An Roinn Oideachais agus Eolaíochta

517

JUNIOR CERTIFICATE EXAMINATION, 2002

MATERIALS AND TECHNOLOGY

METALWORK - HIGHER LEVEL

100 Marks

Tuesday, 18 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.

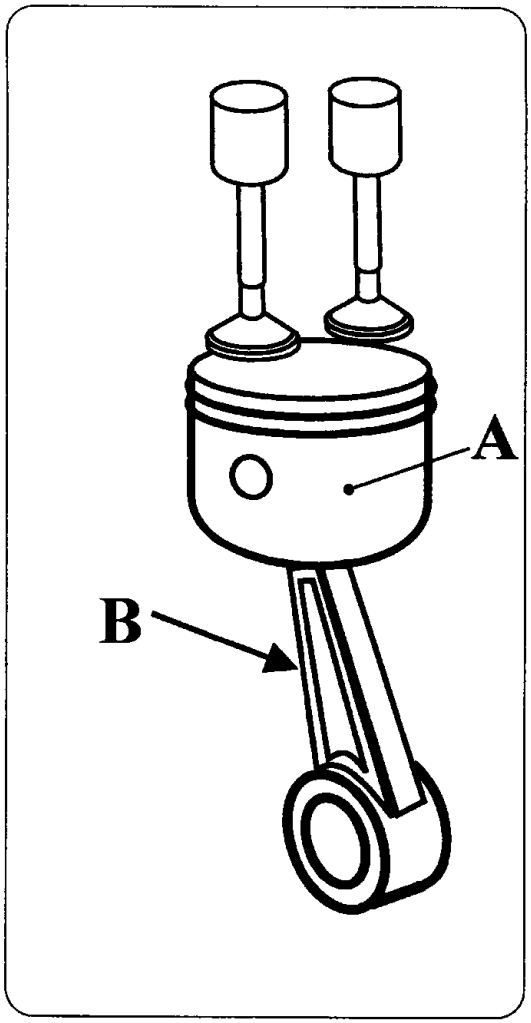
1. **40 Marks**

SECTION A - 20 MARKS
COMPULSORY

Answer any **five** questions.

(a) Describe briefly, the contribution made to technology by **one** of the following people:
Karl Benz, Henry Ford, Isaac Singer.
(4 marks)

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



(c) Suggest a suitable material for Part 'A', and list **one** important property of the material.
(4 marks)

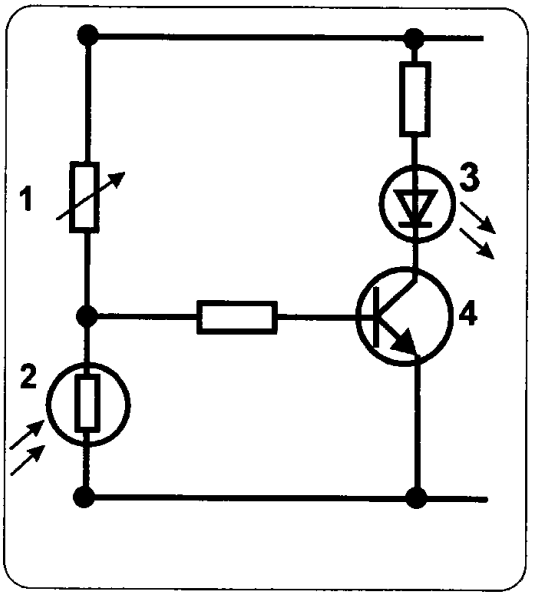
(d) Briefly describe the function of Part 'B'.
(4 marks)

(e) Name the **two** types of valve in a basic 4-stroke engine.
(4 marks)

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

Thermoplastic, Insulator, Alloy.
(4 marks)

