Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2003

MATERIALS AND TECHNOLOGY

METALWORK - HIGHER LEVEL

100 Marks

Tuesday, 17 June - 2.00 - 4.00

INSTRUCTIONS

1. **Answer question 1, sections A and B, and three other questions.**
2. **All answers must be written in ink on the answer book supplied. Diagrams should be drawn in pencil.**
3. **Squared paper is supplied for diagrams as required.**
4. **All dimensions are in millimetres.**

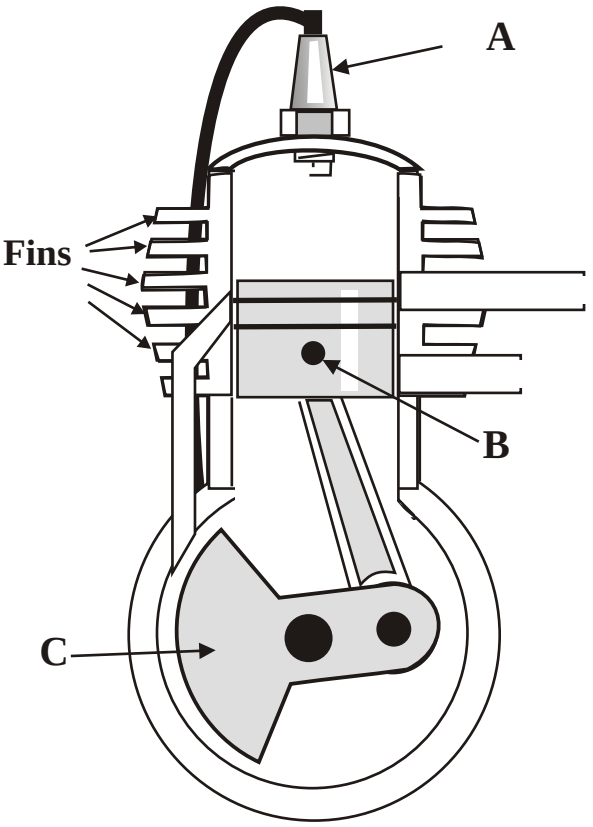
1. **40 Marks**

SECTION A - 20 MARKS
COMPULSORY

Answer any **five** questions.

(a) Briefly describe, the contribution made to technology by **one** of the following people:
Thomas Edison, Charles Parsons,
John Logie Baird.
(4 marks)

(b) The diagram shows some of the main parts of a single cylinder engine.
Name Part 'A', and explain its purpose.
(4 marks)



(c) (i) What fuel is suitable for the engine?
(ii) What is the purpose of the Gudgeon Pin, Part 'B'?
(4 marks)

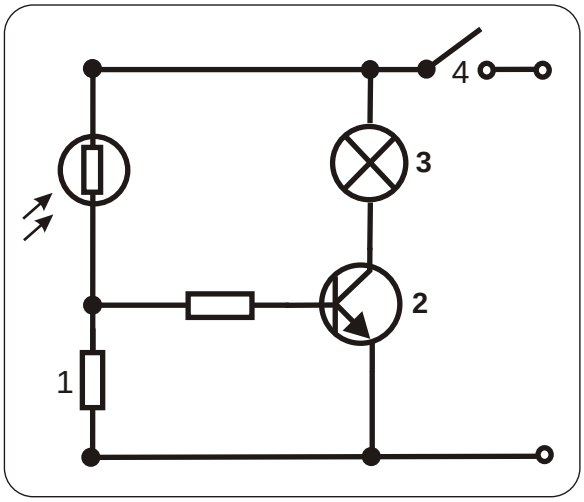
(d) Describe the movement of Part 'C' when the piston moves up and down.
(4 marks)

(e) (i) What is the purpose of the fins?

