Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE 2009

MARKING SCHEME

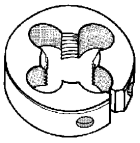
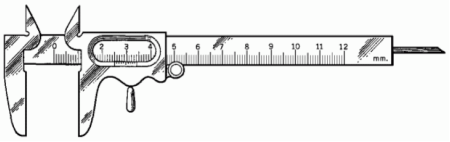
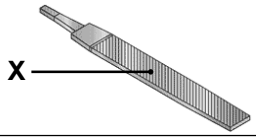
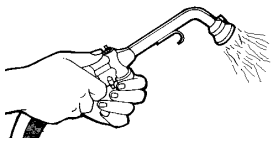
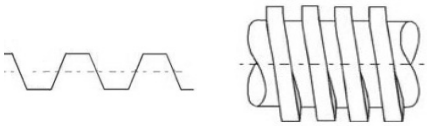
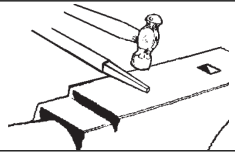
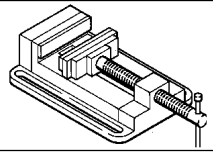
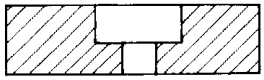
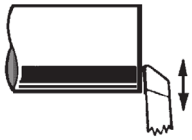
Written Examination and Project

Materials and Technology
METALWORK

ORDINARY LEVEL

Materials and Technology - METALWORK
Written Examination - 100 Marks
Marking Scheme and Sample Solutions

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

(a) 	A die is used for:	Tapping		②
		Reaming		
		Screwing	✓	
		Riveting		
(b) 	This instrument is a:	Micrometer		②
		Vernier Calipers	✓	
		Bevel Gauge		
		Feeler Gauge		
(c) 	A centre drill is used with a:	Pillar Drilling Machine		②
		Lathe	✓	
		Hand Drill		
		Tap Wrench		
(d) 	This fastener is a:	Wing Nut		②
		Spring Washer	✓	
		Split Pin		
		Lock Nut		
(e) 	Part 'X' is called the:	Point		②
		Face	✓	
		Edge		
		Tang		
(f) 	A gas torch is used when:	Brazing		②
		Soldering	✓	
		Welding		
		Riveting		
(g) 	This thread form is a(n):	Square Thread		②
		Butress Thread		
		Acme Thread	✓	
		ISO Metric Thread		
(h) 	This technique is called:	Drawing Down	✓	②
		Hardening		
		Forming an Eye		
		Upsetting		
(i) 	Hammers are classified by:	Length of Shaft		②
		Diameter of Head		
		Total Weight		
		Weight of Head	✓	
(j) 	This holding device is a:	Leg Vice		②
		Bench Vice		
		Hand Vice		
		Machine Vice	✓	
(k) 	This drawing shows a:	Counterbored Hole	✓	②
		Contersunk Hole		
		Pilot Hole		
		Blind Hole		
(l) 	This technique is called:	Taper Turning		②
		Parallel Turning		
		Facing	✓	
		Knurling		

SECTION B - 20 MARKS

ANSWER **ALL** QUESTIONS FROM THIS SECTION

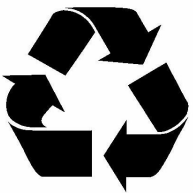
(m)

(i) Complete the chart by listing a different metal for the body of each item.

Item	Metal
Stove	*Cast Iron*
Saucepan	*Stainless Steel*
Padlock	*Brass*
Hot Water Cylinder	*Copper*

4

(n)



(ii) Why should we recycle plastics?

To save on raw materials

2

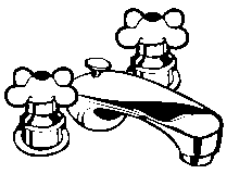
(ii) Name **two** plastic items that can be recycled.