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



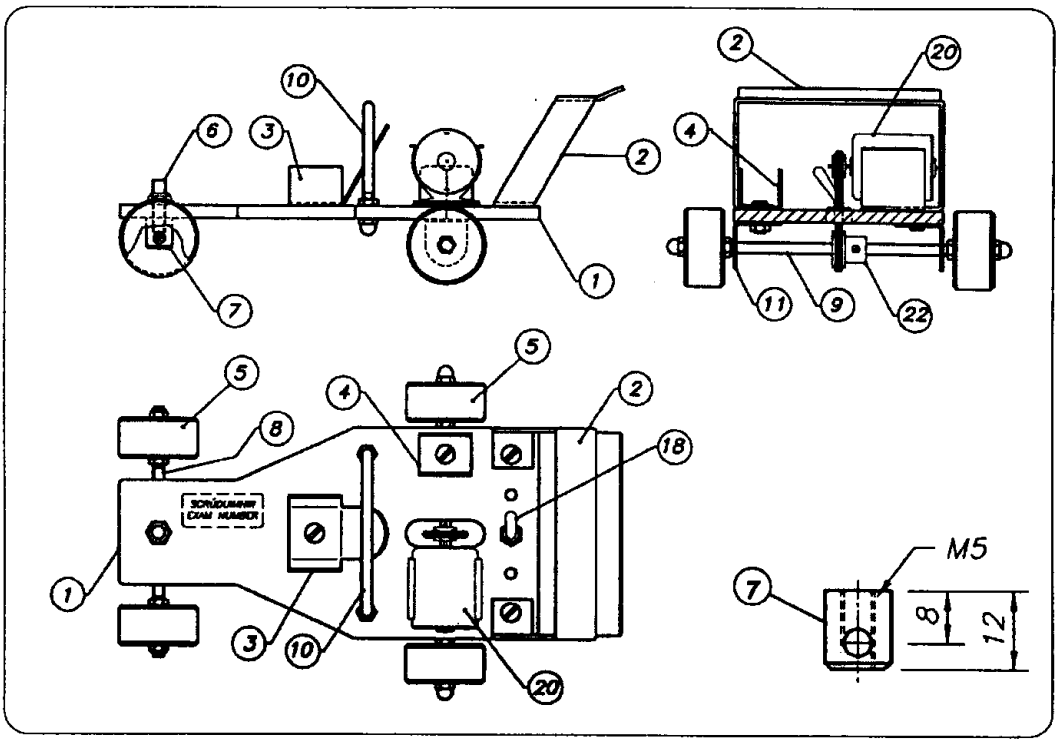
1.

SECTION B - 20 MARKS

COMPULSORY

Answer any **five** questions

The drawing shows an elevation, plan, and sectional view of the 2002 Metalwork Higher Level Project - a Model Motorised Beach Buggy.



(a) Using the correct symbols, draw a circuit diagram of the power control components of the Beach Buggy.

(4 marks)

(b) Describe how the M5 screw-thread is produced in Part '7'.

(4 marks)

(c) Sketch a suitable design for a steering mechanism, and describe how it could be made.

(4 marks)

(d) Describe how the slot for the drive belt is produced in Part '1'.

(4 marks)

(e) (i) Sketch the development of the spoiler, Part '2', before it is bent to shape.

(ii) Briefly describe how Part '2' is bent to shape.

(4 marks)

(f) The motor, Part '20', drives the rear wheels via a belt and pulleys. Describe an alternative drive system.

(4 marks)

2.

