

An Roinn Oideachais agus Eolaíochta

JUNIOR CERTIFICATE EXAMINATION, 2001

8792

MATERIALS AND TECHNOLOGY

METALWORK - HIGHER LEVEL

100 Marks

Tuesday, 19 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.**

**SECTION A - 20 MARKS
COMPULSORY**

Answer any **five** questions.

- (a) Describe briefly, the contribution made to technology by **one** of the following people:
Thomas Edison, Michael Faraday,
Harry Ferguson.

(4 marks)

- (b) The diagram shows some of the main parts of a four stroke engine.

Name part 'A' and explain its purpose.

(4 marks)

- (c) Briefly describe the function of part 'B'.

(4 marks)

- (d) What is the purpose of part 'C'?

(4 marks)

- (e) Briefly describe the function of part 'D'.

(4 marks)

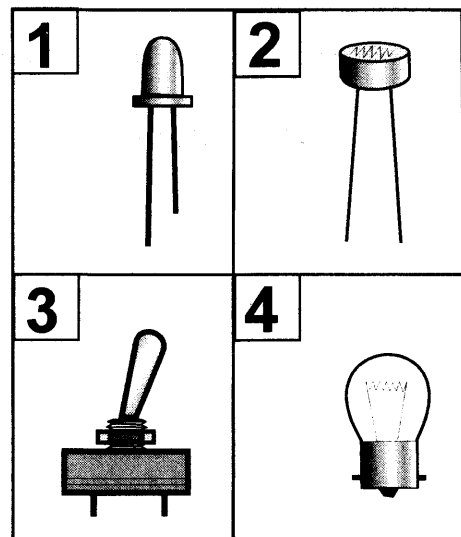
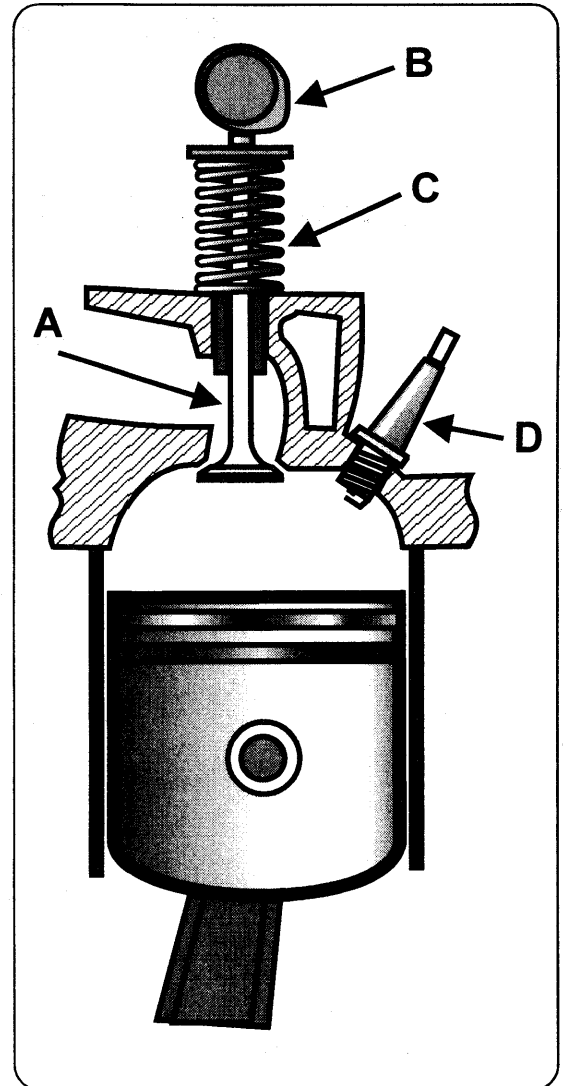
- (f) What is meant by any **two** of the following:

Brittleness, Density, Ferrous metal.

(4 marks)

- (g) Name and identify by number the **four** electronic components shown.

