**Textile fibres**

* Fibre is a long, thin thread that is used in the manufacture of other materials, fibres are twisted together to make yarns and fabrics
* Fabric is a cloth material made by weaving or knitting fibres together
* Classification:
  + Natural fibre
    - natural vegetable
    - natural animal
    - natural mineral
    - asbestos
  + Man-made fibre
    - regenerated manmade fibre
    - synthetic
    - other

**Plant fibres**

* Cotton
  + It is a seed fabric, produced in the USA, India, China, Brazil
  + + strong, soft, easy to clean, keeps body cool in hot weather, absorbs moisture
  + – wrinkles, fades, shrinks, dries slowly
  + Can be washed, bleached, ironed, dry-cleaned
  + Use:
    - Clothing – shirts, socks, underwear
    - Home furnishing – rugs pillows, bed sheets
    - Cosmetics and medicine – cotton wool, pads, Q-tips
* Flax
  + Oldest fibre
  + Comes from the stem of flax plant
  + Produced in Belgium, Ireland, Poland, Slovakia
  + When made into fabric - Linen
  + + absorbent, smooth, stronger than cotton, dyes well, coolest fibre
  + – not elastic, wrinkles, not very tough
  + Can be washed, bleached, ironed
  + Use:
    - Clothing – suits, blouses, summer pants
    - Home furnishing – tablecloths, towels, bed sheets
* Jute
  + Long, soft and thin fibre extracted from the bark of Jute plant
  + It is a partially textile and wood fibre
  + + cheapest plant fibre, comfortable, biodegradable, strong, antistatic
  + – will rot, fades, is brittle
  + Can be hand washed or dry-cleaned
  + Use:
    - Bags, wrapping material, ropes, carpets, rugs
    - Geotextiles
* Bamboo
  + Comes from bamboo plant, that grows very rapidly
  + + soft, cheap, cool in summer, warm in winter, biodegradable, anti-bacterial
  + Can be hand washed or dry-cleaned
  + Use:
    - Bath towels, underwear or socks
    - Face masks, toothbrushes
    - Bedsheets, tablecloths
    - Hygiene materials, napkins, pads
    - Alternative to plastic

**Animal fibres**

* Silk
  + Produced by silkworm, fed on mulberry leaves, it produces liquid silk to form its cocoon
  + + soft, smooth, elastic, dyes well, resist wrinkles, luxurious in appearance
  + – expensive, decomposes in sun and moisture
  + Can be dry-cleaned or hand washed
  + Use:
    - Scarves, ties, hair accessories
    - Luxurious dresses, evening gouse, pyjamas, pillows, draperies, wall coverings
* Wool
  + comes from fleece of sheep, raised in Australia, China, New Zealand, Russia
  + + warmest fibre, comfortable for wear, strong, dyes well, durable, biodegradable, elastic, absorbent, natural heat insulator, fire resistant
  + – itchy, can be damaged by insects, some people are allergic to wool
  + Can be dry-cleaned or hand washed
  + Use:
    - Scarves, hats, coats, sweaters, socks, active sportswear
    - Rugs, carpets, blankets
    - Cosmetic pads
    - Thermal and acoustic insulation

**Man-made fibres**

* Are created by a process called POLYMERIZATION
* Scientists can make man-made fibres in a lab
* 3 categories:
  + Synthetic
    - Polyester, nylon, elastane
    - Are made from chemicals
  + Regenerated
    - Viscose, rayon
    - Are made by transforming natural polymers through chemical-based process
  + Inorganic
    - Fibreglass
    - Are made from raw materials (carbon, petrochemicals)
    - Are cheaper to produce compared to plant fibres
* Polyester
  + Is a thermoplastic polymer
  + + lightweight, strong, weather resistant, easy to wash, resistant to stretching, shrinking, wrinkles, recyclable
  + – stains are hard to remove, melts at high temperature
  + Can be washed, dry-cleaned
  + Use:
    - Clothing – belts, trousers, outdoor clothing
    - Home furnishing – curtains, pillows, upholstery
* Nylon
  + Second most used fibre
  + + lightweight, stronger and softer than PES, elastic, shiny, water and stain resistant
  + – not recyclable, high temperatures melt nylon, it fades
  + Cold water wash, low temperature dying
  + Use:
    - Clothing – stockings, swimwear, raincoats
    - Parachutes, airbags, tents, ropes
    - Machine parts
* Acrylic
  + +lightweight, durable, soft, has warm and dry hand feel, greater insulating power than wool
  + – can form little balls on the surface (pilling)
  + Use:
    - Clothing – sweaters, sock, fleece jackets, sportswear
    - Home furnishing – blankets, rugs, carpets, upholstery
    - Industrial use – car batteries, filtration materials
* Rayon
  + Semi-synthetic – made of cellulose and chemicals
  + Alternative to silk
  + + highly absorbent, comfortable to wear, dyes easily
  + – shrinks, not very durable, catches on fire easily
  + Need to be dry cleaned
* Inorganic
  + Metallic fibre – can be drawn from metals such as copper, gold or silver and extruded from nickel, aluminium or iron
  + Carbon fibre – the body of mobile phones
  + Optical fibre/fibreglass – comes from natural raw materials (quartz, silica)

