



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2015

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









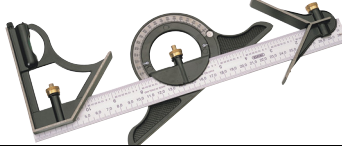



MARKING SCHEME **Written Examination and Project**

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 instrument is a(n):</p>	<table border="1"> <tr><td>Micrometer</td><td>✓</td></tr> <tr><td>Vernier Calipers</td><td></td></tr> <tr><td>Outside Calipers</td><td></td></tr> <tr><td>Inside Calipers</td><td></td></tr> </table>	Micrometer	✓	Vernier Calipers		Outside Calipers		Inside Calipers		<p>②</p>
Micrometer	✓										
Vernier Calipers											
Outside Calipers											
Inside Calipers											
<p>(b) </p>	<p>This tool is a(n):</p>	<table border="1"> <tr><td>Adjustable Spanner</td><td></td></tr> <tr><td>Open Spanner</td><td></td></tr> <tr><td>Combination Spanner</td><td></td></tr> <tr><td>Ring Spanner</td><td>✓</td></tr> </table>	Adjustable Spanner		Open Spanner		Combination Spanner		Ring Spanner	✓	<p>②</p>
Adjustable Spanner											
Open Spanner											
Combination Spanner											
Ring Spanner	✓										
<p>(c) </p>	<p>This tool is a:</p>	<table border="1"> <tr><td>Soft Faced Hammer</td><td></td></tr> <tr><td>Ball Pein Hammer</td><td>✓</td></tr> <tr><td>Straight Pein Hammer</td><td></td></tr> <tr><td>Cross Pein Hammer</td><td></td></tr> </table>	Soft Faced Hammer		Ball Pein Hammer	✓	Straight Pein Hammer		Cross Pein Hammer		<p>②</p>
Soft Faced Hammer											
Ball Pein Hammer	✓										
Straight Pein Hammer											
Cross Pein Hammer											
<p>(d) </p>	<p>This tool is a:</p>	<table border="1"> <tr><td>Machine Vice</td><td></td></tr> <tr><td>Hand Vice</td><td></td></tr> <tr><td>Vice Grips</td><td>✓</td></tr> <tr><td>G-Clamp</td><td></td></tr> </table>	Machine Vice		Hand Vice		Vice Grips	✓	G-Clamp		<p>②</p>
Machine Vice											
Hand Vice											
Vice Grips	✓										
G-Clamp											
<p>(e) </p>	<p>A gas torch is used when:</p>	<table border="1"> <tr><td>Brazing</td><td>✓</td></tr> <tr><td>Riveting</td><td></td></tr> <tr><td>Threading</td><td></td></tr> <tr><td>Knurling</td><td></td></tr> </table>	Brazing	✓	Riveting		Threading		Knurling		<p>②</p>
Brazing	✓										
Riveting											
Threading											
Knurling											
<p>(f) </p>	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Shank</td><td></td></tr> <tr><td>Flute</td><td>✓</td></tr> <tr><td>Land</td><td></td></tr> <tr><td>Flank</td><td></td></tr> </table>	Shank		Flute	✓	Land		Flank		<p>②</p>
Shank											
Flute	✓										
Land											
Flank											
<p>(g) </p>	<p>This fastener is a:</p>	<table border="1"> <tr><td>Split Pin</td><td></td></tr> <tr><td>Grub Screw</td><td></td></tr> <tr><td>Wing Nut</td><td></td></tr> <tr><td>Lock Nut</td><td>✓</td></tr> </table>	Split Pin		Grub Screw		Wing Nut		Lock Nut	✓	<p>②</p>
Split Pin											
Grub Screw											
Wing Nut											
Lock Nut	✓										
<p>(h) </p>	<p>This cutting tool is a:</p>	<table border="1"> <tr><td>Reamer</td><td></td></tr> <tr><td>Centre Drill</td><td>✓</td></tr> <tr><td>Countersinking Bit</td><td></td></tr> <tr><td>Twist Drill</td><td></td></tr> </table>	Reamer		Centre Drill	✓	Countersinking Bit		Twist Drill		<p>②</p>
Reamer											
Centre Drill	✓										
Countersinking Bit											
Twist Drill											
<p>(i) </p>	<p>This instrument is a:</p>	<table border="1"> <tr><td>Thread Gauge</td><td></td></tr> <tr><td>Wire Gauge</td><td></td></tr> <tr><td>Bevel Gauge</td><td></td></tr> <tr><td>Combination Set</td><td>✓</td></tr> </table>	Thread Gauge		Wire Gauge		Bevel Gauge		Combination Set	✓	<p>②</p>
Thread Gauge											
Wire Gauge											
Bevel Gauge											
Combination Set	✓										
<p>(j) </p>	<p>This cutting tool is a:</p>	<table border="1"> <tr><td>Junior Hacksaw</td><td>✓</td></tr> <tr><td>Senior Hacksaw</td><td></td></tr> <tr><td>Fret Saw</td><td></td></tr> <tr><td>Coping Saw</td><td></td></tr> </table>	Junior Hacksaw	✓	Senior Hacksaw		Fret Saw		Coping Saw		<p>②</p>
Junior Hacksaw	✓										
Senior Hacksaw											
Fret Saw											
Coping Saw											
<p>(k) </p>	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Edge</td><td></td></tr> <tr><td>Point</td><td></td></tr> <tr><td>Tang</td><td>✓</td></tr> <tr><td>Heel</td><td></td></tr> </table>	Edge		Point		Tang	✓	Heel		<p>②</p>
Edge											
Point											
Tang	✓										
Heel											
<p>(l) </p>	<p>This tool is a(n):</p>	<table border="1"> <tr><td>Tap Wrench</td><td>✓</td></tr> <tr><td>Stillson Wrench</td><td></td></tr> <tr><td>Adjustable Wrench</td><td></td></tr> <tr><td>Channel Wrench</td><td></td></tr> </table>	Tap Wrench	✓	Stillson Wrench		Adjustable Wrench		Channel Wrench		<p>②</p>
Tap Wrench	✓										
Stillson Wrench											
Adjustable Wrench											
Channel Wrench											

