



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Junior Certificate 2017**

**Marking Scheme**

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

**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.

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

**ORDINARY LEVEL, 2017**

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

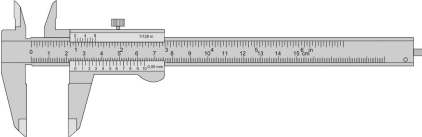
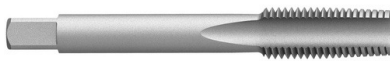




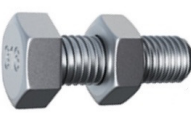


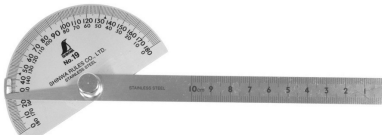


***Note:*** For the written examination - Answer Question 1, Sections A and B and any three other questions - Total: 100 Marks.

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

(a)		This instrument is a(n):	<input type="checkbox"/> Odd-Leg Calipers <input checked="" type="checkbox"/> Vernier Calipers <input type="checkbox"/> Outside Calipers <input type="checkbox"/> Inside Calipers	(2)
(b)		A tap is used for:	<input type="checkbox"/> Drilling <input type="checkbox"/> Reaming <input checked="" type="checkbox"/> Threading <input type="checkbox"/> Riveting	(2)
(c)		This lathe part is called a:	<input type="checkbox"/> Topslide <input checked="" type="checkbox"/> Chuck <input type="checkbox"/> Headstock <input type="checkbox"/> Tailstock Centre	(2)
(d)		This holding device is a:	<input checked="" type="checkbox"/> Machine Vice <input type="checkbox"/> Hand Vice <input type="checkbox"/> Vice Grips <input type="checkbox"/> G-Clamp	(2)
(e)		Part 'X' is called the:	<input type="checkbox"/> Shank <input type="checkbox"/> Body <input type="checkbox"/> Land <input checked="" type="checkbox"/> Flute	(2)
(f)		This measuring tool is a:	<input type="checkbox"/> Wire Gauge <input type="checkbox"/> Screw Pitch Gauge <input checked="" type="checkbox"/> Feeler Gauge <input type="checkbox"/> Radius Gauge	(2)
(g)		This fastener is a:	<input checked="" type="checkbox"/> Set Screw <input type="checkbox"/> Bolt and Nut <input type="checkbox"/> Washer <input type="checkbox"/> Lock Nut	(2)
(h)		A file is cleaned using a:	<input checked="" type="checkbox"/> Card File <input type="checkbox"/> Scriber <input type="checkbox"/> Punch <input type="checkbox"/> Soft Brush	(2)
(i)		A micrometer can measure to an accuracy of:	<input type="checkbox"/> 10 mm <input type="checkbox"/> 1 mm <input type="checkbox"/> 0.1 mm <input checked="" type="checkbox"/> 0.01 mm	(2)
(j)		This measuring tool is a:	<input type="checkbox"/> Centre Square <input checked="" type="checkbox"/> Protractor <input type="checkbox"/> Bevel <input type="checkbox"/> Combination Set	(2)
(k)		This tool is a(n):	<input type="checkbox"/> Open Spanner <input checked="" type="checkbox"/> Adjustable Spanner <input type="checkbox"/> Socket Wrench <input type="checkbox"/> Ring Spanner	(2)
(l)		This tool is a(n):	<input type="checkbox"/> Drift <input checked="" type="checkbox"/> Allen Key <input type="checkbox"/> Punch <input type="checkbox"/> Chisel	(2)

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

(m)



(i) Give **three** reasons why the body of this drone should be made from a plastic material.

1. <i>Light</i>
2. <i>Rigid</i>
3. <i>Easily Moulded</i>

3

(ii) Name **three** plastic materials.

1. <i>Acrylic</i>
2. <i>Nylon</i>
3. <i>PVC</i>

3

(n)



(i) List **two** components that are likely to be found on drones.

1. <i>Propellor</i>
2. <i>Motor</i>

3

(ii) Give **two** uses for drone technology.

