

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

METALWORK

6040/01

Paper 1 Theory, Drawing and Design

October/November 2005

2 hours 45 minutes

Additional Materials: Answer Paper
A2 Drawing Paper (1 sheet)
Standard Drawing Equipment

READ THESE INSTRUCTIONS FIRST

Write your name, Centre number and candidate number in the spaces provided on the Answer Paper/Answer Booklet.

Section A

Answer any **three** questions.

Write your answers on the separate Answer Paper provided.

Section B

Answer **all** questions.

Use the A2 sheet of Drawing Paper prepared prior to the examination for your answers.

At the end of the examination, fasten together the separate Answer Paper for Section A and place it within your folded drawing paper for Section B.

The number of marks is given in brackets [] at the end of each question or part question.

All dimensions are in millimetres unless otherwise stated.

Except where pictorial views are used **all** diagrams are in First Angle Projection.

This document consists of **11** printed pages and **1** blank page.



Section A

Theory

Answer any **three** questions in this section.

Use bold sketches to illustrate your answers wherever possible.

You are advised to spend 1 hour 15 minutes on Section A.

- 1 Fig. 1 shows a lever plate for a lock, which has been marked out on a piece of $42 \times 24 \times 2$ thick bright mild steel.

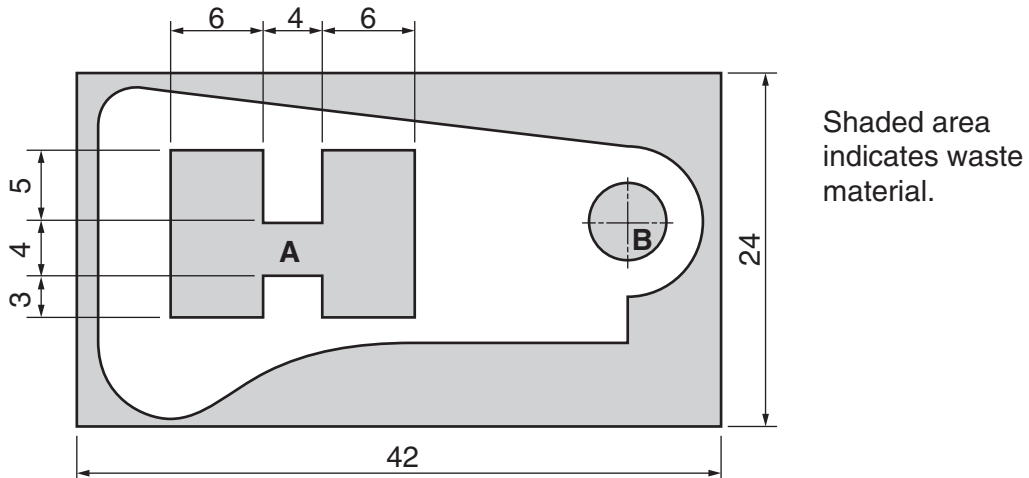


Fig. 1

- (a) Describe, with the aid of sketches and naming all the tools required, how you would:
- (i) shape the outside edge of the lever plate; [6]
 - (ii) remove the waste material and accurately complete cutout **A**. [8]
- (b) It is necessary to drill the 5 mm hole **B**. State the order in which you would carry out the three operations (i) and (ii) above and drilling the hole. Give a reason for your choice. [3]

- 2 Fig. 2 shows a pastry cutting tool used in cookery. The cutting tool is made from a single piece of tinfoil.

