



S56

**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

JUNIOR CERTIFICATE EXAMINATION, 2006

MATERIALS AND TECHNOLOGY

METALWORK - ORDINARY LEVEL



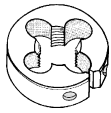
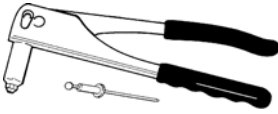
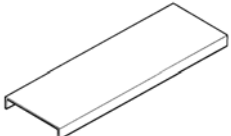
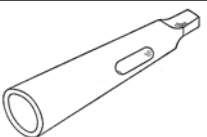
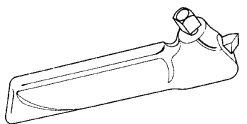
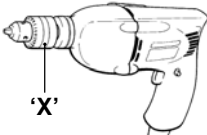
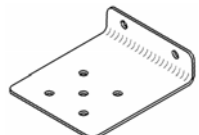
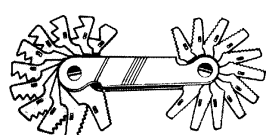
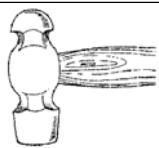

100 Marks

*Marking
Scheme*

1.

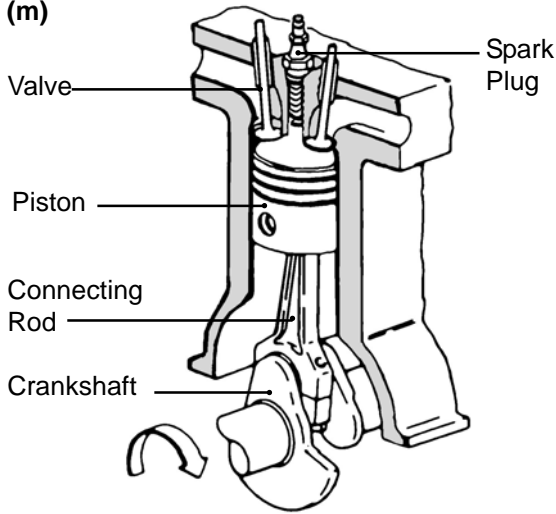
SECTION A - 20 MARKS
ANSWER ANY **TEN** QUESTIONS FROM THIS SECTION

40 Marks

<p>(a)</p> 	<p>This is a:</p>	<table border="1"> <tr><td>Hand File</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Flat File</td><td><input type="checkbox"/></td></tr> <tr><td>Square File</td><td><input type="checkbox"/></td></tr> <tr><td>Round File</td><td><input type="checkbox"/></td></tr> </table>	Hand File	<input checked="" type="checkbox"/>	Flat File	<input type="checkbox"/>	Square File	<input type="checkbox"/>	Round File	<input type="checkbox"/>	<p>②</p>
Hand File	<input checked="" type="checkbox"/>										
Flat File	<input type="checkbox"/>										
Square File	<input type="checkbox"/>										
Round File	<input type="checkbox"/>										
<p>(b)</p> 	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Frame</td><td><input type="checkbox"/></td></tr> <tr><td>Spindle</td><td><input type="checkbox"/></td></tr> <tr><td>Anvil</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Sleeve</td><td><input type="checkbox"/></td></tr> </table>	Frame	<input type="checkbox"/>	Spindle	<input type="checkbox"/>	Anvil	<input checked="" type="checkbox"/>	Sleeve	<input type="checkbox"/>	<p>②</p>
Frame	<input type="checkbox"/>										
Spindle	<input type="checkbox"/>										
Anvil	<input checked="" type="checkbox"/>										
Sleeve	<input type="checkbox"/>										
<p>(c)</p> 	<p>A die should be used with a(n):</p>	<table border="1"> <tr><td>Tap Wrench</td><td><input type="checkbox"/></td></tr> <tr><td>Box Spanner</td><td><input type="checkbox"/></td></tr> <tr><td>Adjustable Wrench</td><td><input type="checkbox"/></td></tr> <tr><td>Stock</td><td><input checked="" type="checkbox"/></td></tr> </table>	Tap Wrench	<input type="checkbox"/>	Box Spanner	<input type="checkbox"/>	Adjustable Wrench	<input type="checkbox"/>	Stock	<input checked="" type="checkbox"/>	<p>②</p>
Tap Wrench	<input type="checkbox"/>										
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Adjustable Wrench	<input type="checkbox"/>										
Stock	<input checked="" type="checkbox"/>										