1. <i>Film Industry</i>
2. <i>Security</i>

2

(o) (i) This device is a:



Flash Drive	
Memory Card	
Hard Disk	✓
Floppy Disk	

(ii) This symbol is used to represent:



Sound	
Wi-Fi	✓
Temperature	
Video	

3

(p) (i) Reports are normally produced using a:



Spreadsheet	
CAD Software	
Database	
Word Processor	✓

(ii) This symbol is used to represent a(n):



USB Connection	✓
VGA Connection	
HDMI Connection	
Audio Connection	

3

(q) (i) Which of the following is a renewable energy source:



Coal	
Petrol	
Natural Gas	
Wind	✓

(ii) Attic insulation can be made from:



Bakelite	
Nylon	
Fibreglass	✓
PVC	

3

(a)

(i) Copper is combined with tin to form:

Brass	
Bronze	✓
Aluminium	

(v) Steel is produced by combining iron with:

Carbon	✓
Zinc	
Lead	

(ii) Applying a zinc coating to steel is called:

Painting	
Dip Coating	
Galvanising	✓

(vi) Which one of these metals is an alloy?

Aluminium	
Brass	✓
Copper	

(iii) Zinc is a(n):

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

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

Gold	
Lead	
Cast Iron	✓

(iv) High speed steel is used to make:

Cutlery	
Cutting Tools	✓
Bicycle Frames	

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

Broken	
Stretched	✓
Fractured	

8

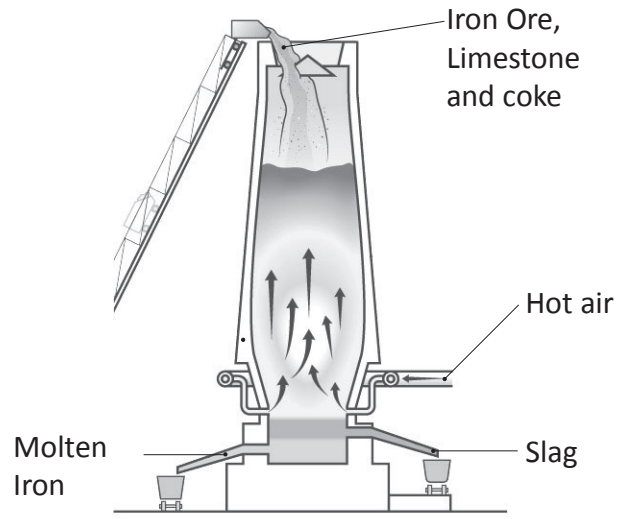
(b) Using the labels in the diagram describe how steel is produced in the Blast Furnace.