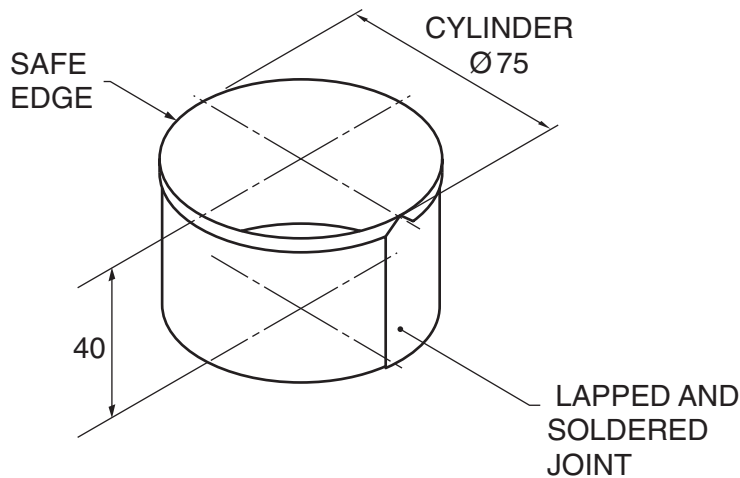


Fig. 2

- (a) Name the tool you would use to cut the required piece of metal from a large sheet of tinfoil. [2]
- (b) Describe, with the aid of sketches, how you would form the safe edge at the top of the cutting tool. Name the tools you would use. [3]
- (c) Having formed the safe edge, describe with the aid of sketches how you would form the piece of tinfoil into the cylinder shown in Fig. 2. [5]
- (d) The two ends of the piece of tinfoil are to be soft soldered together to form a lapped and soldered joint.
- (i) Describe with the aid of sketches the method you would use to hold the two ends together ready for soft soldering. [3]
- (ii) Give the composition of soft solder. [1]
- (iii) Give the name of a flux you could use for soft soldering tinfoil and state the purpose of using a flux. [2]
- (iv) Give the name of the tool you would use for soft soldering the joint. [1]

3 All the following questions are concerned with the heat treatment of metals.

(a) Fig. 3 shows a small bowl made from copper. The bowl is formed by beating a copper disc into a leather sand cushion using a wooden mallet. As the beating is carried out, the copper becomes work-hardened and has to be softened again before beating can continue.

(i) Give the name of this softening process. [1]

(ii) Describe how this process is carried out. [3]

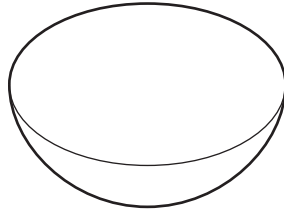


Fig. 3

(b) Fig. 4 shows the blade of a small screwdriver made from 5 mm diameter bright drawn mild steel.

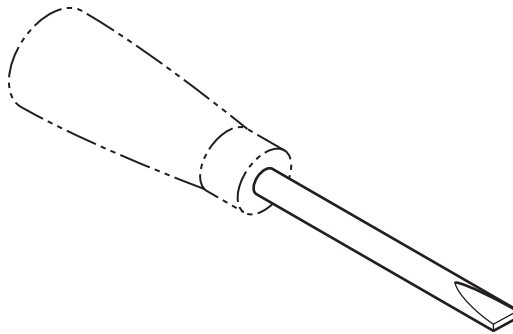


Fig. 4

After the blade has been shaped and finished, the **surface** of the mild steel has to be made hard enough to make the screwdriver wear-resisting.

(i) Give the name of this hardening process. [1]

(ii) Describe how this process is carried out. [4]

(c) Fig. 5 shows the end of a cold chisel made from high carbon steel.

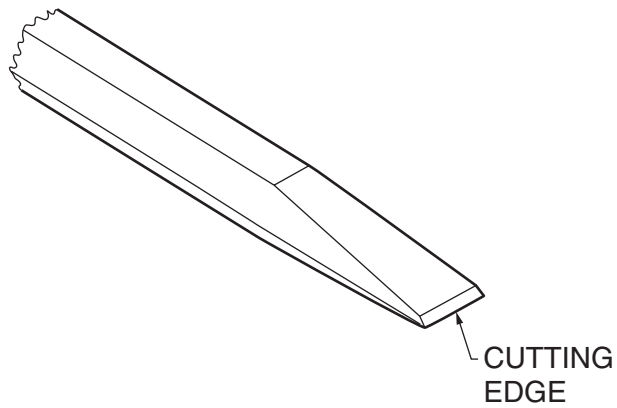


Fig. 5

After the cutting edge of the cold chisel has been formed, it has to be made tough enough to cut softer metals. There are two stages in this process.