<p>(d)</p> 	<p>This is a:</p>	<table border="1"> <tr><td>Rivet Snap</td><td><input type="checkbox"/></td></tr> <tr><td>Pop Riveter</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Rivet Set</td><td><input type="checkbox"/></td></tr> <tr><td>Bolster</td><td><input type="checkbox"/></td></tr> </table>	Rivet Snap	<input type="checkbox"/>	Pop Riveter	<input checked="" type="checkbox"/>	Rivet Set	<input type="checkbox"/>	Bolster	<input type="checkbox"/>	<p>②</p>
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Rivet Set	<input type="checkbox"/>										
Bolster	<input type="checkbox"/>										
<p>(e)</p> 	<p>This brass sheet part can be formed using (a):</p>	<table border="1"> <tr><td>Bench Vice</td><td><input type="checkbox"/></td></tr> <tr><td>Hand Vice</td><td><input type="checkbox"/></td></tr> <tr><td>Toolmaker's Clamp</td><td><input type="checkbox"/></td></tr> <tr><td>Folding Bars</td><td><input checked="" type="checkbox"/></td></tr> </table>	Bench Vice	<input type="checkbox"/>	Hand Vice	<input type="checkbox"/>	Toolmaker's Clamp	<input type="checkbox"/>	Folding Bars	<input checked="" type="checkbox"/>	<p>②</p>
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Folding Bars	<input checked="" type="checkbox"/>										
<p>(f)</p> 	<p>This is a:</p>	<table border="1"> <tr><td>Morse Taper Sleeve</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Drill Drift</td><td><input type="checkbox"/></td></tr> <tr><td>Reamer</td><td><input type="checkbox"/></td></tr> <tr><td>Chuck Guard</td><td><input type="checkbox"/></td></tr> </table>	Morse Taper Sleeve	<input checked="" type="checkbox"/>	Drill Drift	<input type="checkbox"/>	Reamer	<input type="checkbox"/>	Chuck Guard	<input type="checkbox"/>	<p>②</p>
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Drill Drift	<input type="checkbox"/>										
Reamer	<input type="checkbox"/>										
Chuck Guard	<input type="checkbox"/>										
<p>(g)</p> 	<p>This lathe part is known as a(n):</p>	<table border="1"> <tr><td>Top Slide</td><td><input type="checkbox"/></td></tr> <tr><td>Tool Post</td><td><input type="checkbox"/></td></tr> <tr><td>Tool Holder</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Tailstock</td><td><input type="checkbox"/></td></tr> </table>	Top Slide	<input type="checkbox"/>	Tool Post	<input type="checkbox"/>	Tool Holder	<input checked="" type="checkbox"/>	Tailstock	<input type="checkbox"/>	<p>②</p>
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Tailstock	<input type="checkbox"/>										
<p>(h)</p> 	<p>Part 'X' is called the:</p>	<table border="1"> <tr><td>Chuck Key</td><td><input type="checkbox"/></td></tr> <tr><td>Chuck</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Spindle</td><td><input type="checkbox"/></td></tr> <tr><td>Motor</td><td><input type="checkbox"/></td></tr> </table>	Chuck Key	<input type="checkbox"/>	Chuck	<input checked="" type="checkbox"/>	Spindle	<input type="checkbox"/>	Motor	<input type="checkbox"/>	<p>②</p>
Chuck Key	<input type="checkbox"/>										
Chuck	<input checked="" type="checkbox"/>										
Spindle	<input type="checkbox"/>										