(4 marks)



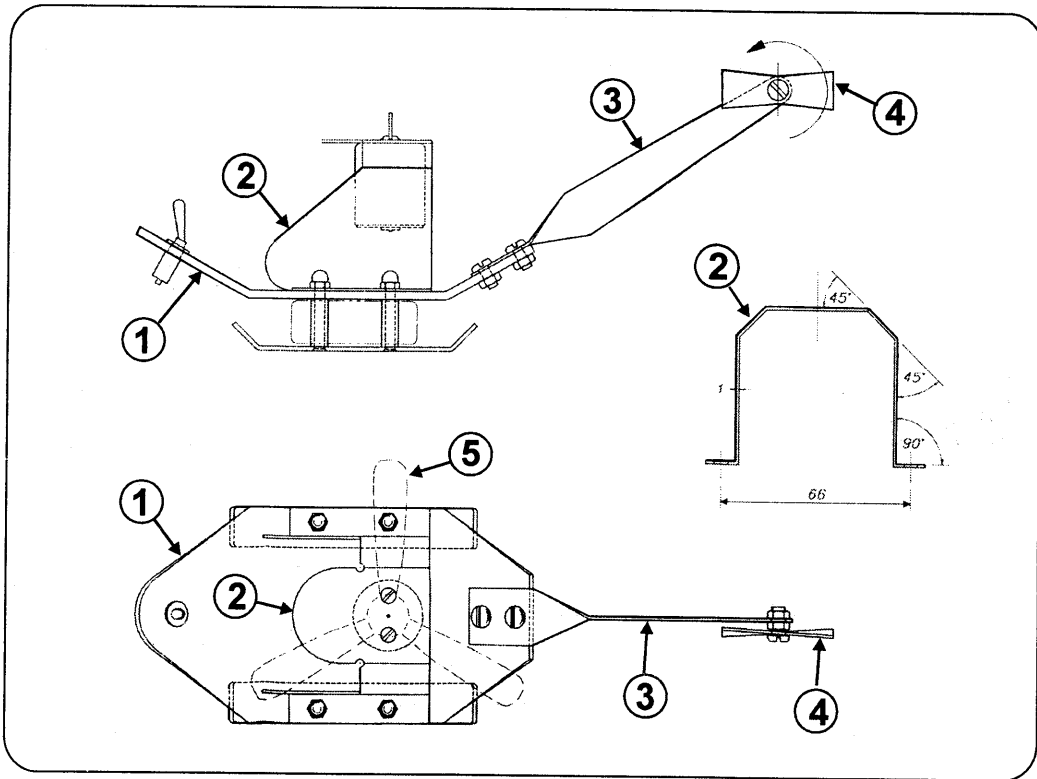
1.

SECTION B - 20 MARKS

COMPULSORY

Answer any **five** questions

The drawing shows an elevation and plan of the 2001 Metalwork Higher Level Project - a Model Motorised Helicopter.



- (a) Using the correct symbols, draw a circuit diagram of the power control components of the helicopter. Label the diagram. (4 marks)
- (b) Part '3' is attached to part '1' using screws. List **three** points to be considered when buying screws of this type. (4 marks)
- (c) Sketch a suitable design for a cab seat, and describe how you would make it. (4 marks)
- (d) Describe how the twist in part '3' is marked out and then twisted through 90°. (4 marks)
- (e) Part '2' is bent at angles of 45° and 90°. (4 marks)
 - (i) How is the 90° angle checked for accuracy?
 - (ii) How is the 45° angle checked for accuracy?
- (f) Explain the function of parts '4' and '5' on a full size operational helicopter. (4 marks)

