**Year 10**

**Gearbox and Mechanism Design & Make Project**

**Design Folder Writing Framework**

**General Information**

In this project you have got to design and make a working educational model of a gearbox and mechanism. The Design Folder is worth 50% of the marks and the Artefact is worth the other 50%. You will have a fixed period of time in which to complete this project; most of the design Folder will be completed as homework tasks and all of the Artefact will be made during normal lesson times. You will be required to submit various sections of the Design Folder for assessment as the project proceeds and when each is returned you must keep it safe to be collated into a complete Design Folder. You will be penalised if you do not submit a complete design folder at the end. The Design Folder must be presented in **A4** **Landscape** format, printed on **Single Sides** and provide all of the required information in the order listed below. Each section must start on a new sheet of paper. You should use this writing framework as a check list for the contents of your Design Folder. The information you give should be presented in a way that assumes your reader has no prior knowledge of this particular problem.

**The Design Brief**

Mechanisms are an essential part of everyday life and for component parts of most of the things that we take for granted. In order to enable primary school children the understand how various mechanism work you have to Design & Make a working educational model that can be used by primary school children.

Your model should be powered by a small 3-5 volt electric motor which drives a compound gear train. The model must show how the high RPM’s of the electric motor can be reduced and the turning power of the motor increased by the use of a compound gear train. The rotary motion output from the gear train must then be converted into either reciprocating or oscillating motion. You must select a suitable method of converting the rotary motion and then design and build a mechanism that will achieve this. The casing of the gear box and the cover of the mechanism will be made from clear acrylic so that the user can easily see the inner workings of the model and also act as a safety cover for the internal moving parts. The various components of the mechanism must be made using contrasting colours so that the users can clearly see what each part does and how the complete model works.

The model must be fully functional, reliable and connect to a mains to DC transformer which will provide the electrical power for the whole system.

**Section One – The Introduction (2 sides)**

This section has four parts.

* A general written introduction where you tell your reader what you are going to make, why you are doing this task, what skills and equipment you will use in the completion of this task.
* The Design Brief here must explain in more detail what the problem is you have chosen to address, why you are doing it and how you will do it. (THIS IS NOT A SPECIFICATION LIST)
* Produce a bullet pint list of your outline Plan of Action which will explain to your reader to the activities that you must do and the sequence that they must be done in. If this task is to be completed successfully.
* Produce a spider diagram Task Analysis. This must identify all of the topics that you must research in order to be able to build this project.

**Section Two – The Research (6 sides)**

This must contain all of the topics identified in your Task Analysis. The Task Analysis is the contents list for your research. In this section must only contain relevant information which could be used in your project. Every topic must be clearly explained using text and illustrations. The text must be in your own words, the illustrations must be placed alongside the appropriate text and must be source referenced; failure to do this will be penalised.

At the end of this section you must provide a bullet point list summary of the important facts that you have found out as a result of your research work.

**Section Three – The Specification List (1 side)**

This section has two parts;

* The first part must explain clearly to your reader what you are going to make, its purpose and how it will work.
* The second part is a very detailed list of the **special features** that your model will have, it is not a parts list. THE SPECIFICATION LIST WILL BE WHAT YOU COMPARE YOUR FINISHED MODEL TO WHEN YOU EVALUATE YOUR WORK AT THE END OF THIS PROJECT. It must clearly relate to the contents of your research section, your specification list cannot contain any features that you have not explained in your research. It must accurately state the purpose of your product, how it works, its size, the materials it is made from, the various sub-systems that make up the whole product and its expected working life.

**Section Four – The Initial Designs (3-4 sides)**

This section must contain annotated designs of the gear box and 3 alternative hand drawn mechanisms you might make. Each design must be hand-drawn in 2D, have a written explanation of how it works and an evaluation of its strengths and weaknesses.

**Section Five – Development and Making of the Final Design (6-7 sides)**

* This section must start with the 2D Designs that will be used to laser cut the gear box casing and the mechanism parts.
* The step-by-step instructions for the production of the gear box these must include text and photographic images to support you explanations.
* The step-by-step instructions for the production of the mechanism these must include text and photographic images to support you explanations.
* A fully annotated image of the finished product.

**Section Six – The Evaluation (3-4 sides)**

This section has three parts;

* **The modifications**. Here you must describe any problems that you encountered and explain how you resolved them. Ideally, you should use text and photographic evidence to explain each modification.
* **The Performance**. Here you must use a two column table to compare how your finished product meets each item in your specification list. In the left-hand column list each item from the specification list. In the right-hand column and opposite each specification item state why and how your product meets each specification criteria.
* **Possible Improvements**. Here you must explain what you would do to improve your product if you were to design and make another.

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