Toys

Packaging

2

(o) (i) Bathroom taps are coated with:



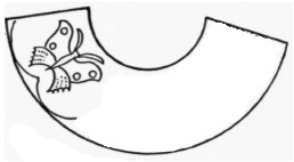
Tin	
Steel	
Lead	
Chrome	✓

(ii) Name the metal used to galvanise gates.

Zinc

4

(p) (i) Placing a design into metal with a sharp tool is called:



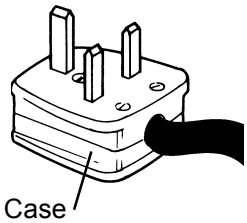
Enamelling	
Engraving	✓
Etching	
Repoussé	

(ii) Why is lacquering applied to copper jewellery?

To protect the surface finish

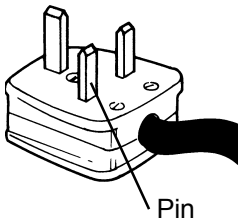
4

(q) (i) The case is a(n):



Insulator	✓
Conductor	
Semi-conductor	

(ii) The pin is a(n):



Insulator	
Conductor	✓
Semi-conductor	

4

Question 2. 20 Marks

(a)

(i) Complete the chart: (The first row has been completed for you, as an example) (6)

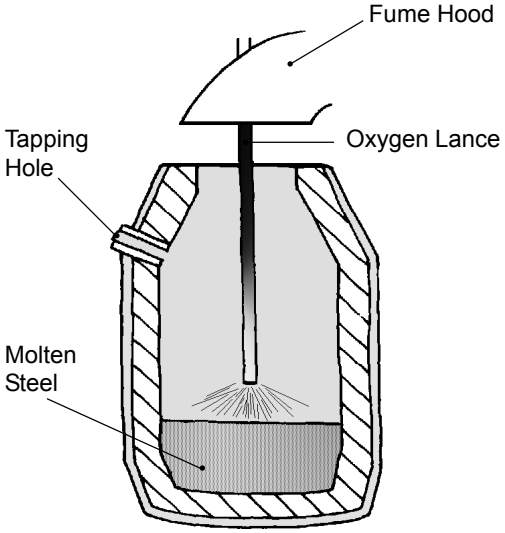
Component Metals	Alloy Formed	List a use for each alloy
Aluminium and Copper	*Duralumin*	*Aircraft manufacture*
Lead and Tin	*Solder*	*To join metals*
Copper and Tin	*Bronze*	*Propellors*
Copper and Zinc	*Brass*	*Screws*

(ii) What happens to a thermoplastic material when heated? *Softens* (2)

(iii) Name **one** thermoplastic material. *Nylon* (2)

(b) Describe how steel is produced using the basic oxygen process. (4)

Charge: Scrap metal / molten iron
Blow: Oxygen from lance
Tapping / Pouring: Steel / Slag
Fume hood extraction



Basic Oxygen Furnace

(c) Complete the chart:

(i)	Can brittle materials bend easily?	Yes	
		No	✓
(ii)	Can steel be hardened and tempered?	Yes	✓
		No	
(iii)	Are non-ferrous metals magnetic?	Yes	*
		No	✓
(iv)	Is the malleability of most metals increased by heating?	Yes	✓
		No	
(v)	Is toughness the ability of a material to withstand blows?	Yes	✓
		No	
(vi)	Is hardness the ability of a material to resist wear?	Yes	✓
		No	

