

Design & Technology

A-Level

Computer Aided Manufacture

Multiple Choice

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer



Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don't spend too much time on one question

Good luck!

Q1. CAD stands for? – edexcel 2014

- A** Computing and design
- B** Computer-aided design
- C** Computer-aided diagram

☐☐☐

Q2. CAM stands for? – edexcel 2014

- A** Computer aided modelling
- B** Computer aided making
- C** Computer-aided manufacture

☐☐☐

Q3. What are the advantages of automation? - bitesize

- A** Less waste produced and faster running time
- B** Low set up cost
- C** Lots of jobs are created

☐☐☐

Q4. What one of these is an example of CAM? - bitesize

- A** Designing on a computer

☐

B Band saw

☐

C 3D printing

☐

Q5. Which of the following statements about 3d printing is True? - self

A Good for mass production

☐

B Fast printing speed

☐

C Prints are high quality

☐

Q6. Which of the following is not a CAD software? - self

A Excel

☐

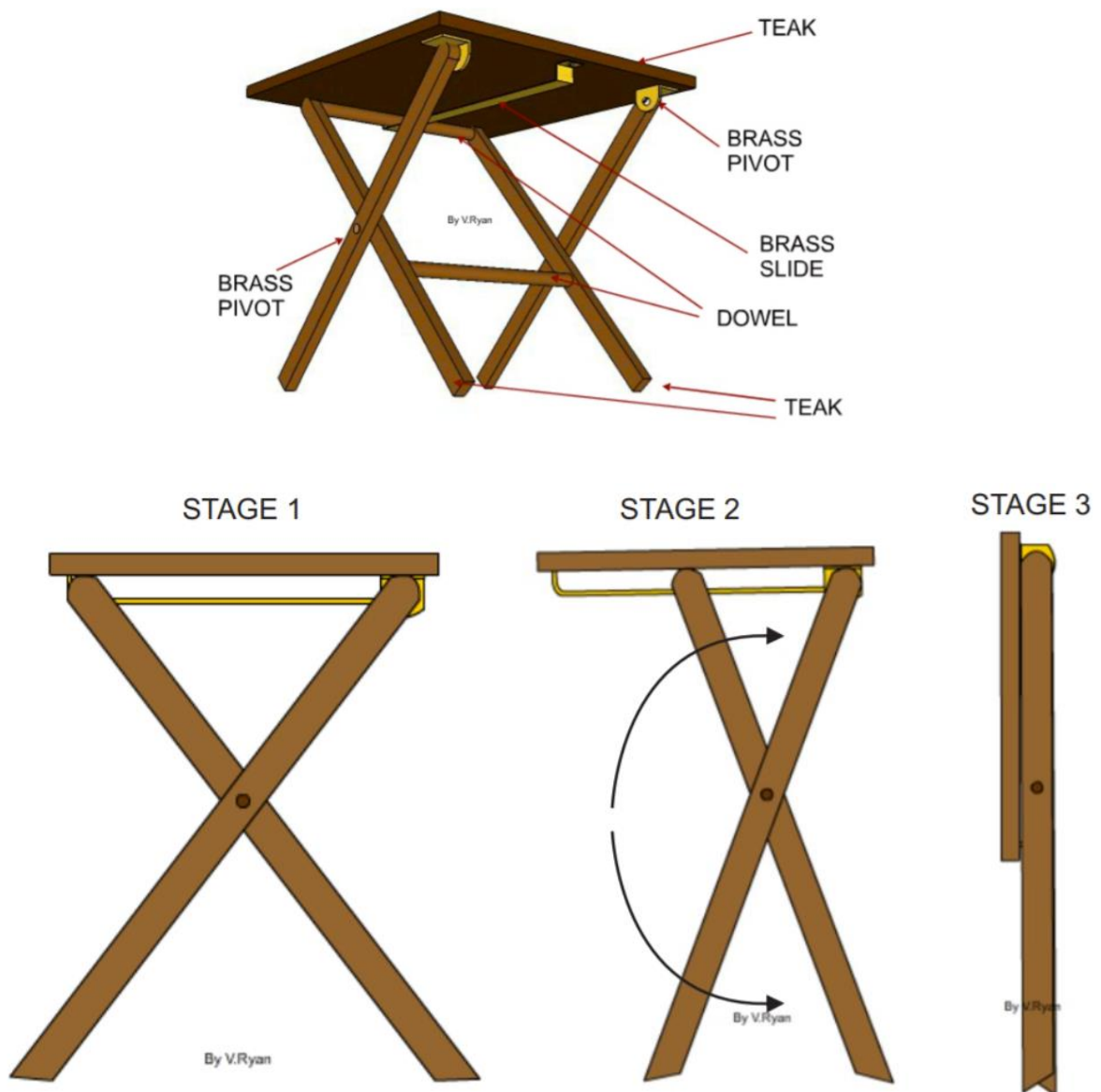
B Google sketchup

☐

C Techsoft 2d design

☐

Q7. Using notes and ketches describe how you would manufacture a batch of 10 folding tables as shown in figure below