**Blends**

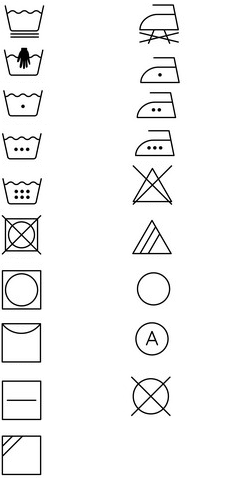
* Fabrics containing two or more fibres to combine the best qualities of each fibre
* Example: Polyester-Cotton blend contains the moisture absorbency of cotton and the strength and wrinkle-resistance of polyester

**Yarns and fabrics**

* Fibres are the raw materials from which yarns are made. This process is called spinning
* Yarns are converted to fabrics by weaving (on looms) or knitting (by hands or machines)
* 3 main types of fabrics:
  + Woven fabrics – from yarns
  + Non-woven fabrics – from fibres
  + Knitted fabrics – from yarns
* Fabric finishes
  + Colouring
  + Flame-resistant
  + Permanent or durable press
  + Stain resistant
  + Waterproof
  + Water-repellent

**Laundry care symbols**

* Pictograms written on labels and attached to clothing
* Provide care instructions – how to take care of clothing and linen
* The international community uses five basic shapes for washing, drying, bleaching, ironing, dry cleaning
* An X through any symbol means – DO NOT DO THIS!



No steam

Iron low heat

Iron medium heat

Iron high heat

Do not bleach

Non chlorine bleach

Dry clean

Dry clean – any solvent

Do not dry clean

Machine wash – gentle cycle

Hand wash

Not above 30°

Not above 50°

Not above 95°

Do not tumble dry

Tumble dry

Hang to dry

Dry flat

Dry in shade

**Buying a suit**

* A suit consists of jacket and a pair of trousers made of the same material
* Off the rack means ready-made suit
* Custom or made to measure (MTM) means it’s made by a tailor to fit your measurements out of different pre-cut pieces
* The most important measurements include:
  + Shoulders
  + Chest
  + Waist
  + Length of the entire jacket
    - Sleeves
    - Trousers
  + Man’s height and weight
* 10 suit buying rules
  + Decide the occasion
    - Special events
    - Everyday office use
  + Set your budget
  + Choose the fabric
    - Tweed or cashmere
    - Wool
    - Blend of wool with synthetic fabric
    - Synthetic fabric (Polyester)
  + Choose the colour
    - Navy
    - Charcoal
    - Gray
  + Choose function over fashion
    - Buttons (two buttons – great classic look)
    - Type of lapel (notched lapel) – the edges that point to the shoulders
  + Get the right fit and cut
    - Smooth across your back and comfortable in the shoulder area
  + Suit jacket sleeves length
    - The sleeve should go to your wrist-bone and show the shirt cuff when your arms are extended out in the front of you
  + Suit jacket’s length
    - The jacket should fall right around the middle of your hand
  + The trousers’ length
    - You can choose trousers of 4 types
      * No break
      * Quarter break
      * Half break
      * Full break
  + Match your shoes
    - The black Balmoral Oxford shoes are the most formal shoe style (closed lacing)
* Most modern suit nowadays