(ii) Give **two** uses of single cylinder engines.
(4 marks)

(f) Define any **two** of the following:

Thermosetting plastic,
Pilot hole,
Ferrous metal.
(4 marks)



(g) Name and identify by number, the **four** electronic components labelled in the circuit.
(4 marks)

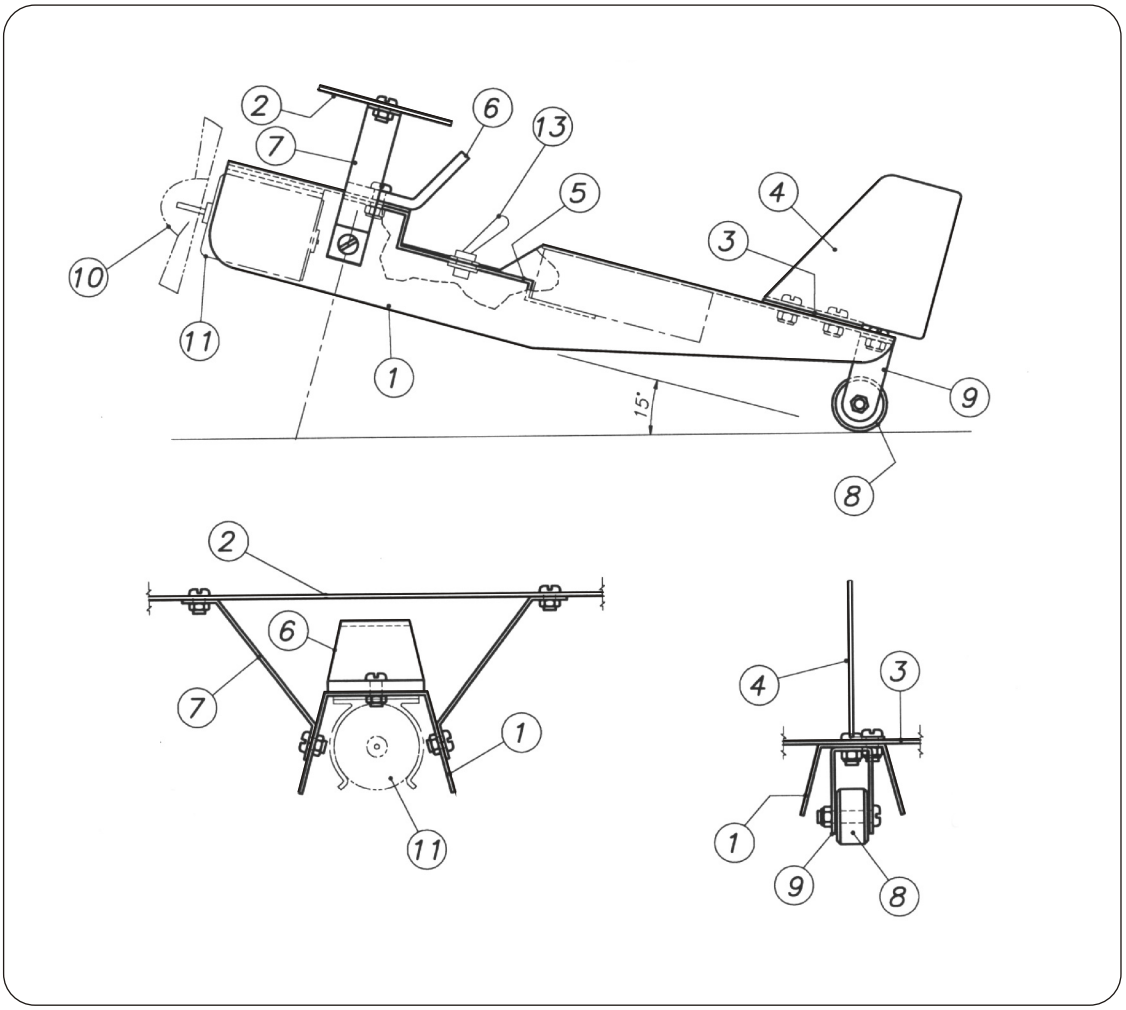
1.

SECTION B - 20 MARKS

COMPULSORY

Answer any **five** questions

The drawing shows an elevation, and front and rear details, of the 2003 Metalwork Higher Level Project - a Model Aircraft.