- (i) Name the stages in this process. [2]
- (ii) Describe how both stages are carried out. [6]

- 4 Circular holes in metal are cut using a drilling machine similar to the one illustrated in Fig. 6.

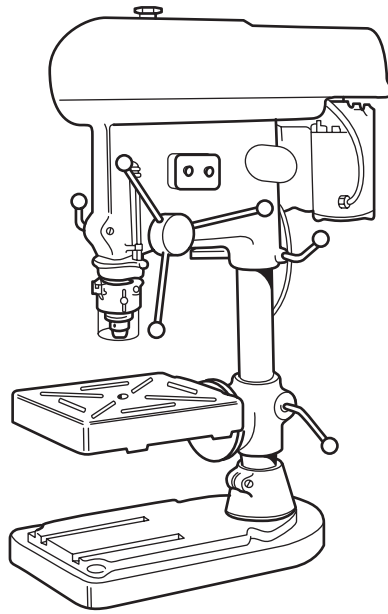


Fig. 6

- (a) (i) Describe, naming the tools used, how a block of metal $50 \times 50 \times 10$ thick would be held on a drilling machine to enable an 8 mm diameter hole to be drilled accurately through the 10 thickness. [4]
- (ii) Describe a different method for holding a $50 \times 50 \times 2$ thick piece of metal to enable a 5 mm diameter hole to be drilled through it. [3]
- (b) Give the name of the lubricant you would use if the 10 thick metal drilled in (a) was:
- (i) mild steel; [1]
- (ii) aluminium. [1]

(c) Fig. 7 shows the cutting end of a twist drill.

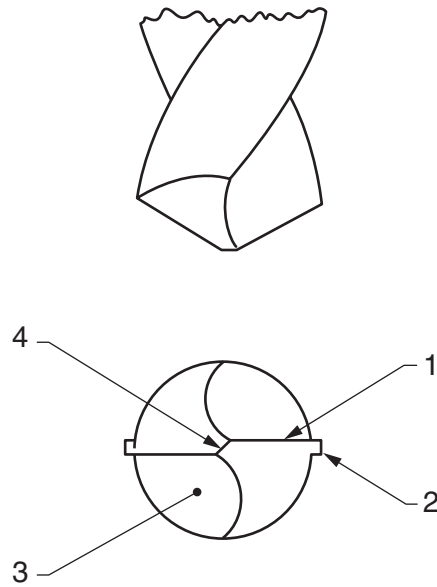


Fig. 7

Name the parts of the drill 1, 2, 3 and 4.

[4]

- (d) Give **two** factors that would influence selection of the cutting speed (rpm) of a drilling machine. [2]
- (e) Give **two** safety precautions that you **must** take when using a power-operated drilling machine. [2]

- 5 A small vase is to be made from 18 SWG (1.2 mm) gilding metal. It has already been **raised** to the shape shown in Fig. 8.

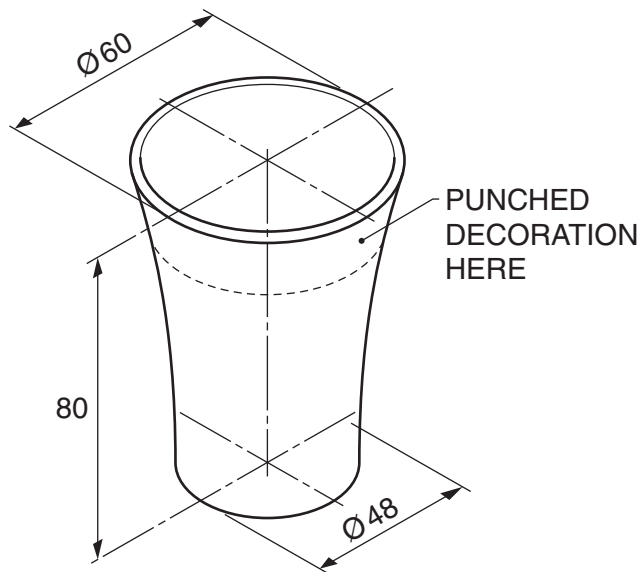


Fig. 8

Describe, using notes and sketches, how each of the following stages in completing the vase is carried out.

