Design & Technology
(Product Design)

DTBase©

OCR A-Level

Commercial Production Processes (7.3a)

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. Which moulding process is best suited for producing large, hollow, seamless plastic products like storage tanks or bins?

A Injection moulding

B Rotational moulding

C Compression moulding

Q2. Which casting method is most appropriate for high-volume production of small, complex, thin-walled metal components like gearbox housings?

A Sand casting

B Die casting

C Lost wax casting

Q3. A car door panel with complex curves and stamped features would most likely be made using:

A Extrusion

B Vacuum forming

C Sheet metal stamping/pressing

Q4. In a high-volume bottling plant, which system is used to move empty bottles between filling, capping, and labelling stations?

A Robotic welding cells

B Conveyor belts with sensors and sorting gates

C CNC milling machines

Q5. The image below shows a hearing aid.

Explain why extrusion would be used to manufacture the tube. **(2 marks)**

Q6. The image below shows a clothes iron.

Identify a suitable method of commercial manufacture for the body of the iron. Justify your answer **(2 marks)**

Q7. The image below shows a toy bike.

Robotic arms and automated systems could be used in the production process of the toy motorcycle.

Identify and explain two advantages and one disadvantage of using robotic arms and automated systems in the production process of the toy motorcycle. **(6 marks)**

Q8. Explain why injection moulding is not a suitable manufacturing method for large products. **(6 marks)**

Q9. Explain two advantages of using an automated storage and retrieval system (ASRS). **(4 marks)**

Answers

Q1. B
Q2. B
Q3. C
Q4. B

Q5.
Possible explanations may include:

- It gives a consistent accurate cross section for the tube (1) so it can be inserted into the ear mould/battery unit (1).
- It can be used for high volume production (1) and as there will be a lot of hearing aids manufactured (1).
- Extrusion allows for a continuous cross section/tube to be produced (1) and cut to length to fit the required length of tubing (1)
- Any other valid suggestion.

Q6.
Suitable manufacturing method:

- Injection moulding (1).

Justifications may include:

- Intricacies and level of detail/ complexity of the moulding (1).
- Type of product and quantity to be manufactured/ commercial/ mass/ automated production (1).

Two part moulding with reference to the colours in the iron is acceptable.
Any other suitable response.

Q7.
Possible advantages could include:

- Cost: You would not have to pay people to do low skilled jobs (1) so you would save on labour and therefore production cost (1).
- Reliability: You would not have people calling in sick, holidays or leave (1) so you can guarantee that the work force will be there (1).
- Safety: Machines can work in environments that may not be safe for humans (1) with chemicals/dust or high/low temperatures, machines are unaffected by these conditions so can be used without negative consequences (1).

- Sterile: Machines could work in a sterile environment (1) which would be especially beneficial for medical supplies that need to avoid contamination for safety (1).
- Consistent quality: Robotic arms do not get tired (1) so are less likely to make mistakes (1).
- 24-hour production: Machines do not need to sleep or have breaks (1) so can work 24/7 increasing productivity (1).
- Any other valid suggestion.

Possible disadvantages could include:

- Cost: To purchase the equipment is expensive (1) and if there is a problem repairs will have to be done by specialist and be an additional cost. (1)
- Unemployment: Local low skill labour will not be needed (1) so this will have a negative effect on the community as there will be less jobs. (1)
- Specialised workforce that may need regular training (1) to keep up to date with the technology (1)
- Any other valid suggestion.

Q8.

Indicative content

- The weight and scale of the mould can make large tooling prohibitive to handle when being manufactured.
- The physical size of the injection moulding machine limits the maximum size of the mould available.
- The costs associated with the production of a large injection mould would be hugely prohibitive, including the material of the mould, the injection moulding machine, the industrial space to locate the machine itself.
- The polymer cooling too quickly means the cavities of the mould may not fill completely.
- A large mould with thick walls increases problems associated with shrinkage.
- Injection moulding may prove challenging to design a successful large moulding with a thin wall thickness.

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

Q9.

Any two pairs of correctly linked items from the following:

- Items are located/ retrieved / delivered faster /more accurately/ right place right time (1)
- More efficient/ faster business/ company/ production line/ lean manufacturing time to market/ lead time (1)
- Items are easily catalogued / recorded/ on central database (1) 4
- Automatically reordered/never run out of stock/ reduced human error (1)
- They can lift heavy loads (1)
- Safer/ reduced H&S issues (1)
- They can stack products in a more organised way/ higher (1)
- Reduced required floor space/ land costs/ better use of space (1)
- They require very little manual input/ run 24/7/ fully automated (1)
- Reduced costs/ wages/ employment (1)