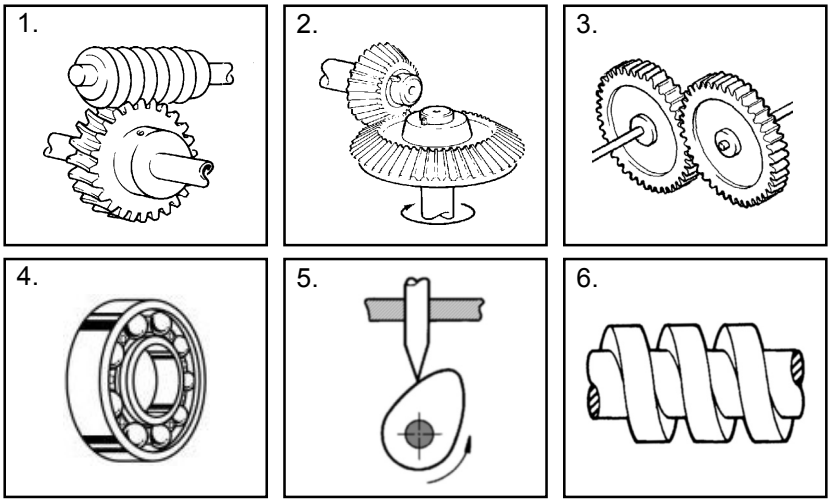
(6)

** A yes answer was also awarded 1 mark as some non-ferrous metals can be magnetic.*

Question 3.

20 Marks

(a) (i) Match each of the numbers below to the correct mechanism part listed on the table.



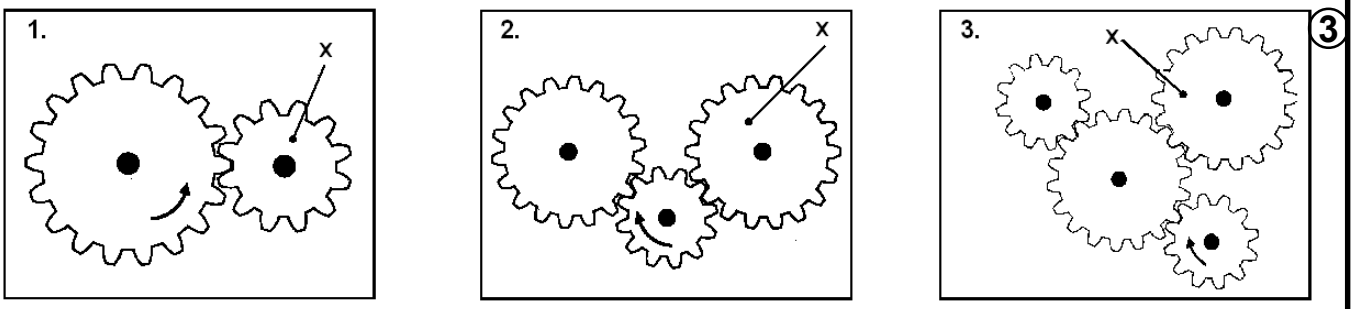
Mechanism	No.
Bearing	4
Gear Train	3
Leadscrew	6
Cam	5
Worm and Wormwheel	1
Bevel Gears	2

6

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

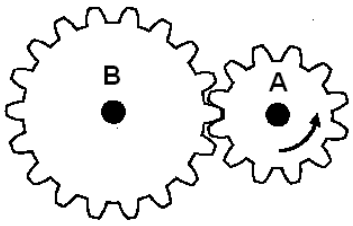
Lathe or Drilling Machine 2

(b) (i) Indicate with an arrow the direction of gear 'X' in each of the following:



3

(ii) If gear 'A' rotates at 10 RPM how fast will gear 'B' rotate? (A = 10 Teeth, B = 20 Teeth.)



100 RPM	
10 RPM	
50 RPM	
5 RPM	✓

2

(iii) Is gear 'A' known as a pinion?

Yes	✓	No	

1

(c) Complete the chart by listing devices that use the following mechanisms.
The first row has been completed for you, as an example.