*Iron ore, coke and limestone fed in at the top through the charging bells.*

*Hot air is blown through the tuyers to assist the melting process.*

*The slag floats on top of the iron and is tapped off from time to time.*

*The molten iron is also tapped.*



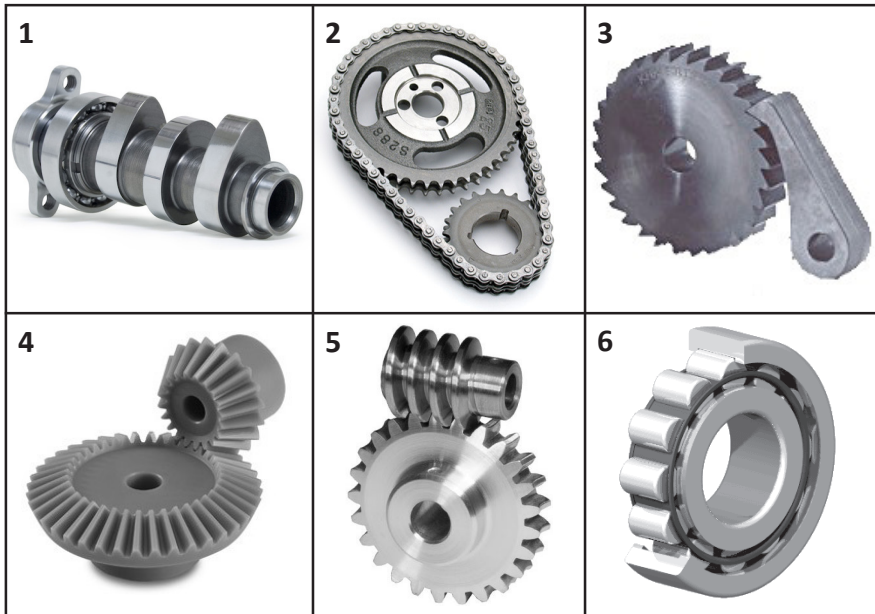
6

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

Task	Tool
To draw an arc on a piece of metal.	<i>Dividers</i>
To flatten copper sheet without causing damage.	<i>Mallet</i>
To cut a 20 mm round mild steel bar.	<i>Hacksaw</i>
To mark out and check angles on a piece of metal.	<i>Protractor</i>
To find the diameter of a small drill.	<i>Drill Gauge</i>
To cut a thin sheet of metal.	<i>Tin Snips</i>
To measure the depth of a hole.	<i>Depth Gauge</i>

6

(a) (i) Match the number to the correct mechanism in the given table.

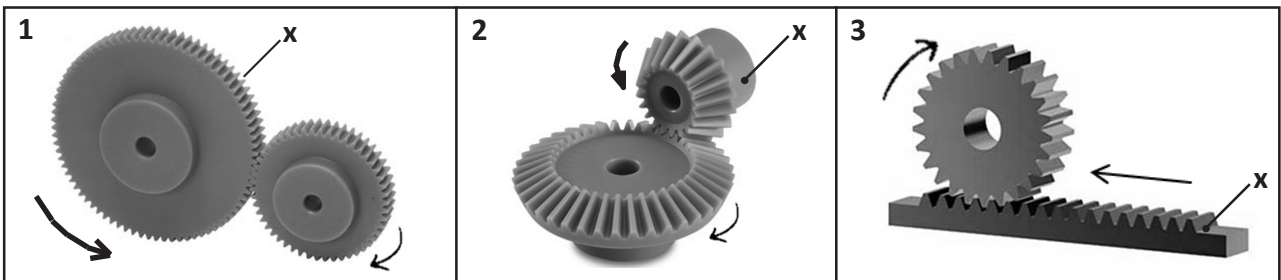


Mechanism	No.
Chain and Sprocket	2
Roller Bearing	6
Ratchet and Pawl	3
Worm and Wormwheel	5
Bevel Gears	4
Camshaft	1

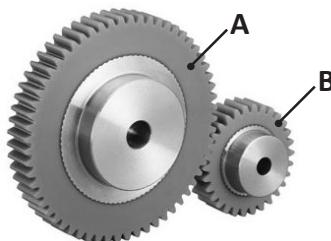
(ii) Name a machine that uses a rack and pinion mechanism.

*Drilling Machine*

(b) (i) Use an arrow to indicate the direction of gear 'X' in each of the following:



(ii) If gear 'A' rotates at 10 RPM how fast will gear 'B' rotate? (A = 60 Teeth, B = 30 Teeth.)



10 RPM	
20 RPM	✓
30 RPM	
60 RPM	

(iii) Is a gear train formed when two or more gears are in mesh?