SECTION B - 20 MARKS
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)



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

1.	<i>Plastic</i>
2.	<i>Glass</i>
3.	<i>Metal</i>
4.	<i>Rubber</i>

10

(n)



List **three** advantages of using a smartphone to take photographs.

1.	<i>Quick to operate</i>
2.	<i>Shares images faster</i>
3.	<i>Photographs can be sent by email</i>

4

(o) (i) This device is called a:



Flash Drive	<input type="checkbox"/>
Memory Card	<input checked="" type="checkbox"/>
Hard Disk	<input type="checkbox"/>
Floppy Disk	<input type="checkbox"/>

(ii) This device uses a(n):



Video Connector	<input type="checkbox"/>
USB Connector	<input checked="" type="checkbox"/>
Network Connector	<input type="checkbox"/>
Audio Connector	<input type="checkbox"/>

2

(p) (i) Digital photographs are normally adjusted using a:



Spreadsheet	<input type="checkbox"/>
Digital Editor	<input type="checkbox"/>
Database	<input type="checkbox"/>
Photo Editor	<input checked="" type="checkbox"/>

(ii) Computer file size is measured in:



Centimeters	<input type="checkbox"/>
Bytes	<input checked="" type="checkbox"/>
Kilos	<input type="checkbox"/>
Litres	<input type="checkbox"/>

2

(q) (i) How can you share a digital photograph with a friend?

<i>Facebook</i>
<i>Email</i>

(ii) Why is it a good idea to use rechargeable batteries?



<i>Reduces waste</i>
<i>which protects the</i>
<i>environment</i>

2

Question 2.

