# Y10 Smart and Modern Textiles Knowledge Organiser

## SMART TEXTILES

Smart fibres and materials interact and adapt to you and the environment around them to create "Micro-environments". They are often referred to as "sense and react" materials. Smart textiles can be divided into three groups:

- MICRO-ENCAPSULATION
- PHOTOCHROMIC INKS
- THERMOCHROMIC INKS

## TECHNICAL TEXTILES

Technical textiles are fabrics and fibres that are developed for their unique properties. They function as electronic devices and sensors. Technical textiles can take the form of:

- INTEGRATED CIRCUITS
- WEARABLE ELECTRONICS
- INTEGRATED WEARABLE ELECTRONICS

## MICRO-ENCAPSULATION

Tiny bubbles that contain scent or chemicals are incorporated into materials. The scent or chemicals are released or activated with heat or friction.

## THERMOCHROMIC INKS

Clothing or textile items printed with thermochromic inks change colour according to wearer and environment. They react to changes in temperature such as body heat or boiling water.

The inks are effectively colourless without the application of heat and turn into vibrant colour once activated.

When the body or general temperature of the product reduces, the inks become clear again.

## PHOTOCHROMIC DYES

Photochromic dyes or inks change colour when exposed to Ultra violet sunlight. They are able to alter from colourless to intense colour after only 15 seconds in direct sunshine and return to clear after about 5 minutes indoors. They are used as an indication to how much UV rays the wearer/user is exposed to.

## PHASE CHANGING MATERIALS (PCM)

Phase changing materials (PCM) when incorporated into clothing have to ability to interact with changes in the wearer's body temperature. Phase changing materials are able to transform from solid to liquid and back whilst storing and releasing heat, large amounts of heat are absorbed and released. This is commonly known as phase change.

## WEARABLE ELECTRONICS

**PURPOSE:** Devices integrated into the garments that allow the wearer/user to listen to music or use mobile phones. Wearing computers as an extension of your body was first seen in 1980's films like Robocop and terminator. Fabrics have recently been developed to make this a reality.

### INTERACTIVE TEXTILES

Interactive textiles, fabrics and materials contain electrical circuits or conductive fibres that enable them to conduct electronics and power so that we are able to communicate and work through the use of smart textiles. Interactive textiles have advanced from miniaturization of computers to the development of computers integrated into garments and textiles. The power needed to operate the devises can be in the form of solar power, battery and human power. They are referred to as: **Intelligent clothing and wearable electronics,**

### INTERGRATED WEARABLE ELECTONICS

Most wearable electronic garments/items available on the market feature either permanent or removable electronic functions. This concept has its use; however the ultimate breakthrough in wearable electronic is the full integration of electronics into fabrics from which clothing can be made.

**PURPOSE:** to aid communication or detecting locations.

## SIGNALLING TEXTILES

**PURPOSE:**
Signalling textiles are used to make reflective garments that help the wearer to be seen in darkness. Glass beads are integrated within the fabrics. They are unrecognisable in daylight, and are reflective only when light is directed on them.

## GEO TEXTILES

**PURPOSE:**
Geo textiles can be natural and synthetic, bonded or woven. In the past geo textiles have been mainly used for civil engineering such as road maintenance and construction. However recent usage has been broadened to include to protection of agriculture crops.

## NANOTECHNOLOGY

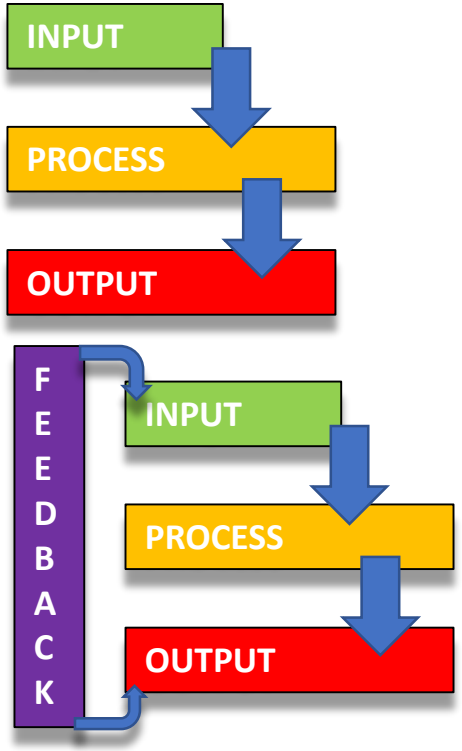
**PURPOSE:**
Nanotechnology enhances fabrics molecularly without compromising their comfort qualities. This is a comparatively new area of textiles, individual atoms are manipulated and located in the desired structures resulting in the development of new textiles: fabrics that are spill or static resistant, stain or moisture resistant.