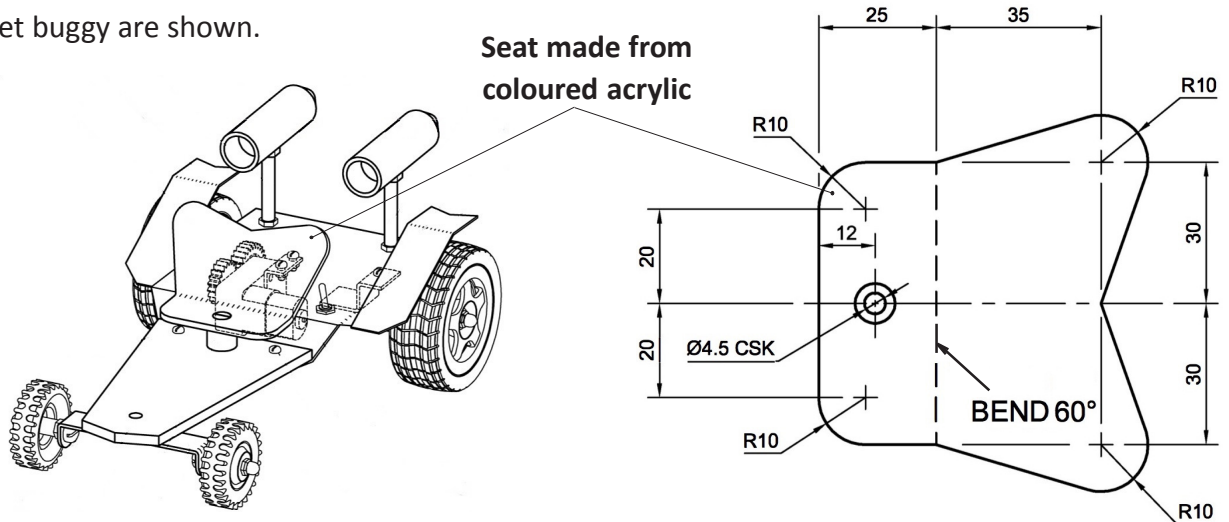
Yes

No

(c) Complete the table by naming devices that use the following mechanisms.

Mechanism	Device
Lead Screw	<i>Lathe</i>
Spur Gears	<i>Gearbox</i>
Pulley	<i>Drilling Machine</i>
Bevel Gears	<i>Hand Drill</i>
Spring	<i>Door Lock</i>
Lever	<i>Bending Machine</i>
Clutch	<i>Strimmer</i>

Details of a seat used in the manufacture of a model jet buggy are shown.



(i) What is the overall length and width of the seat before it is bent to shape? 80mm, 70mm 2

(ii) What does 'Ø4.5 CSK' refer to in the drawing? Drill diameter 4.5mm and countersink 2

(iii) What precautions should be taken when drilling acrylic?

- Make sure the piece is firmly supported*
  - Securely clamped*
  - Correct speed*
  - Correct feed rate*
- 3

(iv) Describe how to apply a polished finish to the edges of the acrylic seat.

- Drawfile using smooth file*
  - Use emery cloth*
  - Use wet and dry paper*
  - Hand polish with acrylic polish and a cloth*
- 3

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

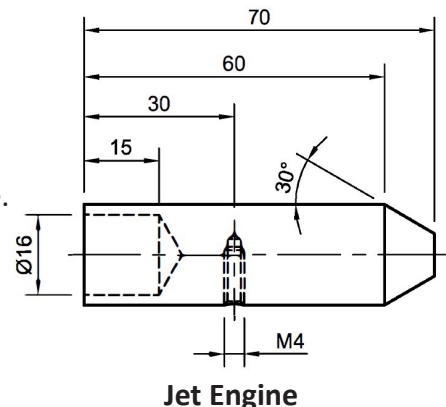
1. *Drilling Machine*
  2. *Hacksaw*
  3. *File*
  4. *Strip Heater*
- 4

(vi) Describe how you would drill the Ø16 hole in the jet engine.

- Using the lathe:*
- Step 1 - using the tailstock, chuck and centre drill*
- Step 2 - drill a pilot hole to a depth of 15mm*
- Step 3 - Drill using a 16mm drill bit to a depth of 15mm*

(vii) Describe how you would form the 30° angle in the jet engine.