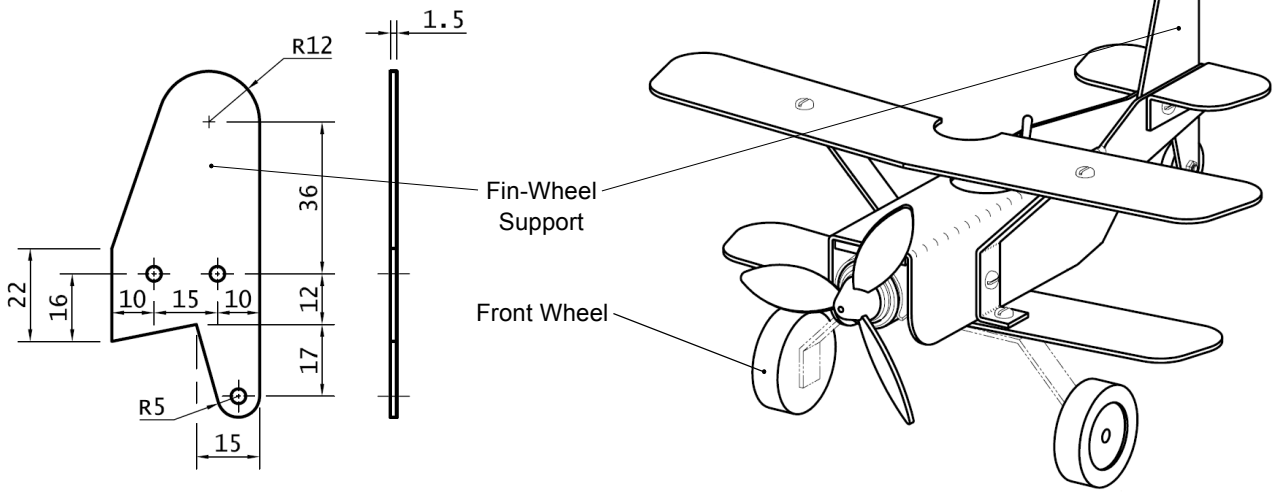
Mechanism	Device
Lever	Nutcracker
Ratchet and Pawl	Tie down straps
Pulleys	Drilling machine
Linkages	Baby buggy
Spur Gears	Lathe
Rack & Pinion	Camera tripod
Crankshaft	Engine

6

Question 4.

20 Marks

Details of the fin-wheel support used in the manufacture of a model biplane are shown.



(i) List the tools that you would use when marking out the fin-wheel support.

Length: Spring dividers, tri-square, rule	3

(ii) What is the overall length and width of the fin-wheel support?

Length: 82mm	2
Width: 35mm	

(iii) Describe how would you cut out and shape the fin-wheel support.

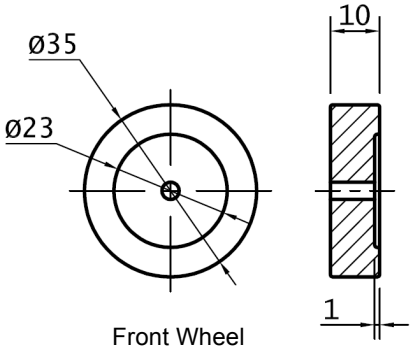
Cutting using a snips or a junior hacksaw	4
Shape using a file	

(iv) Describe how you would safely drill the holes in the fin-wheel support.

Hold using a hand vice	4
Support using a block of wood	
Use correct drilling speed	
Wear safety glasses	

(v) Describe how you would make the front wheel.

Face-off in the lathe	4
Turn down to correct diameter	
Centre drill	
Dril to correct size	
Remove step using boring bar	
Part-off	



Front Wheel

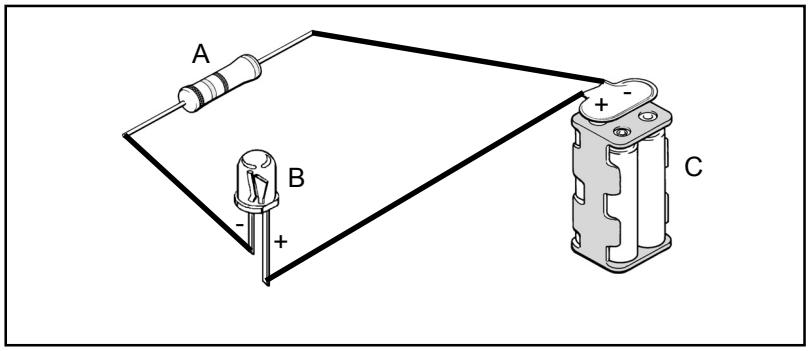
(vi) What safety precautions should you take when operating a lathe?

