



**Coimisiún na Scrúduithe Stáit  
State Examinations Commission**

**JUNIOR CERTIFICATE 2012**

**MARKING SCHEME**

***MATERIALS AND TECHNOLOGY***  
**METALWORK**

**ORDINARY LEVEL**

# ***MATERIALS AND TECHNOLOGY*** ***METALWORK***

## **ORDINARY LEVEL**


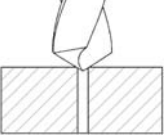
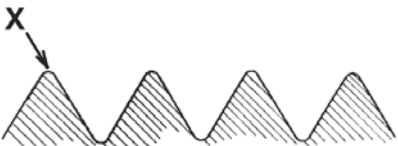
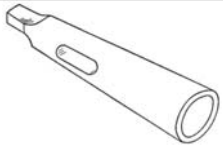
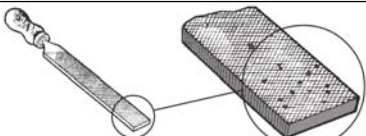
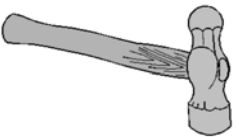
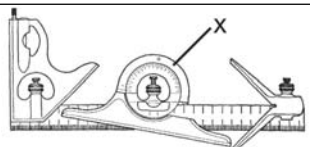
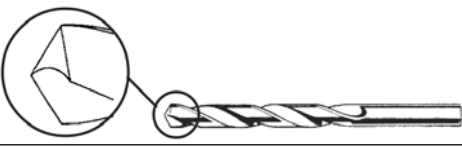

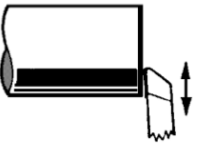
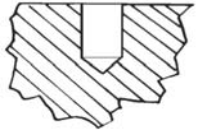
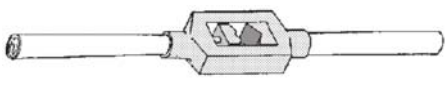
### **MARKING SCHEME** **Written Examination and Project**