20 Marks

(a)

(i) Plastic gears are normally made from:

PVC	<input type="checkbox"/>
Nylon	<input checked="" type="checkbox"/>
Fibreglass	<input type="checkbox"/>

(v) Cooking foil is made from:

Steel	<input type="checkbox"/>
Aluminium	<input checked="" type="checkbox"/>
Copper	<input type="checkbox"/>

(ii) Battery plates are made from:

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

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

Ductility	<input type="checkbox"/>
Toughness	<input type="checkbox"/>
Hardness	<input checked="" type="checkbox"/>

(iii) Bronze is an alloy of:

Copper & Tin	<input checked="" type="checkbox"/>
Copper & Zinc	<input type="checkbox"/>
Copper & Steel	<input type="checkbox"/>

(vii) A material is said to be brittle when it can be easily:

Fractured	<input checked="" type="checkbox"/>
Stretched	<input type="checkbox"/>
Melted	<input type="checkbox"/>

(iv) Galvanised gates are coated with:

Tin	<input type="checkbox"/>
Lead	<input type="checkbox"/>
Zinc	<input checked="" type="checkbox"/>

(viii) Aluminium is a(n):

Ferrous Metal	<input type="checkbox"/>
Non-Ferrous Metal	<input checked="" type="checkbox"/>
Alloy	<input type="checkbox"/>

8

(b) Answer the following by ticking the correct box:

(i) Does a self-centering lathe chuck have three jaws?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(ii) Is copper a good conductor of electricity?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(iii) Can thermosetting plastics be re-shaped?	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(iv) Can brittle materials bend easily?	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(v) Is copper a ferrous metal?	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(vi) Is a Blast Furnace used to make steel?	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>

6

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

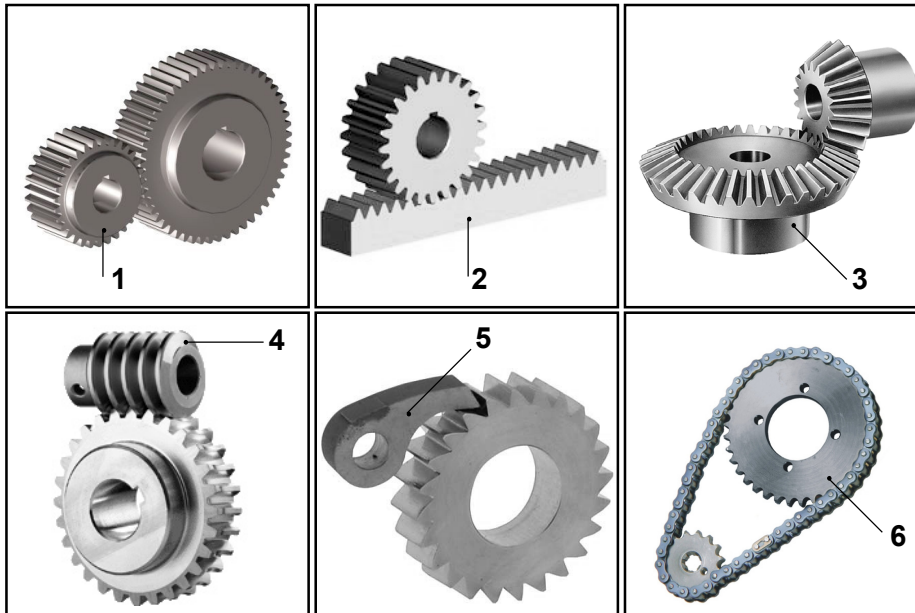
Task	Tool
To bend a piece of acrylic sheet.	Strip Heater
To cut a thin sheet of copper by hand.	Tin Snips
To draw a line on a piece of mild steel.	Scriber
To hold a tap while cutting a thread.	Tap Wrench
To draw a line at right angles to a straight edge.	Try Square
To mark the centre of a hole before drilling.	Centre Punch
To clean a pinned file.	File Card

6

Question 3.