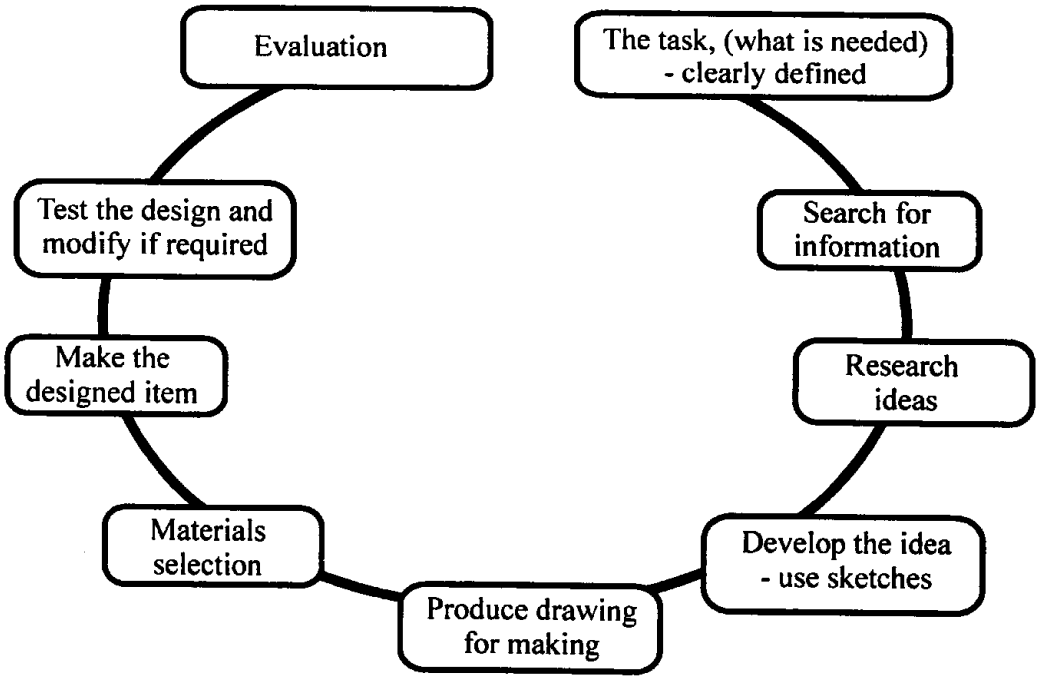
20 Marks

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

(3 marks)

(b) List **two** important points to be considered at the "make the designed item" stage.

(3 marks)



(c) A design of a shelf bracket is shown.

(i) Draw an elevation of the bracket, looking in the direction of arrow 'X', and show **two** improvements to the design.

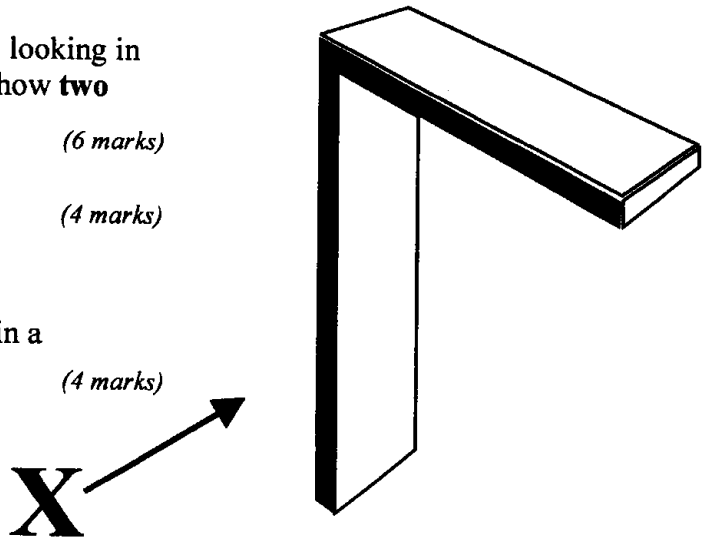
(6 marks)

(ii) Explain the **two** improvements.

(4 marks)

(iii) Suggest a suitable finish for the bracket, if the shelf is to be used in a shower.

(4 marks)

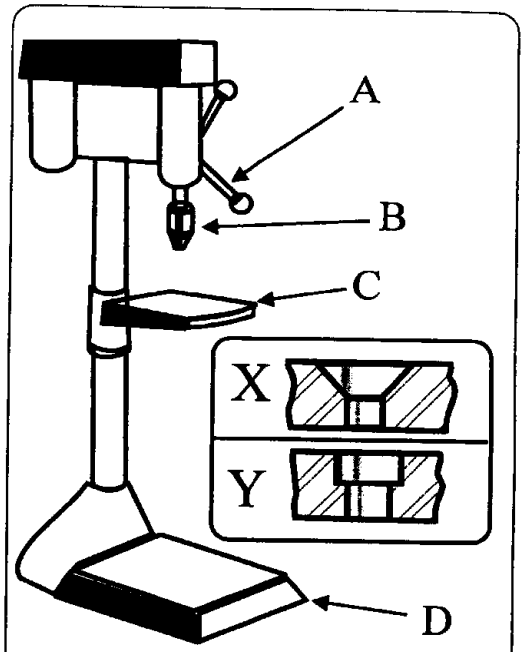


3.

20 Marks

(a) A sketch of a pillar drilling machine is shown. Name and explain the purpose of the Parts 'A', B', 'C,' and 'D'.

(4 marks)



(b) (i) Name the types of hole shown at 'X' and 'Y' and state the purpose of each.