***Note:*** For the written examination - Answer Question 1, Sections A and B and any three other questions.  
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:</p>	<table border="1"> <tr><td>Chisel</td><td></td></tr> <tr><td>Soldering Iron</td><td>✓</td></tr> <tr><td>Centre Punch</td><td></td></tr> <tr><td>Drill Drift</td><td></td></tr> </table>	Chisel		Soldering Iron	✓	Centre Punch		Drill Drift		<p>②</p>
Chisel											
Soldering Iron	✓										
Centre Punch											
Drill Drift											
<p>(b)</p> 	<p>This drill bit is guided by a:</p>	<table border="1"> <tr><td>Clearance Hole</td><td></td></tr> <tr><td>Countersink Hole</td><td></td></tr> <tr><td>Pilot Hole</td><td>✓</td></tr> <tr><td>Punch Mark</td><td></td></tr> </table>	Clearance Hole		Countersink Hole		Pilot Hole	✓	Punch Mark		<p>②</p>
Clearance Hole											
Countersink Hole											
Pilot Hole	✓										
Punch Mark											
<p>(c)</p> 	<p>Part 'X' on a thread is called the:</p>	<table border="1"> <tr><td>Flank</td><td></td></tr> <tr><td>Pitch</td><td></td></tr> <tr><td>Crest</td><td>✓</td></tr> <tr><td>Lead</td><td></td></tr> </table>	Flank		Pitch		Crest	✓	Lead		<p>②</p>
Flank											
Pitch											
Crest	✓										
Lead											
<p>(d)</p> 	<p>This tool is used when:</p>	<table border="1"> <tr><td>Filing</td><td></td></tr> <tr><td>Drilling</td><td>✓</td></tr> <tr><td>Threading</td><td></td></tr> <tr><td>Riveting</td><td></td></tr> </table>	Filing		Drilling	✓	Threading		Riveting		<p>②</p>
Filing											
Drilling	✓										
Threading											
Riveting											
<p>(e)</p> 	<p>This file should be cleaned using a:</p>	<table border="1"> <tr><td>Dividers</td><td></td></tr> <tr><td>Double Cut</td><td></td></tr> <tr><td>File Card</td><td>✓</td></tr> <tr><td>Centre Punch</td><td></td></tr> </table>	Dividers		Double Cut		File Card	✓	Centre Punch		<p>②</p>
Dividers											
Double Cut											
File Card	✓										
Centre Punch											
<p>(f)</p> 	<p>This bench tool is a:</p>	<table border="1"> <tr><td>Cross Pein Hammer</td><td></td></tr> <tr><td>Ball Pein Hammer</td><td>✓</td></tr> <tr><td>Claw Hammer</td><td></td></tr> <tr><td>Mallet</td><td></td></tr> </table>	Cross Pein Hammer		Ball Pein Hammer	✓	Claw Hammer		Mallet		<p>②</p>
Cross Pein Hammer											
Ball Pein Hammer	✓										
Claw Hammer											
Mallet											
<p>(g)</p> 	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Ruler</td><td></td></tr> <tr><td>Centre Square</td><td></td></tr> <tr><td>Bevel</td><td></td></tr> <tr><td>Protractor</td><td>✓</td></tr> </table>	Ruler		Centre Square		Bevel		Protractor	✓	<p>②</p>
Ruler											
Centre Square											
Bevel											
Protractor	✓										
<p>(h)</p> 	<p>The point angle of a standard twist drill is:</p>	<table border="1"> <tr><td>30°</td><td></td></tr> <tr><td>60°</td><td></td></tr> <tr><td>118°</td><td>✓</td></tr> <tr><td>210°</td><td></td></tr> </table>	30°		60°		118°	✓	210°		<p>②</p>
30°											
60°											
118°	✓										
210°											
<p>(i)</p> 	<p>This fastener is a:</p>	<table border="1"> <tr><td>Spring Washer</td><td></td></tr> <tr><td>Split Pin</td><td></td></tr> <tr><td>Grub Screw</td><td>✓</td></tr> <tr><td>Set Screw</td><td></td></tr> </table>	Spring Washer		Split Pin		Grub Screw	✓	Set Screw		<p>②</p>
Spring Washer											
Split Pin											
Grub Screw	✓										
Set Screw											
<p>(j)</p> 	<p>This technique is called:</p>	<table border="1"> <tr><td>Parallel Turning</td><td></td></tr> <tr><td>Knurling</td><td></td></tr> <tr><td>Taper Turning</td><td></td></tr> <tr><td>Facing</td><td>✓</td></tr> </table>	Parallel Turning		Knurling		Taper Turning		Facing	✓	<p>②</p>
Parallel Turning											
Knurling											
Taper Turning											
Facing	✓										
<p>(k)</p> 	<p>The depth of a hole is measured using 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 a(n):</p>	<table border="1"> <tr><td>Open Spanner</td><td></td></tr> <tr><td>Tap Wrench</td><td>✓</td></tr> <tr><td>Adjustable Spanner</td><td></td></tr> <tr><td>Box Spanner</td><td></td></tr> </table>	Open Spanner		Tap Wrench	✓	Adjustable Spanner		Box Spanner		<p>②</p>
Open Spanner											
Tap Wrench	✓										
Adjustable Spanner											
Box Spanner											

**SECTION B - 20 MARKS**  
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)

Name **any four** materials used in the manufacture of modern cars. **5**



1.	<i>Aluminium</i>
2.	<i>Steel</i>
3.	<i>Acrylic</i>
4.	<i>Glass</i>

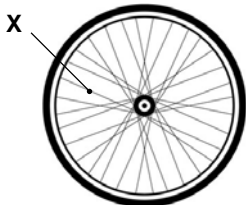
(n)

