



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2013

Marking Scheme

MATERIALS AND TECHNOLOGY
METALWORK

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

MATERIALS AND TECHNOLOGY ***METALWORK***

ORDINARY LEVEL




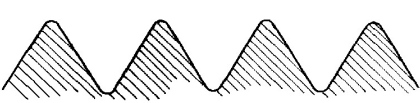


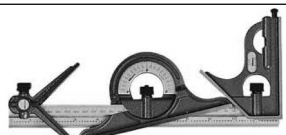
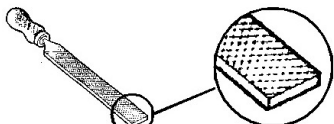



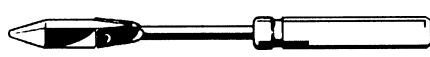
MARKING SCHEME **Written Examination and Project**

Note: For the written examination - Answer Question 1, Sections A and B and any three other questions - Total: 100 Marks.
The solutions presented are examples only.
All other valid solutions are acceptable and are marked accordingly.

Question 1.

SECTION A - 20 MARKS
ANSWER ANY TEN QUESTIONS FROM THIS SECTION

40 Marks

<p>(a)</p> 	<p>This tool is a(n):</p>	<table border="1"> <tr><td>Ring Spanner</td><td></td></tr> <tr><td>Adjustable Spanner</td><td>✓</td></tr> <tr><td>Box Spanner</td><td></td></tr> <tr><td>Adjustable Wrench</td><td></td></tr> </table>	Ring Spanner		Adjustable Spanner	✓	Box Spanner		Adjustable Wrench		<p>②</p>
Ring Spanner											
Adjustable Spanner	✓										
Box Spanner											
Adjustable Wrench											
<p>(b)</p> 	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Shank</td><td></td></tr> <tr><td>Tang</td><td></td></tr> <tr><td>Web</td><td></td></tr> <tr><td>Flute</td><td>✓</td></tr> </table>	Shank		Tang		Web		Flute	✓	<p>②</p>
Shank											
Tang											
Web											
Flute	✓										
<p>(c)</p> 	<p>This tool is a:</p>	<table border="1"> <tr><td>G-Cramp</td><td></td></tr> <tr><td>Vice Grips</td><td></td></tr> <tr><td>Hand Vice</td><td></td></tr> <tr><td>Machine Vice</td><td></td></tr> </table>	G-Cramp		Vice Grips		Hand Vice		Machine Vice		
G-Cramp											
Vice Grips											
Hand Vice											
Machine Vice											
<p>(d)</p> 	<p>This thread form is a(n):</p>	<table border="1"> <tr><td>Buttress Thread</td><td></td></tr> <tr><td>ISO Metric Thread</td><td>✓</td></tr> <tr><td>Acme Thread</td><td></td></tr> <tr><td>Square Thread</td><td></td></tr> </table>	Buttress Thread		ISO Metric Thread	✓	Acme Thread		Square Thread		<p>②</p>
Buttress Thread											
ISO Metric Thread	✓										
Acme Thread											
Square Thread											
<p>(e)</p> 	<p>This technique is called:</p>	<table border="1"> <tr><td>Punching</td><td></td></tr> <tr><td>Bending</td><td>✓</td></tr> <tr><td>Twisting</td><td></td></tr> <tr><td>Scrolling</td><td></td></tr> </table>	Punching		Bending	✓	Twisting		Scrolling		<p>②</p>
Punching											
Bending	✓										
Twisting											
Scrolling											
<p>(f)</p> 	<p>This tool is a:</p>	<table border="1"> <tr><td>Die Stocks</td><td>✓</td></tr> <tr><td>Tap Wrench</td><td></td></tr> <tr><td>Split Die</td><td></td></tr> <tr><td>Reamer</td><td></td></tr> </table>	Die Stocks	✓	Tap Wrench		Split Die		Reamer		<p>②</p>
Die Stocks	✓										
Tap Wrench											
Split Die											
Reamer											
<p>(g)</p> 	<p>This instrument is a(n):</p>	<table border="1"> <tr><td>Vernier Calipers</td><td></td></tr> <tr><td>Outside Calipers</td><td></td></tr> <tr><td>Combination Set</td><td>✓</td></tr> <tr><td>Inside Calipers</td><td></td></tr> </table>	Vernier Calipers		Outside Calipers		Combination Set	✓	Inside Calipers		<p>②</p>
Vernier Calipers											
Outside Calipers											
Combination Set	✓										
Inside Calipers											
<p>(h)</p> 	<p>This tool is a:</p>	<table border="1"> <tr><td>Half-Round File</td><td></td></tr> <tr><td>Square File</td><td></td></tr> <tr><td>Round File</td><td></td></tr> <tr><td>Flat File</td><td>✓</td></tr> </table>	Half-Round File		Square File		Round File		Flat File	✓	<p>②</p>
Half-Round File											
Square File											
Round File											
Flat File	✓										
<p>(i)</p> 	<p>This fastener is a:</p>	<table border="1"> <tr><td>Cheese Head Screw</td><td></td></tr> <tr><td>Grub Screw</td><td></td></tr> <tr><td>Round Head Screw</td><td></td></tr> <tr><td>Countersunk Screw</td><td>✓</td></tr> </table>	Cheese Head Screw		Grub Screw		Round Head Screw		Countersunk Screw	✓	<p>②</p>
Cheese Head Screw											
Grub Screw											
Round Head Screw											
Countersunk Screw	✓										
<p>(j)</p> 	<p>This lathe part is called a:</p>	<table border="1"> <tr><td>Topslide</td><td></td></tr> <tr><td>Headstock</td><td></td></tr> <tr><td>Three Jaw Chuck</td><td>✓</td></tr> <tr><td>Tailstock</td><td></td></tr> </table>	Topslide		Headstock		Three Jaw Chuck	✓	Tailstock		<p>②</p>
Topslide											
Headstock											
Three Jaw Chuck	✓										
Tailstock											
<p>(k)</p> 	<p>This tool is a:</p>	<table border="1"> <tr><td>Micrometer</td><td>✓</td></tr> <tr><td>Drill Gauge</td><td></td></tr> <tr><td>Depth Gauge</td><td></td></tr> <tr><td>Surface Gauge</td><td></td></tr> </table>	Micrometer	✓	Drill Gauge		Depth Gauge		Surface Gauge		<p>②</p>
Micrometer	✓										
Drill Gauge											
Depth Gauge											
Surface Gauge											
<p>(l)</p> 	<p>This tool is used when:</p>	<table border="1"> <tr><td>Welding</td><td></td></tr> <tr><td>Soldering</td><td>✓</td></tr> <tr><td>Glueing</td><td></td></tr> <tr><td>Brazing</td><td></td></tr> </table>	Welding		Soldering	✓	Glueing		Brazing		<p>②</p>
Welding											
Soldering	✓										
Glueing											
Brazing											

