



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

# **JUNIOR CERTIFICATE 2008**

## **MARKING SCHEME**

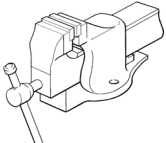
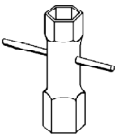
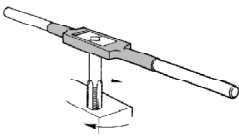
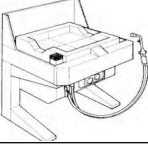
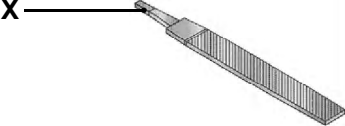
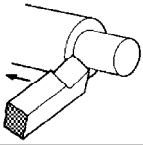
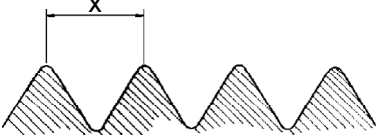
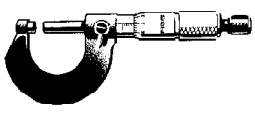
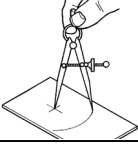
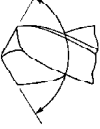
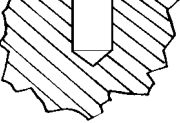
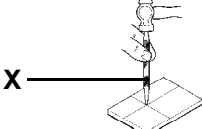
Written Examination and Project

### **Materials and Technology** **METALWORK**

#### **ORDINARY LEVEL**

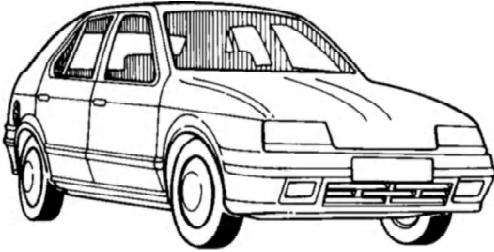
**Materials and Technology – METALWORK**  
**Written Examination – 100 Marks**  
**Answer Sections A and B of Question 1 and three other questions.**

