Resistant Materials
Year 9 Homework Booklet

Name:

Teacher:

Form:

- This book is your property, if you lose it you must buy a new one
- Bring it to each lesson

I will get my homework marked at the start of each lesson.

For my technical knowledge I need to know:

- How to spell the word correctly
- What the meaning is
- How and where it is used

Homework 1:Research the different roles within a product development company.

Understand the roles of:

- The client
- The designer
- The manufacturer
- The user
- Explore how they would interact with each other

Homework 1: Research the different roles within a product development company.

A health food restaurant named 'Healthy Foods' would like to redesign the furniture in their children's area.

Question	Answer	Marks
Describe the role of the **client**, in the product development of new tables and chairs?		2
Describe the role of the **designer**, in the pro duct development of new tables and chairs?		2
Describe the role of the **manufacturer,** in th e product developm ent of new tables and chairs?		2
Describe the role of the **user**, in the product development of new tables and chairs?		2

Homework 2 : Select a designer from the list below and then research the following areas.

Design movement choices:

- Marcel Breuer
- Norman Foster
- William Morris
- Charles Rennie Mackintosh
- Ettore Sottsass
- Philippe Starck

Research:

About the style of their work

The different materials they have used

Different technologies (manufacturing processes)

Homework 2: Chosen designer

Question	Answer	Marks
Name the designer and 1 piece of their work?		1
What inspiration did they use in their work?		2
What type of technologies did they use in their work?		2
What type of traditional materials did they use in their work?		2

Homework 3: Research different types of plastics

Research a range of different types of plastics:

- Include what type of categories of plastic they are from (thermosetting thermoplastics)
- Their properties
- Where they are used

Homework 3: Plastics

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>Tick the correct categories?</td><td>
<table>
<tr><th>Material</th><th>Use</th><th>Thermoplastic</th><th>Thermosetting plastic</th></tr>
<tr><td>Acrylic (PMMA)</td><td>Car indicator lens</td><td></td><td></td></tr>
<tr><td>Polyethylene terephthalate (PET)</td><td>Fizzy drink bottle</td><td></td><td></td></tr>
<tr><td>Melamine formaldehyde (MF)</td><td>Kitchen worktop</td><td></td><td></td></tr>
<tr><td>Low-density polyethylene (LDPE)</td><td>Plastic carrier bag</td><td></td><td></td></tr>
<tr><td>Urea formaldehyde (UF)</td><td>Electric socket</td><td></td><td></td></tr>
</table>
</td><td>5</td></tr>
<tr><td>Name the category of plastic that has been used to manufacture a margarine tub?
Margarine tub
  </td><td></td><td>2</td></tr>
<tr><td>Explain why this category of plastic has been chosen?</td><td></td><td>3</td></tr>
<tr><td>Name the category of plastic that has been used to manufacture an electrical socket?
Electrical socket
  </td><td></td><td>1</td></tr>
</table>

Homework 4 : Research Biomimicry

Research:

- What is biomimicry
- What products are inspired by biomimicry features
- Look why it has been used and what it improves.

Homework 4 : Research Biomimicry

Question	Answer	Marks
What is Biomimicry?		1
Give an example of a product where biomimicry has been used and how it has been used?		2
Compare the two images, what biomimicry links does a bird have with an airplane?		4

Homework 5 : Research different metal processes

Research a range of different types of metal:

- Include what type of categories of metal they are from (Ferrous and Non Ferrous)
- Explore how to enhance metal with regards to alloying
- Their properties
- Where they are used

Homework 5: Metal processes

Question	Answer	Marks
Describe a ferrous metal?		1
Describe a non-ferrous metal?		1
Describe an alloy?		1
Name an alloy and where it can be used?		2

Homework 6:Research advantages and disadvantages of CAD

Research:

- What different design programs can be used for CAD designs
- What are the advantages of using CAD
- What are the disadvantages of using CAD

Homework 6: CAD

Question	Answer	Marks
Computer based tools are helpful to designers when modelling. Discuss how a designer might use the internet?		2
Computer based tools are helpful to designers when modelling. Discuss how a designer might use shape and form?		2
Computer based tools are helpful to designers w hen modelling. Discuss how a designer might use non-destructive testing?		2
Computer based tools are helpful to designer s when modelling. Dis cuss how a designer might use social media?		2

Homework 7: CAM

Research:

- What different machines can be used for CAM
- Explore rapid prototype machines, laser cutter and milling machines in detail
- What are the advantages of using CAM
- What are the disadvantages of using CAM

Homework 7: CAM

Question	Answer	Marks
Computer based tools are helpful to designers when modelling. Discuss why designers would make a mock-up of a final design?		2
Computer based tools are helpful to designers when modelling. What machine could be used to create a model?		2
What are the advantages of using CAD and CAM?		2
What are the disadvantages of using CAD and CAM?		2

