

Design & Technology (Product Design)

DTBase[©]

OCR A-Level

ICT & Digital Technologies in Modern Manufacturing (7.4b)

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
- For the multiple choice questions, circle your 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. Customised manufacture systems are enabled by digital technologies that allow:

- A** Individual customer specifications to be incorporated cost-effectively into each unit
- B** Products to be made identically in batches of 10,000+
- C** Manufacturing to occur only in low-wage countries

Q2. Which digital technology is most directly associated with rapid prototyping?

- A** 3D printing
- B** CNC milling
- C** Injection moulding

Q3. Additive manufacturing differs from traditional subtractive methods because it:

- A** Builds objects layer by layer from digital models, adding material only where needed
- B** Cuts material away from a solid block, resulting in significant waste
- C** Uses moulds to shape molten material under high pressure

Q4. Digital stock control systems (e.g., using barcodes and RFID) help manufacturers by:

- A** Automatically reordering materials when stock runs low and tracking inventory in real time
- B** Printing customised packaging for each product
- C** Designing new products using CAD software

Q5. Modern manufacturing methods are rapidly changing with developments in ICT and digital technology.

Discuss the impact of ICT and digital technologies on the manufacturing industry.

Refer to specific examples in your response. **(6 marks)**

Answers

Q1. A

Q2. A

Q3. B

Q4. C

Q5.

Indicative content:

- The use of automation in the production line through Computer Integrated Manufacture has a huge impact on the manufacturing industry.
 - Initial cost of these systems is large and it requires a complete plan of how the material will flow through production.
 - It increases safety as robots can perform dangerous/ toxic activities. For example, when applying paint, the fumes can be hazardous if inhaled.
 - Improves the quality as there is less chance for human error.
 - 24 hour production as the machines do not need to take breaks or have a rest, which increases productivity and saves the manufacturer money.
- Digital technologies/ programs can be used to calculate the optimum method of manufacture, reducing waste and saving money.
- The need for traditional skills has demised and this results in less workers being needed, resulting in job losses.
- Lights out manufacturing facilities can be operated with few human workers using the IOT.
- Customised products can be manufactured to high standards – e.g. Nike trainers.
- Stock levels can be monitored and techniques automated to order and flag up stock levels.
- JIT can be used for companies to adapt to changes in level of demand, reducing waste and unsold products.
- Digital files can be shared globally in real time, sent to manufacturing units anywhere in the world.
- The use of digital system using visual measurement or weighing sensors at key points of the manufacture process.
- Any other valid suggestion that relates to manufacturing.

Q6.

Indicative Content

- 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.
- It has allowed for the design and manufacture of complex components that would have been prohibitive to manufacture traditionally.
- Rapid prototyping has removed the need for highly skilled manufacturers and tool makers as complex designs can be easily achieved without tooling.
- 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.
- A change in focus of manufacturers primary ability to work with physical materials to being competent to work in the field of CAD/CAM.
- A huge reduction in the lead time taken to design, produce, develop and test a physical product.
- The ability of a manufacturer to now perform many different techniques without the need to subcontract individual component parts out to specialist manufacturers.
- A reduction in the need for large industrial spaces and the investment in materials and machinery.
- The ability to create components from an ever-developing catalogue of material substrates.
- Rapid prototyping can be undertaken using a variety of substrates or materials.
- The move away from manufacturers designing components around stock forms and sizes of material.

This list is not exhaustive. Accept any other valid responses.

Q7.

Indicative content:

EPOS – Electronic Point of Sales systems

Stock Management

- Volume of sales are recorded which in turn monitor stock levels and management. If reorder limits are exceeded, stock is automatically ordered from distributors or manufacturers.

- EPOS data can ensure that a satisfactory level of stock is maintained.
- Shopping patterns such as regional purchasing, seasonal trends, popular brands, colours and models can be recorded and used for planning and interpreting consumer demand.

Purchasing Patterns

- Product sales can be monitored and patterns or decline in sales may trigger manufacturers to redevelop products or limit production.
- Data gained may influence the timing of product launches based on spending patterns.

Customer Data

- Buying trends, brand selection, sizing and styles can be gathered to then be used for focused marketing.
- EPOS systems can be linked to customer accounts and email addresses in order to reduce the need for printed receipts.
- Customer data such as contact details can be obtained and monitored in order to target marketing and promotional materials.
- Shopping patterns can be recorded to then focus digital communication or suggest future potential online purchases.

This list is not exhaustive. Accept any other valid responses.