**1. SECTION A - 20 MARKS. ANSWER ANY TEN QUESTIONS FROM THIS SECTION 40 Marks**

<p>(a) </p>	<p>This holding device is a:</p>	<table border="1"> <tr><td>Hand Vice</td><td></td></tr> <tr><td>Bench Vice</td><td>✓</td></tr> <tr><td>Leg Vice</td><td></td></tr> <tr><td>Machine Vice</td><td></td></tr> </table>	Hand Vice		Bench Vice	✓	Leg Vice		Machine Vice		(2)
Hand Vice											
Bench Vice	✓										
Leg Vice											
Machine Vice											
<p>(b) </p>	<p>This tool is a(n):</p>	<table border="1"> <tr><td>Ring Spanner</td><td></td></tr> <tr><td>Adjustable Wrench</td><td></td></tr> <tr><td>Box Spanner</td><td>✓</td></tr> <tr><td>Vice Grips</td><td></td></tr> </table>	Ring Spanner		Adjustable Wrench		Box Spanner	✓	Vice Grips		(2)
Ring Spanner											
Adjustable Wrench											
Box Spanner	✓										
Vice Grips											
<p>(c) </p>	<p>Taps are used to form:</p>	<table border="1"> <tr><td>Internal Threads</td><td>✓</td></tr> <tr><td>Butress Threads</td><td></td></tr> <tr><td>External Threads</td><td></td></tr> <tr><td>Acme Threads</td><td></td></tr> </table>	Internal Threads	✓	Butress Threads		External Threads		Acme Threads		(2)
Internal Threads	✓										
Butress Threads											
External Threads											
Acme Threads											
<p>(d) </p>	<p>The brass used for brazing is called:</p>	<table border="1"> <tr><td>Spelter</td><td>✓</td></tr> <tr><td>Solder</td><td></td></tr> <tr><td>Enamel</td><td></td></tr> <tr><td>Flux</td><td></td></tr> </table>	Spelter	✓	Solder		Enamel		Flux		(2)
Spelter	✓										
Solder											
Enamel											
Flux											
<p>(e) </p>	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Point</td><td></td></tr> <tr><td>Face</td><td></td></tr> <tr><td>Edge</td><td></td></tr> <tr><td>Tang</td><td>✓</td></tr> </table>	Point		Face		Edge		Tang	✓	(2)
Point											
Face											
Edge											
Tang	✓										
<p>(f) </p>	<p>This technique is called:</p>	<table border="1"> <tr><td>Parallel Turning</td><td>✓</td></tr> <tr><td>Taper Turning</td><td></td></tr> <tr><td>Knurling</td><td></td></tr> <tr><td>Facing</td><td></td></tr> </table>	Parallel Turning	✓	Taper Turning		Knurling		Facing		(2)
Parallel Turning	✓										
Taper Turning											
Knurling											
Facing											
<p>(g) </p>	<p>The distance 'X' is called the:</p>	<table border="1"> <tr><td>Crest</td><td></td></tr> <tr><td>Flank</td><td></td></tr> <tr><td>Root</td><td></td></tr> <tr><td>Pitch</td><td>✓</td></tr> </table>	Crest		Flank		Root		Pitch	✓	(2)
Crest											
Flank											
Root											
Pitch	✓										
<p>(h) </p>	<p>A micrometer can measure to an accuracy of:</p>	<table border="1"> <tr><td>1 mm</td><td></td></tr> <tr><td>0.5 mm</td><td></td></tr> <tr><td>0.1 mm</td><td></td></tr> <tr><td>0.01 mm</td><td>✓</td></tr> </table>	1 mm		0.5 mm		0.1 mm		0.01 mm	✓	(2)
1 mm											
0.5 mm											
0.1 mm											
0.01 mm	✓										
<p>(i) </p>	<p>This tool is called a(n):</p>	<table border="1"> <tr><td>Outside Calipers</td><td></td></tr> <tr><td>Spring Dividers</td><td>✓</td></tr> <tr><td>Odd Leg Calipers</td><td></td></tr> <tr><td>Inside Calipers</td><td></td></tr> </table>	Outside Calipers		Spring Dividers	✓	Odd Leg Calipers		Inside Calipers		(2)
Outside Calipers											
Spring Dividers	✓										
Odd Leg Calipers											
Inside Calipers											
<p>(j) </p>	<p>The drill point angle is:</p>	<table border="1"> <tr><td>118°</td><td>✓</td></tr> <tr><td>90°</td><td></td></tr> <tr><td>180°</td><td></td></tr> <tr><td>60°</td><td></td></tr> </table>	118°	✓	90°		180°		60°		(2)
118°	✓										
90°											
180°											
60°											
<p>(k) </p>	<p>This drawing shows a:</p>	<table border="1"> <tr><td>Counterbored Hole</td><td></td></tr> <tr><td>Countersunk Hole</td><td>✓</td></tr> <tr><td>Pilot Hole</td><td></td></tr> <tr><td>Blind Hole</td><td></td></tr> </table>	Counterbored Hole		Countersunk Hole	✓	Pilot Hole		Blind Hole		(2)
Counterbored Hole											
Countersunk Hole	✓										
Pilot Hole											
Blind Hole											
<p>(l) </p>	<p>Tool 'X' is a:</p>	<table border="1"> <tr><td>Scriber</td><td></td></tr> <tr><td>Parallel Punch</td><td></td></tr> <tr><td>Centre Punch</td><td>✓</td></tr> <tr><td>Centre Square</td><td></td></tr> </table>	Scriber		Parallel Punch		Centre Punch	✓	Centre Square		(2)
Scriber											
Parallel Punch											
Centre Punch	✓										
Centre Square											

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

(m)



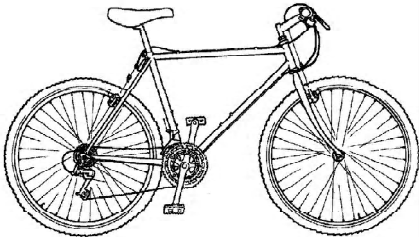
(i) Name any **three** parts in a car engine.