**Leather, footwear and fur**

* Leather
  + A material from the skin (hide) of animals. It is usually processed from animals which were bred for meat production
  + The most common domestic animal sources:
    - Cow
    - Pig
    - Sheep
    - Goats
  + The most common wild animal source:
    - Kangaroos
    - Stingrays
    - Crocodiles
    - Snakes
  + Properties of leather:
    - Flame resistant
    - Long lasting
    - Extremely durable and flexible
    - Some types are water resistant
    - Natural insulator
  + Skin (leather) has 3 layers
    - Epidermis, dermis, hypodermis
    - For leather manufacturing – the top layer epidermis is removed
  + Types of leather
    - Only three kinds of leather are generally considered good quality
    - Full grain leather
      * The best quality, no imperfections
      * Luxurious accessories are made of it
    - Top grain leather
      * Second highest quality
      * Has a velvety surface
    - Split leather
    - Semi-aniline leather (leather jackets)
    - Pigmented leather (car upholstery)
    - Aniline leather – luxurious accessories, bags, wallets
    - Nubuck leather – jacket, bags, shoes
    - Suede – gloves, jackets, shoes
    - Kidskin – gloves
* Leather processing
  + Preservation (Salts are used for curing the leather)
  + Rewetting (Water makes the skin soft)
  + Dehairing (Hair is removed using lime and other chemicals)
  + Tanning (Vegetable and chrome tanning)
  + Drying for several days
  + Roll pressing (Mechanical process to shape and smooth the leather)
  + Finishing (Chemical treatments to colour, soften and apply a surface finish to the leather)
* Tanning
  + Chemical process that converts animal hides and skins into leather (removing hair, proteins and fats, impregnation and finishing phase)
  + Tanning materials:
    - Vegetable (extracts from the bark and wood of trees) – chrome-free leather
    - Mineral (chrome salt) – chrome tanned
    - Combination of vegetable and chrome – latigo leather
* Leather products
  + Sports articles – balls for football, rugby
  + Watch straps
  + Belts
  + Military equipment – holsters for fire arms
  + Stationary articles – writing pads, book covers, camera cases, spectacles cases, jewel cases, mobile phone holsters
  + Travel goods – suitcases, travel bags, sport bags
  + Pocket or small leather goods – wallets, purses, key pouches, pen cases
  + Handbags

**Footwear**

* Refers to garments worn on feet
* Boot and shoe factories usually locate close to leather-producing areas
* 3 main parts of shoe:
  + Upper – top of the shoe – leather, rubber, synthetic material
  + Lining – inside part – wool, polyamide fabric or sheepskin
  + Sole – rubber or plastic
  + Sometimes laces – horsehair or synthetic fibres
* Shoe size- US: 8.5, UK: 7.5, EU: 42, 26,0 cm
* Classification of footwear:
  + Men’s shoes
  + Women's shoes
  + Unisex shoes
  + Children shoes
  + Sports footwear
  + Working footwear
  + Special footwear (diabetes, orthopedic)
* Leather haberdashery
* Gloves
* Bracelets
* Key chains
* Phone cases
* Pen cases
* Handbags
* Care for leather
  + Keep leather away from direct sunlight
  + Always keep leather away from indoor heating appliances
  + Use soft cotton cloth, avoid using chemicals
* Synthetic/vegan leather
  + Polyurethane PU leather
    - Is blend of artificial chemicals and it resembles natural leather
  + Polyvinylchloride PVC leather
    - It does not contain natural leather at all
* Evaluation of leather
  + Different countries have different norms, standards
  + Evaluation between real and fake leather
    - Subjective
      * Senses
        + Eyesight
        + Touch
        + Smell
    - Objective
      * Laboratory
        + Moisture test – real leather absorbs moisture
        + Fire test – it smells of burnt hair

