

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Friday 15 October 2021 – Morning

**A Level in Design and Technology:
Product Design**

H406/02 Problem Solving in Product Design

Resource Booklet

**Time allowed: 1 hour 45 minutes
plus your additional time allowance**

INSTRUCTIONS

Use the Resource Booklet to answer all the questions.

You should spend 35 MINUTES plus your additional time allowance reading this Resource Booklet.

Do not send this Resource Booklet for marking. Keep it in the centre or recycle it.

ADVICE

Read this Resource Booklet carefully before you start your answers.



The stimulus in this booklet relates to issues and opportunities encountered by business enterprises making and selling products for gardens.

ATTRACTING WILDLIFE INTO GARDENS

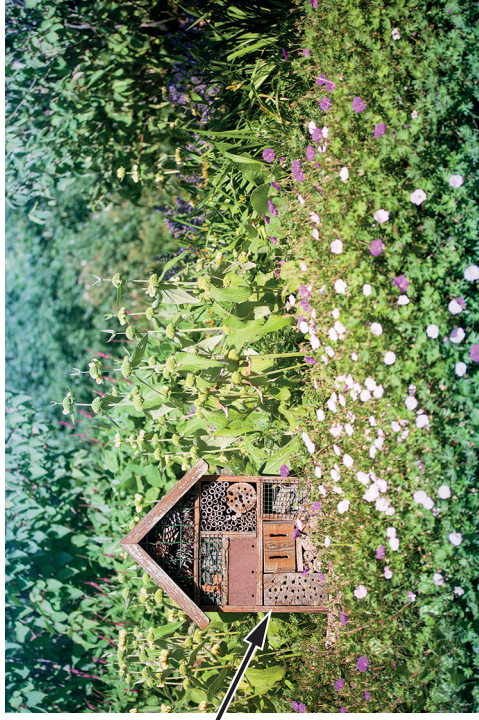
Gardens attract thousands of insects, many of which are helpful because they pollinate flowers and control pests. These insects support biodiversity and help to increase the productivity of the ecosystem.

Insect hotels, also known as bug houses, bug hotels and bug boxes, provide a safe place where insects can shelter in the garden.

FIG. 1



insect hotels



ENTERPRISE

The owner of a garden centre has identified a potential additional income stream. In keeping with the current trend of products made from upcycled materials, garden accessories such as bird boxes and insect hotels made from these materials can be sold.

A trial batch of 50 insect hotels are required to determine consumer interest.

The insect hotels will be based on the prototype shown in FIG. 2 opposite.

FIG. 2



INSECT HOTEL:

**Dimensions L x W x D (mm):
330 x 240 x 110**

Weight: 2.5 kg

Selling price: £35.00



UPCYCLING

The insect hotels will be made by the upcycling of materials such as those shown in FIG. 3.

FIG. 3



slate roof tiles



softwood off-cuts



bamboo



palette wood



CONSUMER FEEDBACK

After two weeks most of the insect hotels were sold to local customers and visitors.

Consumers liked the following aspects:

aesthetics – pastel colours that complement the garden environment

use of upcycled materials

quality of finish

ease of maintenance and cleaning.

The survey results indicated that there is a demand for the following:

an increased range of products

products in a selection of colours.

Additional survey comments indicate the market potential for garden accessories made from upcycled materials.

RANGE EXPANSION

The garden centre owner develops a range of products branded 'Re-New', shown in FIG. 4, that includes a bird box, a robin nesting box, a hedgehog hotel and a bird feeder.

FIG. 4

bird box



robin nesting box



hedgehog hotel



bird feeder



MANUFACTURING

The Re-New range of products are made in-house by an existing employee who is responsible for general repairs and maintenance of the garden centre and associated products. This employee is a skilled craftsperson that has been involved in developing the Re-New product range.