What is the function of a spark plug in a petrol engine? **6**



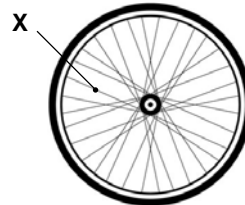
<i>To ignite the petrol and air mixture.</i>

(o) (i) Part 'X' is called a(n):



Hub	<input type="checkbox"/>
Spoke	<input checked="" type="checkbox"/>
Rim	<input type="checkbox"/>
Axle	<input type="checkbox"/>

(ii) Part 'X' is normally in:



Tension	<input checked="" type="checkbox"/>
Torsion	<input type="checkbox"/>
Compression	<input type="checkbox"/>
Shear	<input type="checkbox"/>

(p) (i) Part 'Y' is called a:



Brake	<input type="checkbox"/>
Lever	<input type="checkbox"/>
Fork	<input type="checkbox"/>
Shock Absorber	<input checked="" type="checkbox"/>

(ii) Why are bicycle chains lubricated? **3**



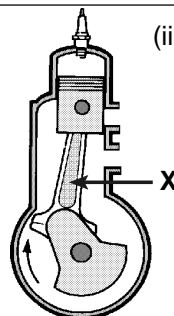
<i>To reduce friction and keep the links moving freely</i>

(q) (i) The links of this chain are joined by:



Soldering	<input type="checkbox"/>
Brazing	<input type="checkbox"/>
Riveting	<input checked="" type="checkbox"/>
Screwing	<input type="checkbox"/>

(ii) Part 'X' is called the: **3**



Valve	<input type="checkbox"/>
Connecting Rod	<input checked="" type="checkbox"/>
Piston	<input type="checkbox"/>
Crankshaft	<input type="checkbox"/>

**Question 2.**

**20 Marks**

**(a)**

**8**

(i) Cooking foil is made from:

Zinc	
Aluminium	✓
Steel	

(v) The furnace used to produce steel is called a(n):

Blast Furnace	
Cupola Furnace	
Electric Arc Furnace	✓

(ii) Aluminium is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

(vi) Metal gates are usually made from:

Steel	✓
Lead	
Zinc	

(iii) Steel is produced by combining iron with:

Lead	
Carbon	✓
Ore	

(vii) Which one of these metals is the best conductor of heat?

Steel	
Lead	
Copper	✓

(iv) Cast Iron is:

Ductile	
Brittle	✓
Malleable	

(viii) Which one of these metals is the hardest?

High Carbon Steel	✓
Aluminium	
Silver	

**(b)** Complete the table:

**6**

(i) Is copper a hard material?	Yes	
	No	✓
(ii) Is copper a malleable material?	Yes	✓
	No	
(iii) Is copper ore called bauxite?	Yes	
	No	✓
(iv) Is nylon a good conductor?	Yes	
	No	✓
(v) Is lime used in the production of steel?	Yes	✓
	No	
(vi) Is galvanised iron coated with zinc?	Yes	✓
	No	

**(c)**

**6**

(i) After moulding thermosetting plastics soften when reheated:

Always	
Never	✓
Sometimes	

(iv) The main raw material for plastic is:

Gas	
Oil	✓
Iron Ore	

(ii) Another name for glass reinforced polyester is:

Polyvinyl Chloride	
Fibre Glass	✓
Acrylic	

(v) Disposable cups are usually made from:

Nylon	
Polystyrene	✓
PVC	

(iii) A strip heater is usually used to bend:

Acrylic	✓
Foam	
Bakelite	

(vi) Which one of these is a Thermoplastic?