# Y10 Electronics Knowledge Organiser

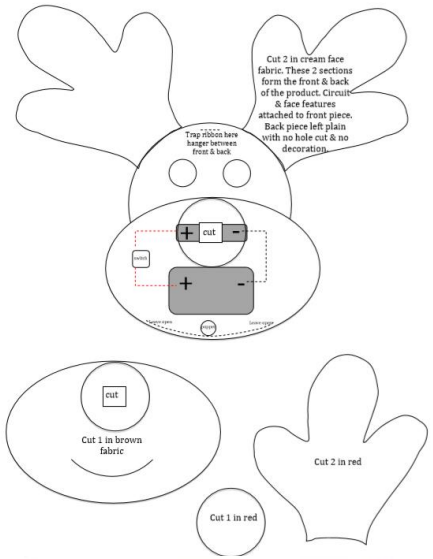
All **SYSTEMS** have an **INPUT**, **PROCESS**, **OUTPUT**

- This **SYSTEM** is often known as a ***OPEN LOOP SYSTEM***
- The **INPUT** directly controls the **OUTPUT**
- The **OUTPUT** cannot influence the **INPUT**
- ***A room heater remains on until it is manually switched off regardless of the temperature.***

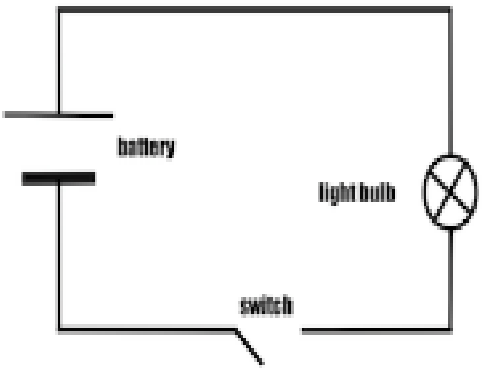
- A ***CLOSED LOOP SYSTEM*** is able to make a decision using **FEEDBACK** usually from a sensor
- The **OUTPUT** can influence the **INPUT**
- ***A room heater may be switched On or OFF when it reaches a certain temperature. The sensor here is the THERM0STAT.***

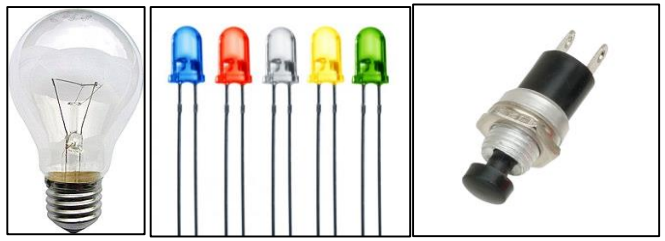


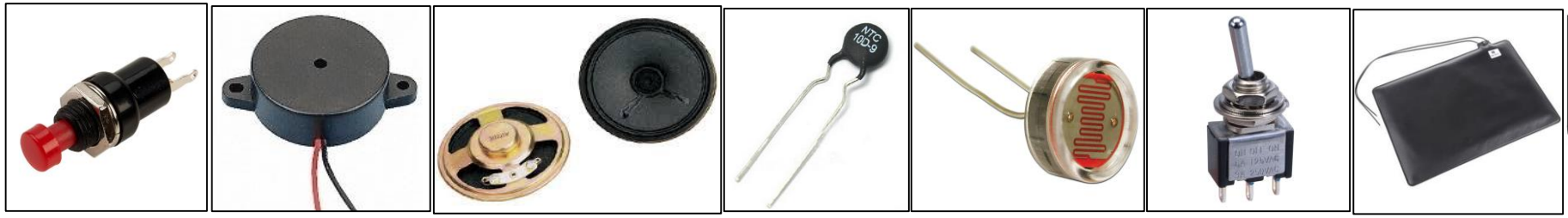

## The Make




## Simple Electric Circuit





## Electronic circuit symbols