels water. Since moisture does not remain on the surface, woolen fabrics tend to feel dry and comfortable even in damp weather. The inner core does absorbs moisture – so much so that wool can absorb almost double its own weight in water and still feel reasonably dry. This absorbency also gives wool its natural resistance to wrinkles. The absorbed moisture also holds down static electricity. And because of the inner moisture, wool is naturally flame resistant.

Wool today is prized for its beauty and durability. It is still the prime choice for high quality business suits, warm sweaters, and premium carpets.

Review

- Wool is a protein fiber that comes from a variety of animals.
- Sheering is done by hand, but the manufacturing of wool fabric is done by machine.
- Wool is ideal for cool weather garments such as sweaters.

Silk

Growth

According to Chinese legend, around 2700 B.C. Empress Hsi Ling Shi [Sigh-Ling-She] sat under a mulberry tree drinking tea. She began playing with a silkworm cocoon and discovered it was made of a delicate thread. The Empress learned to spin the silk and to make luxurious fabric.

Archeological evidence indicates that silk production may have begun as early as 5000BC – that's more than seven thousand years ago. Sericulture is the raising of silkworms and the production of silk. The ancient Chinese kept the details of sericulture a secret – a secret coveted by the rest of the world. Today silk is produced mostly in China, India, and Japan.

Silkworms, which are really caterpillars, are fed mulberry leaves, mulberry leaves, and only mulberry leaves. They never stop eating. That means feedings every four hours.

Harvesting

After 35 days of eating, the silkworm spins a cocoon of silk. It creates nearly a mile of filament! One can by hand, boil the cocoons, pick out the end of a silk filament, and thread it onto a reel. This work may also be done in a manufacturing plant. Several filaments are combined and wrapped on a reel creating a yarn.

Properties & Uses

The length of the silk is important in creating high quality fabric. Long fibers make long, smooth surfaces, which is why silk reflects light and has that special luster we value. But, short fibers and broken fibers may also be spun to create lower quality fabrics.

For all its delicacy, silk is as strong as wire of equal thickness. However, it deteriorates over time. As silk ages, it becomes dry and brittle and will literally fall to pieces in one's hands. Much like shattered glass, silk will develop fissures, crumble, and fall off in chunks.

Feeding all those hungry caterpillars is expensive – so silk fabric is expensive and used primarily in high-end apparel and furnishings.

Review

- Silk is a protein fiber made by silkworms.
- Silk may be harvested either by hand or machine.
- This fabric is prized for its beauty and richness and is for special apparel.

Rayon

Manufacturing

We've seen how expensive silk is – for many years, chemists tried to invent artificial silk that could be mass-produced more cheaply. The first commercial production of artificial silk was in the United States in 1911. This filament fiber was named rayon in 1924.

Rayon is made of cellulose, which is a fibrous chemical found in all plants. Tree bark is made of cellulose, and so are the stringy parts of celery. Some rayon is made from linters, the short cotton fibers left on cottonseeds after ginning.

The cellulose is first chemically treated so that it becomes a liquid solution. The solution is forced through a spinneret, which resembles a high tech showerhead, and into a bath that turns it back into a solid – rayon filaments.

Properties & Uses

Although rayon was first invented as artificial silk, it can also be made to resemble cotton, linen or wool. Because rayon is made from vegetable matter, it absorbs water. But absorbing water makes rayon weak and causes the fiber to break.

Rayon is often used in fashion and home furnishings, but the fiber is also found in sanitary products, diapers, and medical supplies.

Review

- Rayon first used commercially in 1911.
- Rayon is made of cellulose, which is found in all plants.
- Although, the fiber was created as an artificial silk, it can also resemble cotton, linen and wool.

Nylon

Manufacturing

About 8 billion pounds of nylon are produced each year in the U.S. Nylon is an artificial fiber. It is durable, strong and resists abrasion.

In 1939, the DuPont company first manufactured NYLON - it was the first synthetic fiber made in the United States. It was used in nylon stockings during wartime, but even after the war became preferred over silk, and quickly replaced silk in most hosiery.

Nylon is made of polymers known as polyamides which contain carbon, oxygen, nitrogen, and hydrogen. Solid chips of these polyamides are melted and forced through a heated spinneret. The spinneret has from one to

hundreds of holes. Their size and shape changes the characteristics of the resulting fiber. The fiber solidifies as it cools, and can then be spun or woven.