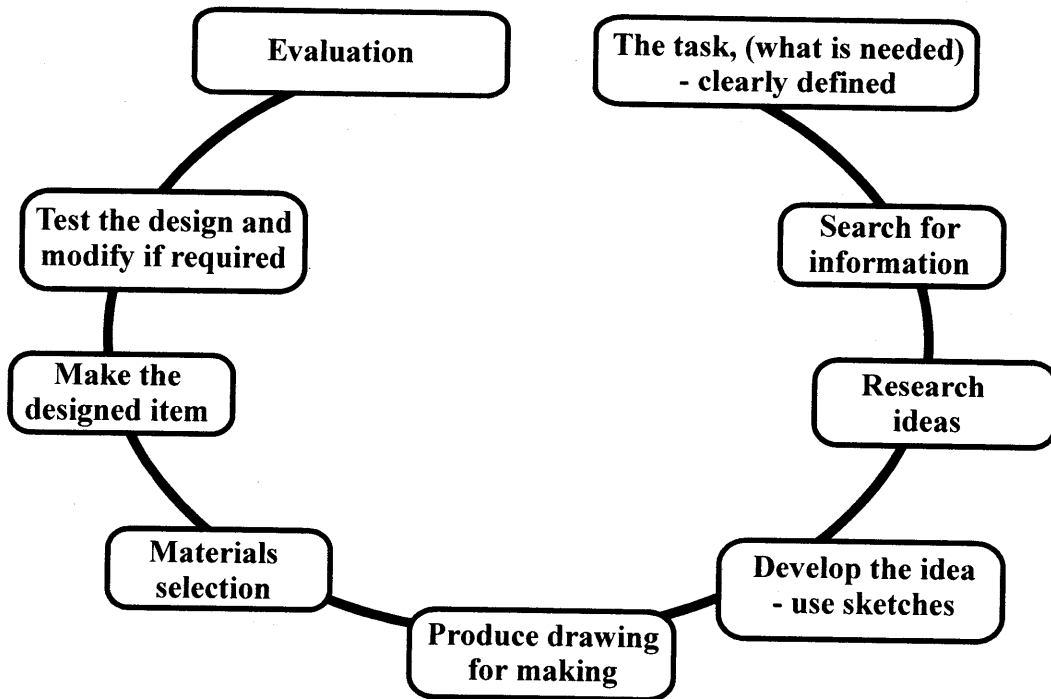
(4 marks)

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. (2 marks)

(b) List **two** important points to be considered at the “evaluation” stage. (2 marks)

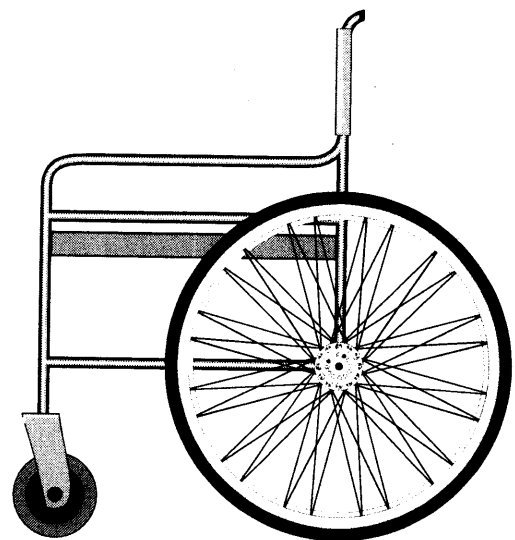


(c) A basic wheelchair design is shown.

(i) Using simple sketches and notes, give details of **two** improvements to this design. (8 marks)

(ii) List **two** materials used in the manufacture of a wheelchair. State a reason for the use of each material. (4 marks)

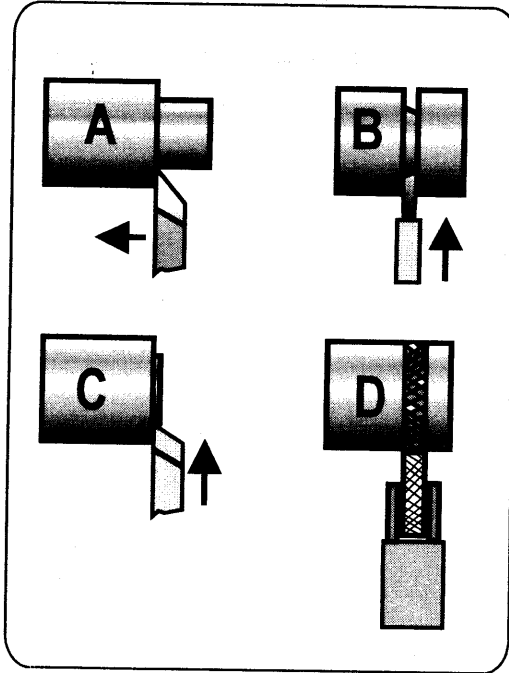
(iii) Describe briefly, either
Case-hardening
or
Vacuum forming. (4 marks)



3.