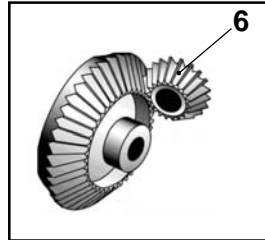
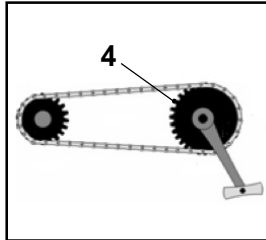
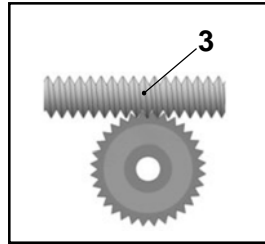
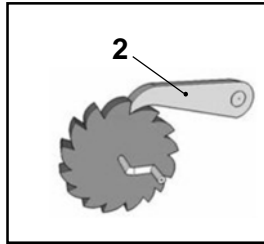
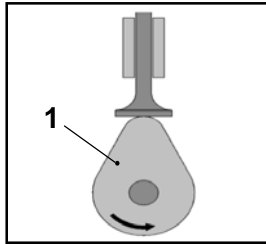
Polyester	
Nylon	✓
Bakelite	

**Question 3.**

**20 Marks**

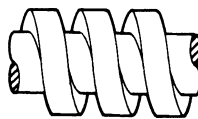
**(a)** (i) Match the number to the correct mechanism part.

**6**



Mechanism Part	No.
Bevel Gear	6
Sprocket Wheel	4
Pawl	2
Cam	1
Pulley	5
Worm Gear	3

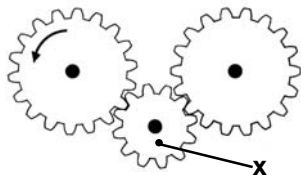
(ii) Name a machine that uses this thread:



Lathe

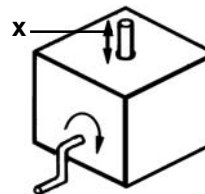
**2**

**(b)** (i) Gear 'X' is the:



Driver Gear	<input type="checkbox"/>
Driven Gear	<input type="checkbox"/>
Idler Gear	<input checked="" type="checkbox"/>

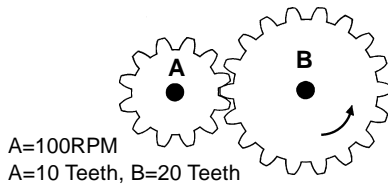
(iv) The motion at 'X' is:



Linear	<input type="checkbox"/>
Oscillating	<input type="checkbox"/>
Reciprocating	<input checked="" type="checkbox"/>

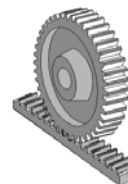
**6**

(ii) Gear 'B' rotates at:



200 RPM	<input type="checkbox"/>
100 RPM	<input type="checkbox"/>
50 RPM	<input checked="" type="checkbox"/>

(v) This mechanism is used in a:



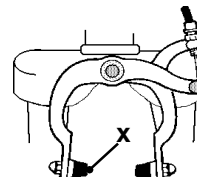
Pillar Drill	<input checked="" type="checkbox"/>
Forge	<input type="checkbox"/>
Bench Shears	<input type="checkbox"/>

(iii) This device is a:



Bearing	<input checked="" type="checkbox"/>
Shaft	<input type="checkbox"/>
Clutch	<input type="checkbox"/>

(vi) The material used to make 'X' is called:



Lead	<input type="checkbox"/>
Aluminium	<input type="checkbox"/>
Rubber	<input checked="" type="checkbox"/>

**(c)** Complete the table by naming devices that use the following mechanisms. The first row has been completed for you, as an example.