Properties & Uses

Nylon does not absorb water – this is great for some uses, but also means that nylon fabric and movement combine to create static electricity.

Nylon has some of the look and feel of silk. It is used in sheer hosiery, sails, parachutes, blouses, gowns and veils, swimsuits, lingerie, and even car tires. Nylon has also replaced wool as the fiber most used in carpets. A process called air-texturing adds bulk to the nylon to make it useful as a floor covering.

Review

- Nylon was the first synthetic fiber manufactured in the US.
- It is made from polymers consisting of carbon, oxygen, nitrogen, and hydrogen.
- Nylon is a versatile fiber used in clothing, carpet, and tires.

Polyester

Manufacturing

Polyester is the most commonly used synthetic fiber. DuPont introduced its Dacron brand of polyester in 1951, but the material itself was patented earlier in 1941.

It's made by reacting dicarboxylic acid with dihydric alcohol. This base material can be used to make many things, from soda bottles to boats, as well as clothing fibers. Like nylon, polyester is melt-spun – this process allows the fibers to be made in different shapes and sizes for specific applications. Chemists can now alter the size and shape of polyester fibers to look and feel more like natural fibers. Ultra thin microfibers can give polyester a smoother, softer feel than the polyester of twenty years ago.

Properties & Uses

It can be used for fashionable dresses; but it is most admired for its ability to resist wrinkling and for its easy washability. Its toughness makes it a frequent choice in children's wear. Polyester is often blended with other fibers like cotton to get the best of both worlds.

Review

- Polyester is the most used synthetic fiber.
- The fiber can be manufactured in different shapes and sizes for specific purposes.
- Polyester is a tough fabric used in clothing

Acrylic

Manufacturing

Acrylic is our final fiber. It can be thought of as artificial wool. It is made from the unlikely combination of coal, air, water, oil and limestone. DuPont first made acrylic fibers in 1944 and began commercial production in 1950. It is spun by either dry spinning or wet spinning.

In dry spinning the dissolved polymers are extruded into warm air. The fibers solidify by evaporation. In wet spinning the polymer is dissolved and extruded into a bath and then dried.

Properties & Uses

In some ways, acrylic imitates wool. It has wool's warmth and softness, but does not absorb water. Instead, acrylic wicks moisture to the surface where it evaporates.

Acrylic is used in knitted apparels such as fleece, socks, sportswear and sweaters. It is also used to create fake fur, craft yarns, upholstery fabric, carpet, luggage, awnings, and vehicle covers.

Review

- Acrylic is an artificial fiber often used as a wool substitute.
- Acrylic became commercially available in 1950.

Identifying Fibers

How do you tell what a fabric is? Unravel a yarn. How long is the fiber? Does it have luster or not?

You can't identify fibers by visual inspection alone. That's why the law requires fiber content labels like these.

But what if there isn't a label?

You can do a flame test. Unravel several warp and weft yarns. Using tweezers, hold the yarn to the edge of a flame.

- If it smells like burning hair, the yarn is wool or silk.
- If it smells like burning paper, the yarn may be cotton, flax, or rayon
- If the yarn melts in the flame, it is a synthetic fiber such as acrylic.

You can also view a fiber under a microscope.

Questions For Discussion

1. Below are matched pairs of items of clothing (or other consumer products) and a fiber. Most are rather poor matches. Explain what qualities of the listed fiber make it unacceptable for the item. For example, for wool and swimsuits point out that wool is weak when wet and absorbs so much water as to become heavy and dries slowly (not to mention with the odor of wet wool).

- Wool/swimsuits Nylon/t-shirts
- Cotton/business suits polyester/underwear
- Silk/stockings Rayon/parachutes
- Acrylic/towels Silk/swimsuits
- Wool/track suit Rayon/backpack
- Silk/window curtains Cotton/swim suits
- Polyester/cloth for washing windows

2. How many different kinds of fiber can you identify right now in this room?

Suggested Activities

1. Find one example of each of the following fibers:

cotton
acrylic
wool

linen
polyester
nylon

silk
natural/synthetic blend
rayon

2. Conduct a debate in which one team takes the position that natural fibers are still superior for clothing and the other that synthetic fibers represent a scientific improvement over natural fibers.

3. Conduct a personal fiber inventory. Take note of every fiber you use during a twenty-four hour period. Make a list showing the fiber name and how it was used (For example: Nylon -- toothbrush bristles, cotton -- towel, wool -- slippers). If you cannot identify a fiber, list it as "unknown."