- (a) **Planishing** the side of the vase. Include in your answer the effect planishing has on the metal. [8]
- (b) Making a **Punched Decoration** in the position indicated round the top edge of the vase. [5]
- (c) **Polishing** the outside surface of the vase. [4]

Section B Drawing and Design

Answer **all** questions in this section.

You are advised to spend 1 hour 30 minutes on this section.

Use the sheet of A2 Drawing Paper prepared prior to the examination for your answers.

Set the paper with the long edge to the top of your drawing board and use the space to the right of the line for your freehand sketches in answer to Question 6.

Use only one side of your paper.

Dimensions not given are left for you to decide.

Fig. 9 is an incomplete view of a tightening device for a wire fence. Orthographic views of the two parts of the device are given in Fig. 10.

A length of wire is passed through hole **A** in the body and is attached to the reel by passing the end of the wire through the 10 mm diameter hole **B**. The wire is tightened by turning the square section end **C** of the reel.

- 6** To the right of the vertical line on your answer paper, make a series of sketches leading to solutions for the Design Problems given below. **Brief** notes should be added to identify details such as important sizes and specific materials. It should be possible for the examiner to understand your solutions from these sketches.

To solve these problems you may incorporate additional parts and make minor modifications to the given components. Methods of assembly should not include the use of adhesives.

Design Problems

- (a) A method for holding the reel captive in position in the body so that it cannot come out and yet is free to rotate.
- (b) A method for preventing the reel from unwinding when the correct tension is achieved.
- 7** Draw full size in either first or third angle orthographic projection the following views of the assembled wire tightening device complete with your solutions to the Design Problems in Question 6.
- (a) The sectional view **XX**.
- (b) A plan projected from the sectional view **XX**.

Mark allocation:	
Communication	[25]
Design	[24]