(a) The Propellor, Part 10, is driven by a motor, controlled by a switch, and powered by a battery. Using the correct symbols, draw a circuit diagram of the power control components of the Model Aircraft. *(4 marks)*

(b) Describe **two** stages in the manufacture of Part '8', the Wheel. *(4 marks)*

(c) Sketch a suitable design for an Undercarriage for the plane, and describe its main components. *(4 marks)*

(d) Describe how the Windshield Part '6', made from acrylic, is bent to shape. *(4 marks)*

(e) (i) Sketch the development of the Wing Support, Part '7', before it is bent to shape.
(ii) Briefly describe how Part '7' is attached to the Fuselage and the Wing. *(4 marks)*

(f) In a full-size single engine aircraft, what is the purpose of either:

(i) the Undercarriage,
or
(ii) the Tail Fin? *(4 marks)*

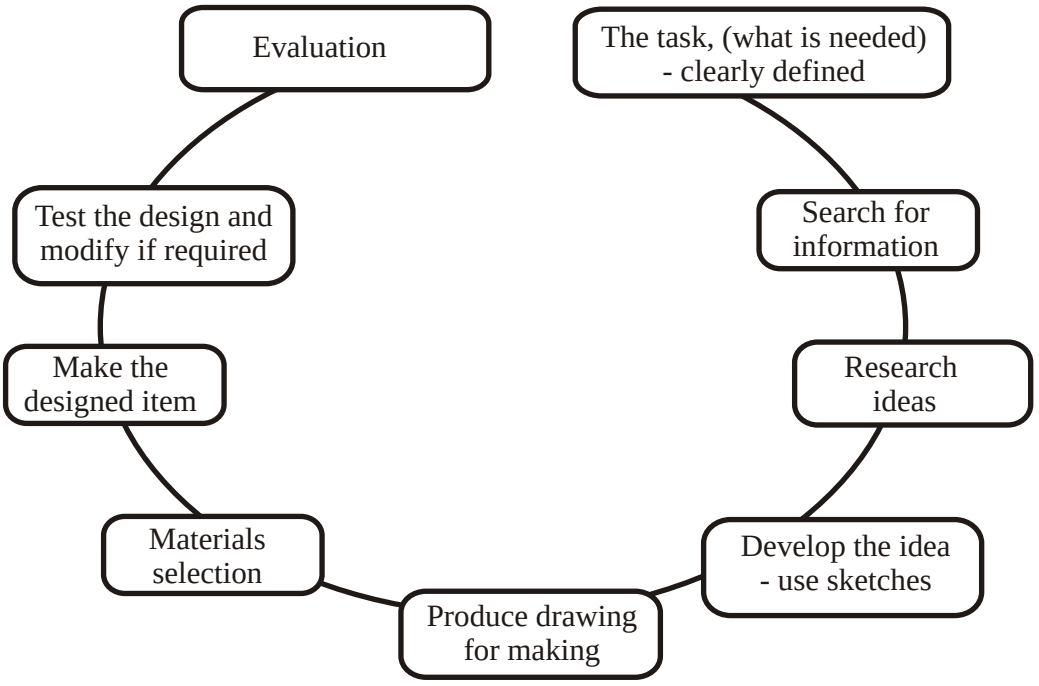
2.

20 Marks

(a) A simple model of a design process is shown. List any **two** important points which should be considered at the "materials selection" stage.

(3 marks)

(b) List **two** important points to be considered at the "produce drawing for making" stage**.** *(3 marks)*



(c) A design of a Garden Truck is shown.

(i) Draw an elevation of the Truck, looking in the direction of arrow 'X'.