4. Devise a way to demonstrate to the class some of the properties of fibers. Show how various fibers handle moisture, static cling, and the absorption of oil. Demonstrate how fibers compare in strength, resistance to sunlight, and elasticity.

5. Very carefully conduct a flame test. Unravel several warp and weft yarns. Using tweezers, hold the yarn to the edge of a flame.

- If it smells like burning hair, the yarn is wool or silk.
- If it smells like burning paper, the yarn may be cotton, flax, or rayon
- If the yarn melts in the flame, it is a synthetic fiber such as acrylic.

Research Project

1. Prepare a report on the different types of cotton used in clothing. Explain why some types of cotton cost more and are considered a "premium." Be sure to mention Egyptian, Sea Island, and Pima in your report.
2. Prepare a report on the different types of wool used in clothing. Explain why some wools are so expensive and are considered premium fibers. Be sure to mention angora, mohair, camel, and vicuna in your report. Also explain why certain kinds of sheep are considered superior for their wool.
3. Below is a list of fibers that may not have been mentioned in the video. Select one and find out what it is made of, how it is used, and how it behaves (its properties). Find an example of the fiber (if possible) to post on a bulletin board with your one page report.

Acetate
Aramid
Asbestos
Avtex
Azlon
Camel hair
Carbon fiber

Fluorocarbon fibers
Glass
Hemp
Kapok
Metallic yarns
Modacrylic
Olefin

Polyethylene
Ramie
Saran
Sisal
Triacetate
Ultra Suede
Vinyon

4. Prepare a brief written and/or oral report on any one of the following topics:

Microfibers
Polypropylene
Wool production in the United States
New "space age" synthetic fibers
How the "secret" of silk production escaped China
The "hottest" fibers in today's fashions
How synthetic fibers changed everyday life

Properties of Natural Fibers

COTTON

- Comfortable to wear
- Natural, cellulosic fiber
- Made from cotton boll
- Absorbs water and "breathes"
- Slow to dry
- Resists static electricity build-up
- Wrinkles easily
- Can withstand heat, detergents, and bleach
- About 20% stronger when wet than dry
- Will shrink unless treated
- Can be damaged by mildew
- Can be damaged by prolonged exposure to sunlight
- Long staple cottons (such a supima, pima, Egyptian, and Sea Island) can be woven into smooth, almost silky fabrics.

LINEN

- Linen has been used for clothing for at least ten thousand years
- The Holy Shroud of Turin is linen
- Similar to cotton in its properties (both are natural, cellulosic fibers)
- Made from flax plant
- Linen fibers have a silky luster and a cool feel
- Fibers are in stem of plant (therefore called a "bast" fiber)
- Long fibers from 6 to 20 inches make linen even smoother than cotton
- Stronger than cotton
- Conducts heat away from the body better than cotton
- Wrinkles easier than cotton

WOOL

- A protein fiber
- Flame resistant (wool usually extinguishes itself when source of flame is removed)
- Weaker than cotton or linen, especially when wet
- Fibers range from one to fourteen inches long
- Most valued for its textured appearance and warmth
- Must be washed gently or dry cleaned
- Can be damaged by chlorine bleach
- Moths and carpet beetles eat wool
- Springs back into shape after being crushed
- Excellent insulator as woolens (80% air)
- Absorbs moisture which is held inside the fiber (the wool will still feel dry even on a humid day)
- Accepts dyes easily ("dyed in the wool")
- Quality of wool varies with the breed of sheep
- Does not attract dirt or static electricity

- Wool products labelling Act permits the word "wool" to be used for fibers from sheep, Angora or Cashmere goats, camel, alpaca, llama, and vicuna.

SILK

- A protein fiber
- Very long filament (up to a mile long)
- Spun by a caterpillar called a silkworm (but not actually a worm).
- Cultivated silk is from silkworms fed only mulberry leaves.
- Most valued for its "silky" feel
- Stronger than cotton or linen
- Damaged by chlorine bleach
- Sunlight can turn white silk yellow and weaken fibers
- Absorbs moisture
- Is resilient and elastic
- Does build up static electricity
- Dries quickly
- Perspiration can deteriorate and discolor dyes
- Requires delicate handling in cleaning
- Expensive