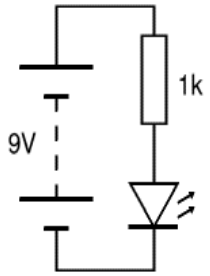
Wear safety glasses	3
Ensure work and cutter are secure	
Do not wear loose clothing	

Question 5.

20 Marks

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





Circuit Diagram

③

(ii) Name the components shown above.

A	Resistor
B	Light Emitting Diode (LED)
C	Battery

③

(iii) State a use for component 'C'.

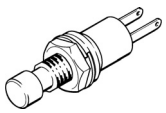
To supply electrical energy to the circuit, motor and bulb.

②

(b) (i) A bulb converts electrical energy into:

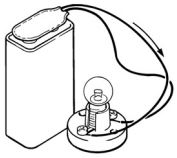
Chemical Energy	
Mechanical Energy	
Light Energy	✓

(ii) This device is a:



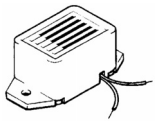
Slide Switch	
Toggle Switch	
Push Switch	✓

(iii) Electric current is measured in:



Ohms	
Volts	
Amps	✓

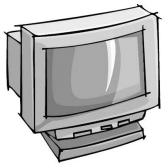
(iv) This component is a(n):



Integrated Circuit	
Buzzer	✓
Relay	

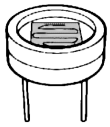
⑥

(v) A computer monitor is a(n):



Output Device	✓
Input Device	
Process Device	

(vi) This component is a(n):



LDR	✓
Fuse	
Transistor	

(c) (i) From the history of transport name one famous inventor:

Rudolf Diesel

④

(ii) What did this person invent?

Diesel engine

①

(iii) How has this person's invention changed the way we live?

Economical car manufacture

①

Question 6.

20 Marks

(i) A design for a plate stand made from clear acrylic is shown. Why is acrylic a suitable material for this project?

Aesthetically pleasing

Easy to shape and bend

Light but strong

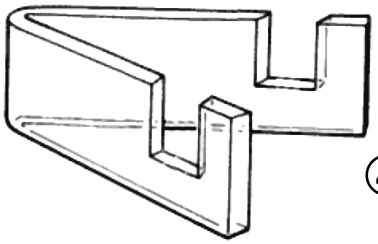


Plate Stand
Length = 250mm, Height = 50mm

4

(ii) Describe how you could get the best finish possible on the edges of the plate stand.

Remove file marks using emery cloth and wet/dry paper

Hand polish with acrylic polish or use a polishing machine

4

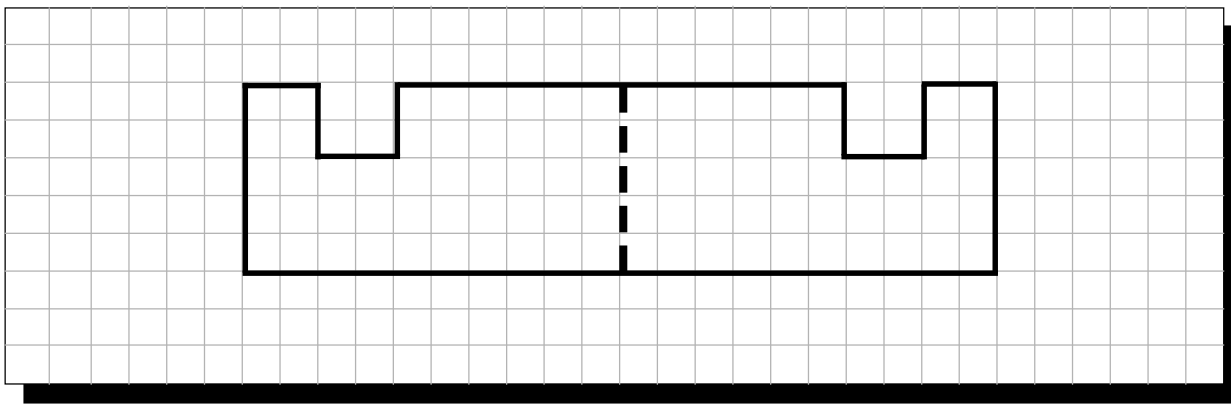
(iii) Using the chart below describe the cutting and shaping processes to be used to make the plate stand. List the tools used at each stage.