(ii) Describe the process required to produce hole 'X'.

(8 marks)

(c) A 9mm diameter hole is to be drilled in a material, which has a surface cutting speed of 54 m/min. Using the given formula, find the correct drilling speed in RPM.

(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 drill gauge,

and

(ii) a reamer.

(4 marks)

4.

20 Marks

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

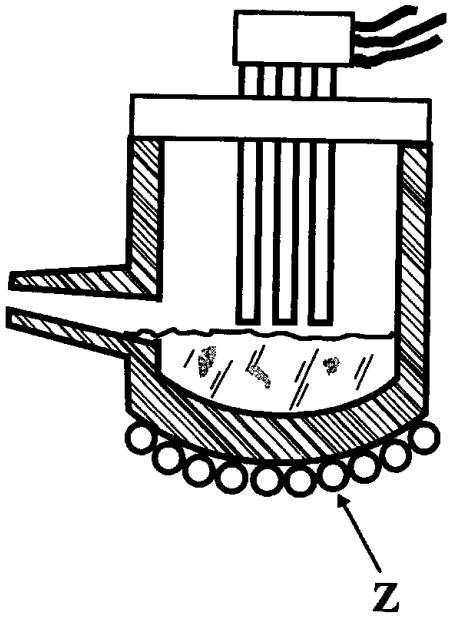
(b) Explain how the furnace is charged. *(2 marks)*

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

(d) Explain how the furnace is emptied. *(2 marks)*

(e) Name Part 'Z' and explain its function. *(2 marks)*

(f) Explain how the charge is heated or melted. *(2 marks)*



(g) Complete the table, naming the alloys, and listing **one** important property of each. The completed table must be drawn in your answer book.

(8 marks)

Composition	Alloy	Property
Copper + Tin		
Tin + Lead		
Copper + Zinc		
Iron + Carbon		

5.

20 Marks

An outboard engine for a boat is shown.

(a) Explain how the plastic protective cover may be formed. *(4 marks)*

(b) Name a material suitable for the manufacture of the propellor. List **two** properties of the material that make it suitable. *(6 marks)*

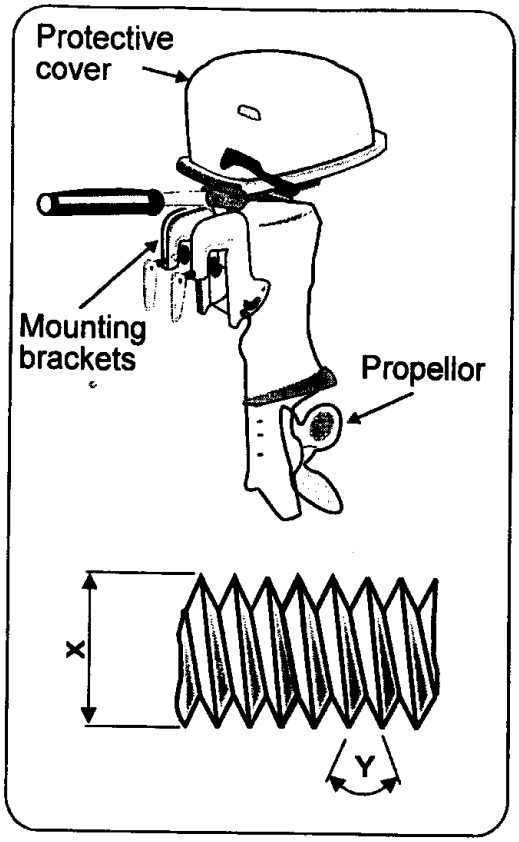
(c) A section of an M10 mounting bracket screw is shown. What is:

(i) the size of the dimension 'X', *(3 marks)*

and

(ii) the name of the angle 'Y'? *(3 marks)*

(d) List **two** effects of internal combustion engines on the environment. *(4 marks)*



6.

20 Marks

(a) A scriber for marking out is shown.