SECTION B - 20 MARKS
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)



(i) List **three** materials used in the manufacture of a smartphone.

1.	<i>Aluminium</i>
2.	<i>Glass</i>
3.	<i>Plastic</i>

4

(ii) List **three** features of a smartphone.

1.	<i>Touch screen</i>
2.	<i>Internet access</i>
3.	<i>Camera</i>

4

(n) Briefly describe how the use of computers has improved our lives.



<i>Shopping from home</i>
<i>Easy access to information</i>
<i>Improved ways of designing and manufacturing</i>
<i>Improved world-wide communications</i>

4

(o) (i) Home computers use electricity supplied at:



50 Volts	
75 Volts	
100 Volts	
220 Volts	✓

(ii) This mouse is a(n):



Input Device	✓
Output Device	
Printing Device	
Storage Device	

2

(p) (i) The rating on a light bulb is in:



Watts	✓
Voltage	
Ohms	
Amps	

(ii) The filament in a bulb is made from:



Steel	
Tungsten	✓
Copper	
Aluminum	

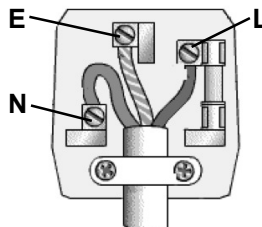
2

(q) (i) The current supplied by a phone battery is called:



Direct Current	✓
Alternating Current	
Electrical Energy	

(ii) Name each terminal in the plug shown:



L	Live
N	Neutral
E	Earth

4

Question 2.

