



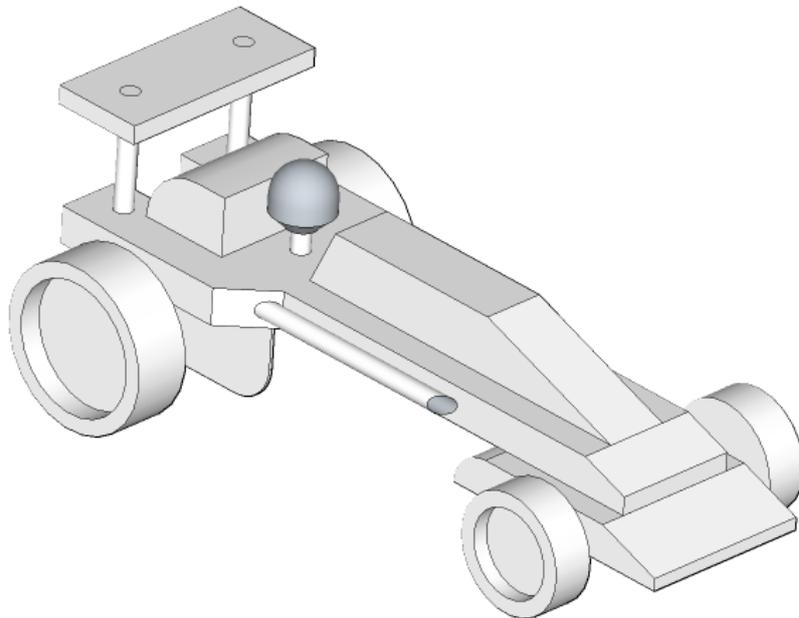
**Australian Government**  
**Department of Defence**  
Defence Materiel Organisation

THE LIVING TOOLBOX

YEAR 7/8

# MANDATORY TECHNOLOGY

**Alternative Energy/Electronics Technologies**  
**INDUSTRIAL DESIGN/ELECTRONICS TECHNOLOGIES**



## STUDENT PORTFOLIO

STUDENT NAME: \_\_\_\_\_

CLASS: \_\_\_\_\_

TEACHER: \_\_\_\_\_



# Alternative Energy / Electric Car



## A) Analysing Needs, Problems and Opportunities

### Problem:

In the space below discuss, what is the problem that needs to be solved.

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### Design Brief:

Rewrite the design brief in the space provided.

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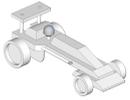
### Design Parameters:

List the different parts which will make up your Electric Car.

### Establishing Criteria for Success:

In the space below describe four different criteria that you will use to determine if your design was successful.

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_



## Task: Design Considerations:

Read the following list of design considerations carefully. Tick the box to identify the most important factors you will need to consider to ensure the success of your project. In the right hand column add comments about each of the important design considerations you identified.

### Organisation

*Questions to consider:* What will I have to do to make this project successful?

<input type="checkbox"/> Time	e.g. finished by week 6	
<input type="checkbox"/> Budget	e.g. cannot exceed \$...	
<input type="checkbox"/> Material available	e.g. timber, plastic	
<input type="checkbox"/> Equipment available	e.g. disc sander, drill	
<input type="checkbox"/> Technical skills	e.g. using a saw	

### Function

*Questions to Consider?* What does the product have to be able to do to be successful?

<input type="checkbox"/> Size or shape	e.g. portable	
<input type="checkbox"/> Safety	e.g. no sharp edges	
<input type="checkbox"/> Comfort	e.g. lightweight	
<input type="checkbox"/> Strength & durability	e.g. withstand heavy use	
<input type="checkbox"/> Ease of use	e.g. practical	
<input type="checkbox"/> Ease of cleaning	e.g. access	
<input type="checkbox"/> Environmentally friendly	e.g. recycled materials	

### Aesthetics

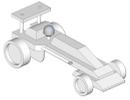
*Questions to Consider?* What qualities will you need to consider so that the user will appreciate the product?

<input type="checkbox"/> Sound	e.g. quiet, noisy	
<input type="checkbox"/> Smell	e.g. fragrant, smelly	
<input type="checkbox"/> Touch	e.g. smooth, silky	
<input type="checkbox"/> Sight	e.g. eye-catching	
<input type="checkbox"/> Taste	e.g. bitter, sweet, sour	
<input type="checkbox"/> Mood	e.g. dramatic, calm	
<input type="checkbox"/> Pattern	e.g. repeated, stripes	
<input type="checkbox"/> Texture	e.g. abrasive, spongy	
<input type="checkbox"/> Colour	e.g. contrasting, cool	
<input type="checkbox"/> Size	e.g. petite, large	
<input type="checkbox"/> Shape	e.g. moulded, flat	



**Task: Word Bank:**

<b>Criteria for Success (Time)</b>	<b>Criteria for Success (i)</b>	<b>Criteria for Success (ii)</b>	<b>Criteria for Success (iii)</b>
<b>Criteria for Success (Budget)</b>			



## Research – Electric Car

### Task: Work Health and Safety - Electronics Safety Tutorial

Answer the following questions by referring to the safety instruction sheets in the reference workbook. You may use other sources of information where necessary.

1. Electronics activities primarily involve working with projects that use low voltage. List THREE (3) typical home or communication appliances using low voltage electronic components.

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2. Describe FOUR (4) hazards that may be encountered in electronics activities.

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3. Tools and materials should be stored appropriately to prevent personal injury. Describe possible injuries to yourself that can occur from incorrectly stored equipment in the electronics workroom.

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4. When soldering the fumes given off may be harmful if inhaled in excessive amounts. What steps can be taken to minimise this happening?