1. <i>Cylinder</i>	<b>6</b>
2. <i>Piston</i>	
3. <i>Crankshaft</i>	

(ii) Describe the purpose of any **one** of these engine parts.

<i>Cylinder guides the movement of the piston.</i>	<b>2</b>

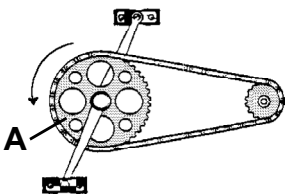
(n)



List **four** design features of a modern bicycle.

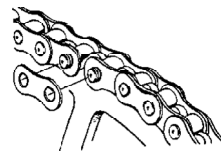
1. <i>Lighter Frame</i>	<b>6</b>
2. <i>Improved Safety Features</i>	
3. <i>Braking system</i>	
4. <i>Drive system</i>	

(o) (i) Part 'A' is called a:



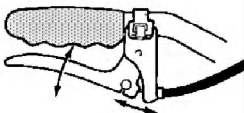
Sprocket	<input checked="" type="checkbox"/>
Linkage	<input type="checkbox"/>
Pawl	<input type="checkbox"/>
Ratchet	<input type="checkbox"/>

(ii) The links of this chain are joined by:



Brazing	<input type="checkbox"/>	<b>2</b>
Screwing	<input type="checkbox"/>	
Riveting	<input checked="" type="checkbox"/>	
Welding	<input type="checkbox"/>	

(p) (i) This mechanism uses a:



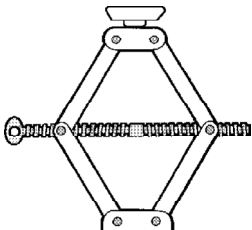
Gear	<input type="checkbox"/>
Lever	<input checked="" type="checkbox"/>
Caliper	<input type="checkbox"/>
Bearing	<input type="checkbox"/>

(ii) Why is a bicycle chain lubricated?



<i>To keep the links moving freely</i>	<b>2</b>

(q) (i) This scissors jack uses a:



Screw mechanism	<input checked="" type="checkbox"/>
Ratchet mechanism	<input type="checkbox"/>
Cam mechanism	<input type="checkbox"/>
Gear mechanism	<input type="checkbox"/>

(ii) Car bodies are made from:



Copper	<input type="checkbox"/>	<b>2</b>
Zinc	<input type="checkbox"/>	
Steel	<input checked="" type="checkbox"/>	
Iron	<input type="checkbox"/>	

**(a)**

(i) Complete the chart:

Plastic Material	Thermosetting or Thermoplastic	List a use for each plastic
Polyurethanes	<i>Thermosetting</i>	<i>Flexible foam for upholstery</i>
Polythene	<i>Thermoplastic</i>	<i>Bottles</i>
PVC	<i>Thermoplastic</i>	<i>Guttering</i>
Nylon	<i>Thermoplastic</i>	<i>Gears</i>

6

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

Lead	<input type="checkbox"/>
Brass	<input checked="" type="checkbox"/>
Silver	<input type="checkbox"/>
Aluminium	<input type="checkbox"/>

1

(iii) Why is copper used to make electrical wire?

*Good conductor*

1

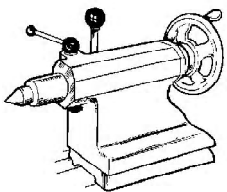
**(b)** Complete the chart:



(i) The tool shown a straight-bit soldering iron.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(ii) Fluxes are used to remove oxides.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(iii) Soft solders begin to melt at 800°C.	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(iv) Resin fluxes are used for electrical work.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(v) Soldering iron bits are made from steel.	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(vi) Sweating is a method of soldering.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>