20 Marks

(a)

(i) Brass is an alloy of:

Copper & Lead	
Copper & Zinc	✓
Copper & Tin	

(v) A material is said to be ductile when it can be easily:

Broken	
Stretched	✓
Fractured	

(ii) Brass is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

(vi) The melting of a plastic material onto metal is called:

Lacquering	
Dip Coating	✓
Enamelling	

(iii) Lead is a:

Malleable Metal	✓
Strong Metal	
Brittle Metal	

(vii) The ability of a material to resist wear is called:

Ductility	
Elasticity	
Hardness	✓

(iv) Electrical wire is normally made from:

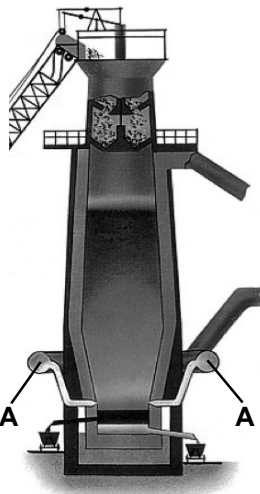
Zinc	
Lead	
Copper	✓

(viii) Gears are normally made from:

PVC	
Nylon	✓
Acrylic	

8

(b) Complete the table:



(i) This sketch shows a Blast Furnace.	Yes	✓
	No	
(ii) This furnace is used to produce steel.	Yes	
	No	✓
(iii) The required heat is generated by an electric arc.	Yes	
	No	✓
(iv) Iron ore is smelted in this furnace.	Yes	✓
	No	
(v) The nozzles, labelled A, are called tuyeres.	Yes	
	No	✓
(vi) This furnace can be rotated to various positions.	Yes	
	No	✓

6

(c) Complete the chart by listing a tool for each task.

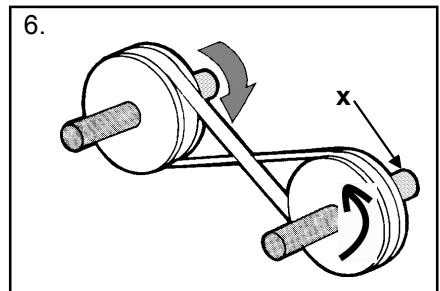
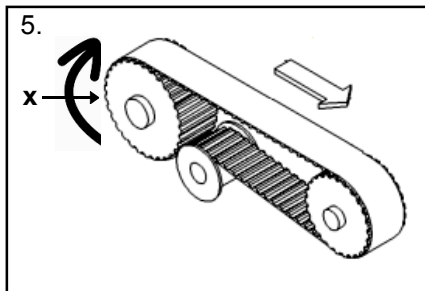
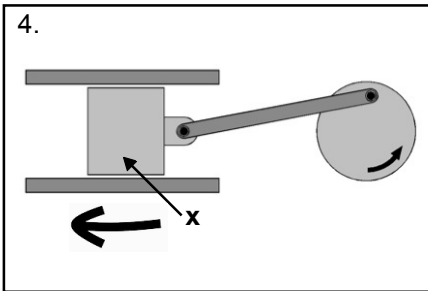
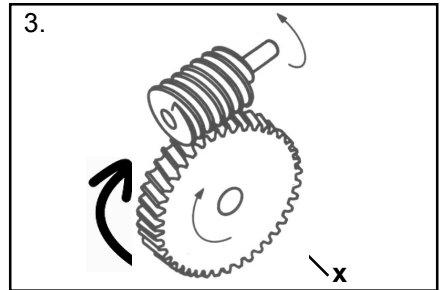
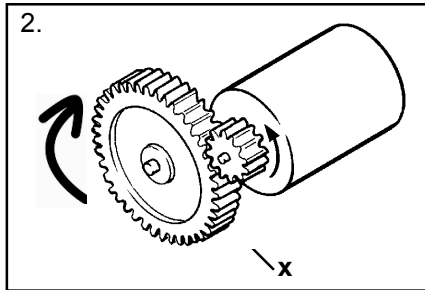
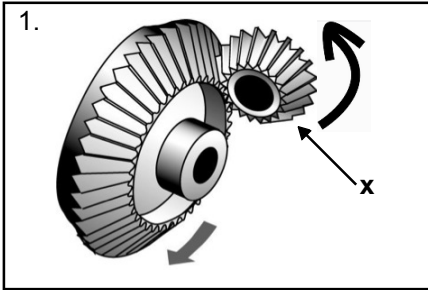
Task	Tool
To draw a circle on a piece of metal.	Dividers
To fold a small piece of thin sheet metal.	<i>Folding bars</i>
To cut thin sheet metal.	<i>Tin snips</i>
To join two pieces of thin sheet metal.	<i>Pop riveting hand tool</i>
To cut an internal thread.	<i>Tap</i>
To mark the position of a hole centre.	<i>Centre punch</i>
To measure the depth of a hole.	<i>Depth gauge</i>

