TECHNOLOGY

Processing

Hoërskool Gerrit Maritz
District D4

2009

Grade 8

Learner ________________________________

Teacher ___ ________________________________
<table>
<thead>
<tr>
<th>Date</th>
<th>Contents</th>
<th>LO 1</th>
<th>LO 2</th>
<th>LO 3</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Investigate:</strong></td>
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<td></td>
<td><strong>Case Study 1:</strong> Combination of</td>
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<td>textiles</td>
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<td>specific properties</td>
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<td><strong>Case Study 3:</strong> Verbetering raw</td>
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<td><strong>Resource Task 3:</strong> Packaging</td>
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<td>Specifications</td>
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<td>Possible ideas</td>
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<td>Final design</td>
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<td><strong>Make</strong>:</td>
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<td><strong>Evaluation</strong>:</td>
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<td></td>
<td>Strong &amp; weak points</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Improvements &amp; changes</td>
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<td>#</td>
<td>#</td>
<td>5</td>
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<td></td>
<td>Total</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>100</td>
</tr>
</tbody>
</table>

Total: 100
**CAPABILITY TASK**

In this module you are going to make a portfolio file in which you can keep your Technology documents. You will use the knowledge you will obtain about materials and the processing thereof in order to comply with the given specifications.

**The portfolio file must:**

- be strong / resist forces
- durable / last long
- keep your portfolio document neat and dry
- be at least 350 x 250 x 60 mm
- be made of recycled paper / cardboard

To help you with your capability task you will complete Resource Tasks and Case Studies.

**INVESTIGATE**

Since the earliest times people used different materials to make articles. Clothes were made of animal skins, hammers were made of sticks and stones. Over the ages people learnt how to process materials to fulfill certain needs. Bones and stones were sharpened against rough surfaces to make knives and needles. Textiles were woven from wool. The development of technology created thousands of processing possibilities. Nylon is one of the first synthetic textiles which today has countless uses.

We are going to investigate different materials and how it can be processed to enhance its properties or to adapt it for specific uses.

**Materials**

Materials can be natural or manmade. Natural materials come from plants, animals or minerals.

**Resource Task 1:**

Date: _______________________

Place a checkmark in the correct columns to indicate where each material originates from. (Each material will have two checkmarks)

<table>
<thead>
<tr>
<th>Material</th>
<th>Natural</th>
<th>Manmade</th>
<th>Plant</th>
<th>Animal</th>
<th>Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>plastic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>copper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>leather</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pine wood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chipboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rubber</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Properties of materials

One of the most important questions that should be asked, before a product can be made, is what material will be used. Materials are chosen based on their properties and the purpose for which the product will be used. You would, for example, not use paper to make an umbrella, since an umbrella must be water resistant.

- **Stiffness**: how little distortion or deflection occurs when placed under pressure
- **Hardness**: ability to withstand being scratched, cut, or dented
- **Brittleness**: when material fractures with little or no deformation
- **Toughness**: resistance to impact
- **Ductility**: allows a material to be elongated or stretched without breaking
- **Elasticity**: can be stretched out of shape, but will return to original shape.
- **Flexibility**: if a material bends easily and does not crack.
- **Plasticity**: after pressing or squashing a material, the shape changes permanently.
- **Absorbent**: materials that suck up water easily.
- **Waterproof**: materials that seem to push water away, it just runs of the material.
- **Corrosion resistant**: resists corrosion (rust) or UV-rays of the sun.
- **Heat resistant**: will not burn or acts an insulator against heat.
- **Conducts electricity**: lets electricity pass through it.
- **Magnetic**: is attracted by a magnet.
- **Transparant**: can see through it.

Types of materials

**Metals**

*Ferrous metals* contain iron which rust and is magnetic. Examples: steel, iron

*Non ferrous metals* contain no iron, do not rust and is not magnetic. Examples: zinc, copper, silver

When two or more metals are mixed it is called an alloy. Metals are alloyed to obtain properties which are absent from pure metals. Examples of alloys are; brass, a mixture of zinc and copper, stainless steel is a composition of carbon, chrome, nickel and magnesium. Bronze consists of copper and tin.
Wood

Timberwood is very expensive and since it is a natural resource we should not abuse it. There are plantations which are grown with the purpose of supplying wood for wood products and paper. At these plantations fast growing trees are planted.

