Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE 2008

MARKING SCHEME

Written Examination, Project and Practical Examination

Materials and Technology
METALWORK

HIGHER LEVEL

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

Question One – Section A — 20 Marks

*Five parts **only** to be counted*

(a) **(i)** John B Dunlop – invented the pneumatic tyre;
(ii) John L Baird – invented the television;
(iii) James Watt – invented the steam engine with separate condenser.

*Any **one** @ 4 marks*

4 Marks

(b) **(i)** The two valves shown are the inlet and exhaust valves. *1 mark **each***
(ii) The inlet valve opens during the induction stroke. *1 mark*
The exhaut valve opens during the exhaust stroke. *1 mark*

4 Marks

(c) The valves are opened by rotating cams and are closed by compression springs when the pressure from the cam eases.

4 Marks

(d) **(i)** Part 'D' is the gudgeon pin. *2 marks*
(ii) The gudgeon pin joins the piston and the connecting rod. *2 marks*

4 Marks

(e) **(i)** Other engine types include 2-stroke and diesel. *Any **one** @ 2 marks*
(ii) 2-stroke – lawnmower.
Diesel – lorries/trucks. *Any suitable application 2 marks*

4 Marks

(f) **(i)** Hardness is the ability of a material to resist wear, indentation and scratching.
(ii) Malleability allows a material to be extruded in all directions without rupture.
(iii) Toughness is the ability of a material to absorb the energy from blows or impact.
(iv) Elasticity is the ability of a material to return to its original shape when released from a force.

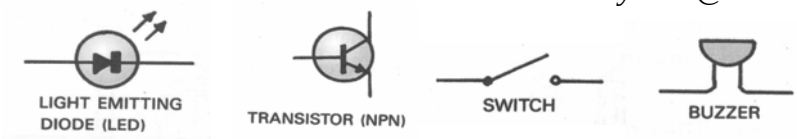
*Any **two** @ 2 marks each*

4 Marks

(g) **(i)** **1** is an LED.
2 is a transistor.
3 is a toggle switch.
4 is a buzzer.

*Any **two** @ 1 mark each*

(ii)



*Any **one** @2 marks*

4 Marks

Question One – Section B — 20 Marks

*Five parts **only** to be counted*

(a) **(i)** The overall length of the rear wheel guard is 112mm. *2 marks*

(ii) Once the section marked **X** is marked out it is shaped as follows -

- Drill two holes
- Cut out using a hacksaw
- Rough file to size
- Draw file finish. *2 marks*

4 Marks

(b) **(i)** The centre is located as follows-

- Measure 20mm from the top and bottom at the right hand end of the piece.
- Swing an arc of 25mm from both points to locate the required centre. *2 marks*

(ii) The guard is bent in a bending machine or in a vice using a folding bar and mallet. The angle accuracy is checked using a bevel protractor. *2 marks*

4 Marks

(c) **(i)** The term Knurling refers to the process of putting serrations on a bar to give increased grip. It is carried out on the lathe using a knurling tool. *2 marks*

(ii) Other lathe processes include-

- Facing
- Drilling
- Taper turning
- Parting-off. *Any **two** @ 1 mark each*

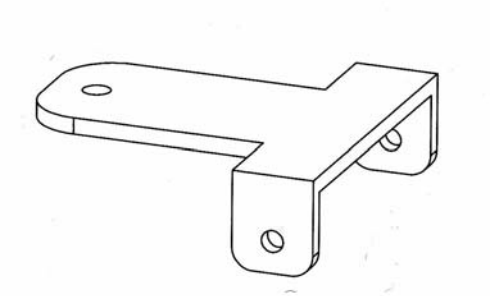
4 Marks

(d) **(i)** DPDT stands for double pole, double throw switch. In the electronic circuit this enables the motor to run forward or reverse. *2 marks*

(ii) The resistor is a limiting resistor. It protects the LED from excess current and prevents it from burning out. *2 marks*

4 Marks

(e)



Suitable design 2 marks
Suitable diagram 2 marks

4 Marks

(f) Applications of Quad bikes include-

- Agricultural use
- Sport and recreational use.

4 Marks

Question Two — 20 Marks

(a) **(i)** Possible sources of information include-

- the library
- the internet
- people of experience
- Information DVD
- magazines.