6

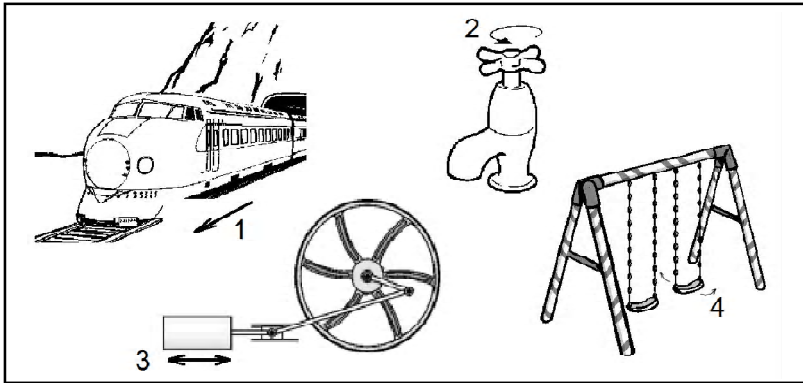
**(c)** Complete the chart:



(i) Lathe work is sometimes called 'turning'.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(ii) A drill chuck can be fitted to a lathe tailstock.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>
(iii) Lathe cutting tool bits are made from cast iron.	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(iv) A self-centring chuck has four jaws.	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(v) A tool holder is used when knurling.	Yes	<input type="checkbox"/>
	No	<input checked="" type="checkbox"/>
(vi) A lathe can be used for screwcutting.	Yes	<input checked="" type="checkbox"/>
	No	<input type="checkbox"/>

6

(a) (i) Match the number to the correct motion type.



Motion Type	No.
Rotary Motion	2
Linear Motion	1
Oscillating Motion	4
Reciprocating Motion	3

(ii) Name a machine in the school workshop that uses rotary motion.

Lathe

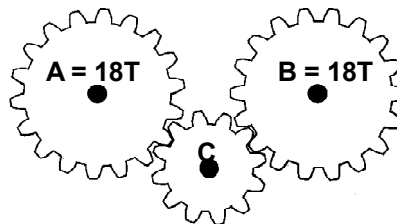
(b) (i) Name a mechanism used by each of these machines.

Name: Crank & Slider

Name: Ratchet & Pawl

Name: Pulley & Belt

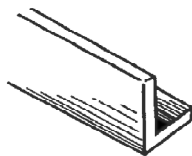
(ii) If gear 'A' rotates at 100 RPM how fast will gear 'B' rotate?



50 RPM	
100 RPM	✓
150 RPM	
200 RPM	

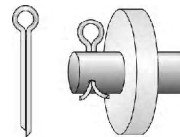
(iii) What is gear 'C' called? Idler gear

(b) (i) This metal section is known as:



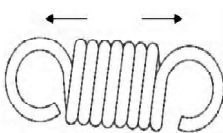
Channel Iron	
Angle Iron	✓
Box Iron	

(iv) This device uses a:



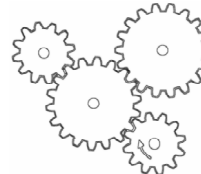
Locknut	
Grub Screw	
Split Pin	✓

(ii) This spring is in:



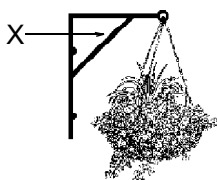
Shear	
Tension	✓
Compression	

(v) This gear arrangement is known as a:



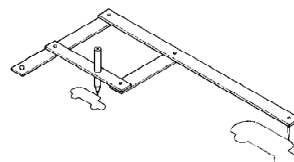
Worm Gear	
Gear Train	✓
Bevel Gear	

(iii) Part 'X' is a:



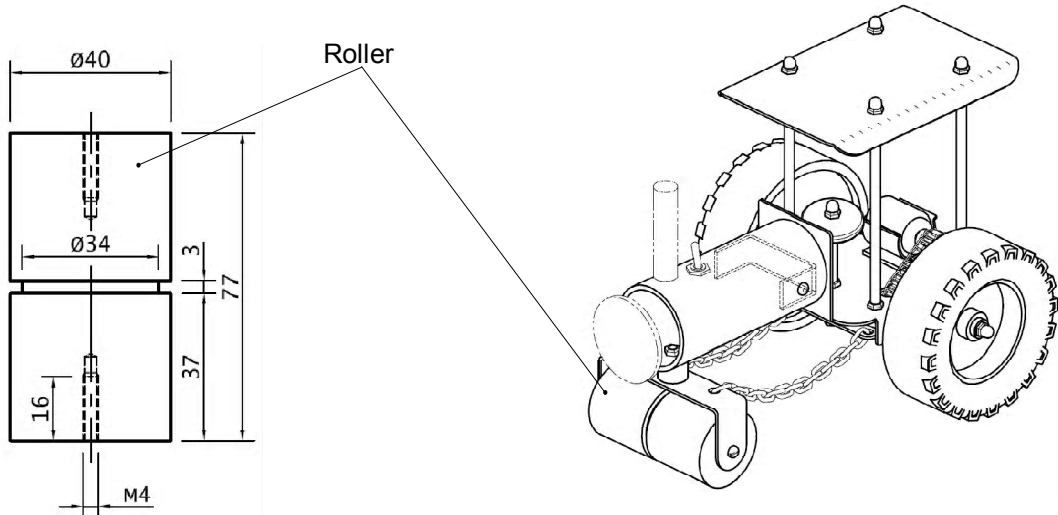
Strut	✓
Tie	
Truss	

(vi) The linkages used are:



Perpendicular	
Parallel	✓
Fixed	

Details of a roller used in the manufacture of a model steam roller are shown.



(i) List the tools and processes used to form the M4 threads in the roller.

Tools:	Processes:	⑥
3 From: Centre Drill, Twist drill, Lathe, Taps, Tap wrench	Drilling	
	Tapping	

(ii) What does M4 mean?

Metric screw thread for size 4mm ②

(iii) Describe how you would form the 3mm undercut in the roller.

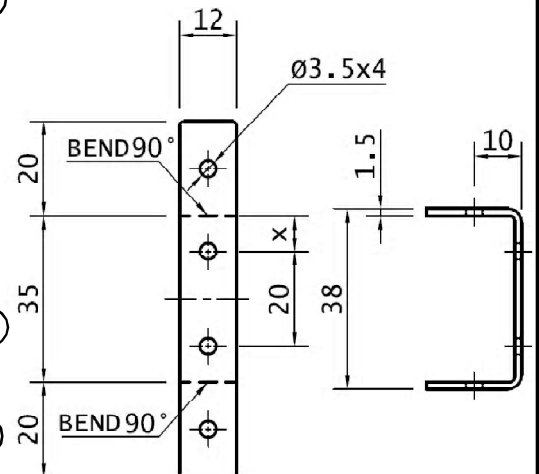
Use the parting-off tool in the lathe. ②

(iv) What precautions should you take when soldering the electric circuit?

Use the correct type of soldering iron.  
Place electric soldering iron in stand when not in use.  
If possible use flux cored solder. ③

(v) Describe how you would accurately mark out the centre of the drill holes in the boiler bracket.

Using the odd-leg callipers to mark the centre line. ③  
Use the rule, scribe and try-square to mark the holes.  
Using centre punch and hammer to locate centres for drilling.



(vi) What is the overall length of the boiler bracket?

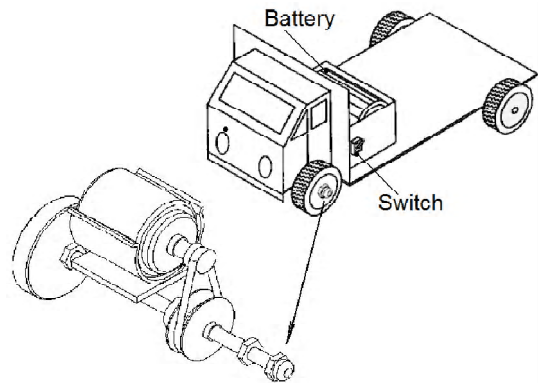
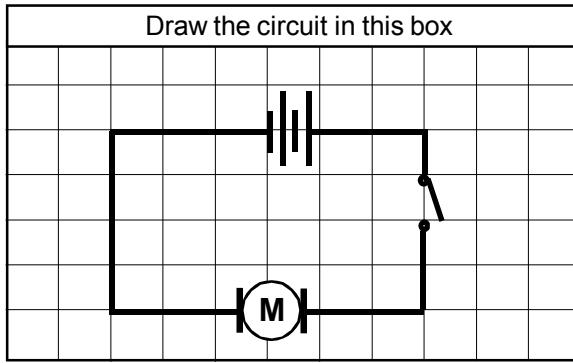
75 ②