The terms hardwood and softwood do not refer to the wood, but to the leaves of the trees: Softwoods come from trees with needle-like leaves; the most common types are pine, spruce and larch. Hardwoods come from broad-leaved trees; they include oak, ash and beech from the temperate zones, and a wide variety of tropical hardwoods such as mahogany, meranti and jelutong. Not all hardwoods are hard - balsa is very soft.

Manufactured board

Manufactured board is made by glueing together layers of woodfibres of veneers. It is usually made with leftover wood and has mainly been developed for industrial use, since it is possible to make many similar sheets of board.

This type of wood is much cheaper than real wood, but because the appearance is not as attractive as the real thing, a veneer is often glued as a top layer.

Types of manufactured board are: plywood, laminated board, chip board, softboard, fibre board and softboard.

Composite materials

When two or more materials with different properties are combined, they form a composite material. The different materials work together to create a new material, which has the properties of both. The two materials can clearly be distinguished in the new composite material.

Examples:

Mud and straw bricks
Humans have been using composite materials for a long time in order to build our dwellings. Some of the earliest forms of building were built of mud bricks. Mud bricks work well when they are being compressed (compression forces) but a cake of mud is easily broken if it is bent (bending forces). This is because the act of bending places a tension force on one edge. At the same time as the mud block buildings were being built other people were making straw dwellings. Straw has a great deal of tensile strength (resistance to pulling forces) but it is very weak when crumpled. These early builders realised was that if straw, which has a good tensile strength was embedded in a block of mud, which has good compressive strength and left to dry the resulting brick would resist both tearing and squeezing. These composite bricks made excellent building materials.

Car tyres
Modern tyres are constructed of layers, which may include rayon cloth, steel bands and nylon belts all set in a matrix (binder) of rubber.

Concrete
Concrete is made from small stones and gravel called aggregate, sharp sand and cement. The small stone and gravel (aggregate) is the reinforcement and the cement is the matrix that binds it together. Concrete has good strength under compression but it is weak in tension. It can be made stronger under tension by adding metal rods, wires, mesh or cables to the composite. The concrete is cast around the rods. This is called reinforced concrete.

Veselglas
Consists of two distinct materials, a fibres of glass (ceramic), which is the reinforcement and a polymer resin called polyester, which serves as the matrix. The polyester resin polymer alone is brittle and has a low strength but when fibres of glass are embedded in the polymer it becomes strong, tough, resilient and flexible. It becomes an ideal material to make boat hulls, swimming pool linings, car bodies, roofing and furniture.
Textiles

Textiles have been used for clothes and shelters for hundreds of years. Much earlier animal skins and natural textiles like wool, cotton and silk were used. The development of technology has provided a great variety of manmade textiles for the modern day technologist. Examples are nylon, polyester, and acrylics.

Textiles are made by weaving or knitting fibres together, sometimes it is only squashed together and is kept together by the friction between the fibres. Some fabrics consist of layers which are bonded together and covered with plastic layer to make it water resistant. Strength of fabrics depends on the weaving methods and the type of fibre used. Other properties which are of importance are flexibility, water resistance, ventilation, isolation against heat and cold, wind resistance, shrinking and stain resistance. The properties of fabrics especially the strength, stiffness and tear resistance depends on the direction in which the force is applied.