20 Marks

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



Mechanism	No.
Bevel Gear	3
Sprocket Wheel	6
Worm Wheel	4
Pawl	5
Spur Gear	1
Rack	2

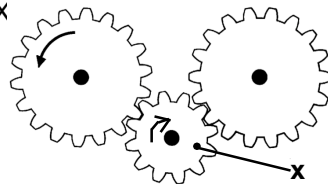
4

(ii) Which one of these mechanisms is used in a Hand Drill?

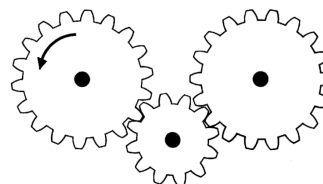
Bevel Gear

2

(b) (i) Use an arrow to indicate the direction of gear 'X'

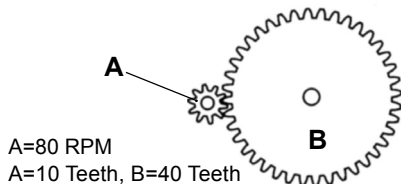


(iv) This mechanism is called a gear:



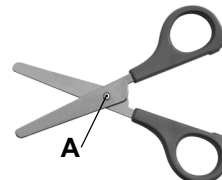
Train	<input checked="" type="checkbox"/>
Mesh	<input type="checkbox"/>
Rack	<input type="checkbox"/>

(ii) Gear 'B' rotates at:



20 RPM	<input checked="" type="checkbox"/>
10 RPM	<input type="checkbox"/>
80 RPM	<input type="checkbox"/>

(v) Point 'X' is called the:



Linkage	<input type="checkbox"/>
Lever	<input type="checkbox"/>
Fulcrum	<input checked="" type="checkbox"/>

6

(iii) The motion of the cam follower is:



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

(vi) The door handle is an example of a:



Lever	<input checked="" type="checkbox"/>
Strut	<input type="checkbox"/>
Linkage	<input type="checkbox"/>

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

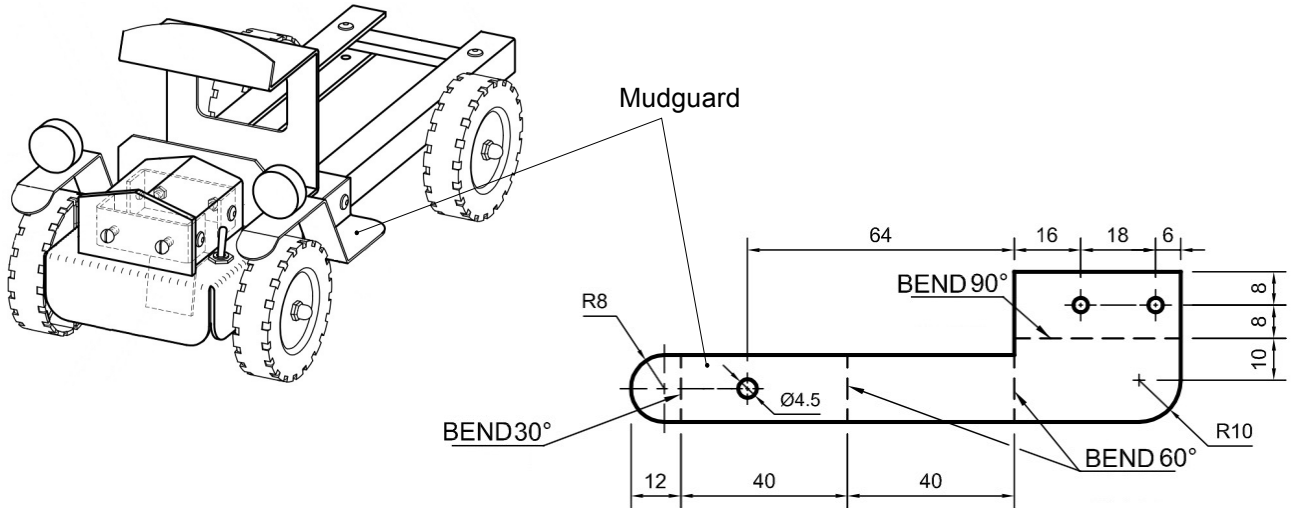
Mechanism	Device
Pulley	Washing machine
Bevel Gears	Shaft driven bicycles
Lever	Tin Snips
Screw Thread	Bench Vice
Sprocket	Go Kart
Clutch	Motorcycle
Bell Crank	Bicycle

6

Question 4.