The products are made in the garden centre's small maintenance workshop using the following tools and equipment:

**work bench with bench vice
tenon saw, bench hook
chisels and mallet
hand-held belt sander
cordless orbital sander
cordless drill driver.**

APPLE BLOSSOM

Apple Blossom is a manufacturer of high-quality wooden garden furniture that supplies garden centres across the country. Examples of some of their products are shown in FIG. 5 opposite.

The availability of low cost imported online garden furniture has had a negative impact on sales and the owners need to consider an overhaul of their product range and manufacturing methods in order to remain competitive.

Designers have been given the brief to develop designs for product ranges that will provide new sales opportunities.

MODERN MATERIAL

One designer has identified a new material that would be suitable for the manufacture of garden furniture – ‘Mediterranean Tricoya Extreme’ (MTX) shown in FIG. 6 opposite.

FIG. 5



FIG. 6

MTX:

launched in early 2019

suitable for construction, landscaping and exterior applications

guaranteed for 50 years above ground

resistant to water and fungus growth

sheet dimensions 1210 mm × 2420 mm

sheet thicknesses of 6, 9, 12, 15, 18 mm.



DIGITAL DESIGN AND MANUFACTURE

Designers have developed a range of concepts, branded 'Kwik slot', to be made of manufactured boards such as MTX.

The use of manufactured boards presents another opportunity to modernise Apple Blossom's factory operations and increase profits. The use of CNC machinery, such as CNC laser cutters and CNC routers, would reduce labour and increase output.

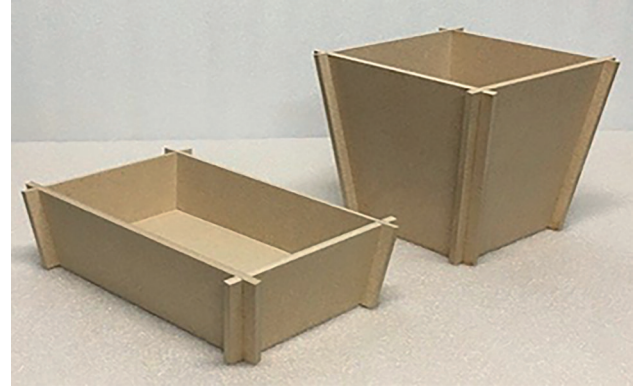
KWIK SLOT GARDEN PLANTERS

One of the design concepts is a range of slot together garden planters shown in FIG. 7. The panels are designed to be made from MTX using an industrial CNC laser cutter.

The garden planters would be delivered to garden centres and other retailers in flat-packed form for self-assembly. The end-user slots the panels together before adding compost and plants.

FIG. 7

EXAMPLES OF PROTOTYPE KWIK SLOT GARDEN PLANTERS



EXAMPLE INDUSTRIAL CNC LASER CUTTER

OCULUS 1325:

**suitable for the cutting and engraving of acrylic,
MDF and plywood**

bed dimensions 1300 mm × 2500 mm

accuracy of ± 0.01 mm

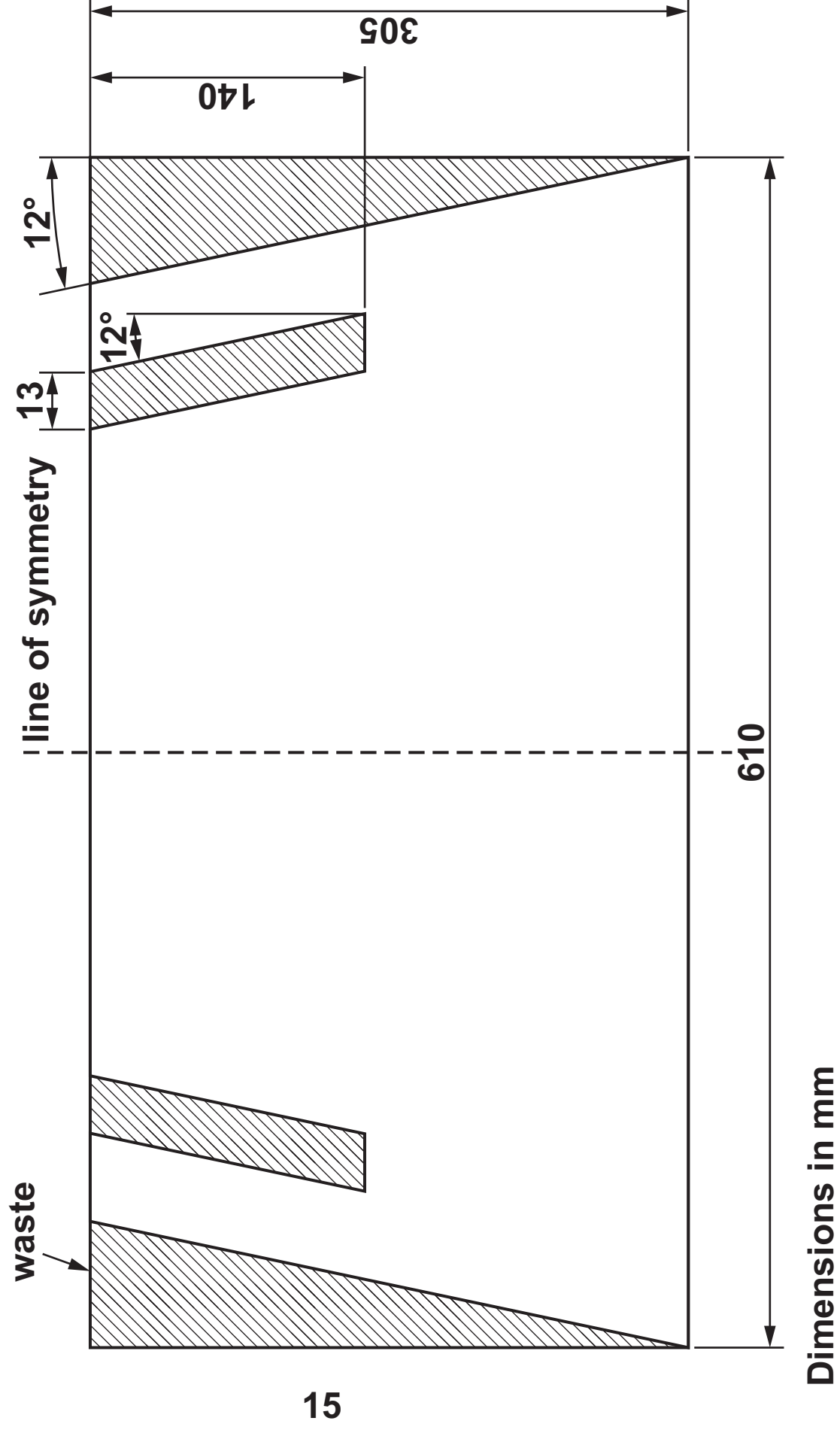
cuts MDF up to 20 mm in thickness

cutting speed up to 36 000 mm / min.



FIG. 7
(not to scale)