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Absorption</th>
<th>Quick drying</th>
<th>Warm/cool</th>
<th>Burns easily</th>
<th>Elastic</th>
<th>Wrinkles easily</th>
<th>Strong when wet</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>wool</td>
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<td>no</td>
<td>warm</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>high</td>
</tr>
<tr>
<td>cotton</td>
<td>high</td>
<td>no</td>
<td>cool</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>average</td>
</tr>
<tr>
<td>silk</td>
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<td>yes</td>
<td>warm</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>high</td>
</tr>
<tr>
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<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>high</td>
</tr>
<tr>
<td>Rayon/viscose</td>
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<td>cool</td>
<td>Burns and melts</td>
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<td>no</td>
<td>yes</td>
<td>low</td>
</tr>
<tr>
<td>Nylon/polyester</td>
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<td>yes</td>
<td>warm</td>
<td>melts</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>low</td>
</tr>
<tr>
<td>acrylics</td>
<td>low</td>
<td>yes</td>
<td>warm</td>
<td>Burns and melts</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>low</td>
</tr>
</tbody>
</table>

Case Study 1:

Textiles are often mixed which means that there can be natural as well as synthetic fibres in clothes, carpets, curtains or upholstery. Look at the properties of the different textiles mentioned above and then discuss the reasons for the following combinations:

**Stretch denim**: 98% cotton, 2% acrylics

Tracksuit: 69% cotton, 31% acrylics
**Assessment**

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Study 1</td>
<td>Answers were logically planned and well structured and provide in-depth information</td>
<td>Answers planned that provide information to suit the aim of the task</td>
<td>Some answers were given but not all are applicable to the aim of the task</td>
<td>Incomplete or could not answer questions</td>
<td>10</td>
</tr>
</tbody>
</table>

**Packaging**

Thanks to modern technology and the discovery and development of different types of materials, packaging has improved vastly over the years, especially as far as food and perishable products are concerned, it is now much more convenient and safe.

**Purpose of packaging:**

- protects products against dust, moisture and bacteria
- Keeps the contents together for better transport and handling
- Gives information about the product, instructions, ingredients and sell by dates.
- Acts as advertisement to attract attention of possible customers.

**Designing packaging for fruit juice containers:**

**Specifications for packaging:**

- must keep light and oxygen out
- must provide resistance against transport and storing damage
- may not burst open or damage if it falls
- must pour easily
- may not be to expensive
- must be visible and attractive
- must preserve the product

**Material which was chosen**

Laminated cardboard boxes. The lamination consisting of:
- paper on the outside, since it can be printed and keep its shape.
• Polyethylene layer on the inside, because it is waterproof.
• Aluminium foil between the polyethylene and paper, because it does not let oxygen of light through.
• The cardboard is light, relatively cheap and can be shaped into a cube, which will take up little space when transported and on shelf displays.

Resource Task 2: Date: __________________________

The packaging for breakfast cereals must also comply with certain criteria. Make a list of 5 specifications the packaging should fulfill.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
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The making of cardboard packaging

Cardboard packaging is usually made from a single sheet of cardboard which is then cut according to a pattern. Tabs are also cut out to attach the parts to one another. The shape is determined by scoremarks according to which the cardboard is folded.

Resource Task 3: Date: __________________________

Find a small cardboard box like those used for medicine or quick soup. Carefully unfold the box and look at the pattern (also called the net or development) Draw the net in the space below and use dashed lines to indicate folds. Also draw the box in 3-D as it looked before you unfolded it.
<table>
<thead>
<tr>
<th>Assessment</th>
<th></th>
<th></th>
<th></th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aspect</strong></td>
<td><strong>Level 7</strong> (Mastered excellently)</td>
<td><strong>Level 6</strong> (Meritoriously mastered)</td>
<td><strong>Level 4</strong> (Adequately mastered)</td>
<td><strong>Level 2</strong> (Elementary mastered)</td>
</tr>
</tbody>
</table>

**Case Study 2**

Datum: ______________________

Do research and find out what the following items were made of or covered with and why. If you have access to the internet, you can visit the given webpages to find the answers.

**scuba gear (wetsuits)**

http://www.adventureholidaytravel.com/divinggear.html
http://en.wikipedia.org/wiki/Wetsuit
http://www.surfing-waves.com/wetsuit.htm

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Firefighter clothing

space shuttles
http://science.howstuffworks.com/question308.htm

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Level 5 (Substantially mastered)</th>
<th>Level 3 (Moderately mastered)</th>
<th>Level 1 (Not mastered)</th>
<th>Mark</th>
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<tr>
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<td>Answers were logically planned and well structured and provide in-depth information</td>
<td>Answers planned that provide information to suit the aim of the task</td>
<td>Some answers were given but not all are applicable to the aim of the task</td>
<td>Incomplete or could not answer questions</td>
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</tbody>
</table>

**Case Study 3**

On microscopic level fabric consists of fibres. Different types of textiles consist of different types of fibres. The fibres in fabrics like cotton, which come from plants are called cellulose. Fibres from fabrics like wool and silk, which are from animals, are proteins.