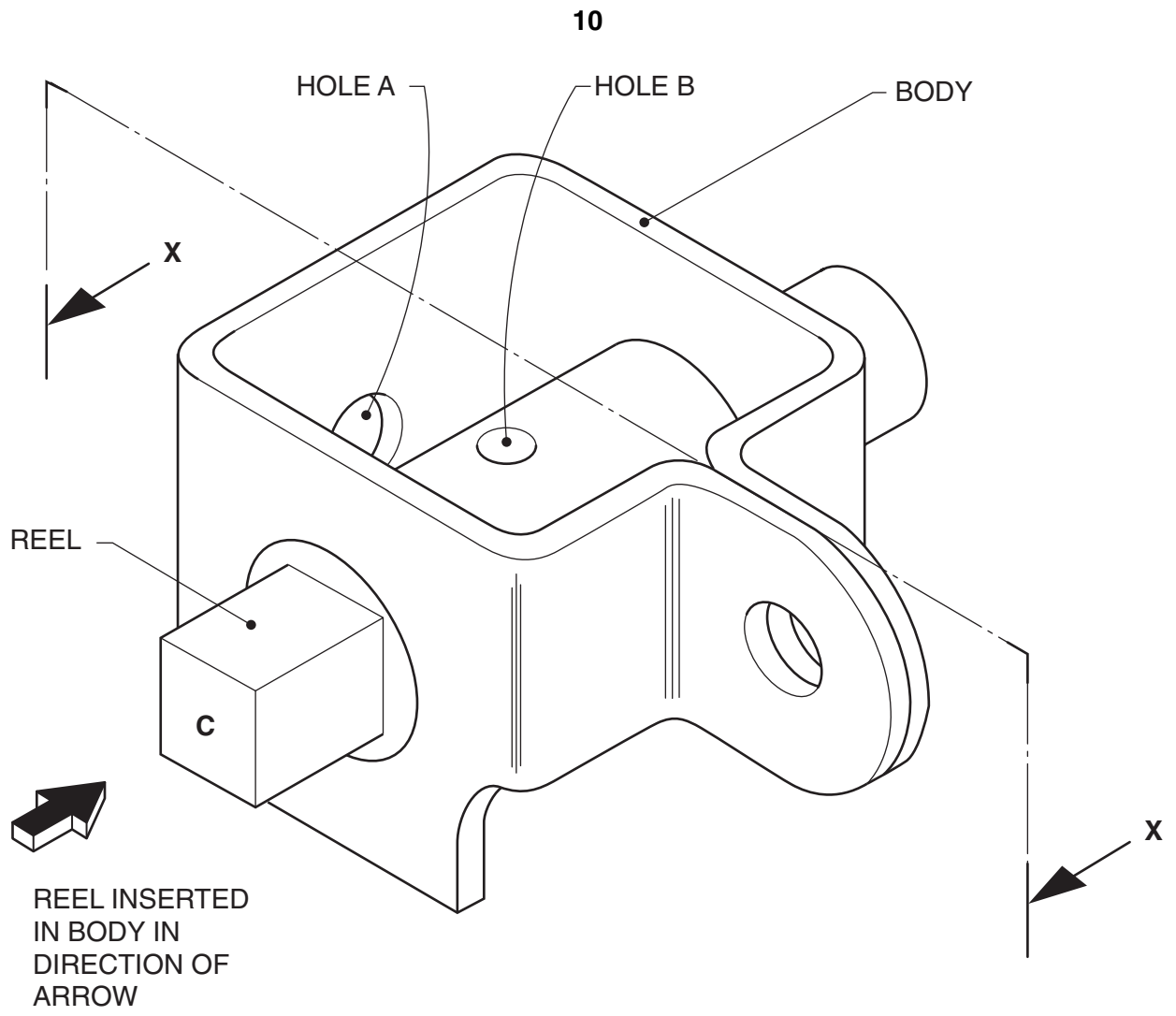
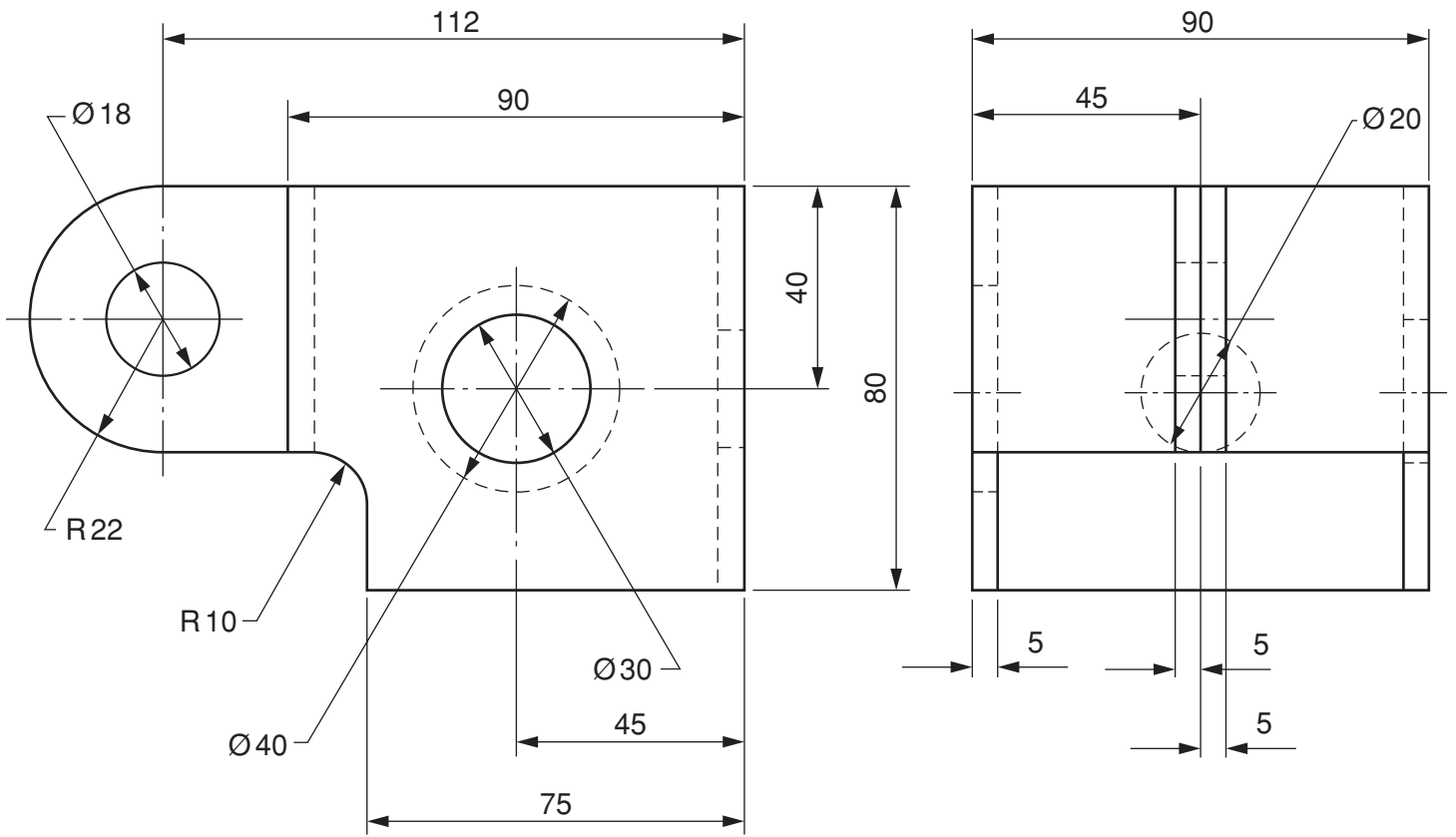
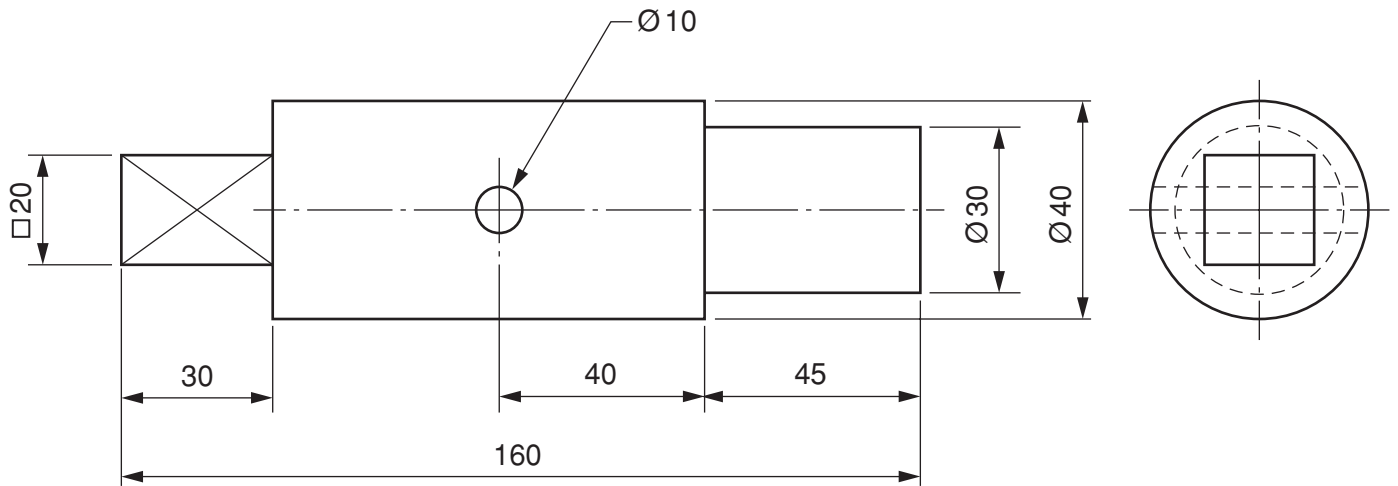


Fig. 9

11



BODY



REEL

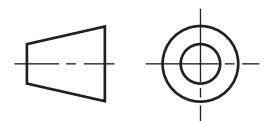


Fig. 10

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