6

Question 3.

20 Marks

(a) (i) Indicate with an arrow the direction of movement of part **X** in each of the following.



(ii) Which one of these mechanisms is a worm and wormwheel?

Number: 3

6

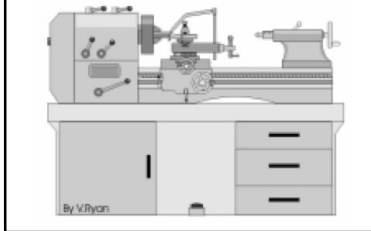
2

(b) (i) Name a mechanism used by each of these machines.

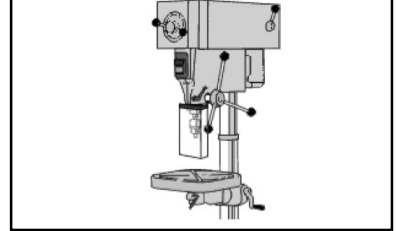
Name: Gears



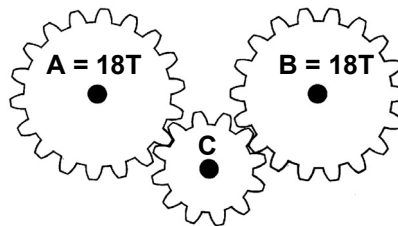
Name: Rack and pinion



Name: Belt and pulley



(ii) If gear **A** rotates at 200 RPM how fast will gear **B** rotate?



100 RPM	
180 RPM	
200 RPM	✓
360 RPM	

(iii) What is gear **C** called?

Idler gear

6

(c) (i) The motion in a moving clock pendulum is:



Rotary	
Oscillating	✓
Linear	

(ii) Guitar strings are normally in:



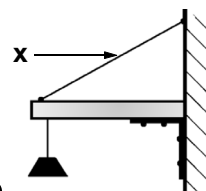
Tension	✓
Compression	
Torsion	

(iii) Part **X** is the:



Fulcrum	✓
Lever	
Link	

(iv) Part **X** is a:



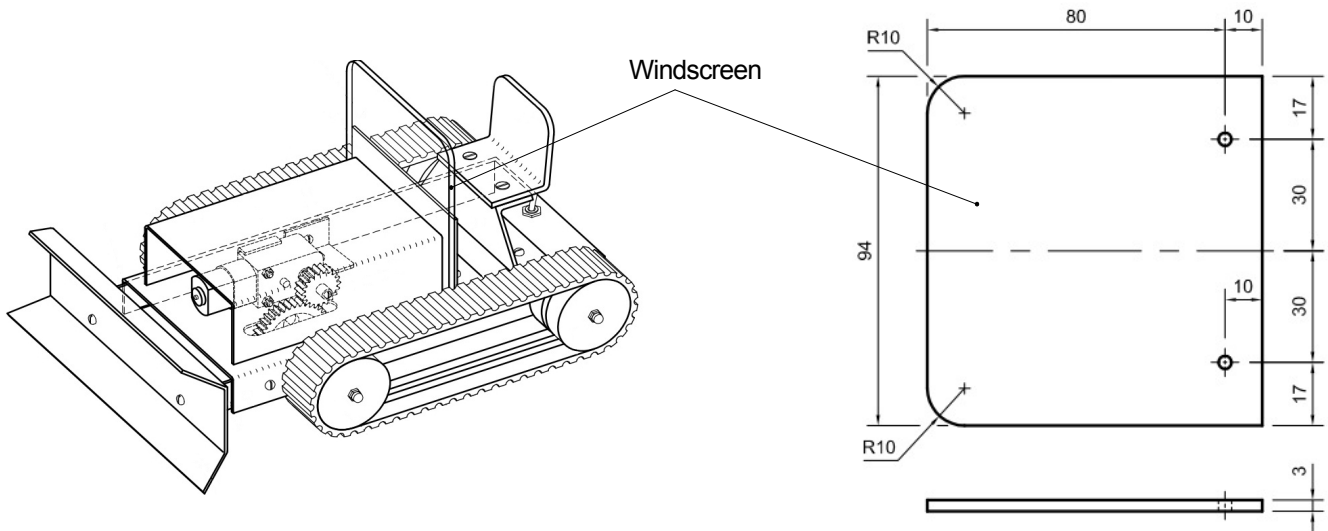
Strut	
Tie	✓
Lever	

6

Question 4.

20 Marks

Details of a windscreen used in the manufacture of a model bulldozer are shown.



(i) List the tools and processes used to make the windscreen.

Tools: <i>Spring dividers</i>	Processes: <i>Marking out</i>
<i>File</i>	<i>Filing</i>
<i>Drilling machine</i>	<i>Drilling</i>
<i>Try square</i>	

4

(ii) In the drawing what does R10 mean?

Radius 10mm

2

(iii) What is the overall length and width of the windscreen?

Length: *94mm*
Width: *90mm*

2

(iv) Describe how you would get a smooth finish on the edge of the windscreen.

Draw filing
Emery cloth
Wet and dry paper

4

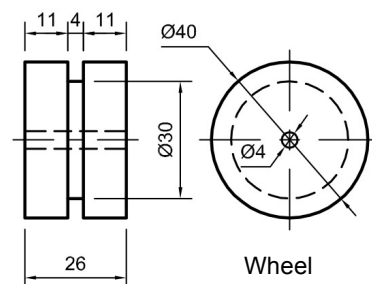
(v) What safety precautions should be observed when drilling acrylic?

Support the workpiece
Secure the work properly
Choose the correct drill speed
Wear safety glasses

4

(vi) Describe how you would make the wheel shown opposite.

Face off
Centre drill
Drill
Cut groove using parting off tool
Part off

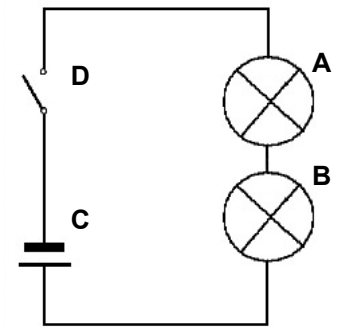
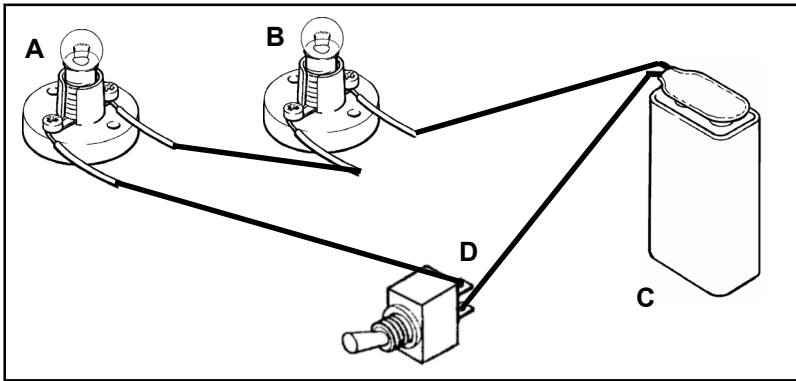


4

Question 5.

20 Marks

(a) (i) Using the circuit diagram as a reference, draw the connecting wires between the components **A**, **B**, **C** and **D** in the box below.



Circuit Diagram

5

(ii) Is this component an LED?



Yes	<input checked="" type="checkbox"/>
-----	-------------------------------------

No	<input type="checkbox"/>
----	--------------------------

(iii) Is this component an integrated circuit?



Yes	<input checked="" type="checkbox"/>
-----	-------------------------------------

No	<input type="checkbox"/>
----	--------------------------

3

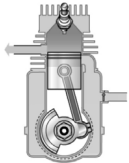
(iv) Is this component a transistor?