20 Marks

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



(i) What is the overall length and width of the piece of metal used to make the mudguard?

Length:	132mm
Width:	36mm

2

(ii) What does 'Ø4.5' refer to in the drawing?

Diameter of the hole

3

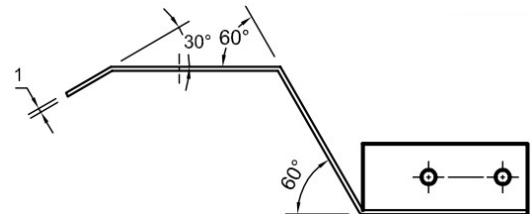
(iii) List the steps involved in producing the R8 curve.

Draw the curve using a spring dividers
Cut close to the outline using a curved tin snips
File to the correct size and shape

3

(iv) Describe how you would bend the mudguard to shape.

Position the bend line in the folding bars
Hold the folding bars in the bench vice
Bend the piece using a mallet
Check the angles using an engineer's protractor



3

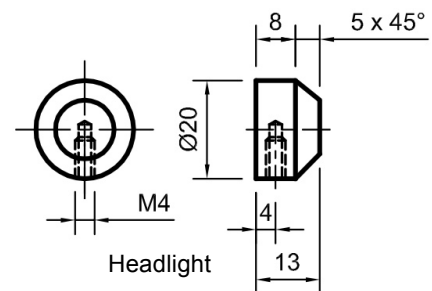
(v) Describe how you would make the 5 x 45° chamfer in the headlight shown below.

Place the piece in the lathe
Mark in the 5mm using the odd leg calipers
Set the top slide using the correct angle
Using the top slide feed handle cut the required chamfer

3

(vi) What does 'M4' refer to in the drawing of the headlight?

M4 refers that there is an internal screw thread cut into the headlight



3

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

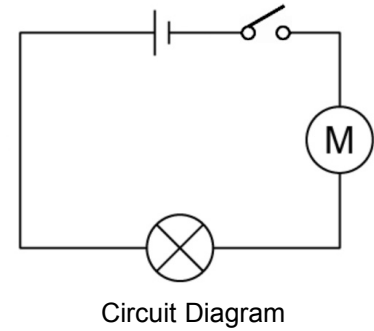
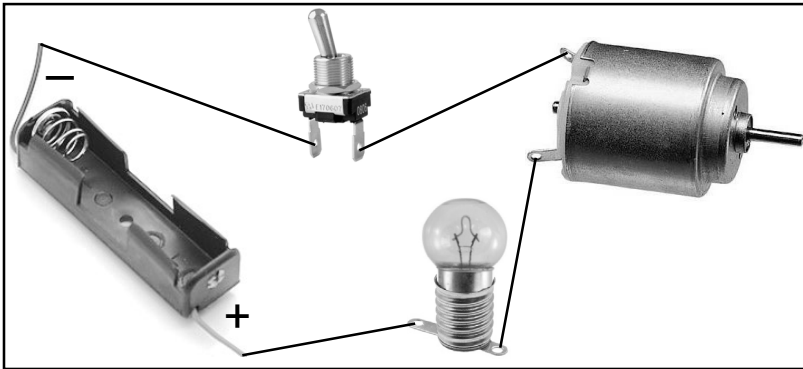
Always wear safety goggles
Do not wear loose clothing
Ensure that the work is gripped correctly in the chuck

3

Question 5.

