Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2007

MATERIALS AND TECHNOLOGY

METALWORK - ORDINARY LEVEL

100 Marks

Tuesday, 19 June, Afternoon, 2.00 to 3.30

Marking Scheme

&

Sample Solutions

INSTRUCTIONS

1. Answer question 1, sections A **and** B, and any **three** other questions.

2. Write your answers in the spaces provided or tick the appropriate box. ☑

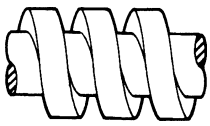
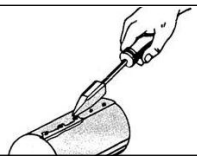
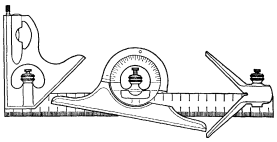
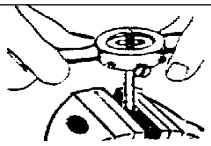
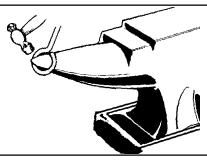
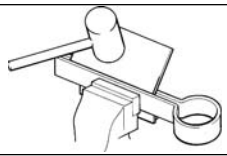
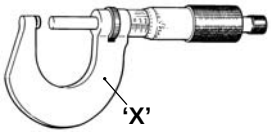
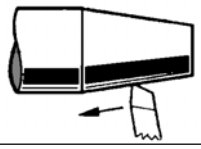
1.

SECTION A - 20 MARKS

ANSWER ANY **TEN** QUESTIONS FROM THIS SECTION

(10 x 2)

40 Marks

(a) 	*This thread form is a(n):*	Buttress Thread		②
		Acme Thread		
		Square Thread	✓	
		ISO Metric Thread		
(b) 	*This tool is a(n):*	Tap Wrench		②
		Adjustable Spanner		
		Box Spanner		
		Ring Spanner	✓	
(c) 	*This fastener is a:*	Rivet		②
		Nut and Bolt		
		Split Pin		
		Grub Screw	✓	
(d) 	*This cutting tool is a:*	Straight Snips	✓	②
		Curved Snips		
		Bench Shears		
		Combination Pliers		
(e) 	*This technique is called:*	Brazing		②
		Soldering	✓	
		Hollowing		
		Punching		
(f) 	*Hand files are made from:*	High Carbon Steel	✓	②
		Mild Steel		
		Stainless Steel		
		Aluminium		
(g) 	*This instrument is a(n):*	Inside Calipers		②
		Combination Set	✓	
		Outside Calipers		
		Vernier Calipers		
(h) 	*Stocks and Dies are used for:*	Tapping		②
		Screwing	✓	
		Riveting		
		Drilling		
(i) 	*This forging technique is called:*	Upsetting		②
		Hammering		
		Drawing Down		
		Forming an Eye	✓	
(j) 	*This technique is called:*	Scrolling		②
		Forming		
		Twisting		
		Bending	✓	
(k) 	*Part **'X'** is called the:*	Frame	✓	②
		Spindle		
		Anvil		
		Sleeve		
(l) 	*This technique is called:*	Parallel Turning		②
		Taper Turning	✓	
		Knurling		
		Facing		

SECTION B - 20 MARKS

ANSWER **ALL** QUESTIONS FROM THIS SECTION

(m)

(i) *Give **three** reasons why the blades of this wind generator should be made from a plastic material.*

1.	*They don't corrode.*
2.	*Strong*
3.	*Light*

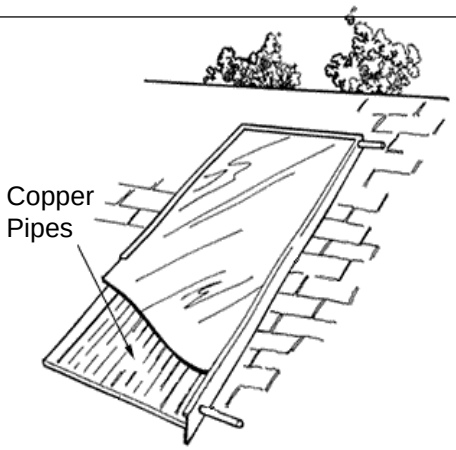
3

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

1.	*Nylon*
2.	*Acrylic*
3.	*PVC*

3

(n)