Properties of Synthetic Fibers

RAYON

- A cellulosic fiber usually made from wood pulp
- First manufactured fiber. Produced in 1911 but first known as "artificial silk"
- Stretches and shrinks more than cotton
- Poor abrasion resistance (easily damaged by scraping)
- Loses strength when wet
- Highly absorbent and dyes easily
- Best to dry clean or wash carefully because of shrinkage
- Fairly expensive
- Synthetic Fibers from Petrochemicals

POLYESTER, ACRYLIC and NYLON share these characteristics:

- Resists abrasion (but can "pill")
- Very resilient (springs back into shape)
- Resist wrinkling
- Very high heat can "melt" the fabric
- The right amount of heat can be used to permanently "heat set" a crease or pleat
- Easy to wash and wear
- Does not absorb water (can be uncomfortable when worn next to the skin in warm weather unless loosely woven)
- Dries quickly
- Attracts static electricity which also attracts dirt and lint
- Although they do NOT absorb water, they DO absorb oil and grease. This means synthetics resist soiling, but once an oil based stain soaks in, it can be difficult to clean.

NYLON

- Very light and strong. Stronger wet than dry, elastic and resilient. All these properties make nylon a popular choice for swimwear and outerwear.

POLYESTER

- Strong fiber (but nylon is stronger)
- Often blended with cotton or even wool to add crease resistance
- Polyester does not absorb water, but it can be produced in such a way (as in polypropylene and microfibers) as to "wick" water away from the skin

ACRYLIC

- Lightweight and fairly strong
- Acrylic can bulk to look like wool
- Drapes well and accepts dye easily

Clothing Fibers Quiz

True or False

1. Ancient Egyptians used both cotton and linen. T or F
2. Rayon was made to be an artificial silk. T or F
3. Wool is a hydrophilic fiber. T or F
4. Nylon was the first synthetic fiber made in the US. T or F
5. A silk fiber's smooth surface absorbs light. T or F
6. Natural fibers are uniform in size. T or F
7. You can always tell what a fabric is made of by looking at it. T or F
8. One of the components of acrylic is limestone. T or F
9. Natural fibers are extruded through a spinnerette. T or F
10. Cotton, wool, silk, and linen once were harvested by hand. T or F

Match the correct terms with the description

- | | | |
|-------|--|--------------|
| _____ | Used to make high end fabrics | 1) Linen |
| _____ | Seed Fiber | 2) Silkworm |
| _____ | Naturally flame resistant | 3) Nylon |
| _____ | Caterpillar | 4) Silk |
| _____ | Made of polyamides containing carbon, oxygen, nitrogen, and hydrogen | 5) Acetate |
| _____ | Made by reacting dicarboxylic acid with dihydric alcohol | 6) Fiber |
| _____ | The basic building block of fabric | 7) DuPont |
| _____ | Bast Fiber | 8) Polyester |
| _____ | Artificial wool | 9) Wool |
| _____ | Manufacturer of synthetic fibers | 10) Cotton |

Clothing Fibers

Quiz Answer Key

True or False

1. Ancient Egyptians used both cotton and linen. **I** or F
2. Rayon was made to be an artificial silk. **I** or F
3. Wool is a hydrophilic fiber. **I** or F
Wool absorbs water
4. Nylon was the first synthetic fiber made in the US. **I** or F
5. A silk fiber's smooth surface absorbs light. T or **E**
The surface reflects light
6. Natural fibers are uniform in size. T or **E**
Natural fibers vary in size
7. You can always tell what a fabric is made of by looking at it. T or **E**
One cannot always identify fibers by visual inspection alone
8. One of the components of acrylic is limestone. **I** or F
9. Natural fibers are extruded through a spinnerette. T or **E**
Synthetic fibers are extruded through a spinnerette
10. Cotton, wool, silk, and linen once were harvested by hand. **I** or F

Match the correct terms with the description

- | | |
|--------------|--|
| 4) Silk | Used to make high end fabrics |
| 10) Cotton | Seed Fiber |
| 9) Wool | Naturally flame resistant |
| 2) Silkworm | Caterpillar |
| 3) Nylon | Made of polyamides containing carbon, oxygen, nitrogen, and hydrogen |
| 8) Polyester | Made by reacting dicarboxylic acid with dihydric alcohol |
| 6) Fiber | The basic building block of fabric |
| 1) Linen | Bast Fiber |
| 5) Acetate | Artificial wool |
| 7) DuPont | Manufacturer of synthetic fibers |

Clothing Fibers

Multiple Choice Worksheet

Circle the best available answer for each of the following:

1) The harvesting of which natural fiber includes rippling, retting, and scutching:

- a) cotton
- b) silk
- c) wool
- d) linen

2) The most commonly used fiber in carpet:

- a) wool
- b) nylon
- c) rayon
- d) cotton

3) The only natural fiber that may be a filament:

- a) cotton
- b) polyester
- c) silk
- d) linen

4) Clothing labels are:

- a) required by law
- b) identify fabric contents
- c) both a) and b)
- d) none of the above

5) Cotton was domesticated in:

- a) Asia
- b) Africa
- c) South America
- d) all of the above

6) Rayon is made of:

- a) coal
- b) oxygen
- c) flax
- d) cellulose

7) The most commonly used synthetic fiber:

- a) nylon
- b) acetate
- c) rayon
- d) polyester

8) Acrylic is used to create:

- a) fake fur
- b) luggage
- c) sweaters
- d) all of the above

9) What makes a wool fiber strong:

- a) overlapping scales
- b) smooth fiber surface
- c) varying lengths
- d) none of the above

10) Fibers can be found in:

- a) hot air balloons
- b) sails
- c) tennis balls
- d) all of the above

Clothing Fibers

Multiple Choice Worksheet Answer Key

Circle the best available answer for each of the following:

- 1) The harvesting of which natural fiber includes rippling, retting, and scutching:
 - a) cotton
 - b) silk
 - c) wool
 - d) linen**
- 2) The most commonly used fiber in carpet:
 - a) wool
 - b) nylon**
 - c) rayon
 - d) cotton
- 3) The only natural fiber that may be a filament:
 - a) cotton
 - b) polyester
 - c) silk**
 - d) linen
- 4) Clothing labels are:
 - a) required by law
 - b) identify fabric contents
 - c) both a) and b)**
 - d) none of the above
- 5) Cotton was domesticated in:
 - a) Asia
 - b) Africa
 - c) South America
 - d) all of the above**
- 6) Rayon is made of:
 - a) coal
 - b) oxygen
 - c) flax
 - d) cellulose**
- 7) The most commonly used synthetic fiber:
 - a) nylon
 - b) acetate
 - c) rayon
 - d) polyester**
- 8) Acrylic is used to create:
 - a) fake fur
 - b) luggage
 - c) sweaters
 - d) all of the above**
- 9) What makes a wool fiber strong:
 - a) overlapping scales**
 - b) smooth fiber surface
 - c) varying lengths
 - d) none of the above
- 10) Fibers can be found in:
 - a) hot air balloons
 - b) sails
 - c) tennis ball fuzz
 - d) all of the above**

Clothing Fibers

Vocabulary Worksheet

Match the words in the first column to the best available answer in the second column.

- | | | |
|-------|---|------------------|
| _____ | Long, continuous strands measured in yards or meters | 1) hydrophobic |
| _____ | A process to add bulk to a fiber | 2) dry spinning |
| _____ | Dissolved polymers are extruded into warm air | 3) Cellulose |
| _____ | A natural fiber (raw cotton, wool, hemp, flax) that can be twisted to form yarn | 4) bast fiber |
| _____ | Repelling, tending not to combine with, or incapable of dissolving in water | 5) air-texturing |
| _____ | Cotton fibers | 6) Staple fiber |
| _____ | Fibrous chemical found in all plants | 7) boll |
| _____ | A strong woody fiber obtained chiefly from plants | 8) scutching |
| _____ | The breaking up and separating of the woody portions of flax stems from the retted fiber by means of rollers. | 9) Lint |
| _____ | A seed pod about the size of a golf ball | 10) filament |

Clothing Fibers

Vocabulary Worksheet *Answer Key*

Match the words in the first column to the best available answer in the second column.