20 Marks

(a) (i) Using the circuit diagram as a reference, draw the connecting wires between the components in the box below.



8

(ii) Answer the following by ticking the correct box:

Does a battery convert chemical energy directly into electrical energy?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
Is the current supplied by a battery called Direct Current (DC)?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
Is PVC a good insulator?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
Does solder, used for electronics, contain flux?	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>

(b) (i) This device is a:



Toggle Switch	<input type="checkbox"/>
Push Switch	<input type="checkbox"/>
Slide Switch	<input checked="" type="checkbox"/>

(iv) A mouse is a(n):



Input Device	<input checked="" type="checkbox"/>
Output Device	<input type="checkbox"/>
Process Device	<input type="checkbox"/>

6

(ii) Electrical resistance is measured in:



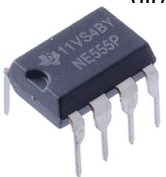
Volts	<input type="checkbox"/>
Ohms	<input checked="" type="checkbox"/>
Current	<input type="checkbox"/>

(v) This device is a:



Transistor	<input type="checkbox"/>
Fuse	<input checked="" type="checkbox"/>
Capacitor	<input type="checkbox"/>

(iii) The device is a(n):



Integrated Circuit	<input checked="" type="checkbox"/>
Resistor	<input type="checkbox"/>
Transistor	<input type="checkbox"/>

(vi) A speaker converts electrical energy into:



Sound Energy	<input checked="" type="checkbox"/>
Light Energy	<input type="checkbox"/>
Chemical Energy	<input type="checkbox"/>

(c) (i) Complete the table by matching the inventors listed to their achievement.

Inventors: Thomas Edison, Henry Maudslay, Wright Brothers, James Watt.

Achievement	Inventors
1. Steam Engine	James Watt
2. Lathe	Henry Maudslay
3. Electric Lamp	Thomas Edison
4. Aeroplane	Wright Brothers

6

(ii) Name a famous Irish inventor and write a brief note about this person's invention.

J.P. Holland
Invented the submarine

Question 6.

20 Marks

- (i) This design shows a candle stand. Name a suitable metal to make the base 'X' and give a reason for your choice.

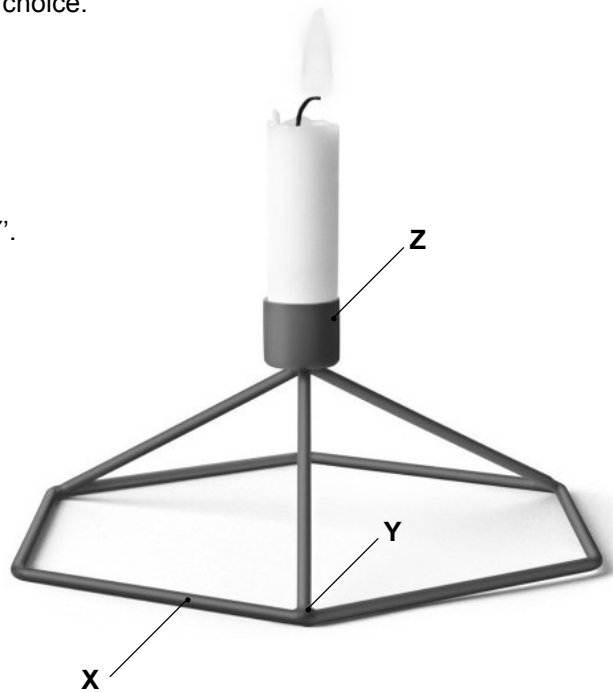
Metal:	<i>Steel</i>
Reason:	<i>Easily shaped and joined</i>

- (ii) Describe how you would join the metal rods at point 'Y'.

<i>Clean the pieces to be brazed</i>
<i>Apply the flux</i>
<i>Heat to the required temperature</i>
<i>Apply the spelter to the joint</i>

- (iii) What information would you need to know before making part 'Z'?