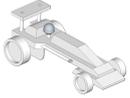
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5. The general use of electricity inherently includes hazards that require precautions to be implemented. Describe FOUR (4) aspects of electrical safety that must be observed at all times.

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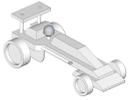
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## Risk Management - Tools

List every tool and machine you will need to use in the construction of your job. Make sure you understand how to use each tool safely.

Name of tool/machine	What types of injury risks are possible	How is each risk of injury to be avoided



## Task: Electricity Basics

Answer the following questions by referring to the Electricity Basics section in the reference workbook. You may need to use other sources of information where necessary.

1. Energy sources we use to make electricity can be renewable or non-renewable. Research energy sources and explain the terms renewable and non-renewable. In the space provided below list three renewable and three non-renewable resources.

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2. Explain what is meant by the term 'Electricity'?

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3. In the space provided below draw a labelled diagram of an atom, include all sub-atomic particles.

4. Using a garden hose as an analogy explain how water flow through the hose is similar to current?

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5. What charges Protons, Neutrons and Atoms have in a stable state?

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### Task: Research of Electronic Components of the Electric Car

Fill in the vacant area on the grid with the correct response.

Component	Sketch	Symbol	Function
Battery			
Resistor			
Diode			A diode allows electricity to flow in one direction only and blocks the flow in the opposite direction.

In the space provided below draw a diagram of a circuit which is in series.

In the space provided below draw a diagram of a circuit which is in parallel.



# Batteries

1) How do batteries produce electricity and why do they run out?

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2) What observation did scientist make which led to the invention of the battery?

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3) In the space provide below produce a cut a way diagram of a dry cell battery labelling the main parts.

4) Explain the purpose of an electrolyte in a battery?

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5) Describe the experiment that Volta used to prove that electric current was flowing between metals.

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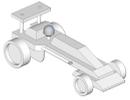
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6) What is a Voltaic Pile?

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## Design Challenge - Construct an Electric Motor

Students are to construct a universal electric motor from common materials to experience how electromagnetic induction changes electrical energy into mechanical energy.

This task may be undertaken as a group activity where each student has a task of constructing one component.

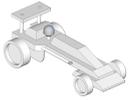
Firstly research the parts of an electric motor and in the space provided below produce a diagram of what your motor will look like.



## Task: Literacy/Research Task

Use the template below to plan your Procedure.

<p><b>Word Bank:</b></p> <p>Stage 1  <u>Marking out and cutting stock material</u>          Stock          Material list          Measure          Radiata Pine          Square Off (Perpendicular 90 degrees)          Dock (cut across grain)          Try Square          Tenon saw          Bench hook          Vice          Disc Sander</p> <p>Stage 2          Assembly          Glue and nail together          25 mm nails          PVA glue          Marking gauge          Warrington hammer</p> <p>Stage 3          Final Sanding          With the grain</p> <p>Stage 4          Soldering</p> <p>Stage 5          Decorative painting and applying a finish</p>	<p><b>Design Brief:</b>          Write down the design brief.</p>	<p><b>Hints:</b></p> <p>Start each new point with a verb (doing word)          i.e measure, cut, dock.</p> <p>Remember a verb can be a process i.e square off, nail, disc sand.</p> <p>Keep the sentence short and to the point without any unnecessary words.</p> <p>Use correct terminology (jargon)</p> <p>Do not use phrases such as “then we”.</p> <p>Keep the procedure in the present tense</p> <p>Sequence steps in the order in which you carried them out.</p> <p>Punctuate direct speech correctly.</p>
	<p><b>Materials:</b>          You need to list tools and materials in the order that you use them. (Use correct technical terms)</p>	
	<p><b>Stage 1</b> <u>Marking out and cutting stock material</u>          - Measure stock material to length (see material list) using a pencil, try square and steel rule.          - Dock timber to length using a tenon saw. Hold timber securely in the bench hook whilst cutting.</p>	
	<p><b>Stage 2</b></p>	
	<p><b>Stage 3</b></p>	
<p><b>Stage 4</b></p>		
<p><b>Stage 5</b></p>		



## Task 7: Steps in Construction Text Type: Procedural

In the table below record the main steps required to complete each stage of your storage box design. Layout your responses, using a procedural text type. If you do not remember how to write this way, ask your teacher

Stage	Procedure
1	
2	
3	
4	
5	



**Task: Communicating Ideas – Rear Tail**

In the space below sketch four (4) different design ideas for the rear tail of the electric car. List some good points about each design.

<p><b>Idea No 1</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>	<p><b>Idea No 2</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>
<p><b>Idea No 3</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>	<p><b>Idea No 4</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>

Indicate which idea you have decided to use and why?

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**Task: Communicating Ideas – Colour Scheme / Racing Decals**

In the space below sketch four (4) different design ideas for the colour scheme and racing decals used on the electric car. List some good points about each design.

<p><b>Idea No 1</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>	<p><b>Idea No 2</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>
<p><b>Idea No 3</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>	<p><b>Idea No 4</b></p>          <p><b>Good points</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/></li><li><input type="checkbox"/></li></ul>

Indicate which idea you have decided to use and why?

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## Evaluation

To help you arrive at some conclusions about your work, carefully answer the following questions.

1. Did you do anything differently to your planned design?

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2. List the difficulties that you encountered whilst making your design.

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3. Complete the following table;

Good features of my design	Bad features of my design

4. Indicate on the line below how successful you think you have been in achieving your goal as stated in the design brief?

**Very successful**  
**successful**

**Not very**



5. What would you change about your design if you had to make it again?

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6. How well did you do with the four criteria's for success that you set earlier?

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