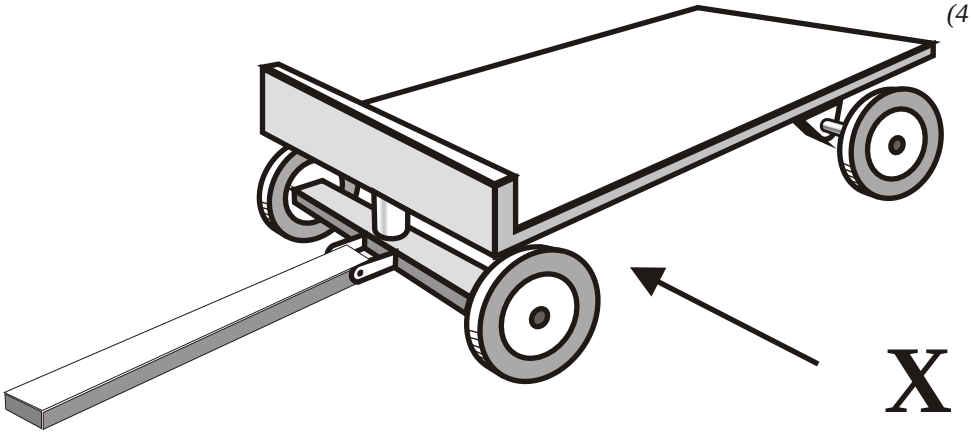
(6 marks)

(ii) Briefly describe **two** improvements that could be made to the design of the Truck. Use sketches if necessary.

(4 marks)

(iii) Briefly describe a mechanism that would allow the front axle to turn for steering.

(4 marks)



3.

20 Marks

(a) State **two** reasons why drilling machines are designed to run at different speeds (RPM). *(4 marks)*

(b) An aluminium plate is to have two holes drilled in the positions as shown. Briefly describe:

(i) how the positions of the two holes would be marked out.

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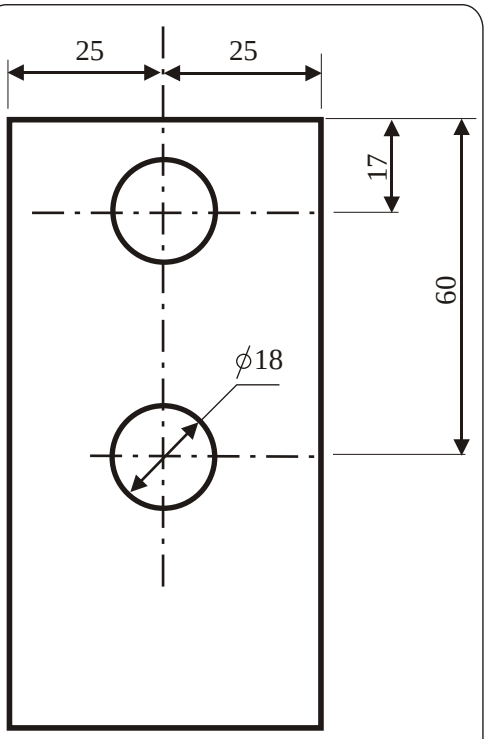
(ii) the steps required to drill the two holes accurately and safely. *(8 marks)*



(c) A 15mm diameter bar is to be turned on a lathe. If the material has a surface cutting speed of 45 m/min, what speed in RPM, should the lathe be set at. Use the given formula.

(Take π as 3)

$$N = \frac{S \times 1000}{\pi \times D}$$

(4 marks)

(d) Explain, with the aid of sketches, the purpose of:

(i) a depth gauge,
and
(ii) a taper tap. *(4 marks)*

4.

20 Marks

(a) Name the type of furnace shown. *(1 mark)*

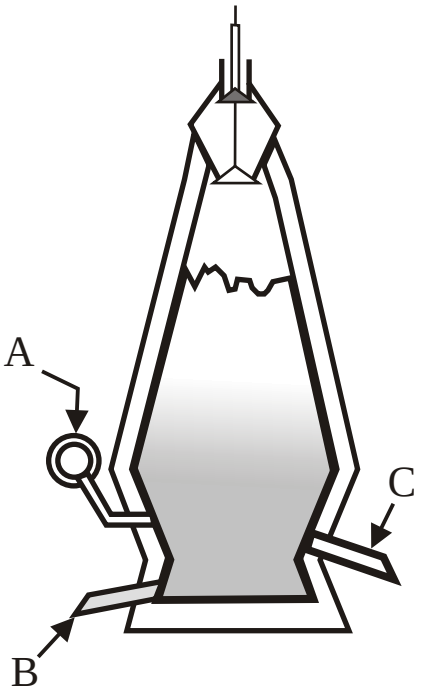
(b) Name the metal produced by the process. *(1 mark)*

(c) List the materials in the charge. *(3 marks)*

(d) Explain the purpose of Part 'A'. *(2 marks)*

(e) When the furnace is being emptied, what material is:

(i) removed at 'B',
and
(ii) removed at 'C'? *(4 marks)*



(f) Explain how the charge is heated or melted.