(i) *Why is copper used in the manufacture of solar panels?*

It does not corrode
It is a good conductor of heat

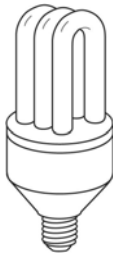
2

(ii) *List **two** other common uses of copper.*

1.	*Water cylinders*
2.	*Electrical wire*

2

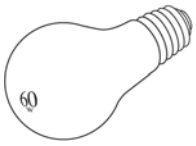
(o) *The use of energy saving bulbs saves electricity. List **four** other ways to save energy in the home.*



1.	*Double glazing*
2.	*Insulation*
3.	*Switch off appliances when not in use*
4.	*Keeping doors and windows closed when heating is on.*

4

(p) ***(i)*** *Filament bulbs produce light by heating a(n):*



Ceramic Coil	
Tungsten Coil	✓
Brass Coil	
Aluminium Coil	

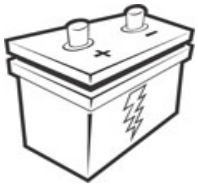
1

(ii) *How would you conserve energy in the school workshop?*

Switching off appliances
such as soldering irons
and strip heaters
when not in use.

1

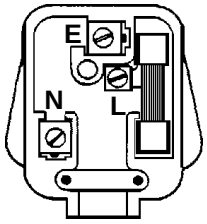
(q) ***(i)*** *The current supplied by a battery is called:*



Direct Current	✓
Alternating Current	
Electrical Energy	

2

(ii) *Name each terminal:*



L	*Live*
N	*Neutral*
E	*Earth*

2

2. **20 Marks**

(a)

(8 x 1)

(i) *Dead mild steel contains the following amount of carbon:*

0.05% - 0.15%	✓
0.25% - 0.35%	
0.45% - 0.55%	

(ii) *High carbon steel is sometimes called:*

Silver Steel	
Cast Steel	✓
Alloy Steel	

(iii) *Tin is a(n):*

Ferrous Metal	
Non-Ferrous Metal	✓
Alloy	

(iv) *Brass is an alloy of:*

Copper & Tin	
Copper & Zinc	✓
Copper & Lead	

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

Stretched	✓
Fractured	
Melted	

(vi) *Plastic glazing is made from:*

Phenolic Resins	
Nylon	
Acrylic	✓

(vii) *Do thermosetting plastics soften when heated?*

Always	
Never	✓
Sometimes	

(viii) *Galvanised iron is coated with:*

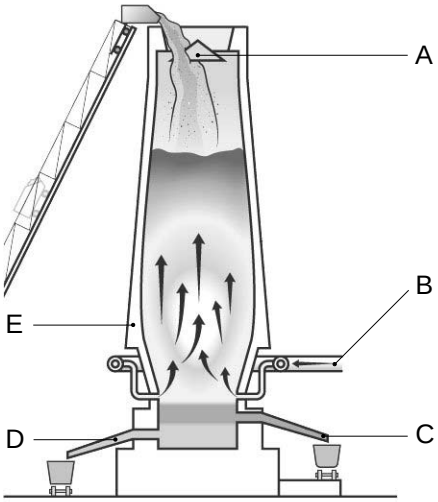
Tin	
Zinc	✓
Lead	

(b)

The diagram shows a Blast Furnace.
Name **any three** of the parts labelled.

Part	Name
A	*Charging bells*
B	*Bustle pipe*
C	*Slag hole*
D	*Tap hole*
E	*Fire brick lining*

⑥



(c)

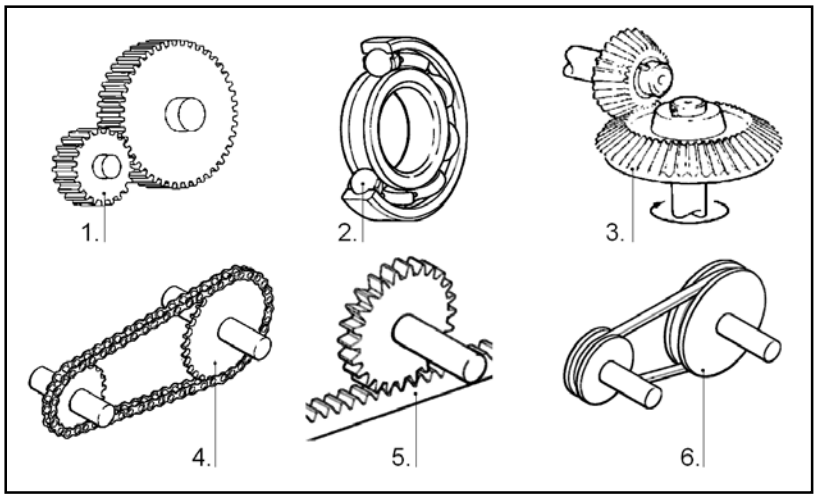
Complete the chart by listing a tool for each task.