*Any **three** @ 1 mark each*

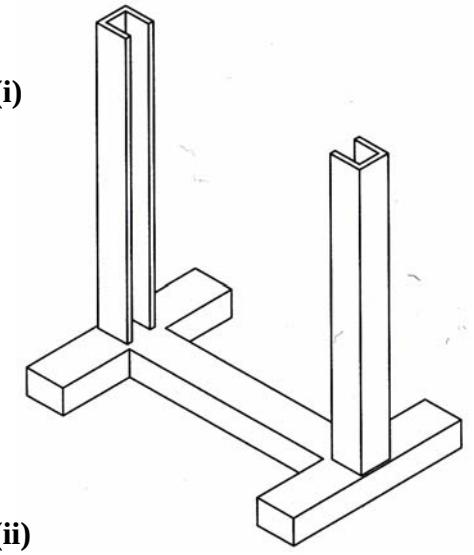
(ii) Ideas could be developed by-

- drawing/sketching
- model making/prototypes.

*Any **two** @ 2 marks each*

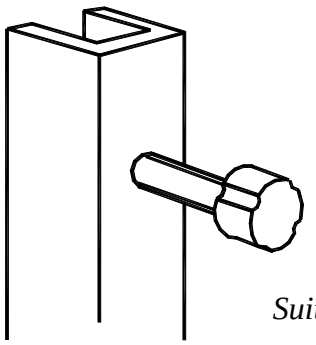
7 Marks

(b) **(i)**



Suitable design for stand @ 5 marks

(ii)



Suitable secure attachment @ 2 marks
Suitable diagram @ 2 marks

(iii) Suitable metals may include steel, aluminium, copper or brass.

Any suitable metal @ 2 marks

(iv) The finish used will depend on the metal selected. Steel and aluminium may be painted while copper and brass may be polished.

Any suitable finish @ 2 marks

13 Marks

Question Three — 20 Marks

(a) **(i)** Part A is the Headstock. *1 mark*
Part B is the Cross Slide. *1 mark*

(ii) Functions of the tailstock include-
- drilling
- supporting long bars when turning.

*Any **two** functions @ 1 mark each*

(iii) Reasons why lathes are designed to run at different speeds include-
- turning of different materials (hard or soft)
- use of different cutting tools
- turning of different diameters of work
- different turning operations (drilling, knurling).

*Any **two** reasons @ 2 marks each*

(iv) Safety precautions include-
- wearing of eye protection
- tie-back long hair
- tuck-in loose clothing.

*Any **two** precautions @ 1 mark each*

10 Marks

(b) The speed is 2600RPM.

*Correct substitution 2 marks, calculation 2 marks **OR** Correct answer 4 marks*

4 Marks

(c) **(i)** Tool A is a morse sleeve. *2 marks*
Tool B is a drill drift. *2 marks*

(ii) A morse sleeve fits onto small morse drills and enables them to fit into the spindle of the drilling machine.

A drill drift is used to remove a morse tapered chuck or drill from the spindle of the drilling machine. *Any **one** explanation @ 2 marks*

6 Marks

Question Four — 20 Marks

(a) **(i)** The Blast furnace is shown. *1 mark*

(ii) The bells shown make up the double bell charging system. At all times one bell is closed to prevent heat loss. Firstly bell A opens to let the charge fall onto bell B. Bell A then closes. Once A is closed bell B then opens to let the charge into the furnace. Finally bell B closes. *3 marks*

(iii) The tuyere is used to blast the hot air into the furnace. *2 marks*

(iv) Chute C is the upper chute and is therefore used to remove the slag which is lighter than the iron. *1 mark*
Chute D is lower and is therefore used to remove the heavier iron. *1 mark*

8 Marks

(b) **(i)** Non-ferrous metals include-
Aluminium, copper, tin, lead, zinc, silver and gold.
*Any **two** @ 1 mark*

(ii) Applications include-

- Aluminium- Cans
- Copper- Piping
- Tin- Tinplating
- Zinc- Galvanising
- Lead- Battery

*Suitable application for **both** metals named @ 1 mark each*

4 Marks

(c) **(i)** Bronze – copper and tin. *2 marks*
Stainless steel – steel with chromium and nickel. *2 marks*