Homework 8: Electronics

Research:

- What materials conduct electricity
- What materials don’t conduct electricity
- Health and safety issues around using a soldering iron

Homework 8: Electronics

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>Give two reasons why copper wire is used to connect electrical components.</td><td>Reason 1:

Reason 2:</td><td>2</td></tr>
<tr><td>Name the material that is used to cover the copper wire. Explain why this material has been used.</td><td>Material

Explanation</td><td>2</td></tr>
<tr><td>The process of soldering can be a dangerous activity. Complete the table</td><td>
<table>
<tr><th>Health and safety issue</th><th>Hazard</th><th>Precaution</th></tr>
<tr><td>The tip of the soldering iron gets hot.</td><td>.....
.....
.....
(1 mark)</td><td>.....
.....
.....
(1 mark)</td></tr>
<tr><td>Soldering gives off fumes.</td><td>.....
.....
.....
(1 mark)</td><td>.....
.....
.....
(1 mark)</td></tr>
</table>
</td><td>4</td></tr>
</table>

Homework 9: Applying a finish

Research:

- Finishes that can be applied to woods
- Finishes that can be applied to metals
- Preparing the surface
- Applying the finish

Homework 9: Applying a finish

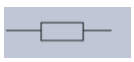
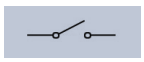
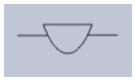
Question	Answer	Marks
Use notes to describe how you would prepare the surface prior to applying a finish? 		2
Use notes to describe how you would apply varnish to the surface of a material?		2
Use notes to describe how you would apply multiple layers of varnish to the surface of a material?		2
Explain why a galvanised finish has been applied to a steel watering can		2

Homework 10 :Topic test revision

Research:

- Electronic components- soldering
- Circuit diagrams
- Advantages and disadvantages of CAD/CAM
- Biomimicry
- Product analysis
- Metals categories -properties-use
- Enhancing metals via alloying
- Plastics categories-properties-use
- Woods categories -properties-use
- Designers

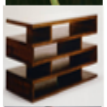
Homework 10 : Topic Test

Question	Answer	Marks
What does each letter stand for in ACCESS FM?		7
What are the three main groups of woods?		3
What is the difference between a ferrous and non ferrous metal?		2
What is an alloy, give an example and use?		2
What three colours are used when laser cutting and what are they used for?		6
What component controls the flow of current through a circuit?		2
What is a thermosetting plastic, give an example and use?		2
What are the circuit symbols below?	     	6
Total	30	

Year 9 RM Knowledge Organiser H/W

Design movements:
Product age as a result from the exhibition, manufacturers realised that product designers were needed.
Arts and craft 1890-1910 products are functional, natural materials, organic form, nature and expensive. William Morris.
Art Nouveau 1880-1914 designs are intricate linear, flowing curves, elongate, natural floral forms. Mackintosh
Bauhaus 1920- innovative, contemporary, functional, steel, wood, glass, black, white, brown and grey. Walter Gropius.
Art Deco 1920-1939 brought together several movement, geometric shapes, chevron patterns, sunburst motifs. Clarice Cliff.
Memphis 1981-1988 aesthetics rather than function, bright colourful shocking pieces, Ettore Sottsass.





Materials:
Wood-hard-soft-manufactured
Hard-deciduous trees-grow slower-grain closer-expensive
Oak attractive grain, light brown in colour, furniture
Soft-coniferous tress-grow fast-cheaper-grain far apart
Pine easy to work with, knotty, light in colour, simple joinery
Manufactured-fibres and resin-large sheets-don't warp, cheaper, environmentally friendly
Plywood strong, layers, with the grain opposite, inner panelling
Metal-ferrous-non ferrous-alloy
Ferrous-contain iron, prone to rust are magnetic
Mild steel tough, high tensile strength, railway tracks
Non ferrous- no iron, isn't magnetic and doesn't rust
Aluminium ductile, soft, malleable and lightweight, ladders
Alloy-mixture of two or more different metals, to enhance
Plastics-thermoplastic-thermoset
Thermoplastic- can be reheated and reshaped.
ABS-tough material, lightweight, toys
PP- hygienic, used for food containers
PET- hygienic- used for plastic bottles
Thermoset-cannot be reheated/reshaped
UF-tough, durable, plug sockets

USING CAD Advantages
It is quick to produce/ saving money
It can be easily modified/do not need to redraw the design
It can be rendered to look like it is made in any material/ so you can visualise how it will look.
It can be emailed anywhere in the world/saving the time and expense of postage
It can be transferred to manufacture/saving time and money
It can be shared instantly with the client/reducing the time it takes to get a successful design
Disadvantages
Initial set up costs is expensive/design software are expensive
If there is a fault, your work can be lost/costly in terms of time/ money
Your idea can be hacked/ideas stolen
You need good IT skills to design in 3D/employing a different workforce or retrain the existing workforce

Soldering
Soldering iron- tip gets hot, used to heat up the legs of components, to join the solder.
Wires-
Rubber outside- doesn't conduct heat or electricity
Copper wire- good conductor or electricity, flexible

Research:
Primary- you have completed yourself.
Secondary- using someone research they have conducted.
Product analysis: ACCESSFM
Aesthetics, **C**ost, **C**ustomer, **E**rgonomics, **S**afety, **S**ustainability, **F**unction, **M**aterial.