Fibres are strong in tension but weak in compression. They are only strong across the length, if you pull at them across the width they will tear. (Test is for yourself with an old piece of cloth)

The answer to the problem is composite materials:
One of the first fibre reinforced polymer composite materials which were made is the raincoat. In the middle of the nineteenth century a Scot by the name of Charles Macintosh came up with a clever plan. He took two layers of cotton and placed a layer of rubber in between. Cotton is a fabric which is used for comfortable clothes and the rubber makes it waterproof. To this day raincoats are referred to as macintoshes in England.

1. What happens if you tear fabric lengthwise? ____________________________________________
   ___________________________________________________________________

2. What happens if you tear fabric across the width? ____________________________________
   ___________________________________________________________________

3. How can you **reinforce** fabric? _________________________________________________
   ___________________________________________________________________

4. What is the purpose of a raincoat? _______________________________________________
   ___________________________________________________________________

5. What did Charles Macintosh use to make his raincoat waterproof? _________________
   ___________________________________________________________________

6. What other methods can you think of to waterproof something? _________________
   ___________________________________________________________________

7. Why do you think, did he use two layers of cotton? ____________________________
   ___________________________________________________________________

8. How can you reinforce paper? _________________________________________________
   ___________________________________________________________________

9. How can you waterproof paper? _______________________________________________
   ___________________________________________________________________

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect</td>
<td>Level 5 (Substantially mastered)</td>
<td>Level 3 (Moderately mastered)</td>
<td>Level 1 (Not mastered)</td>
<td></td>
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</tr>
<tr>
<td>Case Study 3</td>
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<td>Answers planned that provide information to suit the aim of the task</td>
<td>Some answers were given but not all are applicable to the aim of the task</td>
<td>Incomplete or could not answer questions</td>
<td>9</td>
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</table>
### Design Brief

<table>
<thead>
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<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulation of problem solving</td>
<td>Formulation of problem solving is clear and comprehensible.</td>
<td>Formulation of problem solving is reasonably clear</td>
<td>Formulation of problem solving is vague</td>
<td>Formulation of problem solving is incomplete and not relevant</td>
<td>5</td>
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</table>

### Specifications

<table>
<thead>
<tr>
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<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of specifications complete and relevant.</td>
<td>Specifications complete</td>
<td>A few specifications were given</td>
<td>Specifications incomplete</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
Possible ideas

Draw freehand 3-D representations of 3 possible solutions for the problem and briefly give pros and cons for each idea.

Pros and Cons: ____________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Pros and Cons: ____________________________________________
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__________________________________________________________________________
Pros and Cons: 

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<table>
<thead>
<tr>
<th>Aspect</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 5 (Substantially mastered)</th>
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<th>Level 3 (Moderately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible ideas</td>
<td>Ideas very neatly drawn, labels added. All pros and cons mentioned. Chosen idea very well motivated.</td>
<td>Ideas reasonably neatly drawn, labels added. Pros and cons mentioned. Chosen idea motivated.</td>
<td>Ideas not neatly drawn labels added. Few pros and cons mentioned. Chosen idea not clearly motivated.</td>
<td>Incomprehensible drawings of ideas. Pros and cons incomplete. Weak motivation of chosen idea.</td>
<td>10</td>
<td></td>
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</tbody>
</table>

**Final Design**

Date: __________________________

Give final information regarding your product and make the required drawings.

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___________________________________________________________________
Make a first angle orthographic drawing of your product and indicate dimensions.