Motor	<input type="checkbox"/>										
<p>(i)</p> 	<p>Before drilling, hole centres should be marked with a(n):</p>	<table border="1"> <tr><td>Pin Punch</td><td><input type="checkbox"/></td></tr> <tr><td>Outside Calipers</td><td><input type="checkbox"/></td></tr> <tr><td>Centre Punch</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Inside Calipers</td><td><input type="checkbox"/></td></tr> </table>	Pin Punch	<input type="checkbox"/>	Outside Calipers	<input type="checkbox"/>	Centre Punch	<input checked="" type="checkbox"/>	Inside Calipers	<input type="checkbox"/>	<p>②</p>
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Centre Punch	<input checked="" type="checkbox"/>										
Inside Calipers	<input type="checkbox"/>										
<p>(j)</p> 	<p>This instrument is a:</p>	<table border="1"> <tr><td>Radius Gauge</td><td><input type="checkbox"/></td></tr> <tr><td>Wire Gauge</td><td><input type="checkbox"/></td></tr> <tr><td>Screw Pitch Gauge</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Feeler Gauge</td><td><input type="checkbox"/></td></tr> </table>	Radius Gauge	<input type="checkbox"/>	Wire Gauge	<input type="checkbox"/>	Screw Pitch Gauge	<input checked="" type="checkbox"/>	Feeler Gauge	<input type="checkbox"/>	<p>②</p>
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Wire Gauge	<input type="checkbox"/>										
Screw Pitch Gauge	<input checked="" type="checkbox"/>										
Feeler Gauge	<input type="checkbox"/>										
<p>(k)</p> 	<p>This hammer head is made from:</p>	<table border="1"> <tr><td>Cast Iron</td><td><input type="checkbox"/></td></tr> <tr><td>High Speed Steel</td><td><input type="checkbox"/></td></tr> <tr><td>High Carbon Steel</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Stainless Steel</td><td><input type="checkbox"/></td></tr> </table>	Cast Iron	<input type="checkbox"/>	High Speed Steel	<input type="checkbox"/>	High Carbon Steel	<input checked="" type="checkbox"/>	Stainless Steel	<input type="checkbox"/>	<p>②</p>
Cast Iron	<input type="checkbox"/>										
High Speed Steel	<input type="checkbox"/>										
High Carbon Steel	<input checked="" type="checkbox"/>										
Stainless Steel	<input type="checkbox"/>										
<p>(l)</p> 	<p>This fastener should be adjusted using a(n):</p>	<table border="1"> <tr><td>Ring Spanner</td><td><input type="checkbox"/></td></tr> <tr><td>Vice Grips</td><td><input type="checkbox"/></td></tr> <tr><td>Allen Key</td><td><input checked="" type="checkbox"/></td></tr> <tr><td>Box Spanner</td><td><input type="checkbox"/></td></tr> </table>	Ring Spanner	<input type="checkbox"/>	Vice Grips	<input type="checkbox"/>	Allen Key	<input checked="" type="checkbox"/>	Box Spanner	<input type="checkbox"/>	<p>②</p>
Ring Spanner	<input type="checkbox"/>										
Vice Grips	<input type="checkbox"/>										
Allen Key	<input checked="" type="checkbox"/>										
Box Spanner	<input type="checkbox"/>										