6 x 1)

Task	Tool
To draw a circle on a piece of metal.	*Dividers*
To draw a line at right angles to a straight edge.	*Tri square*
To locate the centre of a round bar.	*Centre square*
To hold a tap while cutting a thread.	*Tap wrench*
To accurately measure the diameter of a round bar.	*Micrometer*
To hold small sheet metal parts while drilling.	*Hand vice*
To remove large drills from a drilling machine.	*Drill drift*

3. **20 Marks**

(a) **(i)** Match the number to the correct mechanism part. *(6 x 1)*



Mechanism Part	No.
Pulley	*6*
Rack	*5*
Sprocket	*4*
Ball Bearing	*2*
Spur Gear	*1*
Bevel Gear	*3*

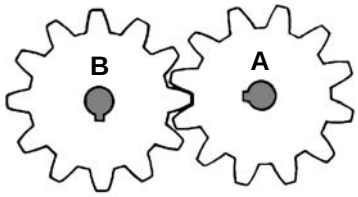
(ii) What is a set of meshing gears called?

Gear train (1)

(b) **(i)** Complete the chart by listing devices that use the following mechanisms: *(4 x 1)*

Mechanism	Device
Ratchet	*Micrometer*
Screw Thread	*Vice*
Crankshaft	*Two-stroke engine*
Cam	*Four-stroke engine*

(ii) If gear 'A' rotates at 150 RPM how fast will gear 'B' rotate? (A = 12 Teeth, B = 12 Teeth.)



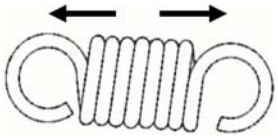
200 RPM	
100 RPM	
150 RPM	✓
50 RPM	

(2)

(iii) Can gears be made from nylon?

Yes (1)

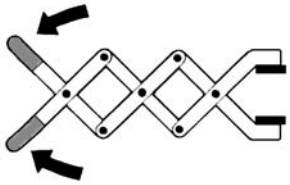
(c) **(i)** When pulled in the direction of the arrows the spring will be in:



Tension	✓
Compression	
Torsion	
Shear	

(2)

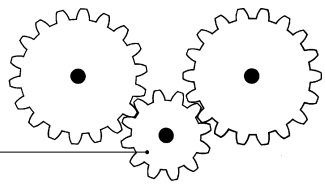
(ii) A linkage is made up of several:



Levers	✓
Struts	
Ties	
Mechanisms	

(2)

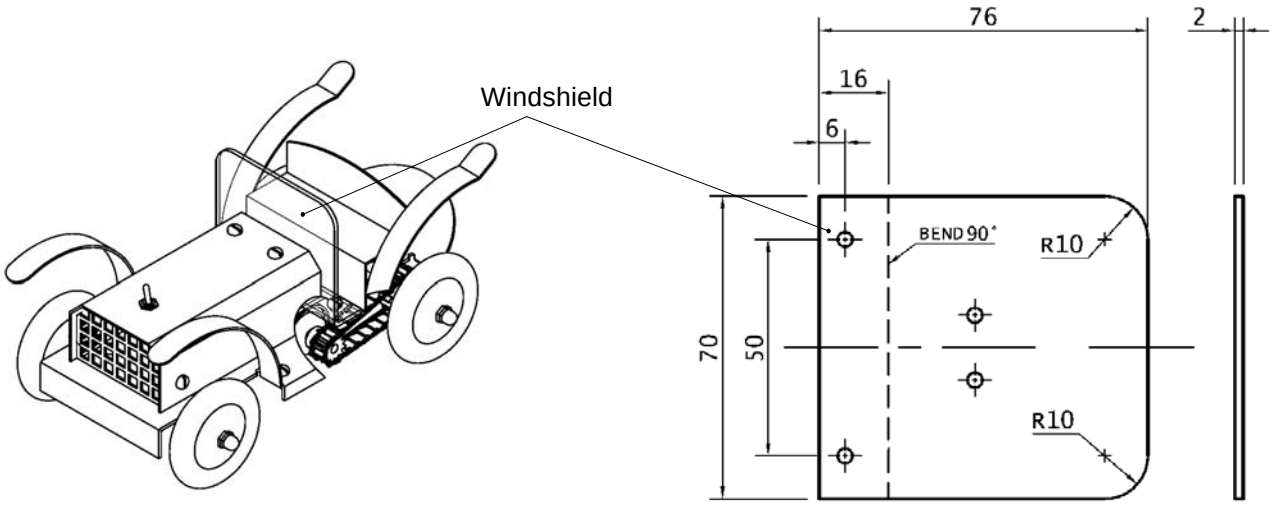
(iii) Name gear 'X'.