20 Marks

- (a) Four different lathe turning operations are shown in the diagrams at 'A', 'B', 'C,' and 'D'. Name and explain the operation of any **three**. (9 marks)



- (b) List **three** safety precautions that should be taken before beginning work on a lathe. (3 marks)

- (c) A 12mm diameter hole is to be drilled in a material which has a surface cutting speed of 72 m/min. Using the given formula, find the correct drilling speed in RPM for drilling the hole. (Take π as 3)

$$N = \frac{S \times 1000}{\pi \times D} \quad (4 \text{ marks})$$

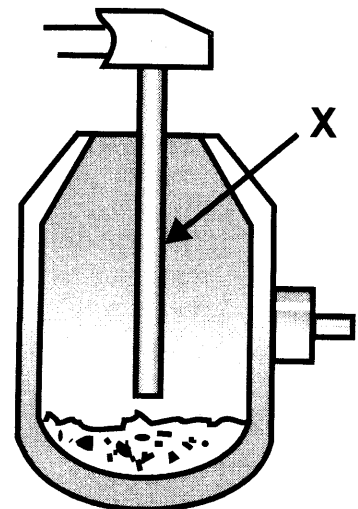
- (d) Explain, with the aid of sketches, the purpose of :

- (i) A pilot hole,
and
(ii) A tapping size hole. (4 marks)

4.

20 Marks

- (a) Name the type of furnace shown. (2 marks)
- (b) Explain how the furnace is charged (3 marks)
- (c) List the materials in the charge. (3 marks)
- (d) Explain how the furnace is emptied. (2 marks)
- (e) Name part 'X' and explain its function. (2 marks)
- (f) What prevents part 'X' from being melted by the heat? (2 marks)
- (g) Select any **two** alloys from the list given. State the composition of the two chosen alloys and give a use for each. (6 marks)



List of alloys

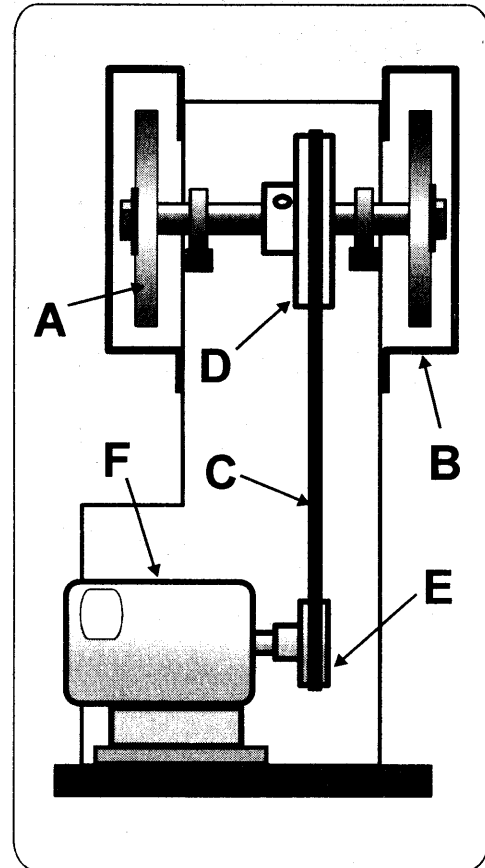
- Soft solder
- Brass
- Carbon steel
- Bronze

5.

20 Marks

The diagram shows a pedestal grinder.

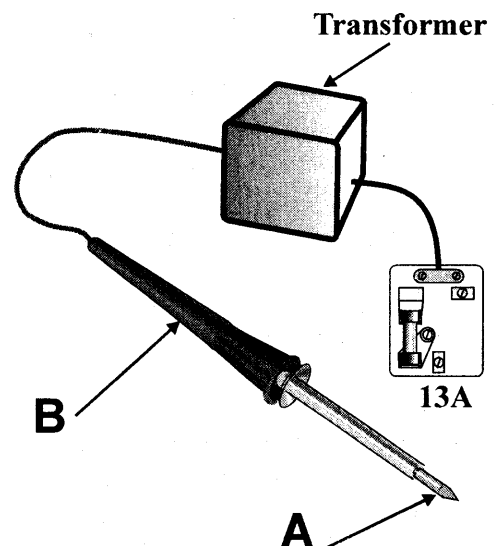
- (a) Name the parts 'A', 'B', and 'C', and describe the function of each. (6 marks)
- (b) A Vee belt drive system is used.
- (i) Pulley 'D' has a diameter of 180mm and pulley 'E' has a diameter of 90mm. What is the gear ratio? (3 marks)
- (ii) If the driving pulley 'E' attached to the motor 'F', turns at 2200 RPM, what is the speed of part 'A'? (3 marks)
- (c) The motor 'F', has three markings on it: AC, 240V, 500W. Explain the meaning of these markings. (4 marks)
- (d) The body of the grinder is made from cast iron. List **two** reasons why cast iron is used. (4 marks)