SECTION B - 20 MARKS
ANSWER ALL QUESTIONS FROM THIS SECTION

(m)



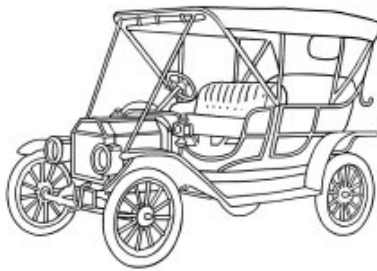
(i) Using the labels briefly describe how this engine works.

Crankshaft rotates.	5
Connecting rod moves the piston up and down.	
Valves open & close, fuel comes in & exhaust gasses out.	
Sparkplug ignites the fuel.	

(ii) What type of fuel does this engine use?

Petrol	1
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(n) From the history of transport, briefly describe the contribution of one engineer.



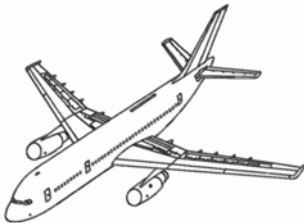
Rudolf Diesel	2
Designed the diesel engine which is used in cars, lorries, tractors and boats.	

(o) List **four** safety features found in modern cars.



1. Seat belts.	1 1 1 1
2. Air bags.	
3. Toughened windscreens.	
4. ABS brakes.	

(p) (i) Why is aluminium used to make planes?



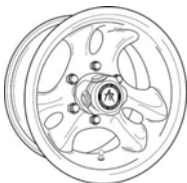
Lightweight	2

(ii) Why is rubber used to make tyres?



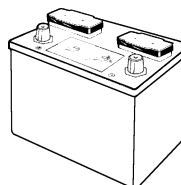
Good grip	2

(q) (i) Alloy wheels contain:



Steel		2
Tungsten		
Copper		
Aluminum	✓	

(ii) Car batteries contain:



Brass		2
Lead	✓	
Steel		
Bronze		

(a)

(i) The Basic Oxygen process is used to produce:

Pig Iron	
Steel	✓
Cast Iron	

①

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

Toughness	
Hardness	✓
Ductility	

①

(ii) Steel is an alloy of iron and:

Limestone	
Coke	
Carbon	✓

①

(vi) Soft solder is an alloy of lead and:

Tin	✓
Silver	
Zinc	

①

(iii) Silver steel contains:

Silver	
Chromium	✓
Lead	

①

(vii) Zinc is a(n):

Alloy	
Ferrous Metal	
Non-Ferrous Metal	✓

①

(iv) Bronze is an alloy of:

Copper & Tin	✓
Copper & Zinc	
Copper & Lead	

①

(viii) Cast Iron is:

Ductile	
Brittle	✓
Malleable	

①

(b)

(i) Low density polyethylene softens at about:

85°C	✓
285°C	
485°C	

①

(iv) In the workshop, a strip heater is used to bend:

Perspex	✓
Foam	
Bakelite	

①

(ii) High density polyethylene can be used to make:

Bottles	
Gears	✓
Adhesives	

①

(v) Enamel is made from:

Polyester Resin	
Glass	✓
PVC	

①

(iii) Which one of these is a Thermoplastic?

Polyester Resin	
Nylon	✓
Phenolic Resin	

①

(vi) Polyester Resin is used to make:

Raincoats	
Ornamental Castings	✓
Shopping Bags	

①

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

Task	Tool
To check drill sizes.	Drill Gauge
To cut a thin piece of copper sheet.	Snips
To hold metal while forging.	Tongs
To hold work firmly while drilling.	Machine Vice
To find the depth of a hole.	Depth Gauge
To find the diameter of a small drill.	Drill Gauge
To tighten a nut.	Spanner

①

①

①

①

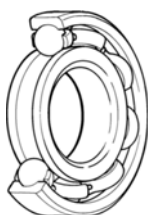
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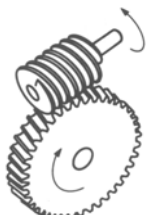
(a) (i) Name the mechanism in each box.

Name: Bearing



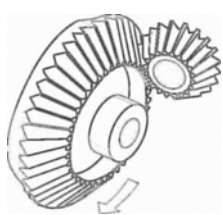
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Name: Worm & Wheel



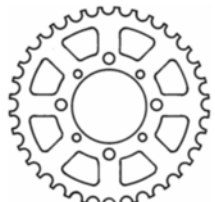
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Name: Bevel Gear




①

Name: Sprocket



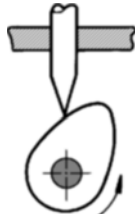
①

Name: Ratchet & Pawl



①

Name: Cam

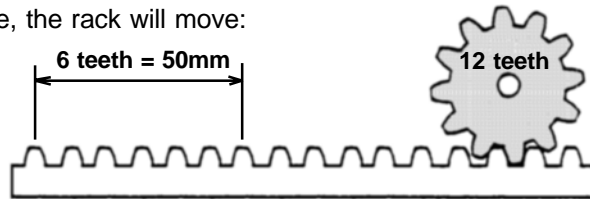


①

(ii) What is the purpose of an idler gear?