Idler gear (2)

4. **20 Marks**

Details of a windshield used in the manufacture of a model vintage car are shown.



(i) List the tools and processes used to make the windshield.

Tools:	Processes:
Rule	*Marking out*
Drilling Machine	*Drilling*
File	*Draw filing*
Strip heater	*Bending*

6

(ii) What does R10 refer to in the drawing?

Radius of the curve is 10mm. 2

(iii) Describe how you would get a smooth finish on the edge of the windshield.

Use fine grade emery cloth followed by wet and dry paper.
It then can be polished by hand or machine. 2

(iv) What safety precautions should be observed when drilling sheet metal?

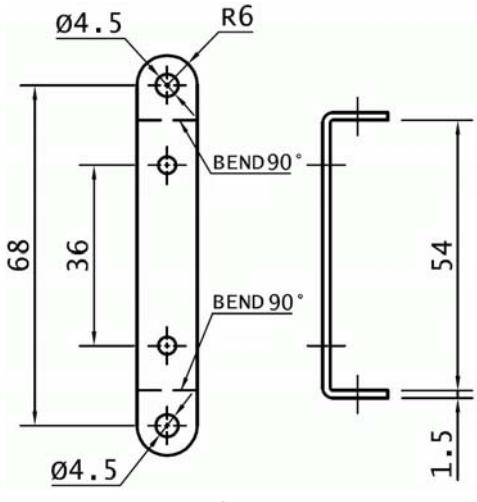
Clamp properly and support with wood
Correct drilling speed
Do not apply too much pressure on the feed lever 3

(v) Describe how you would safely drill the holes in the axle support.

Hold the piece securely using a hand vice.
Select the correct speed.
Apply light pressure to the feed lever.
Wear safety goggles. 3

(vi) What is the overall length of the axle support? *80mm* 2

(vii) What is the overall width of the axle support? *12mm* 2

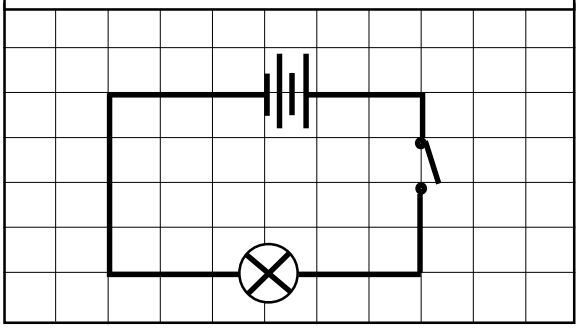


Axle Support

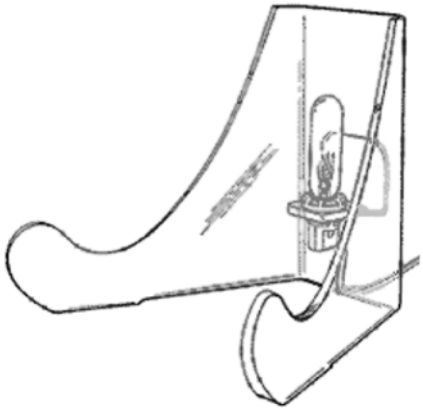
5. **20 Marks**

(a) **(i)** A design for an illuminated display-stand is shown. The design uses a battery, a bulb and a switch. (The battery and switch are not shown.) Draw the electrical circuit diagram for this design.

Draw the circuit in this box



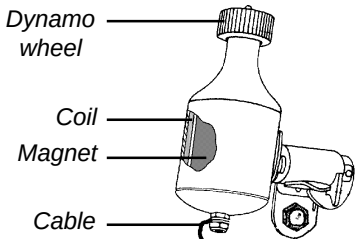
④



(ii) Complete the chart:

Resistance can be measured using a multimeter.	Yes	✓	1
	No		
A fuse is a safety device in an electrical circuit.	Yes	✓	1
	No		
Aluminium is an insulator.	Yes		1
	No	✓	
A car battery is made up of a number of cells joined together.	Yes	✓	1
	No		

(b) **(i)** Briefly describe how a bicycle dynamo works.



As the dynamo wheel rotates it
moves the magnet inside the coil.
This induces a current in the coil which
is conducted to the bulb through the cable.

③

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

Inventor's Name: *John P. Holland*
Invention: *He designed the submarine*

③

(c) **(i)** Name any **three** electronic components.