**Fur**

* Fur clothing is made of furry animal hides
* Pelts are obtained from fur farmers of hunters
* People use fur to make hats, jackets, coats, rugs or carpets
* Characteristics of fur:
  + Durable, long lasting
  + Soft, fragile
  + Excellent insulating properties
* Types of fur
  + Beaver – very durable - hats
  + Fox – needs regular cleaning - coats
  + Mink – the majority of pelts, very durable
  + Chinchilla – the softest and most luxurious fur
  + Muskrat – used for making fur hats
  + Rabbit – affordable, average durability
  + Stroat – used for royal fur coats
  + Seal – very warm and nearly waterproof, used for coats
  + Wild animals – coyotes, wolves, bobcats, lynxes
* Fur processing
  + Means obtaining fur from animals
  + Making of furs into garments is called furriery
  + Much of the process is done by hand
  + It contains of 2 steps:
    - 1. Preservation
      * Air drying, salt and brine curing
    - 2. Fur dressing
      * Includes washing, tanning, drying, cleaning, finishing)
* Fur products
  + Coats, Parkas, Vests
  + Ski mittens, Gloves
  + Stoles, Scarves
  + Purses, Wallets
  + Boots, Slippers
  + Bags, Hats
  + Accessories
  + Rugs
* Evaluation of fur
  + Technical norms provide us with requirements on quality of fur used for clothing
  + When evaluating we have to consider
    - Overall appearance
    - Quality of pelts
    - Length and density of hairs
    - Flexibility, colouring etc.
  + Real fur
    - Pointed ends
    - Animal skin base
  + Faux fur
    - Blunt ends
    - Woven fabric base
* Environmental impact
  + Various chemicals are used in leather and fur industries
  + Huge carbon footprint of cattle rearing
  + Synthetic chemicals pollute water, soil
  + Odours and gas emissions pollute air
  + Possible solutions
    - Use of environmental friendly chemicals
    - Recycling and reuse of waste water
    - Conversion of solid waste into useful products

**Glass**

* An amorphous solid material – in between the crystalline and the liquid state
* Its molecules are arranged in irregular pattern
* Pros:
  + Visible transmittance
  + Optically transparent
  + Weather and rust resistant
  + Dustproof and waterproof
  + Safe packaging material
  + Insulator of electricity
  + Colour availability
  + Recyclable
  + UV stable
* Cons:
  + Brittleness
  + Heat transparency
  + Fragile
* Raw materials
  + Major
    - Quartz/silica sand
    - Soda ash
    - Limestone
  + Minor
    - Dolomite
    - Crushed/recycled glass (cullet)
    - Boric acid, lead oxide, sodium oxide (to get coloured glass)
* History of glass
  + The first manufactured glass material appeared 6000 years ago
  + 1st Century B.C. – glass blowing begins (blow pipe was developed)
  + By the 16th Century – glass was made all over Europe
* Glass processing
  + 3 steps
    - Fusion of raw materials
      * The raw materials are weighed and mixed together to form the BATCH. Later broken glass is added to lower the temperature. The batch is melted in a furnace.
      * The furnaces are usually electrical, gas-fired, or oil-fired. The temperature varies from 1500°C to 2800°C according to the type of product.
    - Working with molten glass
      * Blowing (automatic blowing – bottles, lamp bulbs, traditional hand blowing)
      * Casting (large pieces of glass – mirror)
      * Drawing (Windows – thin sheets of glass)
      * Pressing (glass bricks, lenses)
      * Rolling (wired and plate glass)
    - Annealing
      * Annealing of glass is a process of slowly cooling down hot glass objects after they have been formed (glass will break when cooled suddenly)
      * In glass manufacturing, a special type of furnace, a Lehr is used for this process
      * Glassware moves through the oven’s zones on a conveyor belt
      * After annealing the glass can be cut, drilled, sized and polished for use
    - Finishing
      * Cleaning
      * Griding
      * Polishing
      * Etching
      * Engraving
      * Sandblasting
      * Cutting
      * Painting
    - Coloured glass
      * Red coloured glass can be obtained by adding selenium sulfide
      * Blue glass can be obtained by adding copper oxide
      * Milky glass can be obtained by adding alumina or phosphate
    - Types of glass
      * According to the melting point
        + Soda glass – soft glass - melting temperature of batch is 1300°C, bottles, windows
        + Quartz glass – hard glass - melting temperature of batch is 1500°C, wine glasses, electrical bulbs
        + Pyrex glass - melting temperature of batch is 1700°C, baking Jena dish, laboratory glass ware
      * According to chemical composition
        + Silica glass
        + Soda-lime glass – bottles
        + Flint glass (lead glass) – optical lenses
        + Borosilicate glass – glassware in kitchens and laboratories
        + Alumo-silicate glass – screen of smartphones
      * Decorative and technical glass
        + Lead crystal glass – it sparkles, expensive glass ware
        + Technical