(2 marks)

(g) (i) List any **three** non-ferrous metals. *(3 marks)*

(ii) Define any **two** of the following: Malleability, Hardness, Ductility, Brittleness, Elasticity.

(4 marks)

5.

20 Marks

A diagram of an All Terrain Vehicle (ATV) is shown. The rear wheels are driven by an engine.

(a) Name suitable materials for Parts 'A', 'B', and 'C', and give reasons for your choice.

(6 marks)

(b) (i) If the driving sprocket has 14 teeth, and the driven sprocket, attached to the rear axle, has 28 teeth, what is the gear ratio involved?

(2 marks)

(ii) If the driving sprocket turns at 2400 RPM, how fast does the rear wheel turn?

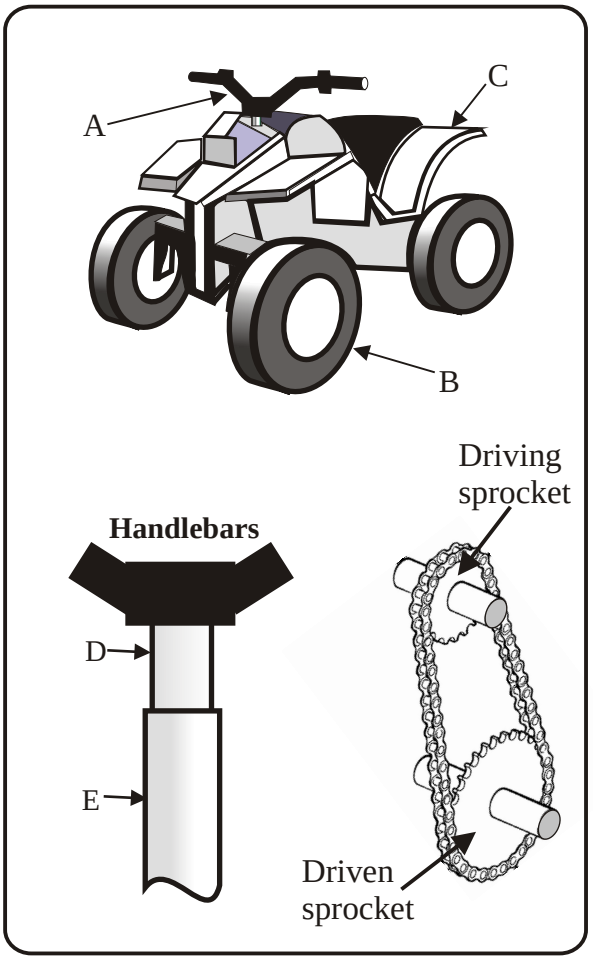
(2 marks)

(c) The handlebars are mounted on Part 'D'. Show, with the aid of a sketch, how Part 'D' could be locked in position in Part 'E' to allow handlebars height adjustment.

(6 marks)

(d) List **two** advantages of an All Terrain Vehicle (ATV) on a farm.

(4 marks)



6.

20 Marks

(a) A component is to be soldered onto a printed circuit board as shown.

(i) Describe **two** important steps to be taken when soldering.

(4 marks)

(ii) Name the **two** metals used to make solder.

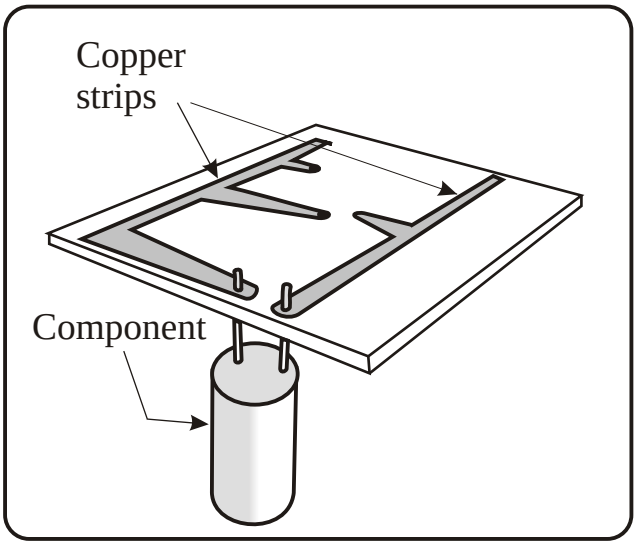
(2 marks)

(iii) What is the purpose of flux in soldering?