Yes	<input type="checkbox"/>
-----	--------------------------

No	<input checked="" type="checkbox"/>
----	-------------------------------------

(b) (i) A car engine converts chemical energy to:



Kenetic and Heat Energy	<input checked="" type="checkbox"/>
Light Energy	<input type="checkbox"/>
Heat Energy	<input type="checkbox"/>

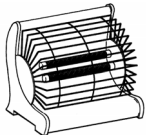
(iv) This symbol represents a(n):



Motor	<input checked="" type="checkbox"/>
LDR	<input type="checkbox"/>
Fuse	<input type="checkbox"/>

6

(ii) An heater converts electrical energy to:



Kenetic Energy	<input type="checkbox"/>
Heat and Light Energy	<input checked="" type="checkbox"/>
Sound Energy	<input type="checkbox"/>

(v) This symbol represents a:



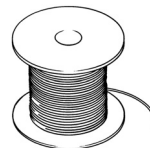
Battery	<input type="checkbox"/>
Switch	<input type="checkbox"/>
Buzzer	<input checked="" type="checkbox"/>

(iii) A solar powered calculator converts light energy to:



Kenetic Energy	<input type="checkbox"/>
Heat Energy	<input type="checkbox"/>
Electrical Energy	<input checked="" type="checkbox"/>

(vi) Electrical solder has a core of:



Copper	<input type="checkbox"/>
Lead	<input type="checkbox"/>
Flux	<input checked="" type="checkbox"/>

(c) Name any **two** inventors associated with engineering and state what they invented.

Inventor 1

Name: <i>Robert Stirling</i>	Invention: <i>Stirling engine</i>

Inventor 2

Name: <i>Igor Sirkorskey</i>	Invention: <i>Single rotor helicopter</i>

6

Question 6.

20 Marks

- (i) This design shows a photograph frame made from acrylic sheet. Describe how you would bend the photograph frame to shape.

Using a wire strip heater along the bend lines

shape using a former.

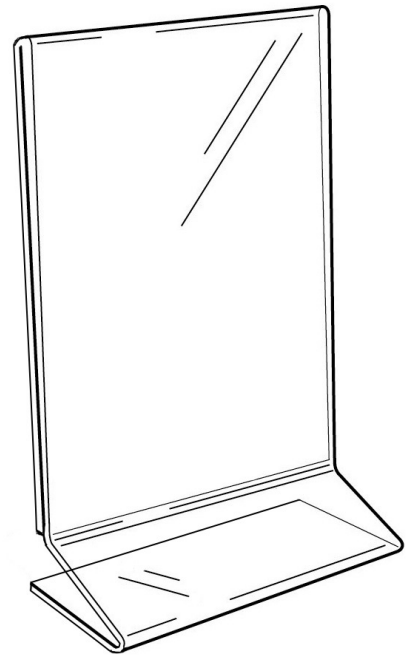
- (ii) What information would you need to know before making a photograph frame?

Size of photograph

- (iii) After manufacture the frame was found to be unstable. How would you improve the design of the frame?

