

Year 8 Resistant Materials Knowledge Organiser

Design for maintenance and repair



Advantages of repairable products and those that can be maintained:

Can be updated, to be more efficient, lengthening their useful life time.
It is cheaper to repair than replace an entire product.
Repairable products are environmentally friendly

A **standard component** is a pre-manufactured product that is used in the manufacturing of another product. As well as saving time, using a standard component can ensure a consistent product is produced. Users can remove standard fittings to help them repair or replace parts. **Nuts, bolts, washers, zips, buttons** are just some examples.



CAD - Computer aided design.

2D Design, Google Sketch-up

Advantages

- Easy to make changes
- Show clients 3D models of your idea
- Files can be emailed across the world instantly
- You can test your idea in a virtual environment

Disadvantages

- Software can be expensive
- You need training



CAD Tools

Large Tool Set

- | | | | |
|-------------------|--|-------------------|--|
| Select (Spacebar) | | Make Component | |
| Paint Bucket (B) | | Eraser (E) | |
| Line (L) | | Freehand | |
| Rectangle (R) | | Rotated Rectangle | |
| Circle (C) | | Polygon | |
| Arc | | 2 Point Arc (A) | |
| 3 Point Arc | | Pie | |
| Move (M) | | Push/Pull (P) | |

Computer aided manufacturing machines

Laser cutter



3D printer



Accurate, can be used to make multiple copies



Design movement: A design movement is a group of designers with a common cause view or idea who then produce designs based upon their views or ideas. Memphis Design movement, Art Deco, modernism and Art Nouveau are examples from the 20th century.

Input Components



These devices form the crucial control needed for a product to operate. Most input components need to be bought but some can be manufactured especially for a project. For instance, a pressure sensor.

Light dependent resistors (LDRs) are a type of variable resistor whose resistance increases with light.

Switches are simple input devices which allow electrical current to flow when pushed.

Motion sensors use infrared to detect changes in the environment to activate the system.

Thermistors are a type of variable resistor whose resistance changes when it becomes hot or cold.

Process Components



These devices are used in combinations to turn the signal from the input component into the signal to the output component. Careful designing and a good knowledge of the way circuits are designed is crucial

Resistors limit current flow in an electronic circuit and have to be placed before some components to prevent damage.

Capacitors store charge in circuits and release charge when the circuit is off.

Integrated circuits (ICs) are manufactured for many different uses and functions. A tiny circuit is encased in silicone (a semiconductor material). Although they look complex, they follow the same logic as simple circuits. Because of their reduced size, smaller products can be achieved as more technology can be made to fit into smaller spaces.

Microcontrollers are tiny integrated circuits used widely in automatically controlled devices such as engine management in cars. These can be combined with drivers to control devices such as motors. Raspberry Pi and BBC micro:bit computers are examples used in schools.

Output Components

The output is the end function of the product. In most cases, the output can be classed as light, sound, motion or a combination of two or more functions.

Light emitting diode (LED) come in different colours and levels of brightness. They have replaced the filament bulb in many everyday uses.

Light bulbs are not as widely used because of LEDs in an everyday context but minilight bulbs do not require soldering, so can still be useful.

Buzzers use electric current to create their own sound. Used in alarm systems.

Speakers allow a sound signal from a circuit to be amplified.

Motors are magnetic devices and are behind nearly all moving parts in electronic systems.

Solder



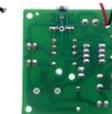
Soldering iron



Side cutters



Tenon saw

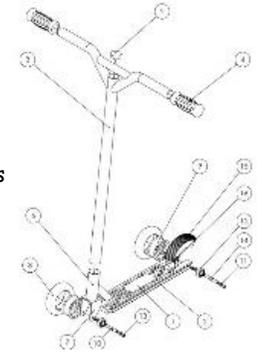


Printed circuit board. Electronically connect components using copper tracks.

A **hazard** is any source of potential damage, harm or risk.

A **precaution** is a measure taken to prevent something dangerous or harmful happening

Exploded drawings show how a product is assembled. Each component is usually labelled.



Soldering is a permanent addition method for electronic components.

Short-circuit In a circuit, often as the result of a solder bridge, electricity will flow in the shortest path back to the battery.

Insulator A material that does not conduct electricity and can therefore be used as a coating to components, circuit boards and wires. PVC is an example.

Conductor A material which allows heat or electricity to pass through it easily. Copper is an example.