Cutting:	Tools used:
Hold in the vice	*Coping saw*
Using a saw remove unwanted material	*Hacksaw*

Shaping:	Tools used:
Heat	*Strip heater*
Bend	*Jig or former*

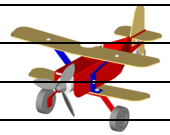
4

(iv) Draw a development of the plate stand in this box.



4

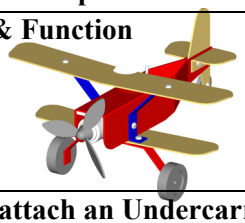
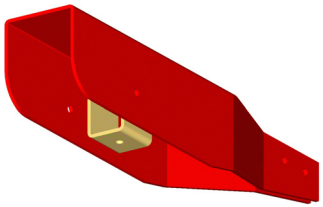
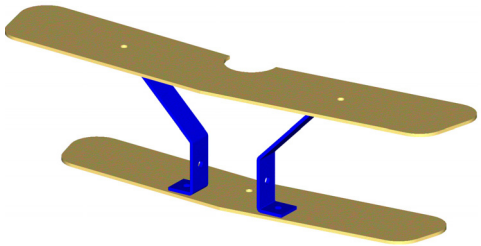
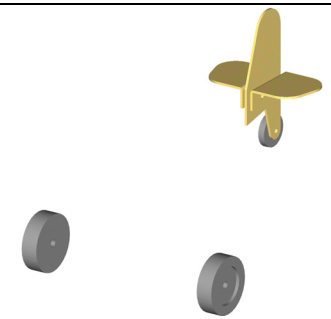
Coimisiún na Scrúduithe Stáit
State Examinations Commission



Junior Certificate Ordinary Level Metalwork Project, Marking Scheme 2009

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	Mark
1	**Complete Model** (Not including Design Element)	**Assembly Finish & Function** 	**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 Feature**	**Design make and attach an Undercarriage**	**Design** Subjective Grade 1-10			10	20
			Make Subjective Grade 1- 5			5	
			Attach Subjective Grade 1- 5			5	
3	**Parts 1 & 4**		**Fuselage**	18	**Marking Out**	4	20
					Drill	4	
					Slot	5	
					Shape & Bend	5	
			Battery Holder	2	**Marking Out**	1	
					Shape, Drill & Bend	1	
4	**Parts 2, 3 & 5**		**Upper Wing**	8	**Marking Out**	3	20
					Shape & Drill	5	
			Lower Wing	6	**Marking Out**	3	
					Shape & Drill	3	
			Wing Support ×2	6	**Marking Out**	3	
					Shape, Drill & Bend	3	
5	**Parts 6, 7, 8, 9 & 10**		**Right Tailplane**	4	**Marking Out**	1	20
					Shape, Drill & Bend	3	
			Left Tailplane	4	**Marking Out**	1	
					Shape, Drill & Bend	3	
			Front Wheel ×2	4	**Turn, Drill & Recess**	4	
			Fin/Wheel Support	6	**Marking Out**	3	
					Shape & Drill	3	
			Rear Wheel	2	**Turn &Drill**	2	

100 Marks (× 3 = 300 Total)