- | | |
|------------------|---|
| 10) filament | Long, continuous strands measured in yards or meters |
| 5) air-texturing | A process to add bulk to a fiber |
| 2) dry spinning | Dissolved polymers are extruded into warm air |
| 6) Staple fiber | A natural fiber (raw cotton, wool, hemp, flax) that can be twisted to form yarn |
| 1) hydrophobic | Repelling, tending not to combine with, or incapable of dissolving in water |
| 9) Lint | Cotton fibers |
| 3) Cellulose | Fibrous chemical found in all plants |
| 4) bast fiber | A strong woody fiber obtained chiefly from plants |
| 8) scutching | The breaking up and separating of the woody portions of flax stems from the retted fiber by means of rollers. |
| 7) boll | A seed pod about the size of a golf ball |

Glossary

Air-texturing	The air-texturing process transforms flat multi-filament yarns into yarns with a spun like character
Bast fiber	a strong woody fiber obtained chiefly from the phloem of plants and used especially in cordage, matting, and fabrics
Blend	A fabric made by combining two or more fibers. For example, cotton and polyester are often blended for clothing. A blend does not mean alternating threads of cotton and polyester; it is made of blended threads
Boll	The seed-bearing capsule of certain plants, especially cotton
Boll weevil	A small, grayish, long-snouted beetle (<i>Anthonomus grandis</i>) of Mexico and the southern United States, having adults that puncture cotton buds and larvae that hatch in and damage cotton bolls
Carding	Carding separates and straightens the fibers. Fine wires perform a brushing function during carding
Cellulose	The main component of plants. Cotton and rayon are cellulosic fibers
Dry spinning	a fiber-forming process in which a solution of polymer dissolved in solvent is extruded; the fiber coagulates as solvent evaporates
Filament	A single thread of fiber
Fabric	A general term referring to any material that is woven, knitted or made into cloth
Fiber	A hairlike unit of raw material from which cloth is made. Cotton, wool, polyester, etc. are fibers
Flax	A straw-like plant. The fibers in its stem are used to make linen, once called flaxen cloth. Most flax is grown in Belgium, France, Holland, and the Soviet Union.
Fleece	a.) The coat of wool of a sheep or similar animal. b.)The yield of wool shorn from a sheep at one time
Hand	1. The way a fabric feels. 2. small bundle of flax fibers
Hydrophilic	"water loving." Hydrophilic fibers absorb moisture. Cotton and wool are hydrophilic
Hydrophobic	Repelling, tending not to combine with, or incapable of dissolving in water
Lint	Cotton fibers

Linters	The short fibers that cling to cottonseeds after the first ginning. Often used in the plural
Loom	A machine used to weave yarns into cloth
Luster	the visual property of something that shines with reflected light
Melt spinning	the process of producing fibers by melting polymer chips and extruding the molten polymer in fiber form. Coagulation occurs by cooling
Natural fibers	Fibers which can be found in nature and made into yarn with only a few steps. The most used are wool, cotton, silk, linen, jute, and hemp
Polymer	Any of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule
Polyamide	A polymer containing repeated amide groups, as in various kinds of nylon
Raw wool	wool in its natural condition; not refined or processed
Retting	To moisten or soak (flax, for example) in order to soften and separate the fibers by partial rotting
Rippling	To remove seeds from with a comblike, toothed instrument
Roving	to stretch and twist (fibers) before spinning
Scutching	The breaking up and separating of the woody portions of flax stems from the retted fiber by means of rollers
Seed fiber	the fiber that grows from seeds
Sericulture	the breeding and raising of silk worms for the production of silk
Shearing	To remove (fleece or hair) by cutting or clipping
Silkworm	Any of various caterpillars that produce silk cocoons, especially the larva of a moth (<i>Bombyx mori</i>) native to Asia that spins a cocoon of fine, strong, lustrous fiber that is the source of commercial silk
Spindle harvester	also called a picker. It has drums with spindles that pull the cotton from the boll
Spinneret	A device resembling a showerhead used in the production of synthetic fibers. Syrupy liquid is forced through the holes and dried into fiber filaments. The size and shape of the holes help determine the properties of the fiber
Staple fiber	A <u>natural fiber</u> (raw cotton, wool, hemp, flax) that can be <u>twisted</u> to <u>form yarn</u>

Stripper harvester	A machine used to harvest cotton. It moves along rows of plants, passing them between revolving rollers or brushes that pull off the cotton
Synthetic fibers	Fibers that do not appear as a fiber in nature. Also called man-made or manufactured fibers. Common examples include polyester, nylon, and acrylic
Warp threads	In weaving, these are the threads placed on the loom first. They run lengthwise in the fabric. Filling, or weft, threads are woven over and under the warp
Wet spinning	a fiber-forming process in which the polymer is dissolved in a solvent and the solution is extruded into a chemical bath
Woolen	Wool is made into two types of cloth: woolens and worsteds. Worsteds are smooth and hard to the touch, woolens are soft and fuzzy. Worsted wool is made from long wool fibers that are twisted more tightly than woolen yarn