A SIDE PANEL FOR A LARGE KWIK SLOT GARDEN PLANTER



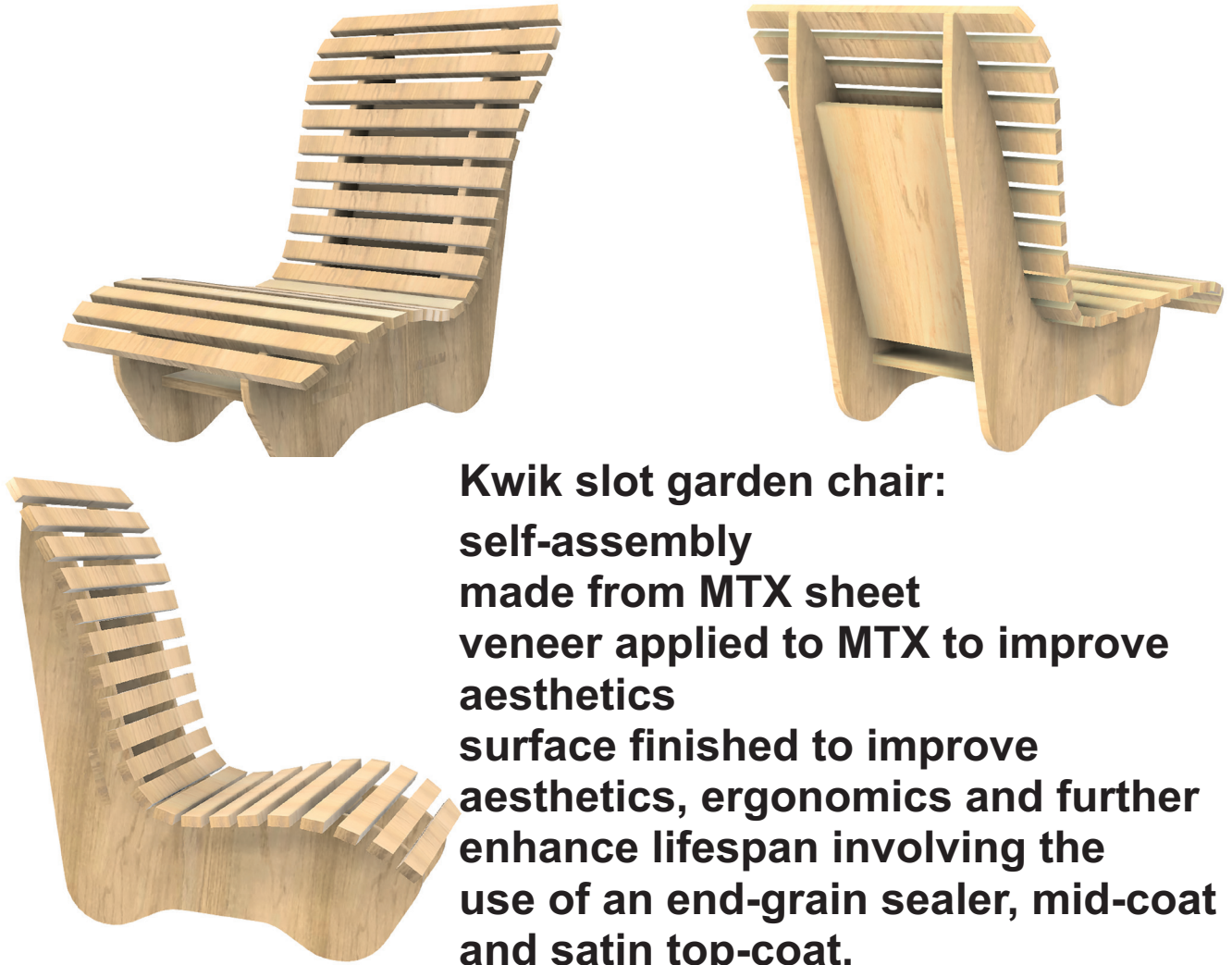
KWIK SLOT FURNITURE

Designs have also been developed for a range of slot together outdoor garden furniture.

The chair concept shown in FIG. 8 is part of the range of slot together furniture. It is designed to be manufactured out of MTX using an industrial CNC router.

The chair would be flat-packed in cardboard boxes for the end-user to assemble.

FIG. 8
(not to scale)



Kwik slot garden chair:
self-assembly
made from MTX sheet
veneer applied to MTX to improve
aesthetics
surface finished to improve
aesthetics, ergonomics and further
enhance lifespan involving the
use of an end-grain sealer, mid-coat
and satin top-coat.

Example industrial CNC router

Olympus 1325:
suitable for the cutting and
routing of manufactured
boards including MDF,
plywood, laminates, as well
as hard and soft wood
bed dimensions
1300 mm × 2500 mm
accuracy of +/- 0.01 mm
spindle speed 24 000 rpm
vacuum bed.



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