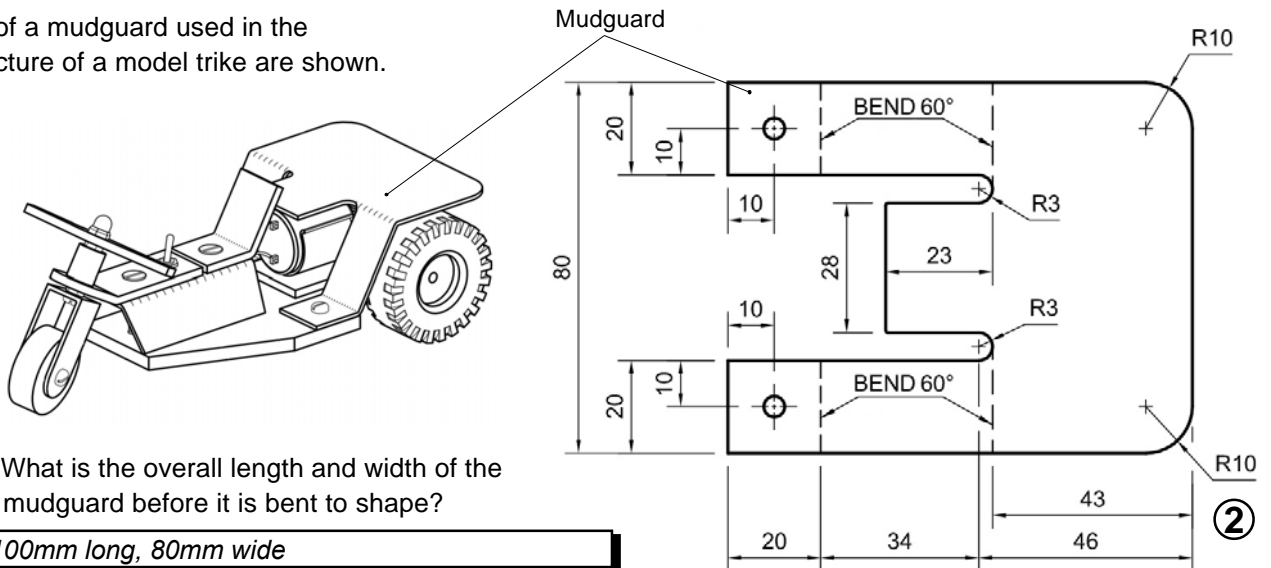
**6**

Mechanism	Device
Lever	<i>Nutcracker</i>
Chain	<i>Oil filter wrench</i>
Pulley	<i>Car water pump</i>
Cam	<i>Toys</i>
Gears	<i>Electric screwdriver</i>
Spring	<i>Door handles</i>
Linkage	<i>Windscreen wiper</i>

**Question 4.**

**20 Marks**

Details of a mudguard used in the manufacture of a model trike are shown.



(i) What is the overall length and width of the mudguard before it is bent to shape?

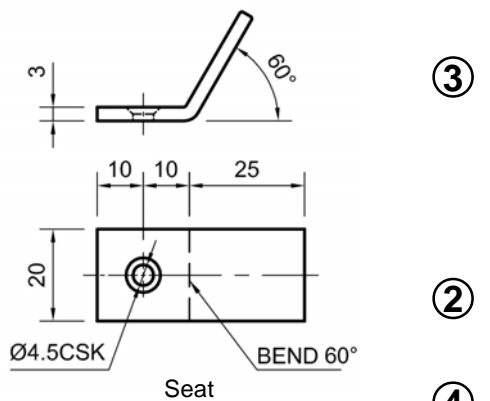
100mm long, 80mm wide

(ii) Describe the stages involved in bending the mudguard to shape.

Align the 43mm bend line in the folding bars, hold in the vice and using a mallet bend each 20mm section separately to the correct angle.  
For the 20mm bend lines hold each section separately in the folding bars and bend to shape.

(iii) What precautions should be taken when working with acrylic?

Use fibre clamps when holding in the vice.  
Support when drilling.



(iv) What does 'Ø4.5CSK' refer to in this drawing?

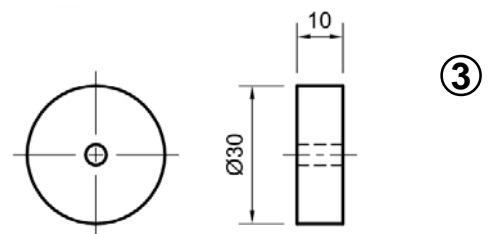
Drill hole using a 4.5mm drill bit & then countersink

(v) List **four** tools used in the manufacture of the seat.