6.

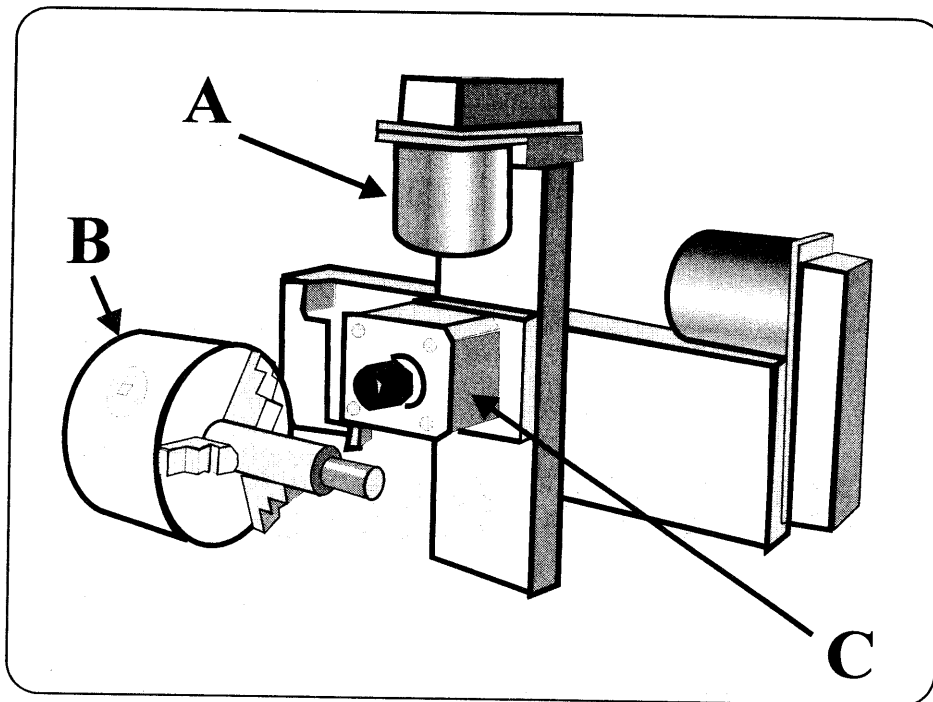
20 Marks

- (a) An electric soldering iron is shown.
- (i) Name part 'A' and state a material from which it is made. (2 marks)
- (ii) List **two** properties of the material used to make part 'B'. (2 marks)
- (iii) The soldering iron is connected through a transformer to the mains with a 13A plug. Draw a sketch to show where the Live, Neutral and Earth wires are connected inside the plug. (4 marks)
- (iv) Why is the soldering iron connected to the mains through the transformer? (2 marks)
- (b) State **one** advantage and **one** disadvantage of using nuts and bolts as a method of joining. (4 marks)
- (c) Explain the meaning of **three** of the following : Malleability, Melting point, States of matter, Hardness. (6 marks)



7.

20 Marks



- (a) The diagram shows parts of a CNC lathe. Name and describe the function of any **two** of the parts 'A', 'B' and 'C'.
(6 marks)
- (b) Explain any **three** of the following :
- | | |
|-------------|----------------------|
| (i) CPU. | (ii) G-code. |
| (iii) Menu. | (iv) Computer virus. |
- (4 marks)
- (c) With the aid of a sketch, show the directions represented by the jog keys **-X**, **+X**, **-Y**, and **+Y**.
(4 marks)
- (d) Describe the steps in programming a CNC lathe using 'define a profile mode', to produce the part shown in the diagram below.
(6 marks)