(vii) What is distance 'X'?

7.5 ②

Boiler Bracket

(a) (i) This toy truck uses a motor to turn the front axle. A switch and a battery are also used in this project. Draw the electrical circuit diagram for this project.

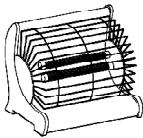


4

(ii) Complete the chart:

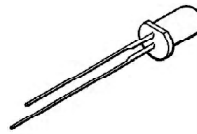
A battery is made up of a number of cells joined together.	Yes	<input checked="" type="checkbox"/>	1
	No	<input type="checkbox"/>	
The current supplied by a battery is called Alternating Current (AC).	Yes	<input type="checkbox"/>	1
	No	<input checked="" type="checkbox"/>	
In an electronic system, a buzzer is an output device.	Yes	<input checked="" type="checkbox"/>	1
	No	<input type="checkbox"/>	
An ordinary bulb has a tungsten filament.	Yes	<input checked="" type="checkbox"/>	1
	No	<input type="checkbox"/>	

(b) (i) A heater covers electrical energy into:



Chemical Energy	<input type="checkbox"/>	1
Mechanical Energy	<input type="checkbox"/>	
Heat Energy	<input checked="" type="checkbox"/>	

(iv) This component is a(n):



LED	<input checked="" type="checkbox"/>	1
LDR	<input type="checkbox"/>	
Bulb	<input type="checkbox"/>	

(ii) This device is a:



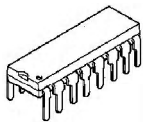
Floppy Disk	<input type="checkbox"/>	1
CD	<input checked="" type="checkbox"/>	
Hard Disk	<input type="checkbox"/>	

(v) A mouse is a(n):



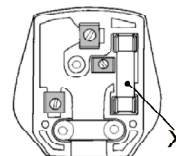
Output Device	<input type="checkbox"/>	1
Input Device	<input checked="" type="checkbox"/>	
Process Device	<input type="checkbox"/>	

(iii) This component is a(n):



Transistor	<input type="checkbox"/>	1
Integrated Circuit	<input checked="" type="checkbox"/>	
Relay	<input type="checkbox"/>	

(vi) Part 'X' is a:



Diode	<input type="checkbox"/>	1
Fuse	<input checked="" type="checkbox"/>	
Resistor	<input type="checkbox"/>	

(c) Complete the chart by matching the inventor to the achievement.

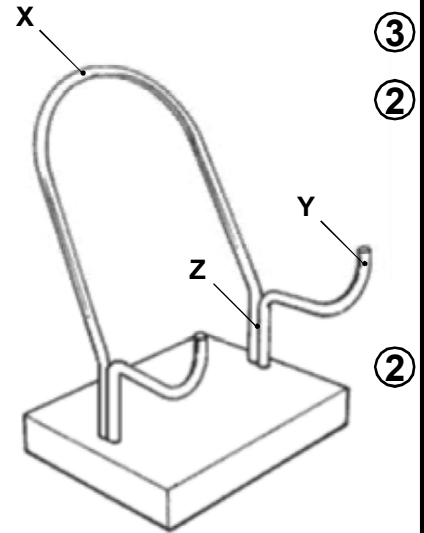
Inventors: Henry Ford, John Dunlop, John P. Holland, Wright Brothers

Achievement	Inventor(s)
1. Aeroplane	Wright Brothers
2. Submarine	John P. Holland
3. Pneumatic Tyre	John Dunlop
4. Mass Production	Henry Ford

6

(i) This drawing shows a kitchen book holder. Name a metal suitable for making the rods 'X' and 'Y'. Give a reason for your choice.