(ii) Stainless steel is used to make the kitchen sink. *2 marks*
Bronze is used to make the statue. *2 marks*

8 Marks

Question Five — 20 Marks

(a) **(i)** The hose is made from rubber. *1 mark*
The metal body is made from aluminium *1 mark*

(ii) Rubber is suitable for the hose as it is flexible. *1 mark*
Aluminium is suitable for the body as it will not rust. *1 mark*

(iii) Safety precautions include-

- do not use a naked flame/mobile phone nearby
- clean up any spillages

*Any **two** safety precaution @ 1 mark each*

(iv) Some of the environmental effects of burning petrol include: global warming, acid rain, depletion of the ozone layer and air pollution.

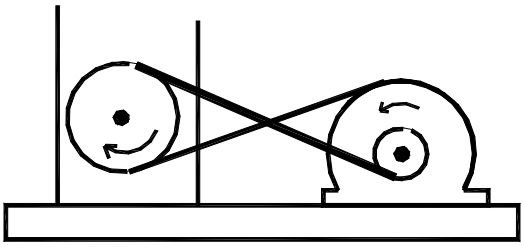
*Any **two** environmental effects @ 2 marks each*

10 Marks

(b) **(i)** Chain and sprocket and meshing gears are two other drive mechanisms.

*Any **two** drive mechanisms @ 2 marks each*

(ii) The direction of rotation may be changed by simply crossing the belt as shown.



Explanation 2 marks
Diagram 2 marks

(iii) Due to the larger area of contact between the belt and the pulley there is less chance that a vee belt will slip.

Any suitable advantage @ 2 marks

10 Marks

Question Six — 20 Marks

(a) **(i)** Soldering Iron A is a straight iron.
Soldering Iron B is an electric iron. *1 mark each*

(ii) Iron A is heated by a flame from a kiln.
Iron B is heated by an electric element. *1 mark each*

(iii) Both bits are made from copper. The bit for the electric iron is normally supplied having been tinned. *2 marks*

(iv) Iron A usually has a wooden handle.
Iron B usually has a plastic handle. *1 mark each*

(v) The straight iron should be placed on a suitable stand when not in use. Care should be taken not to damage the electric flex by placing the hot iron on it. *2 marks*

10 Marks

(b) ***Two parts only*** *to count*

(i) A ***conductor*** is a material that will allow heat or electricity to flow through it. An ***insulator*** is a material that will resist the flow of heat or electricity through it. *2+1 mark*

(ii) A ***passive*** flux prevents oxidation during soldering. An ***active*** flux removes oxides from the surface and prevents further oxidation during soldering. *2+1 mark*

(iii) ***Soft solder*** is an alloy of lead and tin and starts to melt at 183°C. ***Silver solder*** is mainly an alloy of silver, copper and zinc. Its melting temperatures range from 600°C to 830°C. *2+1 mark*

6 Marks

(c) **(i)** Typical Thermoplastics and their uses include:

Acrylic - used in lenses and dentures.
Polyethylene - used in bottles and pipes.
Polypropylene - used in safety helmets.
Polystyrene - used in CD cases, egg boxes and disposable plates.
PVC - used in guttering and windows.
Nylon - used in brush bristles.

4 Marks

*Name any **two** @ 1 mark each*
***One** suitable application @ 2 marks*

Question Seven — 20 Marks

(a) (i)

Name	Input/ output	Applications
Mouse	Input	***Pointer/selector***
Digital camera	***Input***	Images/ pictures
Plotter	Output	***Ink drawings***

Redraw @ 1 mark
Three *completed boxes @ 1 mark each*

(ii) ***Byte*** – the storage capacity of a computer is given in bytes. A byte is a collection of eight bits.
File – is a collection of information that has been given a name and stored.
VDU – is the visual display unit. It is also known as the screen or monitor of the computer.
CD-ROM – stands for compact disk-read only memory. This disk can store lots of data. This data can be read from the disk but cannot be changed.
Any ***two*** *@ 1 mark each*

(iii) Part A is the chuck. *1 mark*
Part B is the turret. *1 mark*

(iv) Safety features include an emergency stop button and a clear Perspex cover over the workings of the lathe. *Any* ***two*** *safety features @ 1 mark each*