Specification: a detailed description of the design and materials used to make something, this is based on the research conducted.
Evaluation: Designers evaluate their finished products or prototypes in order to test whether they work well and if the design can be corrected or improved.

Biomimicry: Designs that are inspired by nature
Example Anglepoise lamp:
George Carwardine-biomimicry inspired-muscles
Lamp to stretch and bend like an elbow, tension springs work the same as the biceps and triceps, when the lamp is lowered, one spring is relaxed, while the other is in tension.

CAM:
Computer aided manufacture
Examples: laser cutter, 3d printer
Advantages-quicker, less waste, accurate, consistency, efficiency and safer.
Disadvantages- initial set up costs are high, staff require retraining, loss of technical skills

Client: The client will ask the designer to produce ideas for the tables and chairs.
The client will fund the project.
Designer: The designer will produce ideas, the designer will research the needs of the user, present a range of ideas to the client, they will liaise with the manufacturer to find the most efficient method of manufacture.
Manufacturer: The manufacturer will make the product, The manufacturer will make the product to the specification
User: The users are the person that will use the product, the user will test the product.

Finishes:
Wax protects like a varnish against knocks, scuffs and scratches. The difference is in the finish - It leaves your wood looking and feeling natural.
Gloss Paint are generally more resistant to damage than flat paint, more resistant to staining, and easier to clean, adds colour to the material.
Matt Paint dull rather than shiny, adds some protection, adds colour to the material.
Linseed oil adds protection, enhances the grain, dries quickly.
Varnish is a transparent, hard, protective finish or film that is primarily used in wood finishing but also for other materials.
Stain achieve a great deal of different colours, which can be very helpful when matching your wood to existing or planned decorations.
Decoupage decorates the exterior of the product with images, these images can be protected by using glue or resin.

Electronics:
Polarised indicates whether a circuit component is **symmetric** or not.
Non-polarised a part without polarity, can be connected in any direction and still function the way it's supposed to function.


Resistor non polarised, determines the flow of current through a circuit.



Electrolytic Capacitor polarised, stores energy and releases it when needed.



Speaker polarised, converts electrical energy into sound



Battery snap polarised, a connection from the circuit to the power supply.



Slide switch polarised, when switched this allows the circuit to work.



LED (light emitting diode) polarised, converts electrical energy into light.



Buzzer polarised, converts electrical energy into sound.


Lamp polarised, converts electrical energy into light.



Motor polarised, converts electrical energy into rotary motion.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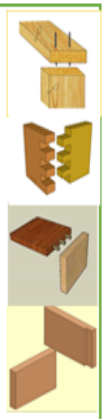
Box wood joints:

Butt joint a weak joint, held together with glue and pins.

Finger joint interlocking joint, with a larger surface for gluing, strong.

Dowel joint easy to produce, uses aligned holes and pegs.

Lap joint stronger than a butt due to larger surface to glue, pins added for strength.



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Design Brief: a description of what you are planning to design and make and the problems you wish to solve.

Tools:

Wire cutters- tool used for cutting wire and stripping rubber off wire.

G clamp- used to clamp material in place, looks like the letter G.

Wood vice- a tool with movable jaws to hold work in place.

Machine vice- a tool with movable jaws to hold work in place when using a machine.

Vacuum former- a machine that heats the sheet of plastic to a forming temperature, stretch onto a mould with a vacuum.

Strip heater- heats the plastic in a straight line, so it can be bent by hand.

Hot air gun- used to heat up a material by means of a stream of very hot air.

Drill- a tool with a rotating cutting tip, used to create holes.

Laser cutter

Technology that uses a laser to cut materials.

Speed and power settings can be changed for different materials and thicknesses.

Links to CAD program- 2D design.

Red line- etch

Blue lines- kiss cut

Black lines-cut

Modelling:

- Get a visual representation of the product before it has been made
- Notice any mistakes before fully manufactured.
- Cheaper materials to be used, less cost.
- See and manipulate designs in the 3d environment.
- This helps the client to imagine what their design will look like.
- Use of computer to test components before manufacture..

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