- Using the lathe:*
- Set the compound slide / top slide to 30 degrees.*
- Using the feed handle take a number of cuts*
- until the required taper is achieved.*

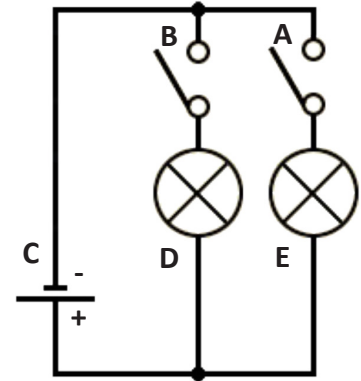
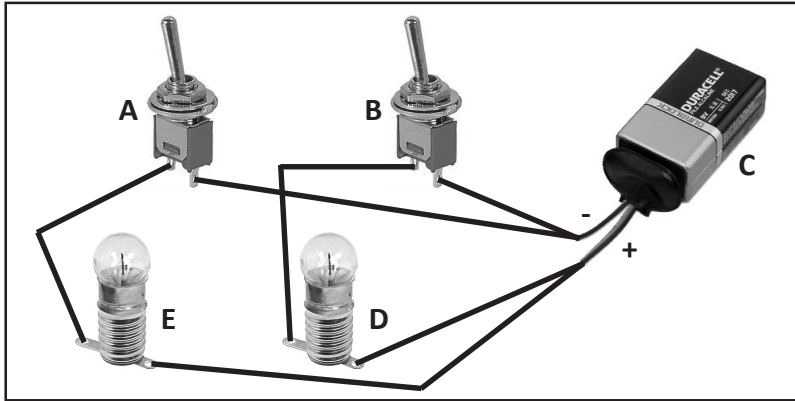




Question 5.

20 Marks

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



Circuit Diagram

(ii) Name the components A, C, and E shown above.

A	Switch
C	Battery
E	Bulb

(iii) Does this circuit use AC or DC current?

DC

(b) (i) A keyboard is a(n):



Output Device	
Input Device	✓
Process Device	

(iv) A bulb converts electrical energy into:



Solar Energy	
Chemical Energy	
Heat and Light Energy	✓

(ii) This symbol represents a:



Motor	✓
Transistor	
Fuse	

(v) This electronic component is a(n):



Buzzer	
Resistor	✓
Integrated Circuit (IC)	

(iii) This device is a(n):



LED	✓
LDR	
Resistor	

(vi) This device is used for:



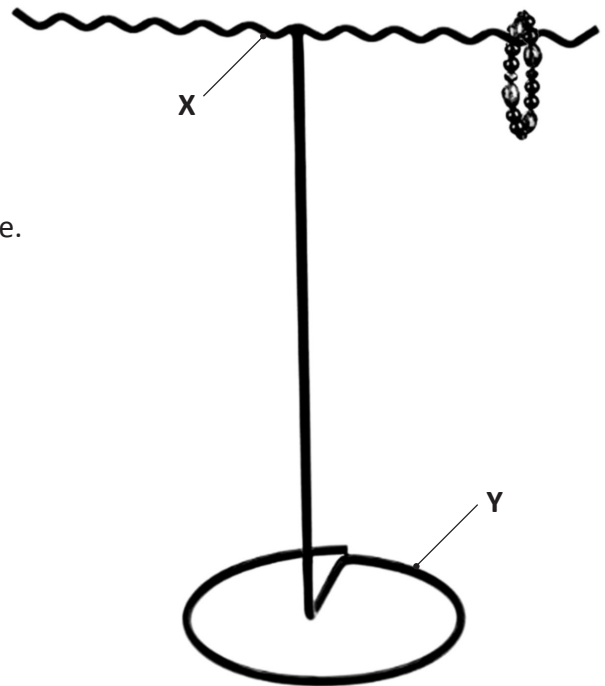
Temperature Sensing	
Light Sensing	✓
Movement Sensing	

(c) Name **one** famous Engineering inventor. Write a brief note about this person's invention.

Inventor's Name:	JP Holland
Invention:	Submarine

- (i) A design for a jewellery stand is shown. Name a metal suitable for making the stand. Give a reason for your choice.

Metal: <i>Steel</i>
Reason: <i>Strong metal</i>
<i>Easy to shape</i>
<i>Easy to join</i>



- (ii) Describe how you would bend the base 'Y' to shape.

<i>Using a bench vice, round former and a hammer.</i>

- (iii) Describe how you would join parts 'X' and 'Y'.