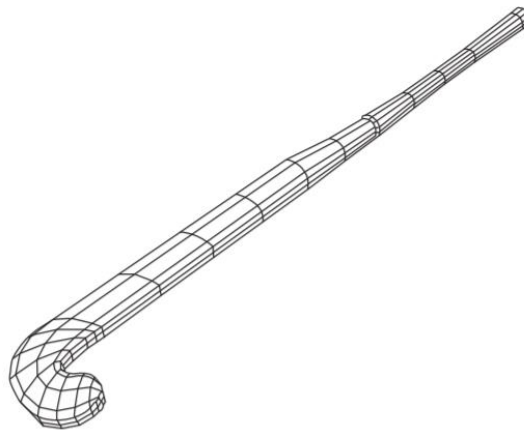
The table is designed through the use of CAD and manufactured through CAM

In your answer include an explanation of how you would:

- Use CAD to design the legs and table top **(3 marks)**
- Use CAM to cut out the shapes you have designed **(3 marks)**
- Manufacture 1 brass hinge **(3 marks)**

Include the names of all the equipment and software that you would use – **tech student res mats paper 1**

Q8. The image below shows a virtual model of a new hockey stick.



Explain 2 reasons for creating a virtual model of a new hockey stick
(4 marks) – edexcel 2018

1.

2.

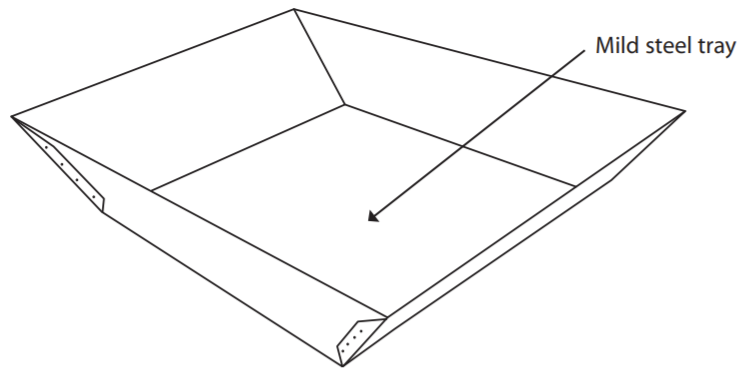
Q9. Discuss the advantages and disadvantages of using CAM for
manufacture of products **(6 marks)** – Self

Q10. Describe 2 advantages of laser cutting **(4 marks)** -edexcel 2015

1.

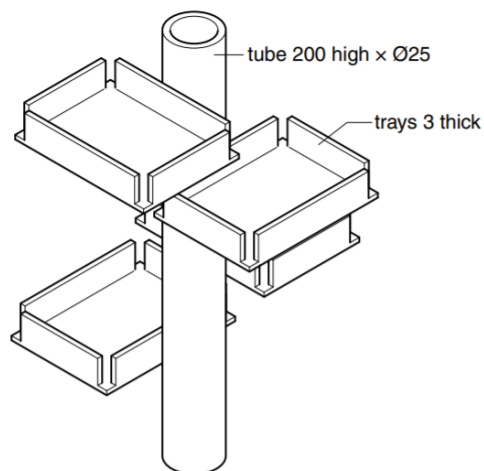
2.

Q11. A wheelbarrow tray is made from mild steel.



Explain 1 way in which materials can be reduced in the manufacture of the wheelbarrow **(2 marks)** – Edexcel 2013

Q12. The figure below shows an incomplete design for a desk tidy made from acrylic



Describe how CAM could be used to cut out the shape of the trays **(3 marks)** – CIE IGCSE 2020

[illegible]

Answers

Q1. B

Q2. c

Q3. A

Q4. C

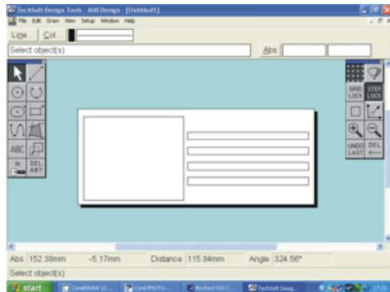
Q5. C

Q6. A

Q7.