(v) ***G codes*** are used for controlling the tool movements while ***M codes*** are used for miscellaneous commands (switching on spindle etc.) *2 marks*

In ***Incremental*** dimensioning each section is dimensioned while in ***Absolute*** dimensioning all dimensions are taken from a datum point. *2 marks*

14 Marks

(b) (i) Instrument A is a Vernier callipers. *1 mark*
Instrument B is a Micrometer. *1 mark*

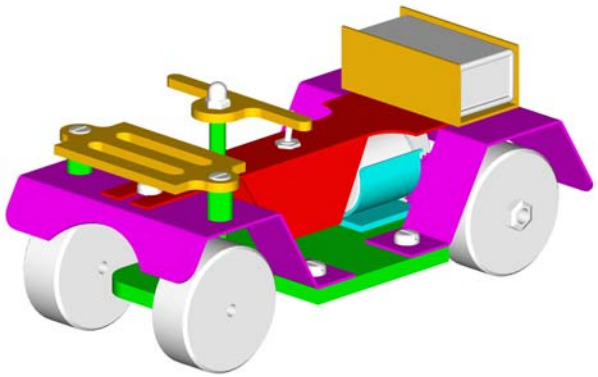
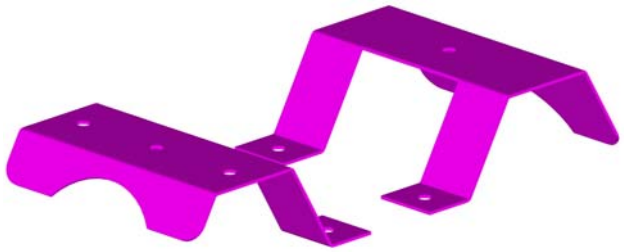
(ii) Part C is the Locknut. *1 mark*
Part D is the Ratchet. *1 mark*

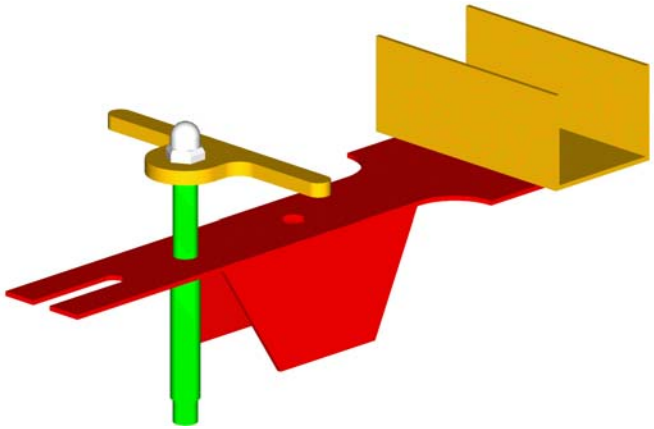
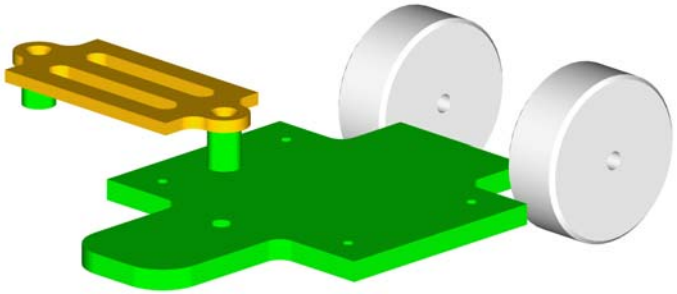
(iii) The value of the reading shown is 19.55mm. *2 marks*

6 Marks

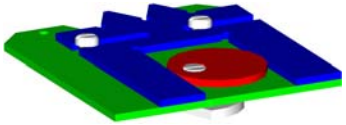
Junior Certificate Higher Level Metalwork Project - Marking Scheme 2008