1. *Light Emitting Diode (LED)*
2. *Light Dependent Resistor (LDR)*
3. *Transistor*

③

(ii) List **three** devices that use electronic components.

1. *Computer*
2. *iPod*
3. *Mobile phone*

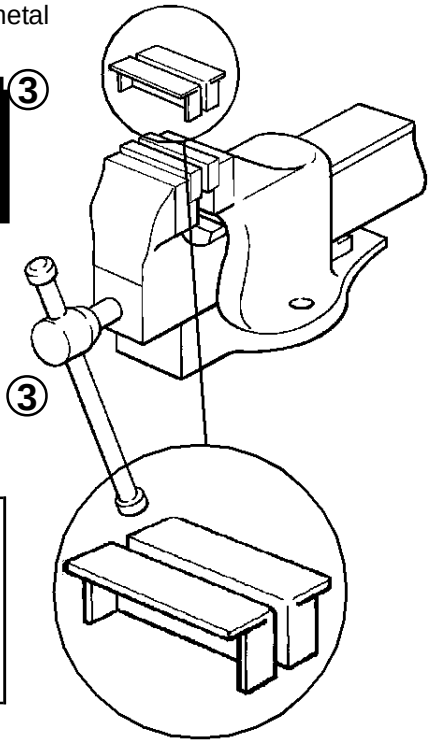
③

6. **20 Marks**

(i) This drawing shows a bench vice and a pair of vice clamps. Name a metal suitable for making these clamps. Give a reason for your choice.

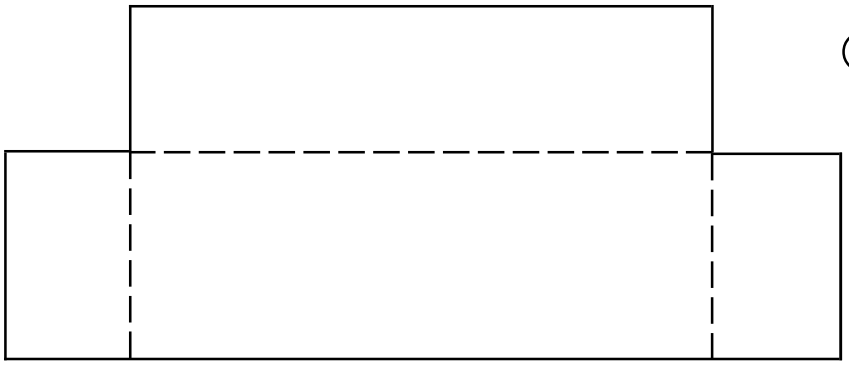
Metal:	*Aluminium*
Reason:	*A soft material which will not damage the workpiece.*

③



③

(ii) The diagram below represents a blank piece of metal to be used to make **one** of the vice clamps. Complete the marking out to show where the bend lines should be located.



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

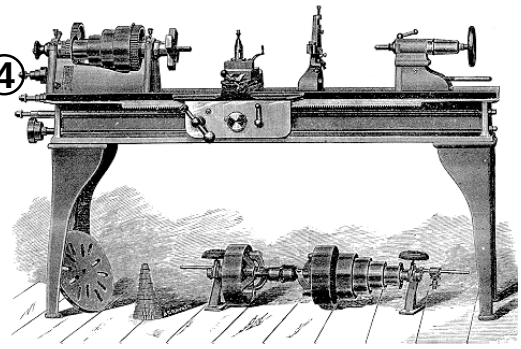
Shaping Process: *Bending*	Tools used:
	Folding bars
	Mallet
Finishing Process: *Draw filing*	Tools used:
	Smooth hand file
	Emery cloth

④

(iv) List **two** features of a modern lathe that are not to be found in old lathes.

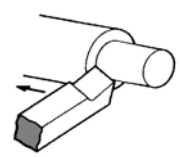
Safety guards
Emergency stop bar

④

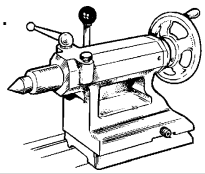


(v) Match the number to the correct part.

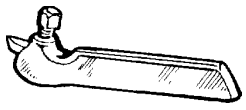
1.



2.

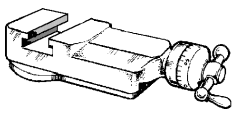


3.

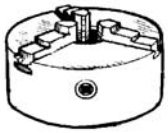


4.

5.



6.



Part	No.
Tool Bit	*1*
Tool Holder	*3*
Three-Jaw Chuck	*6*
Tailstock	*2*
Morse Taper Sleeve	*4*
Top Slide	*5*

⑥