Chemical – glassware in laboratories

Optical – cameras, lenses, glasses

Building – windows

Safety – car glass, wired glass

Glass fibres – surfboards, helmets, canoe

* + - Future of glass
      * Functional integration of glass that can become an ideal substrate for OLED lighting, touch screens, etc.
      * Bioactive glass – include the original bioactive glass, bioglass, implant materials in the human body to repair and replace diseased or damaged bones
      * Smartphones – bendable glass, scratch resistance
      * Special coatings for buildings: Smart mirrors and highly insulating glass windows
    - Testing
      * Impact testing
      * Thermal shock resistance
      * Physical inspection
      * Stress testing

**Ceramics**

* Origins of ceramics
  + Word ceramics derives from the Greek word keramos/keramikos, meaning “a potter” or “made of clay”
  + One of the oldest human crafts
  + The oldest ceramic object discovered is the statue of Venus
  + The potter’s wheel has become a tool for creating pottery (Mesopotamia, 6000-4000 BC)
* Raw materials
  + Plastic base
    - Ball clay
    - Stoneware clay
    - Kaolin
  + Fluxes (tavivá)
    - Silica
    - Feldspar
    - Talc
  + Fillers (ostrivá)
    - Limestone
    - Other
  + Colours/dyers
    - Metal oxides
* Pottery products
  + Earthenware
    - Brown, orange
    - Are fired at 1000 to 1200 °C
  + Stoneware
    - Off white to grey
    - 1100 to 1300°C
  + Porcelain
    - White, very brittle
    - 1200 to 1400°C
* Basic processes
  + Preparation of powders
  + Forming and shaping
    - Hand-building
    - Potter’s wheel
    - Granulates pressing
    - Injection moulding
    - 3D Printing
  + Drying
    - More stressful than firing
    - Many varieties of dryers such as band, batch and tunnel, they are used together with electrical and bottle kilns
  + Firing
    - It undergoes chemical changes
* Finishing processes
  + Application of glaze
  + Glost firing
  + Decoration
* Ceramic materials
  + Are inorganic, non-metallic materials
  + Are formed by heating and subsequent cooling
  + Properties of ceramic materials
    - Extreme hardness
    - Brittleness
    - Heat and corrosion resistance
    - High melting temperature
    - Very good chemical and thermal stability
* Types of ceramics
  + According to the porosity
    - Porous ceramics (ball clay, kaolin, bentonite)
    - Non-porous ceramics (adding feldspar)
    - Hard ceramics (+ flint, quartz)
  + According to the usage
    - Utility ceramics
      * Products for baking, storing or serving food made mostly of porcelain and pottery
    - Decorative ceramics
      * The emphasis is on the artistic side
      * Vases, candlesticks, ashtrays
      * Folk ceramics – jugs, plates for hanging
    - Technical ceramics
      * Used for technical purposes
      * Divided into
        + Building ceramics – bricks, tiles
        + Chemical stoneware – pumps, pipes, sinks
        + Sewage ceramics – waste water drainage
  + According to the assortment
    - Whiteware
    - Redware
  + Other classifications
    - Traditional ceramics
      * Normally made of clay, silica and feldspar
      * Products:
        + Pottery
        + Tableware
        + Stoneware
        + Tiles
        + Bricks
        + Electrical porcelain
    - Advanced ceramics
      * Developed over the past 60 years
      * Special type of ceramics – electroceramics (optical, magnetic), nuclear and bioceramics (teeth, bones and joint replacements)
* Ceramics in Slovakia
  + The influence of HABANS (came from Alpine countries)
  + HABAN faience – a fine glazed earthenware used for ornamental and decorative purposes.
  + Our territory – 16 – 17th century
  + MAIOLICA - glazed ceramics with white background
  + Centres of ceramics in Slovakia:
    - Modra – white base glaze, flower ornaments
    - Sladice – similar to Modra and Haban faience
    - Ľubietová – brown base glaze, white ornaments
    - Pozdišovce – black base glaze, typical dance ornaments
* Chinese porcelain
  + Chinese were far ahead of the rest of the world
  + JINGDEZHEN – the birthplace of Chinese porcelain, 1000 B.C. (TANG Dynasty)
  + Greatest development during HAN dynasty (206 B.C. – 220 A.D.)
  + Classification
    - BONE China – lower firing temperature, cow bone ash is used – milky white colour, smoother glaze, more expensive
    - FINE China – no bone content, heavier in weight, offwhite

