**Design & Technology**

**Computer Aided Manufacture**

**Materials required for questions**

* Pencil
* Rubber
* Calculator

**Instructions**

* Use black ink or ball-point pen
* Try to answer all questions
* Use the space provided to answer questions
* Calculators can be used if necessary
* For the multiple choice questions, circle your answer

**Advice**

* Marks for each question are in brackets
* Read each question fully
* Don’t spend too much time on one question

**Good luck!**

**Q1.** CAD stands for?

**A** Computing and design

**B** Computer-aided design

**C** Computer-aided diagram

**Q2.** CAM stands for?

**A** Computer aided modelling

**B** Computer aided making

**C** Computer-aided manufacture

**Q3.** What are the advantages of automation?

**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?

**A** Designing on a computer

**B** Band saw

**C** 3D printing

**Q5.** Which of the following statements about 3D printing is True?

**A** Good for mass production

**B** Fast printing speed

**C** Prints are high quality

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

**A** Excel

**B** Google sketchup

**C** Techsoft 2D design

**Q7**. Explain **two** reasons for creating a virtual model of a new hockey stick **(4 marks)**

1.

2.

**Q8.** Discuss the advantages and disadvantages of using CAM for manufacture of products **(6 marks)**

**Q9**. Describe **two** advantages of laser cutting **(4 marks)**

1.

2.

**Q10.** Describe how CAM could be used to cut out the shape of the trays for a desk tidy made from acrylic **(3 marks)**

**Q11.** Explain how rapid prototyping has impacted on traditional manufacture **(9 marks)**

**Answers**

**Q1.** B **Q2.** C **Q3.** A **Q4.** C **Q5.** C **Q6.** A

**Q7**.

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)

**Q8.**

**Advantages**

* Can be output to 3D printing (1)
* Creates products that are identical to each other (1)
* Drawings can easily be repeated for new batches (1)
* Enables very high accuracy levels in large-scale production (1)
* Usually speeds up production of low-volume products (1)

**Disadvantages**

* High cost / expensive set up (1)
* Highly skilled operative required / training issues (1)
* Power-cuts can stop work (1)
* Machinery can be expensive and time consuming to repair (1)
* Continual development/upgrade of software/hardware required (1)

If the answer only includes advantages or only includes disadvantages, a maximum of **four** marks will awarded

**Q9.**

**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)

CAD related answers will not be accepted

**Q10.**

Accept any **three** stages in the CAM production process:

* Select type of CNC machine used (1)
* Design drawings transferred or downloaded to CNC machine (1)
* Setting up of acrylic workpiece (1)
* Setting of machine parameters (1)

**Q11.**

* Rapid prototyping has allowed companies the ability to develop and produce fully functioning prototypes without a huge financial investment in the manufacture of moulds or ancillary components (1)
* It has allowed for the design and manufacture of complex components that would have been prohibitive to manufacture traditionally (1)
* Rapid prototyping has removed the need for highly skilled manufacturers and tool makers as complex designs can be easily achieved without tooling (1)
* Traditional labour intensive manufacturing processes have been replaced by 3D printing that can run without supervision for extended periods of time without breaks or loss of concentration (1)
* A change in focus of manufacturers primary ability to work with physical materials to being competent to work in the field of CAD / CAM (1)
* A huge reduction in the lead time taken to design, produce, develop and test a physical product (1)
* The ability of a manufacturer to now perform many different techniques without the need to subcontract individual component parts out to specialist manufacturers (1)
* A reduction in the need for large industrial spaces and the investment in materials and machinery (1)
* The ability to create components from an ever-developing catalogue of material substrates (1)
* Rapid prototyping can be undertaken using a variety of substrates or materials (1)
* The move away from manufactures designing components around stock forms and sizes of material (1)