Draw 3-D representations of your product. Make use of exploded drawings and labelling to explain your idea in detail.
### Assessment

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final design</td>
<td>Working drawing and 3-D drawing is done and labeled.</td>
<td>Parts of the working drawing and 3-D drawing have been omitted.</td>
<td>Working drawing and 3-D drawing are incomplete.</td>
<td>Working drawing and 3-D drawing are neat and is labeled.</td>
<td>10</td>
</tr>
</tbody>
</table>

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**MAKE**

**Flow diagram**

Date: ______________________

Draw a flow diagram to show your workmethod, time, tools equipment and materials.

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**Make a list of your equipment, tools and materials.**

<table>
<thead>
<tr>
<th>List item</th>
<th>List item</th>
<th>List item</th>
<th>List item</th>
<th>List item</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Assessment</td>
<td>Level 7 (Mastered excellently)</td>
<td>Level 6 (Meritoriously mastered)</td>
<td>Level 4 (Adequately mastered)</td>
<td>Level 2 (Elementary mastered)</td>
</tr>
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<td>------------</td>
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<td>----------------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Aspect</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Flow</td>
<td>List of tools and materials is detailed</td>
<td>List of tools and materials is complete</td>
<td>List of tools and materials is not quite complete</td>
<td>List of tools and materials is incomplete</td>
</tr>
<tr>
<td>diagram</td>
<td>Flow diagram is logical and comprehensible.</td>
<td>Flow diagram is logical and but a bit sketchy.</td>
<td>Flow diagram is not logical or comprehensible.</td>
<td>Flow diagram is incomprehensible.</td>
</tr>
</tbody>
</table>

**Project**

*Paste a picture of your project here*

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Level 7 (Mastered excellently)</th>
<th>Level 6 (Meritoriously mastered)</th>
<th>Level 4 (Adequately mastered)</th>
<th>Level 2 (Elementary mastered)</th>
<th>Level 1 (Not mastered)</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Project</td>
<td>The project is strong, can withstand forces, will have an increased lifespan. Documents will be kept neat and dry. The size is at least 350 x 250 x 60 mm. Was made of recycled paper/cardboard.</td>
<td>The project is reasonably strong, can withstand forces, will have an increased lifespan. Documents will be kept neat. The size is at least 350 x 250 x 60 mm. Was made of recycled paper/cardboard.</td>
<td>The project is not very strong, can withstand forces to a certain extent, will not have an increased lifespan. Documents will be kept neat. The size is not at least 350 x 250 x 60 mm. Was not made of recycled paper/cardboard.</td>
<td>The project was not done or is incomplete. The measurements does not comply to the specifications. Documents can not be kept neatly in the folder.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Aspect</td>
<td>Level 7 (Mastered excellently)</td>
<td>Level 6 (Meritoriously mastered)</td>
<td>Level 4 (Adequately mastered)</td>
<td>Level 2 (Elementary mastered)</td>
<td>Level 5 (Substantially mastered)</td>
<td>Level 3 (Moderately mastered)</td>
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</tr>
<tr>
<td>Evaluation</td>
<td>Relevant evaluation criteria. Useful ideas to improve product.</td>
<td>Reasonable evaluation criteria and ideas to improve product.</td>
<td>Evaluation criteria unclear. Ideas to improve product irrelevant.</td>
<td>No evaluation criteria. Ideas to improve product incomplete.</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
Help with projects

**Scoring**

Try using an empty ballpoint pen or a safety magic cutter to score card before folding.

**Folding**

1. Thick card sheets glued onto base board
2. Ruler
3. A home-made folding board


http://www.sln.org.uk/d&t/Datalife/

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**Strengthening**

By laminating – sandwiching stronger layers.

By folding

Corrugated card


http://www.sln.org.uk/d&t/Datalife/
Cutting

Take extreme care when using a craft knife. Use with a safety rule and cutting board.

Rotary cutters
- wave cutter
- perforation cutter
- rotary cutter

Circle cutters

Punching

Card drill

Hole punch

Joining

Lacing
- staples
- double-sided tape
- paper, card, fabric, sticky tape
- paperclip
- glue
- string or thread

http://www.sln.org.uk/d&t/Datafile/