

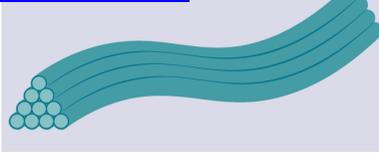
## Materials and their properties

### Textiles

**A: Fabrics** are used to make **textile** products - the most obvious ones are clothing and home furnishings, but they are also used in many other ways, such as medical applications, car interiors and engines, road and house building and safety **and security products**. There are many types of fabric available and each will be different depending on the fibre it is made from and the way the fabric is made. When choosing fabric it is important to select one that will perform well for the product being made.

Fibres are very fine hair-like threads and are the basic building blocks of fabrics. Fibres are either **natural** (from plant or animal sources) or **synthetic** (manufactured from oil-based chemicals). A fibre can be short, called a **staple fibre**, or a very long continuous length called a **filament fibre**. All natural fibres, except silk, are staple fibres. All manufactured fibres are filament fibres. Fibres have different properties according to where they come from.

filament fibre



staple fibre



#### B: Blended and mixed fibres

Most modern fabrics contain more than one fibre. This is because there is no such thing as a perfect fibre so manufacturers include different fibres in a **blend**.

Blending is achieved by spinning two or more fibres together to make a yarn. This enables a fabric to be made which will be better suited to the product. Some important reasons for blending fibres are:

- To help reduce the cost of the fabric
- To make the fabric stronger
- To make the fabric easier to care for
- To enable fabrics to be more crease-resistant
- To allow fabrics to be heat set

Polycotton is a blend of polyester fibres and cotton fibres. It can be printed or dyed, is easy to wash and is cheaper than cotton to buy.

Wool is often blended with nylon to produce a fabric which is soft, warm and has good strength and resistance to abrasion.

#### C: Natural fibres

Natural fibres can come from plant or animal sources.

- Cotton fibres come from the seed of a bushy plant grown in tropical parts of the world
- Wool is a hair fibre made from protein and comes mostly from sheep. Some luxury wools come from goats, rabbits and other furry animals
- Silk is a protein fibre that comes from the cocoon of the silk caterpillar

Natural fibre	Properties	Common uses
Cotton	Strong, good at absorbing moisture (this means they can take a long time to dry). Can be washed and ironed at high temperatures. Creases badly and shrinks unless a special finish is applied. Easy to set alight, so can be dangerous	T-shirts, socks and underwear, denim jeans, bed sheets, fishing nets, medical dressings, nappies
Wool	Soft and warm. Comfortable to wear; will not crease easily. Water-repellent, but also very good at absorbing moisture. Takes a long time to dry. Most wools will shrink if put in the tumble dryer. Does not set alight easily and when it does, it puts itself out. Shrinks badly (felting) and therefore difficult to wash unless a special finish is applied to prevent shrinking.	Jumpers, coats, socks, blankets, carpet, tennis balls, pool tables, mattresses
Silk	Fibres have triangular cross section that makes it soft and smooth and gives it a lustre. Lightweight, absorbent, warm in cold conditions but cool in hot weather. A strong fibre that becomes weak when wet so needs to be washed carefully. Has natural elasticity so can crease very badly. Expensive and often considered to be a luxury fibre.	Evening dresses, ties, lingerie, bedding, wall hangings, parachutes

#### D: Synthetic fibres

Synthetic fibres are manufactured from oil-based chemicals. Examples of synthetic fibres are polyester, polyamide and elastane.

Synthetic fibre	Properties	Common uses
Polyester	Very strong and resistant to abrasion. Does not absorb water so will dry quickly. Crease resistant. Will soften when heated (it is thermoplastic) and can be heat-set into new shapes that it will maintain when cooled down. Finishes can be added easily (for example, permanent pleats and creases). A smooth fibre that does not trap air, so is not very warm to wear.	Clothing, bedspreads, sheets, pillows, padding for upholstery, carpets, curtains, ropes, sails for boats
Polyamide (nylon)	Fine and lightweight but extremely strong and abrasion resistant. Does not absorb moisture, stays strong when wet. Not affected by alkalis but is weakened by bleach. Long exposure to sun will turn white nylon yellow and eventually rot the fabric. Thermoplastic so can be heat-set.	Underwear, shoe laces, tights, tents, parachutes, carpets, seatbelts
Elastane (Lycra is the most well-known elastane fibre)	Very stretchy (can stretch up to six times its length and then return to its original length), allowing it to fit close to the body and give freedom of movement. Because it is so stretchy it cannot be used on its own and needs to be blended with other fibres. Crease resistant. Easily washable. Absorbent. Resistant to perspiration and quick drying. Not very warm to wear.	Swimwear, sportswear, leggings, tights

# Materials and their properties

## Textiles

### E: Keywords

- Natural fibres: fibres from plant and animal sources
- Synthetic fibres: fibres manufactured from oil-based chemicals
- Blended/mixed fabrics: fabrics that contain two or more fibres

### F: Video and web-links

- GCSE bitesize: <https://www.bbc.com/bitesize/guides/zjgyb82/revision/6>
- How its made - fabric: <https://www.youtube.com/watch?v=v0C3EnTji3A>
- How its made - silk: [https://www.youtube.com/watch?v=eqFm\\_7KyfHI](https://www.youtube.com/watch?v=eqFm_7KyfHI)

### Revision Checklist

I know the primary source of materials for producing natural and synthetic fibres

I can recognise and characterise different types of natural and synthetic fibres

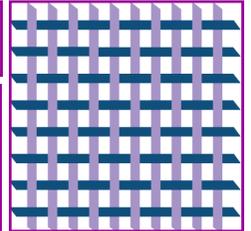
I understand how the physical and working properties of a range of natural and synthetic fibres affect their performance

I can recognise and characterise woven, non-woven and knitted fabrics

### G: Woven fabrics

Woven fabrics use a warp and weft yarn on a loom to interlock fibres.

Woven fabric	Physical properties	Working properties
Plain weave	Threads are woven in a simple under one, over one	Simple and cheap, strong and available in different thicknesses, when torn it rips in a straight line



### H: Non-woven fabrics

Non-woven fabrics are webs of fibres that are glued, compressed or melted together.

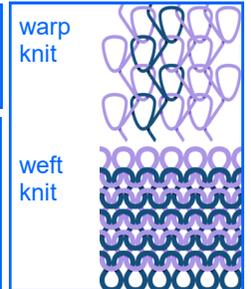
Non-woven fabric	Physical properties	Working properties
Bonded fabrics	Fibres are visible and random, often has small holes on the surface	Does not fray as it has no grain, not strong
Felted fabrics	Randomly matted fibres, often wool, available in many thicknesses and colours	Formed with moisture, heat and pressure, can be shaped as it has no elasticity or drape, used for hat making



### I: Knitted

Knitted textiles are made from rows of interlocking loops. They can be made from a variety of fibres, not just wool.

Knitted fabric	Physical properties	Working properties
Knitted fabrics	Can be warp knitted (straight lines) or weft knitted (knitted upwards), available in a variety of textures and colours, can have patterns knitted in.	Warm, stretchy and strong, tend to unravel when a hole is made, used in clothing and sportswear



### Test yourself

1. List three properties of cotton and name three products commonly produced from cotton.
2. Describe the differences between woven and non-woven fabrics.
3. Give two examples of synthetic fibres.
4. Fibres come as staple lengths or filaments. Which of the two is longer?