(i) What type of steel is used to make the scriber? *(2 marks)*

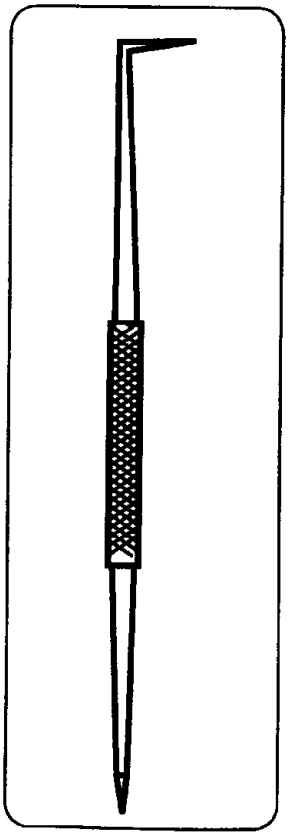
(ii) Name the process used to soften the points, before they are shaped. *(2 marks)*

(iii) The scriber is to be hardened and tempered. Describe how this is done. *(6 marks)*

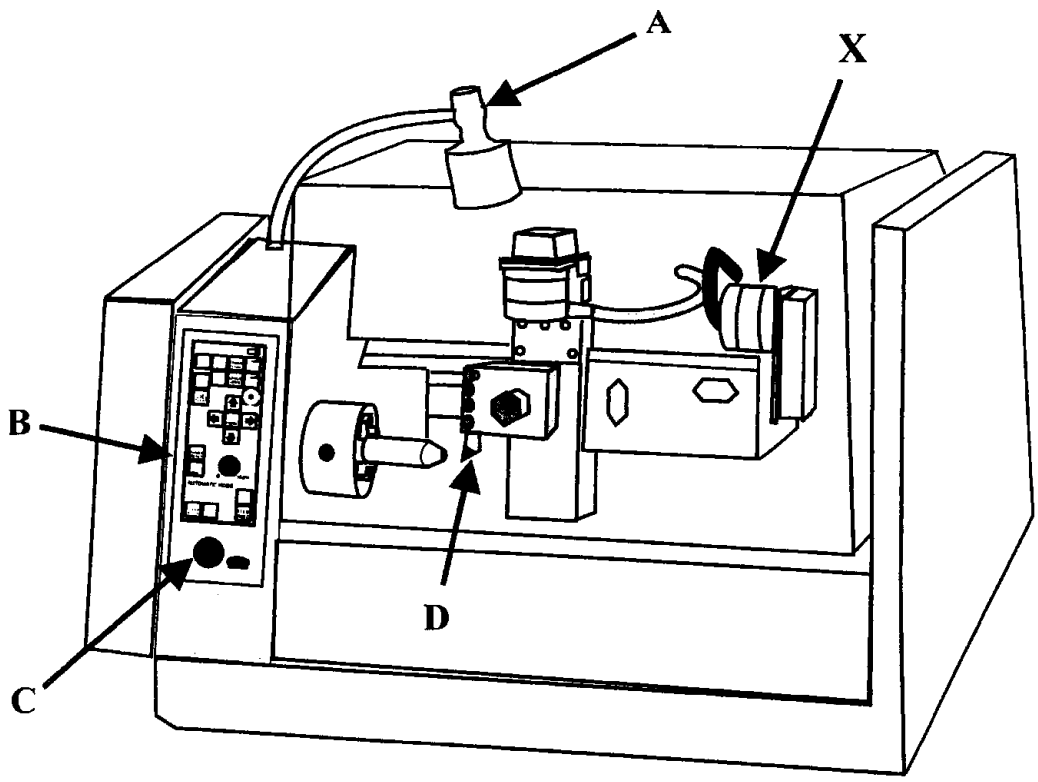
(iv) List **two** safety precautions to be taken during heat treatment. *(2 marks)*

(b) Briefly describe any **two** of the following:
Enamelling, Knurling, Dip-coating. *(6 marks)*

(c) Why is a Vernier Calipers sometimes used, in preference to a rule? *(2 marks)*



7. **20 Marks**



(a) The diagram shows a CNC lathe. Name and describe the function of any **three** of the Parts 'A', 'B', 'C' and 'D'. *(6 marks)*

(b) (i) List **two** advantages of CNC machines. *(4 marks)*

(ii) What is the function of the stepper motor 'X'? *(4 marks)*

(c) Explain the following :

(i) CAM. (ii) CNC.

(iii) RAM. (iv) WWW. *(4 marks)*

(d) List **two** advantages of Computer Aided Design. *(2 marks)*