**Light sources**

* Light characteristics
  + Intensity
  + Direction
  + Polarity
  + Coherence
  + Wavelength
  + Light travels in form of waves
  + The amount and type of lighting directly affects our appetite, mood and daily life
* Division of light sources
  + Natural light sources
    - Include sun, stars, fire and electricity in storms
    - There are animals which can create their own light like fireflies, jellyfish
  + Artificial light resources
    - Are created by humans
    - Flashlights, table lamps, neon signs and televisions
    - Most of the light which are man-made need an energy source such as electricity or batteries to produce light
    - We divide into:
      * Electrical light source
        + They convert electrical current into visible light
      * Spot lights
        + Allow room lighting to suit individual needs
        + Bathroom, kitchen
      * Surface lights
        + Street lights
        + Sodium, LED or mercury vapor lights
        + Energy efficient, Eco-friendly
        + Rather expensive
    - Incandescent light bulbs
      * 19th century technology
      * Inventor – T.A. Edison
      * Generate light by heating the metal filament
      * Have been forbidden in EU since 2009
      * Advantages
        + Low price
        + Simple
        + Cheap to manufacture
      * Disadvantages
        + They often overheat
        + 90% of energy is wasted
        + Very low efficiency
        + Short lifetime (1000 hours)
        + High electricity consumption
      * Halogen lamps
        + Incandescent lamps that run in higher temperature
        + The gas inside the bulb is halogen-based (iodine, bromine, xenone)
        + They have been forbidden in EU since 2018
    - Compact fluorescent lamp (CFL)
      * Energy-saving lamps
      * They have 2 electrodes in a glass tube
      * Use electric current to stimulate mercury vapor inside the lamp
      * Advantages
        + Various colours
        + Use less energy
        + Last 8-15 times longer (10 000 hours)
      * Disadvantages
        + Relatively expensive
        + Not eco-friendly – contain toxic mercury
        + Emit ultraviolet (UV) radiation
    - Discharge lamp (výbojka)
      * HID lamps – high intensity discharge lamps
      * Vapor lamps for lighting large areas, headlights of cars and aircrafts
    - LED lamps/stripes
      * Electric current passes through a semi-conductor
      * Have tiny crystals of gallium instead of gas and one or more light-emitting diodes
      * Have 50 times longer life (50 000 hours)
      * Low power consumption
      * Are available in various colours

**Electrical appliances**

* Electrical/mechanical devices use or generate electricity and transform it into another form of energy
* They usually accomplish household functions, such as cooking, cleaning or entertainment
* Basic types:
  + Electrothermal (ET)
  + Electromechanical (EM)
* Classification of home appliances
  + Major appliances = white / heavy appliances
    - ET
      * Cooker
        + A standard cooker can have 4 burners and up to 2 ovens
        + Types:

Gas – uses natural gas, propane, butane

Ceramic

Electric – an electric powered device

Induction – requires special material of cooking vessels – ferromagnetic metal such as cast iron or stainless steel

Cook stove – heated by burning wood, charcoal, animal dung

* + - * Fridge
        + It uses electricity to preserve food at a cold temperature (from 3 to 7 °C)
        + It consists of a thermal insulated compartment and a heat pump that transfers heat from its inside to its external environment
        + Heat pump:

Mechanical

Electronic

Chemical

* + - * + History

1930s – Not flammable synthetic refrigerant such as Freon-12 were introduced.

However R-12 damaged the ozone layer.

Since 1990 less harmful tetrafluoroethene (R-134) has been in common use.

Nowadays, the most common used coolant is R-600a, or isobutane.