(3 marks)

(iv) List **three** safety procedures that should be observed when soldering.

(3 marks)



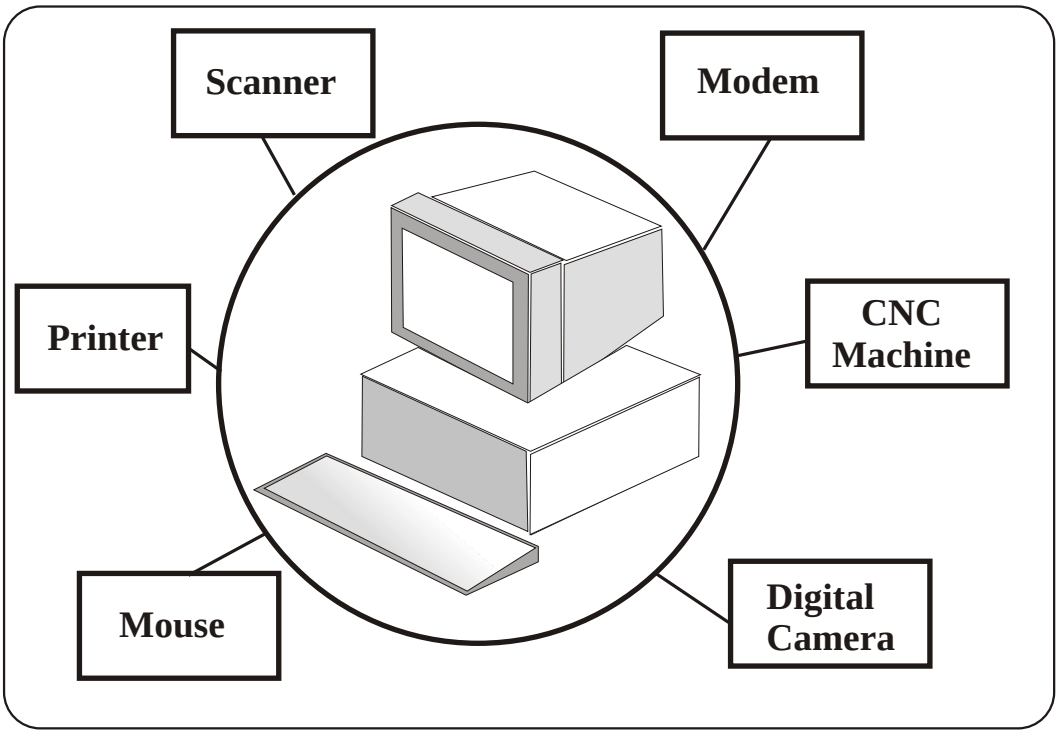
(b) List **two** properties of solder that make it suitable for joining electronic components?

(4 marks)

(c) Explain **two** of the following terms: Alloy, Clearance angle, Engraving.

(4 marks)

7. **20 Marks**



(a) A Personal Computer (PC) system is shown. All six items listed in the boxes may be connected to a PC. State which items are input and which are output.

(6 marks)

(b) Briefly describe the function of any **four** of the six items listed above.

(4 marks)

(c) Explain the meaning of the following:

(i) CD Writer. (ii) ROM.

(iii) DOS. (iv) Computer Virus.

(4 marks)

(d) List **two** advantages of Computer-Aided Manufacture (CAM).

(4 marks)

(e) Explain any **two** of the following CNC terms:

(i) Test run. (ii) Define a profile.

(iii) Canned cycle. (iv) Program.

(2 marks)