CAD

- The design is drawn using software such as TechSoft 2D Design, shown below is the legs and table



- When the design is complete the drawing is processed. This converts the drawing into a detailed series of X, Y and Z coordinates
- When the CNC machine cuts the material the cutter follows the coordinates, in sequence, until the various shapes have been manufactured
- Most CAD/CAM software allows the designer to test the manufacture of his/her design on a computer rather than actually making it. This saves time and materials
- It also checks whether the design can be manufactured successfully. Many designs have to be altered before they can be made by a CNC machine

CAM

- The CNC machine seen below is controlled by the computer
- The drawing is converted by the software to coordinates and transferred to the CNC
- The CNC machine then cuts out the shapes of the table top and four legs automatically
- When the first set of shapes are cut, they can be removed from the machine and a new piece positioned for cutting
- Each piece cut on the CNC machine will be exactly the same. The process of cutting new pieces can be repeated hundreds and thousands of times.
- The router is guided around the shapes of the table top and legs by the computer. The shapes are cut efficiently.

Hinge

- The sheet brass is marked out using an engineers try square and scribe. The arc is scribed using spring dividers, after the centre of the arc has been marked with a centre punch.
- The location of the drill holes are marked out using a centre punch. This means that the drill bit will not slip when the brass is drilled.

- The hand vice is one safe way of holding the brass whilst drilling. It has two jaws that are closed by turning a wing nut.
- In the example the brass is held in the vice and it also rests on scrap wood on the table.
- Tinsnips are used to cut away the waste brass. The waste is stored in recycling bins until there is enough to sell for scrap metal.
- A hand file is used to smooth all the sharp edges. This can be followed by using emery cloth. This will smooth the brass further.
- Folding bars are used to fold (bend) the brass to exactly 90 degrees. Force is exerted on the brass whilst it is held in the folding bars. Care must be taken not to slip when carrying out this procedure. The edges of the brass will still be relatively sharp.
- The slide is manufactured using the same metalworking techniques.

Q8.

Any two reasons explained from:

- Products can be viewed / seen all round / 3D / see what it looks like / coloured / textures added (1) therefore a true and accurate representation can be gained from the computer model (1)
- Designs can be edited / modified / viewed all round on screen without having to redraw / physically modelled (1) which saves time / materials / speeds up any development (1)
- Files can be sent electronically via email (1) which saves time / reduces costs / speeds up the whole design and make process (1)
- Files can be output to 3D printing / rapid prototyping machines (1) which enables real models to be produced to test / hold / evaluated (1)
- Computer simulations such as stress / strain tests can be carried out (1) which will allow the designer to see if the hockey stick will be able to withstand the forces / impacts it will be subjected to when playing (1)

2 x 1

2 x 1

Q9.

Indicative content

Discussion to address the following issues:

Advantages

- Can be output to 3D printing
- Creates products that are identical to each other
- Drawings can easily be repeated for new batches
- Enables very high accuracy levels in large-scale production

- Usually speeds up production of low-volume products

Disadvantages

- High cost/expensive set up
- Highly skilled operative required / training issues
- Power-cuts can stop work
- Machinery can be expensive and time consuming to repair
- Continual development/upgrade of software/hardware required

(Cap marks at a maximum of 4 if candidates only present advantages or disadvantages and not both)

Q10.

Two advantages described from:

- The file/program is created once (1) and can be used over and over again / easily repeated / no marking out required (1)
- Once tested and set up (1) there is no need for human intervention / human error / reduced labour costs (1)
- The machine can run 24/7 (1) which means greater output / efficiency (1)
- It is very accurate/every component will be the same size (1) which means rejects will be fewer / fewer mistakes / less material wasted / parts will fit / identical parts (1)
- Great detail can be achieved (1) which means complex shapes can be achieved (1)
- Little edge finishing is required (1) which means production time / secondary processing is reduced (1)
- Text/pictures (1) can be engraved onto the surface by adjusting laser power (1)
- Clean edges produced (1) leaves no sharp / jagged edges (1)
- Quick / fast process (1) so many items can be cut in a short amount of time (1)
- Identical components cut (1) because it is computer numerically controlled CNC machine (1)
- Adaptable process / power easily adjusted so it can cut different materials (1)

Do not accept CAD related answers

2 x 1

2 x 1

Q11.

One advantage explained from:

- Thinner / lighter sections (1) will need less material (1)
- Fabricating the shape (1) will mean smaller pieces can be joined together (1)
- Lay planning/ nesting / tessellations (1) will mean less waste (1)
- Making it smaller/changing shape (1) will use less material (1)
- Use CAD/CAM (1) to lay plan/laser cut (1)
- Use templates to aid marking out (1) to minimise material waste (1)
- It could be pressed (1) from a single piece/shape (1)
- Use less/fewer components (1) and weld bits/pieces together (1)

Do not accept anything related to recycling/strong.

2 x 1

Q12.

Accept any three stages in the CAM production process:

- select type of CNC machine used
- design drawings transferred or downloaded to CNC machine
- setting up of acrylic workpiece
- setting of machine parameters

[3 × 1 mark]