1. File
2. Saw
3. Drilling machine
4. Strip heater

(vi) Describe the stages involved in making the nylon wheel shown.

Face off  
Centre drill  
Drill correct diameter  
Part off



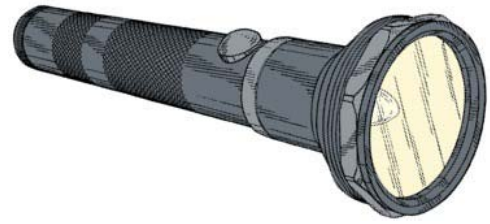
(vii) What safety precautions should you take when operating a lathe?

Wear eye protection  
Ensure work is held securely  
Do not handle swarf  
Do not leave the chuck key in the chuck

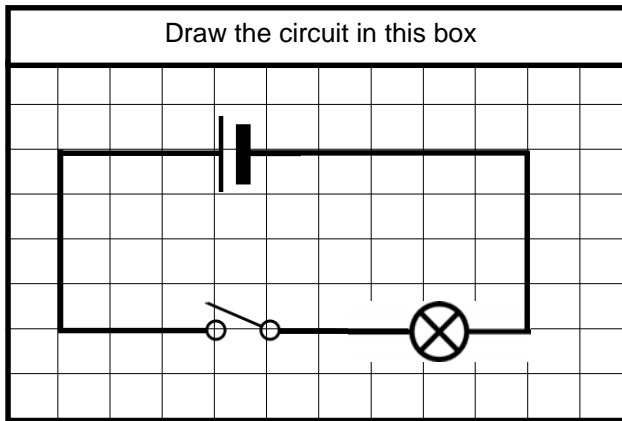
**Question 5.**

**20 Marks**

- (a)** (i) Using the symbols from the table below draw the circuit diagram for the torch.



**4**



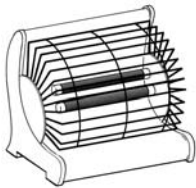
- (ii) What energy conversion takes place when a torch is switched on?

Electrical energy to light energy

**5**

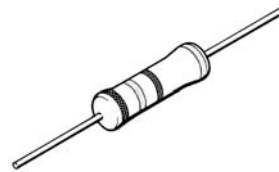
Component	Symbol

- (b)** (i) Electrical power is measured in:



Ohms	
Watts	✓
Amps	

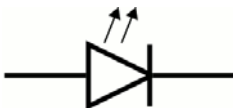
- (iv) This is a(n):



LED	
LDR	
Resistor	✓

**6**

- (ii) This is the symbol for a(n):



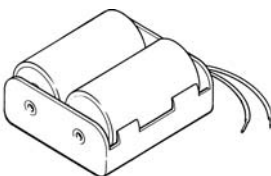
Motor	
LED	✓
Buzzer	

- (v) A scanner is a(n):



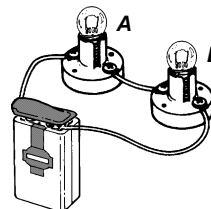
Output Device	
Input Device	✓
Process Device	

- (iii) Batteries convert chemical energy directly into:



Electrical energy	✓
Mechanical energy	
Kinetic energy	

- (vi) When this circuit is connected:



Bulb A will light	
Bulb B will light	
Both will light	✓

- (c)** Complete the table by matching the inventors listed to their achievement.  
Inventors: Rudolf Diesel, John Dunlop, John P. Holland, James Watt.

**5**

Achievement	Inventors
1. Steam Engine	<i>James Watt</i>
2. Submarine	<i>John P. Holland</i>
3. Pneumatic Tyre	<i>John Dunlop</i>
4. Diesel Engine	<i>Rudolf Diesel</i>



**Question 6.**

**20 Marks**

- (i) The design shows a mobile phone holder made from acrylic. Why is acrylic a good choice of material to make the holder?