Metal: <i>Brass</i>
Reason: <i>Looks pleasing to the eye</i>
<i>Resists corrosion</i>
<i>Easy to bend and join</i>



(ii) Describe how you would join the metal rods at 'Z'.

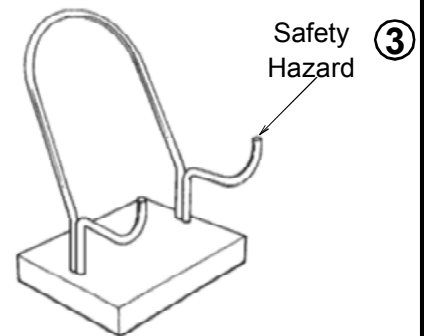
<i>Clean, flux and solder together</i>

(iii) Using the chart below describe **one** shaping process, **one** finishing process and name the tools used to make the kitchen book holder.

Shaping Process: <i>Bending</i>	Tools used:
	<i>Mallet and Former</i>
Finishing Process: <i>Polishing</i>	Tools used:
	<i>Polishing machine</i>

(iv) Draw a sketch to show how you would modify the stand to make it safer.

Possible Solutions




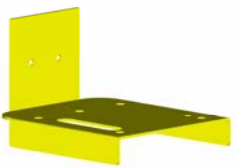

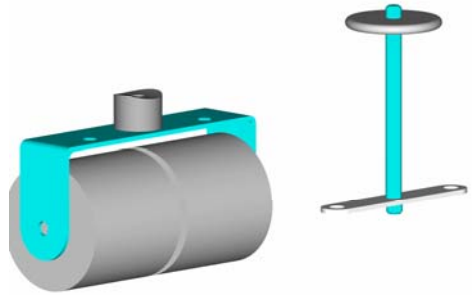
(v) Match the household item to the correct material.

1.  Sink	2.  Bucket	3.  Key
4.  Toothbrush	5.  Drinks Can	6.  Stove

Item	No.
Cast Iron	<b>6</b>
Aluminium	<b>5</b>
Stainless Steel	<b>1</b>
Polyethylene	<b>2</b>
Nylon	<b>4</b>
Brass	<b>3</b>





Subjective Grading 1 - 5		5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor			
Section	Part Number	Pictorial Sketch / Description			Concept		Mark	Mark	
1	All Parts of Project (Design Elements not included)	<b>Assembly Finish &amp; Function</b> 	Assembly Subjective Grade 1 - 5		5	20			
			Finish Subjective Grade 1 - 5		5				
			Mechanical Function		5				
			Electrical Function		5				
2	Design Feature	<b>Design make and attach a Removable Inspection Cover and Chimney</b>	Design Inspection Cover Subjective Grade 1-5		5	20			
			Design Chimney Subjective Grade 1-5		5				
			Make & Finish		5				
			Attach		5				
3	Part 2		Chassis	20	Marking Out	4	20		
					Drilling	4			
					Slot	4			
					Shape	5			
					Bend	3			
4	Parts 1, 3, 4 & 10		Roof	8	Marking Out	2	20		
					Shape & Drill	4			
					Bend	2			
			Boiler	4	Mark Out & Drill	3			
					Length	1			
			Roof Supports	4	Length	2			
					Threading	2			
			Boiler Bracket	4	Mark Out & Drill	2			
		Shape & Bend	2						
5	Parts 5, 6, 7, 8 & 9		Steering Link	4	Mark Out & Drill	3	20		
					Shape	1			
			Steering Wheel	2	Shape & Drill	2			
			Roller	4	Length & Groove	2			
					Drill & Tap	2			
			Roller Bracket	8	Mark Out & Drill	4			
					Shape	2			
		Bend	2						
		Steering Pivot	2	Turn, Drill & Shape	2				