Subjective Grading: 1 - 5	5 Excellent	4 Very Good	3 Good	2 Poor	1 Very Poor

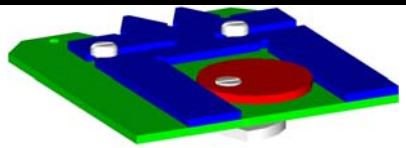
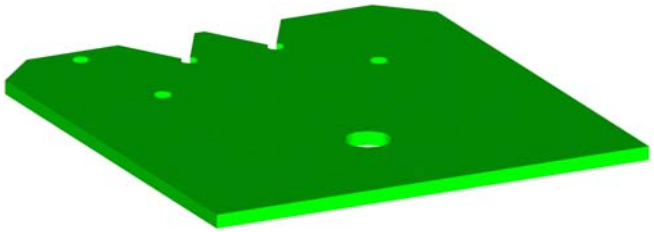
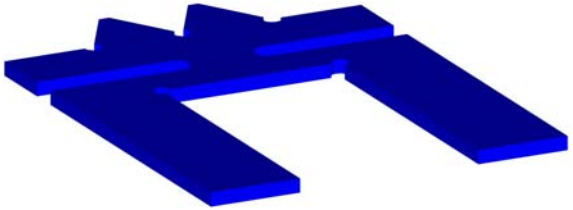
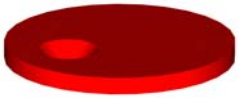
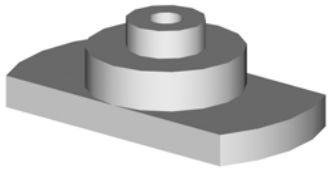
Section	Part Number	Pictorial Sketch / Description	Concept			Mark	Mark
1	All Parts of Project (Design Elements not included)	sembly Finish Function 	Assembly Subjective Grade 1-5			5	20
			Finish Subjective Grade 1-5			5	
			Mechanical Function			5	
			Electrical Function			5	
2	Design	Design Make & Attach a Front Wheel Support and Steering Mechanism	Design Wheel Support Subj. Grade 1-5			5	20
			Design Steering Mechanism Subj. Grade 1-5			5	
			Make & Finish			5	
			Attach			5	
3	Parts 1 & 3		Front Wheel Guard	10	Marking Out	1	20
					Drill	3	
					Bend	3	
					Shape	3	
			Rear Wheel Guard	10	Marking Out	1	
					Drill	3	
					Bend	3	
					Shape	3	

4	**Parts 6, 7, 10 & 11**		**Central Support**	**10**	**Marking Out**	**1**	**20**
					Drill & Slot	**3**	
					Bend	**2**	
					Shape	**4**	
			Battery Holder	**2**	**Drill &Shape**	**1**	
					Bend	**1**	
			Steering Column	**3**	**Ø 5, Length & Thread**	**3**	
			Steering Handle	**5**	**Marking Out**	**1**	
					Drill & Shape	**4**	
5	**Parts 2, 5, 8 & 9**		**Chassis**	**8**	**Marking Out**	**2**	**20**
					Drill & Shape	**4**	
					Tap	**2**	
			Rear Wheels x 2	**4**	**Ø 40 & Width**	**2**	
					Drill & Knurl	**2**	
			Carrier	**6**	**Marking Out**	**2**	
					CSK	**1**	
					Drill & Shape	**3**	
			Spacers x 2	**2**	**Drill**	**1**	
					Length	**1**	

100 Marks (× 1.5 = 150 Total)



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	**Parts 1, 2, 3 & 4**		**Complete Piece**	**Assembly**	**5**	**20**
				Finish Grade 1 - 5	**5**	
				Function Grade 1 - 10	**10**	
2	**Part 1**		**Backplate**	**Marking Out**	**6**	**25**
				Length	**2**	
				Width	**2**	
				45° Angles	**4**	
				60° Angles	**4**	
				Tapped Holes	**4**	
				Ø 4mm Hole	**1**	
				Ø 10.5mm Hole	**2**	
3	**Part 2**		**Slider**	**Marking Out**	**6**	**35**
				Width	**2**	
				Heights	**2**	
				6mm Slot	**8**	
				Ø 4mm Holes	**4**	
				60° Angles	**8**	
				62mm x 40mm Slot	**5**	
4	**Part 3**		**Cam**	**Marking Out**	**2**	**8**
				Ø 40mm	**4**	
				Ø 5.5mm CSK	**2**	
5	**Part 4**		**Knob**	**Lengths**	**2**	**12**
				Ø 40mm	**1**	
				Ø 20mm	**1**	
				Ø 10mm	**1**	
				M5 Tapped Hole	**2**	
				Flats	**5**	

100 Marks (× 1.5 = 150 Total)