<i>The diameter of the candle</i>



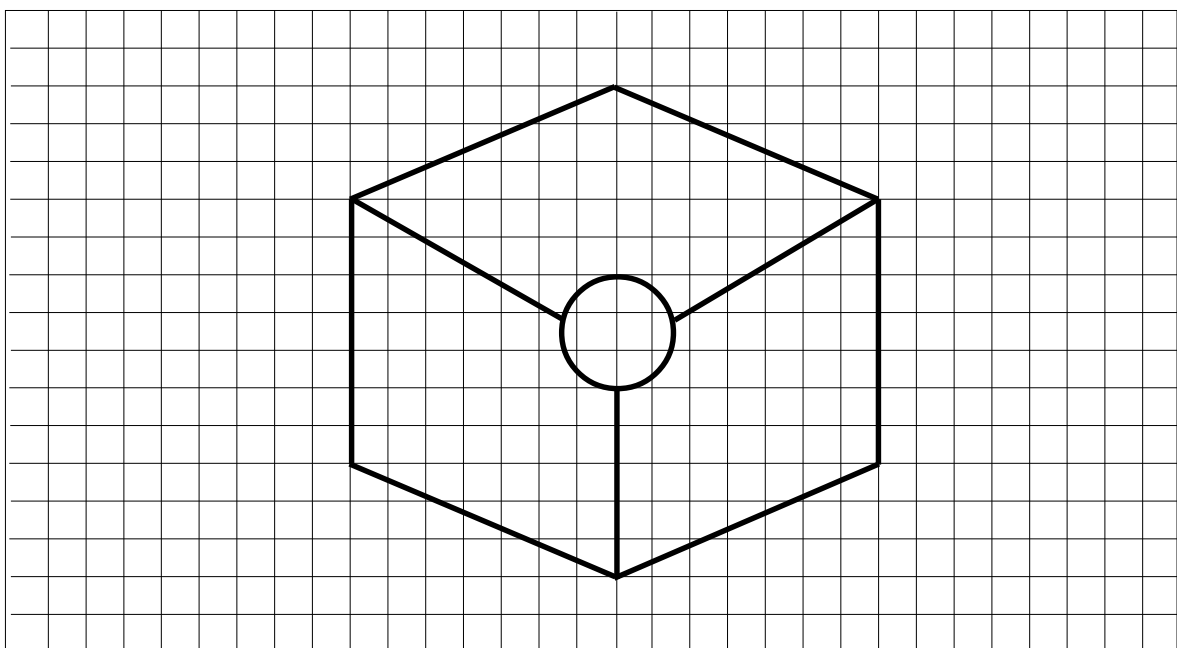
- (iv) Describe how you would make part 'Z'.

<i>Face it off in the lathe</i>
<i>Centre drill, then drill to the required size and depth</i>

- (v) Describe how you would apply a finish to the stand.

<i>Clean with emery cloth and apply paint with a brush</i>

- (vi) Draw a plan view of the candle stand in the grid below.