To make two gears rotate in the same direction. ②

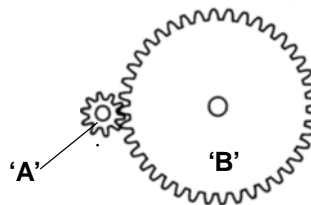
(b) (i) When the pinion turns once, the rack will move:



1000 mm	
100 mm	✓
600 mm	
200 mm	

②

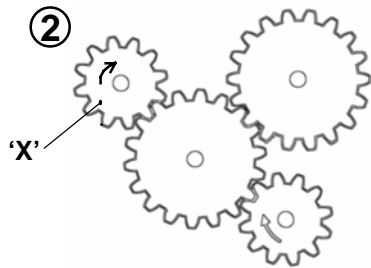
(ii) If gear 'A' rotates at 400 RPM how fast will gear 'B' rotate? (A = 10 Teeth, B = 40 Teeth)



400 RPM	
300 RPM	
100 RPM	✓
40 RPM	

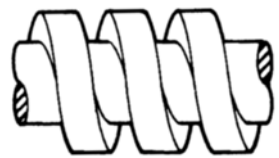
②

(iii) Indicate with an arrow the direction of gear 'X'.

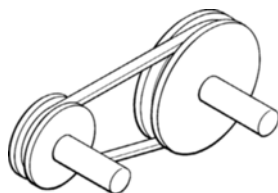


(c) Name a machine that uses each of these mechanisms:

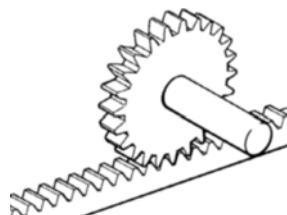
Machine: Screw Jack ②



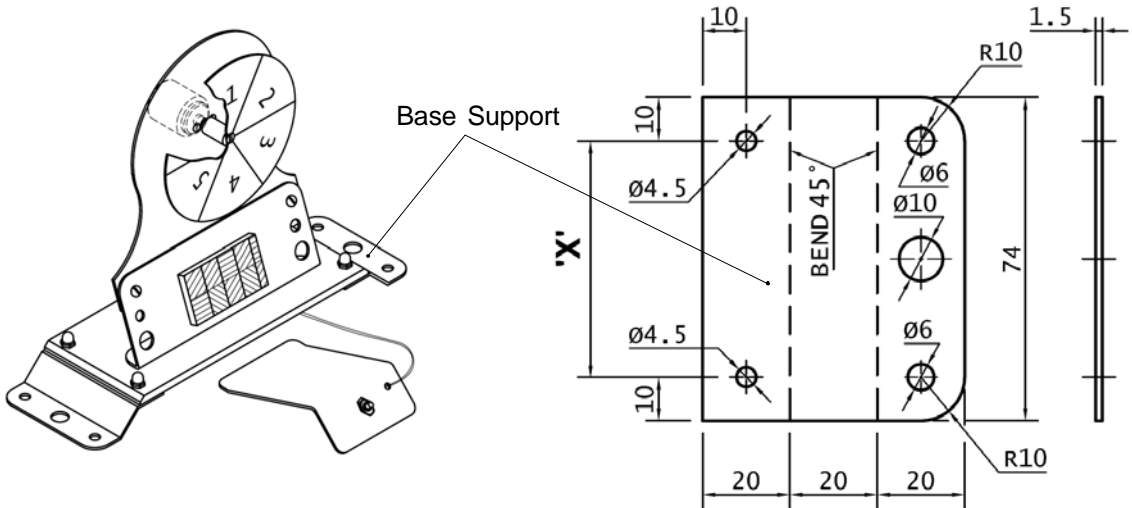
Machine: Drilling Machine ②



Machine: Lathe ②



Details of the base support used in the manufacture of the solar powered dice game are shown.



(i) Calculate the measurement 'X' in the drawing above.

54mm (3)

(ii) Describe the procedure for drilling the Ø10 hole.

Clamp securely. (3)
 Drill pilot hole.
 Drill diameter 10 hole.

(iii) What energy conversion is taking place when the motor rotates?