* + - * + How it works:

Compressor – heart of the fridge (it circulates the refrigerant throughout the system and makes it hot)

Condenser – the refrigerant is cooled down inside and condenses here – it turns from a gas back into a liquid

Evaporator

Capillary

Thermostat

* + - * + Types of fridges:

Compressor fridge

The most common type

The most efficient

Give greatest cooling effect

They make a noticeable noise

Absorption fridge

May be used in caravans, trailers and places without electricity

Is powered by gas, kerosene or 12V batteries

Solar fridge

They do not use refrigerants

Use ammonian as the working gas and solar panels

American style fridge

Very spacious

Popular for its unusual features, e.g. ice maker, instaview, built-in camera, SodaStream

Magnetic fridge

They work on the magnetocaloric effect

* + - * + Special features

Auto-defrost, self-defrosting – it regularly defrosts the evaporator

Adjustable shelves and trays

Door locks and alarms

In-door ice maker, coffee maker

Smart fridges knows what kind of products are being stored inside and keep a track of the stock through barcode or RFID scanning

* + - * + Energy label – shows the energy efficiency scale A-G
        + Noise emission class
        + Total volume of a fridge/freezer in litres
      * Freezer
        + A refrigerated cabinet or room for preserving food at very low temperature
        + It is designed to hold food at -18°C for a long term storage
        + The majority of freezers are bottom freezers, having the freezer compartment below the refrigerator compartment
        + Basic types:

Upright freezer

Under-counter freezer

Chest freezer

Drawer freezer

* + - * + Special features:

Fast freeze function

No frost/frost free

Temperature alarm

Freezer defrost

* + - * + Rating system:

\* -6°C

\*\* - 12°C

\*\*\* -18°C

\*\*\*\* -18°C (with fast freezing function)

* + - * Oven
        + Electrothermal appliance based on the generation of heat by passing current through a conductor
        + Types:

Built-in oven

Free-standing

Steam oven

Light oven

* + - * + Gas ovens are more expensive to purchase than electrical ovens, but they cost less to run
        + Special features:

Dehydration options

Touch screens

Speed cooking

Wireless connection

Ventilation

* + - * Dishwasher
        + The first dishwasher woth electric motor was invented by Miele in 1929
        + Mechanical machine that cleans off dishes through spraying bursts of hot water (45°C – 75°C) and detergent at the dishes
        + How does it work:

Mix of water and detergent is pumped to one or more rotating spray arms.

Once the wash is finished, the water is drained, and the rinse cycle begins.

After the rinse cycle finishes and the water is drained, the dishes are dried.

* + - * + Advantages

More efficient than hand washing – it uses around six times less energy, water and detergent

Saves your energy – you may wait several days for it to be full before running it

* + - * + Disadvantages

You cannot wash certain items in a dishwasher (made of wood, aluminium, children’s dishes with design, fine china dishware)

* + - * + Special features

Anti-flood protection

Fan or auto-open

Adjustable plate racks

Height-adjustable baskets

Cutlery tray

Child lock

Sensor-assisted wash cycles – adjust the wash duration to the number of dirty dishes

* + - * + Types of dishwashers:

Built-in

Double

Portable

Countertop

* + - * + Energy label – water and energy rating, the new labe shows the energy consumption in kWh/100 washing cycles
      * Water heater
      * Heating appliances
    - EM
      * Washing machine
        + An electrical appliance used to wash laundry
        + Early Miele washing machine with a mangle (probably 1930)
        + How does it work:

There are 2 drums, one inside the other

Bigger drum holds the water while the inner drum (in a front loader) or the agitator (in a toploader) rotates

Operation of washing machine is split into 3 cycles:

Wash cycle – here clothes are washed in water with detergent

Rinse cycle – here dirt which is separated from clothes is drained

Dry cycle – here clothes are made to be dried

* + - * + Types:

Top-loading

Have shorter cycle times

Operate more quietly

Easy to add clothes

Use more water, energy, and washing detergent

Cost more to run

Front-loading

They usually use less energy, water and detergent

Their maximum spin speeds are higher – up to 2000 RPM (revolutions per minute)

More expensive and louder

* + - * + Special features

Delayed start

Predefined programmes for different laundry types

Variable temperatures, including cold wash

Time remaining indication

Rotation speed settings

Wi-Fi connectivity

Child lock

Steam washing

* + - * + Energy label – Washing performance and spin efficiency are graded in the range A – G, other information include noise level of spinnig cycle, maximum wash time and capacity
      * Grass mower
      * Vacuum cleaner
  + Small appliances
    - ET
      * Electrical kettle
      * Coffee maker
      * Deep fryer
      * Grill
      * Toaster
      * Curling iron
      * Hair straightener
      * Microwave oven
        + Used mainly for defrosting, cooking, heating or melting
        + Advantages:

Melting and defrosting process is easy

Heating is simpler, without burning

Cooking time is shorter

* + - * + Disadvantages

Not suitable for all food

Certain cookware can’t be used

* + - * + Inside the solid metal box, there is a microwave generator called a magnetron
        + Magnetron tube – converts high voltage energy into electromagnetic energy
        + Microwaves aren’t dangerous because she electromagnetic waves stop as soon you cut off the power and open the door, and they don’t remain in the food and make it radioactive
        + Microwave radiation is not dangerous to humans, but can sometimes cause interference to Wi-Fi and Bluetooth
    - EM
      * Blender
      * Food processor
      * Grinder
  + Consumer electronics
    - Devices for entertainment
      * TV
      * DVD player
      * Game console
      * Remote control cars
    - Devices for communication
      * Smartphone
      * Headphones
      * Laptop
      * Tablet
    - Devices for home-office activities
      * Desktop computer
      * Printers
      * Paper shredders
* Energy label
  + Provides information about the product’s energy consumption and other specific data (the product’s noise, emissions, or water consumption)
  + A new generation of labels was released on 1st March 2021
  + Changes:
    - The QR code
    - The rescaled energy efficiency class
    - The annual energy consumption

**Plastics**

* The word comes from Greek word “plastikos” meaning capable of being shaped or moulded
* Main ingredient polymers
* All plastics are based on carbon, most plastics are derived from fossil fuel-based chemicals (natural gas or oil)
* Properties of plastics:
  + Pros:
    - Lightweight, flexible and durable material
    - Non-corrosive material, easily moulded
    - Safe and tough packaging material
    - Strong, non-reactive to air and water
    - Resistant to heat, chemicals, oil and grease
    - Low processing cost
    - Good insulation and low thermal conductivity
  + Cons:
    - Poor mechanical strength
    - Both the production and recycling of plastics pollute the environment
    - Difficult disposal after use (natural decomposition lasts very long and some are non-degradable)
    - Plastic materials affect water bodies like oceans, seas, lakes
    - Many animals consume plastic products and are dying
* Classification of plastics
  + By their behaviour in the manufacturing process:
    - Thermoplastics:
      * Do not undergo a chemical change in their composition when heated, can mould several times
      * Example: PP, PE, PVS and PS
    - Thermosets:
      * Can melt and mould into any shape only once, they cannot be returned to their original state
      * Example: Rubber, acrylic, silicone
  + Commodity plastics:
    - Six major types
    - They are masked with a triangle of 3 “chasing” arrows, with a number giving the plastic type (3 parts of recycling process – Collection, remanufacturing and resale)

1. PET (PETE) – polyethylene terephthalate
   * + - Use: soda bottles, water bottles, polyester film, containers for food, jars, fibre for clothing
       - Recycled: Commonly – into fleece, fiber, bags, furniture, carpets
2. HDPE – high-density polyethylene

* Use: detergent containers, plastic bottles, piping for water and sewer, snowboards, boats
* Recycled: Commonly – into detergant/oil bottles, pens, floor tile, drainage pipe

1. PVC – polyvinyl chloride
   * Use: Window frames, plumbing products, electrical cable insulation, clothing, medical tubing
   * Recycled: Rarely – never burn PVC
2. LDPE – low-density polyethylene
   * Use: Shopping bags, plastic bags, clear food containers, disposable packaging
   * Recycled: Sometimes – into trash bind and cans, compost bins
3. PP – polypropylene
   * Use: laboratory equipment, automotive parts, medical devices, food containers
   * Recycled: Sometimes – into brooms, brushes, pallets, trays
4. PS – polystyrene
   * Use: CD and DVD cases, packing peanuts, single-use disposable cutlary trays
   * Recycled: Rarely – sometimes into insulation, egg cartons, foam packing
5. Other types (PUR, PES, ABS, Polyerethane, Polycarbonate, Lexan)
   * Use: Baby feeding bottles, car parts, water cooler bottles, sippy cups
   * ABS Use: Monitor/TV cases, coffee makers, cell phones, calculators, most computer plastic, lego bricks
   * Recycled: Sometimes – Custom-made products