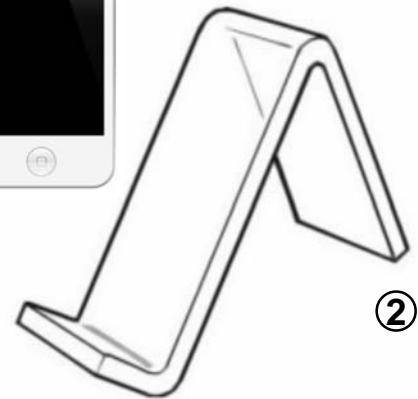
<i>Light</i>
<i>Easily shaped</i>
<i>Available in different colours</i>



④

- (ii) State **any one** change that you would make to improve the given design of the mobile phone holder.

<i>Side supports</i>
<i>Make it wider</i>



②

- (iii) Describe how you would polish the edges of the mobile phone holder.

<i>Drawfile</i>
<i>Use wet &amp; dry paper</i>
<i>hand or machine polish</i>

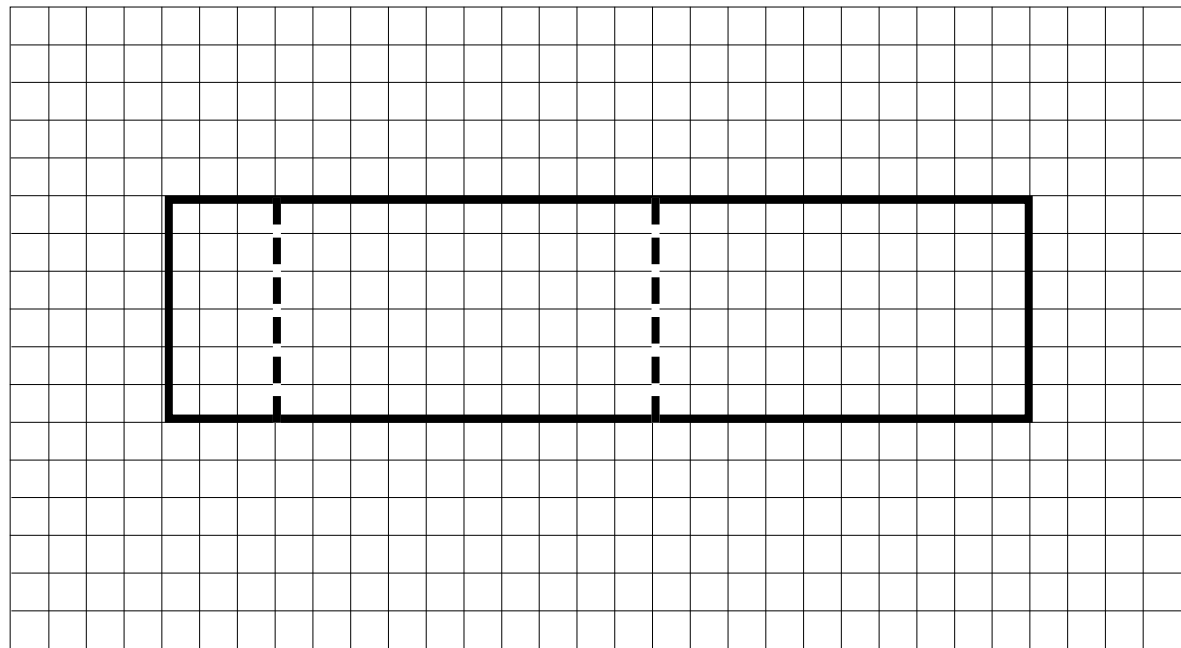
③

- (iv) How would you make sure that the mobile phone holder was not damaged during manufacture?

<i>Use fibre clamps when holding in a vice</i>
<i>Keep low in a vice when filing</i>

③

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



⑤

- (vi) Briefly describe how you would bend the mobile phone holder to the required shape.