Electrical energy is converted into mechanical energy. (2)

(iv) What tool would you use to mark out the R55 circle?

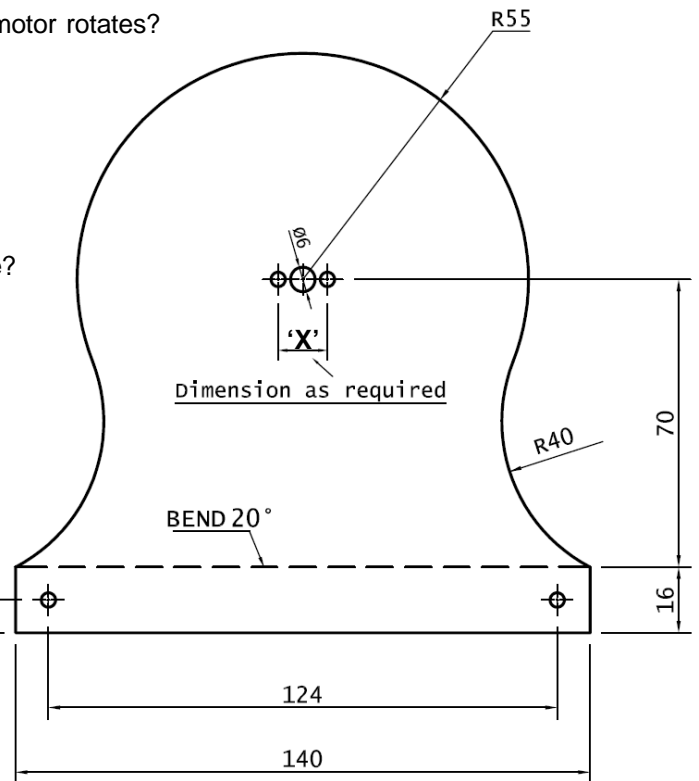
Spring dividers (3)

(v) List the steps involved in forming the R40 curve.

Cut using curved tinsnips. (3)
 Draw file using half-round file

(vi) How would you form the 20° bend?

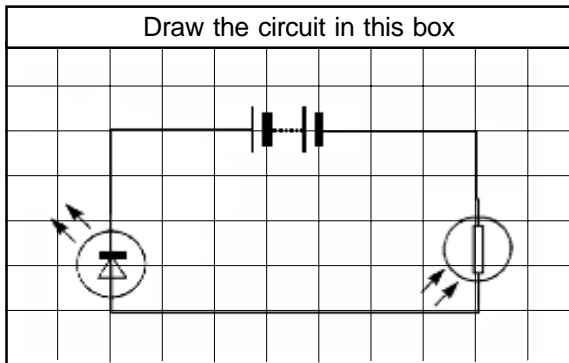
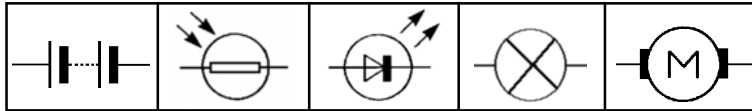
Bend using folding bars and mallet. (3)
 Check 20 degree bend using an engineers protractor.



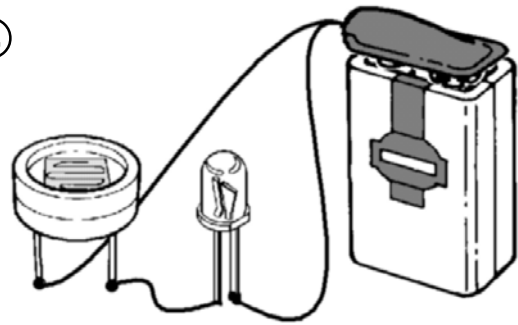
(vii) What safety precautions should you take when drilling acrylic?

Wear safety glasses. (3)
 Clamp securely.

(a) (i) Select the correct symbols from the chart and complete the electrical circuit diagram for this project.



④



(ii) What flows in the wires when the LED lights?

Electricity

②

(iii) What should happen when you place your hand over the LDR?

No light emits from the diode.