<i>Part X can be joined to Part Y by brazing.</i>
<i>Clean both parts to be joined.</i>
<i>Apply flux and heat until red hot.</i>
<i>Apply the spelter and then allow to cool.</i>

- (iv) Describe a finishing process that could be used to enhance the jewellery stand.

<i>Finishing Process: Plastic dip coating should be used.</i>
<i>Clean the piece, heat to the correct temperature and dip into the fluidizing unit.</i>
<i>Allow to cool.</i>

- (v) In the space below draw an alternative design for a jewellery stand.

*Alternative Design*

4

3

4

4

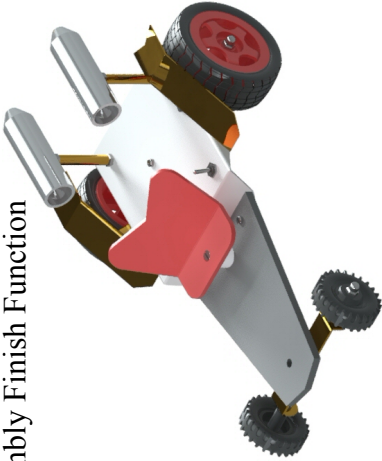
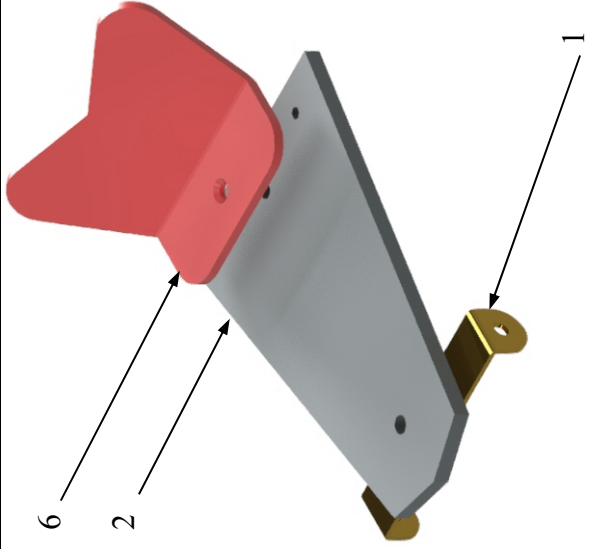
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Coimisiún na Scrúduithe Stáit  
State Examinations Commission



Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2017

Subjective Grading 1/10		9-10 Excellent	7-8 Very Good	5-6 Good	3-4 Poor	1-2 Very Poor				
Subjective Grading 1/5		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor				
Section	Part Number	Pictorial Sketch/Description				Concept	Mark	Marks		
1	Complete Model (Design Element not included)	 <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	Design, make and attach a <b>Simple Steering System</b> for the model. (20% of marks for this section)				Design: Subjective Grade 1 – 10	10	20		
						Make: Subjective Grade 1 – 5	5			
						Attach: Subjective Grade 1 – 5	5			
3	Parts 1, 2 & 6					Part 1 Front Axle Support	5	Mark Out	2	20
								Drill, Shape & Bend	3	
						Part 2 Front Chassis	7	Mark Out	2	
								Drill & Shape	5	
						Part 6 Seat	8	Mark Out	2	
								Drill, CSK, Shape & Bend	6	



Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2017

4	Parts 3, 5 & 9		<p><b>Part 3</b> Rear Chassis</p>	16	Mark Out	5	20
				5	Drill	5	
				6	Shape & Bend	6	
				2	Mark Out, Drill, Shape & Bend	2	
				2	Lathe Work & Drill	2	
5	Parts 4, 7 & 8		<p><b>Part 4</b> Jet Engine x 2</p>	6	Lathe Work, Drill & Tap	6	20
				7	Mark Out, Drill, Shape & Bend	7	
				7	Mark Out, Drill, Shape & Bend	7	
				7	Mark Out, Drill, Shape & Bend	7	
				7	Mark Out, Drill, Shape & Bend	7	