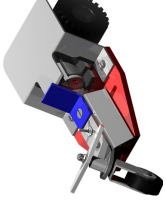
<i>Place the bend line over the heating element of the strip heater and heat to the correct temperature. Shape using a former or a jig.</i>

③



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

Junior Certificate Ordinary Level Metalwork Project - Marking Scheme 2012

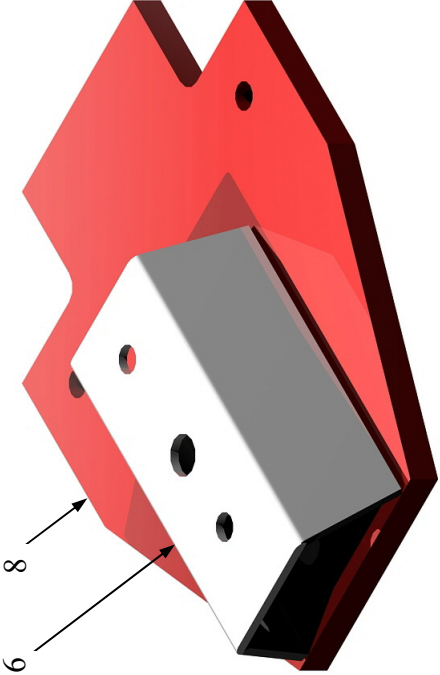
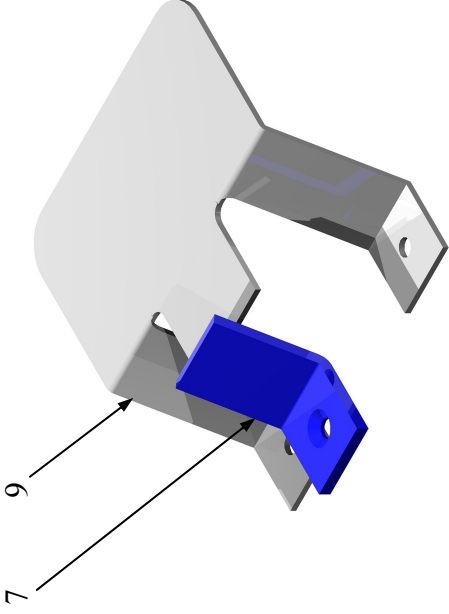


Subjective Grading 1-5		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor	Mark	Marks	
Section	Part Number	Pictorial Sketch/Description			Concept		Mark	Marks	
1	Complete Model (Not including Design Element)	Assembly			Subjective Grade 1-5		5	20	
		Finish			Subjective Grade 1-5		5		
		Function			Mechanical Function:		5		
					Electrical Function:		5		
2	Design	Design, make and attach a Rear Carrier to hold the battery unit and a Front Mudguard for the model.			Design Rear Carrier: Subjective Grade 1 – 5		5	20	
					Make/Finish		3		
					Attach		2		
					Design Front Mudguard: Subjective Grade 1 – 5		5		
					Make/Finish		3		
Attach		2							
3	Parts 1, 2, 3, 4 & 5				Part 1 Front Fork		7	1	20
					Drill & Shape		6		
					Part 2 Front Fork Support		5	1	
					Drill, CSK, Shape & Bend		4		
					Part 3 Steering Column		2	2	
					Drill & Length		2		
					Part 4 Handlebars		4	4	
					Mark Out, Drill & Shape		4		
					Part 5 Front Wheel		2	2	
					Drill & Width		2		



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4	Parts 6 & 8		Part 6 Centre Support	8	Mark Out	1	20
			Part 8 Chassis	12	Drill, Shape & Bend	7	
5	Parts 7 & 9		Part 7 Seat	6	Mark Out	1	20
			Part 9 Rear Mudguard	14	Drill, CSK, Shape & Bend	5	
					Mark Out	2	
					Drill, Shape & Bend	12	

**100 Marks (×3 =300 Total)**