②

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



Output Device	
Input Device	✓
Process Device	

①

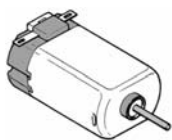
(iv) The filament produces:



Current	
Voltage	
Light	✓

①

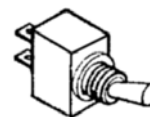
(ii) This device is a:



Motor	✓
Battery	
Capacitor	

①

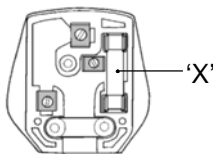
(v) This is a:



Push Switch	
Toggle Switch	✓
Slide Switch	

①

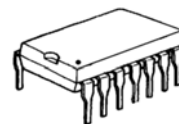
(iii) Part 'X' is a:



Resistor	
Fuse	✓
Terminal	

①

(vi) This component is a(n):



Integrated Circuit	✓
PCB	
LCD Display	

①

(c) (i) State **three** uses for computers in schools.

1. Technical Graphics
2. CNC lathe operation
3. Browsing the Internet

①

①

①

(ii) State **three** uses of electronics in the home.

1. Televisions
2. Cookers
3. Washing machines

①

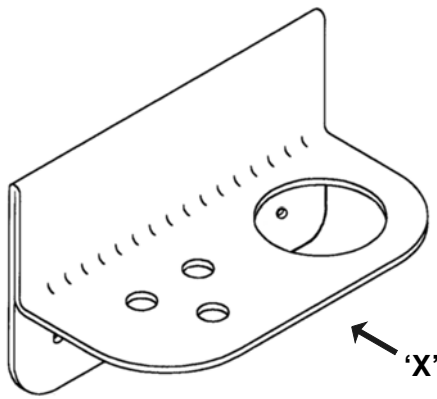
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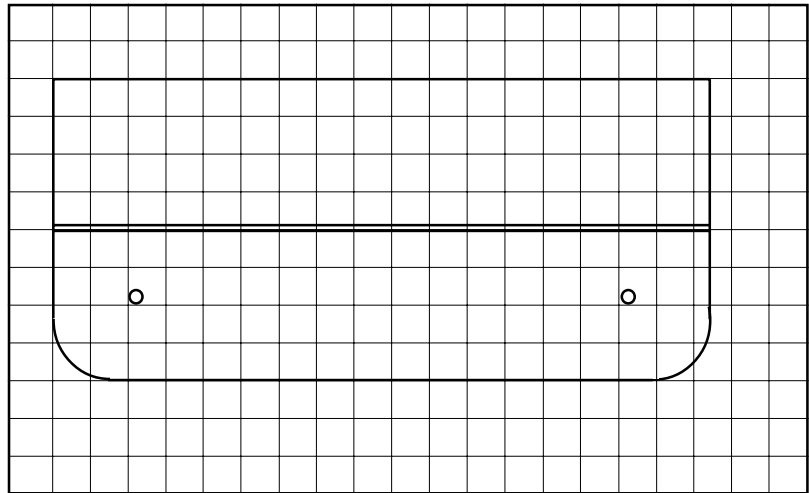
(i) A design for an acrylic toothbrush holder is shown. State **three** reasons for selecting this material and also state **one** disadvantage.

1. <i>Lightweight</i>	①
2. <i>Does not corrode</i>	①
3. <i>Available in different colours</i>	①
Disadvantage: <i>Brittle</i>	①

(ii) Draw an elevation of the toothbrush holder when viewed from arrow 'X'. ④



Width = 150, Height = 100



(iii) Describe how you could get the best finish possible on the edges of the holder.

<i>Remove file marks with fine emery cloth, then use wet and dry paper.</i>	④
<i>Polish using a soft cloth and acrylic polish.</i>	

(iv) Describe how the hole for the glass is formed.

<i>Drill clearance hole to fit tension file, attach tension file to hacksaw frame.</i>	④
<i>Cut close to the required shape.</i>	
<i>File to size and shape using a half-round file.</i>	

(v) How is the toothbrush holder bent to shape? Describe this process.

<i>Heat along the bend line using a strip heater.</i>	④
<i>Bend to shape using a former and bending jig.</i>	