3

3

3

3

3

5

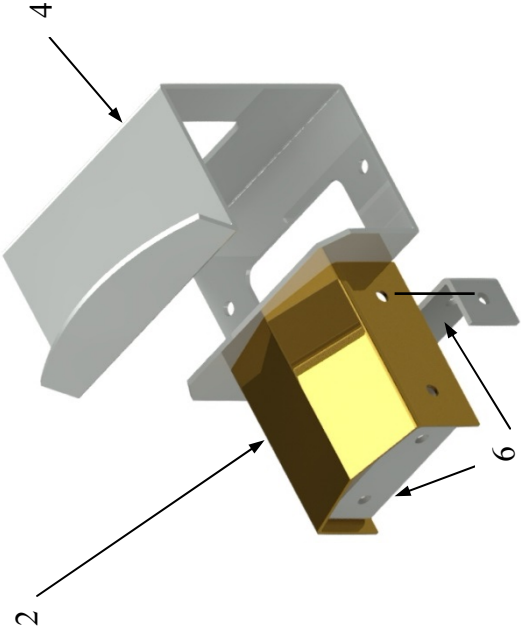
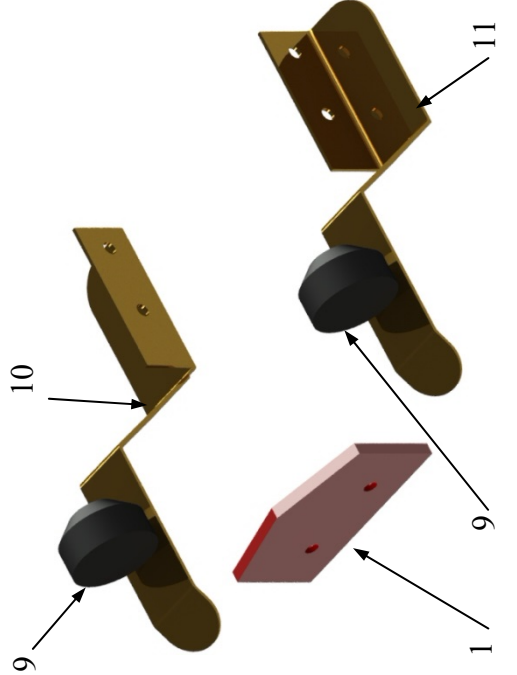


Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2015

		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor				
		9 - 10 Excellent	7 - 8 Very Good	5 - 6 Good	3 - 4 Poor	1 - 2 Very Poor				
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		
						Mechanical Function: Subjective Grade 1 – 5		5		
						Electrical Function: Subjective Grade 1 – 5		5		
2	Design	Design, make and attach Rear Axle Support(s) for the model. (Note: 20% of the marks will be awarded for this section)				Design: Subjective Grade 1 – 10		10	20	
						Make: Subjective Grade 1 – 5		5		
						Attach: Subjective Grade 1 – 5		5		
3	Parts 3, 5, 7 & 8					Part 3 Chassis		12	4	20
						Part 5 Cross Member		2	8	
						Part 7 Battery Holder Clamp		2		
						Part 8 Chassis Rail × 2		4	2	
						Mark Out		2		
						Drill, Shape & Bend			2	
						Mark Out, Drill, Drill & Shape		2		
						Mark Out, Drill, Shape & Bend			2	
Mark Out		2	2							
Drill & Shape				2	2					



Junior Certificate Metalwork - Ordinary Level Project - Marking Scheme 2015

4	Parts 2, 4 & 6		<p>Part 2 Bonnet</p> <p>Part 4 Cab</p> <p>Part 6 Bonnet Bracket × 2</p>	<p>4</p> <p>12</p> <p>4</p>	<p>Mark Out</p> <p>Drill, Shape & Bend</p> <p>Mark Out</p> <p>Slot × 2</p> <p>Drill, Shape & Bend</p> <p>Mark Out</p> <p>Drill, Shape & Bend</p>	<p>2</p> <p>2</p> <p>3</p> <p>6</p> <p>3</p> <p>2</p> <p>2</p> <p>20</p>
5	Parts 1, 9, 10 & 11		<p>Part 1 Grill</p> <p>Part 9 Headlight × 2</p> <p>Part 10 Right Mudguard</p> <p>Part 11 Left Mudguard</p>	<p>4</p> <p>4</p> <p>6</p> <p>6</p>	<p>Mark Out</p> <p>Drill & Shape</p> <p>Mark out, Turn, Drill & Tap</p> <p>Mark Out</p> <p>Drill, Shape & Bend</p> <p>Mark Out</p> <p>Drill, Shape & Bend</p>	<p>2</p> <p>2</p> <p>4</p> <p>2</p> <p>4</p> <p>2</p> <p>4</p> <p>2</p> <p>4</p> <p>20</p>

100 Marks (× 3 = 300 Total)