Increase the width of the base

Attach a support to the back

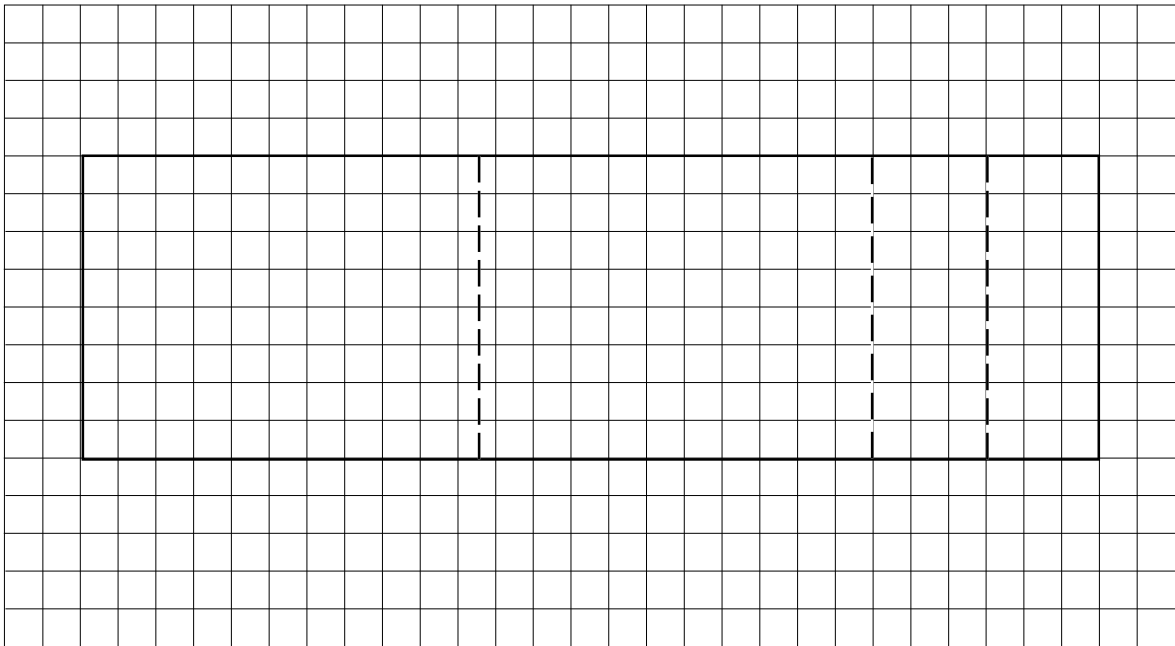


- (iv) What is the difference between a Thermoplastic and a Thermosetting plastic material?

Thermoplastic materials can be reheated and reshaped

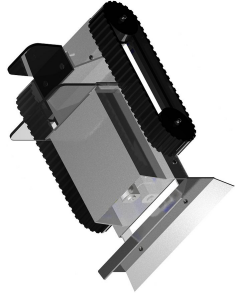
Thermosetting plastic materials cannot be reheated or reshaped

- (v) Draw, in the grid below, the acrylic strip before it was bent to form the photograph frame shown above. Show on your drawing the position of the bend lines.



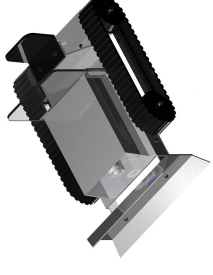
- (vi) Give an example of another project that could be made from acrylic sheet.

Clock face



Junior Certificate Metalwork, Ordinary Level Project – Marking Scheme 2013

Subjective Grading 1 – 5		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Mark	Marks	
Section	Part Number	Pictorial Sketch/Description				Concept	Mark	Marks	
1	Complete Model (Not including Design Element)	<p>Assembly Finish Function</p>				Assembly: Subjective Grade 1 – 5	5	20	
						Finish: Subjective Grade 1 – 5	5		
						Mechanical Function: Subjective Grade 1 – 5	5		
						Electrical Function: Subjective Grade 1 – 5	5		
2	Design	<p>(i) Design, make and attach a Front Grill for the model.</p> <p>(ii) Design and make a securing device to attach the Bonnet (Part 2) to the model which allows access to the transmission unit.</p>				Design <i>Front Grill</i> : Subjective Grade 1 – 5	5	20	
						Make:	3		
						Attach:	2		
						Design <i>Securing Device</i> : Subjective Grade 1 – 5	5		
						Make:	3		
3	Parts 1, 2, & 6					Attach:	2	20	
						Part 1 Blade	Mark Out		2
							Drill, Shape & Bend		10
						Part 2 Bonnet	Mark Out		2
							Shape & Bend		2
Part 6 Blade Bracket × 2	Mark Out, Drill, Shape & Bend	4	4						



Junior Certificate Metalwork, Ordinary Level Project – Marking Scheme 2013

4	Parts 3, 4 & 5		Part 3 Chassis Part 4 Seat Support Part 5 Seat	12	Mark Out	2	20
				6	Slots	6	
				2	Drill	2	
				2	Shape & Bend	2	
5	Parts 7, 8, 9 & 10		Part 7 Wheel × 4 Part 8 Battery Holder Bracket Part 9 Windscreen Part 10 Windscreen Support	8	Turn, Groove & Drill	8	20
				3	Mark Out, Drill, Shape & Bend	3	
				4	Mark Out, Drill & Shape	4	
				5	Mark Out, Drill, Shape & Bend	5	

100 Marks (×3 = 300 Total)