Design & Technology

Moulding

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. Which one of the following processes would be used to manufacture yoghurt pots?

A Injection moulding

B Vacuum forming

C Blow moulding

Q2. Which one of the following processes would be used to manufacture continuous lengths of plastic pipe?

A Extrusion

B Injection moulding

C Blow moulding

Q3. Which process would have been used to make a plastic water bottle?

A Injection moulding

B Casting

C Blow moulding

Q4. Which one of the following processes is best suited to manufacture a hollow shampoo bottle?

A Vacuum forming

B Blow moulding

C Extrusion

Q5. Which one of the following processes involves the use of heat?

A Laminating

B Pop riveting

C Vacuum forming

Q6. When injection moulding, how is the polymer moved along the heating chamber?

A By a belt

B By the heater

C By an Archimedean screw

Q7. What is a former?

A A rigid shape that is used so other materials take its form

B A hollow cavity where molten material can be formed

C A hollow shape produced on a vacuum former

Q8. Which of the following is the process called injection moulding?

A Plastic coating of a metal surface, to increase its resistance to temperature

B A process involving heating plastic granules to liquid form and forcing the solution into a mould

C A process that creates a reflective coating on a range of polymers

Q9a. A board game has been manufactured using a CNC router to form the base from a single piece of oak. A travel version of the game base could be made from a polymer using the rotational moulding process.

Name **two** suitable materials that could be used to rotationally mould the base of the game **(2 marks)**

1.

2.

Q9b. Explain **two** benefits of using rotational moulding in preference to injection moulding when producing the base of the game **(4 marks)**

1.

2.

Q10. The body of a calculator has been made using injection moulding.

Describe the process of injection moulding. Start your description after the hopper has been filled with polymer granules and finish it at the point of the moulding being ejected **(6 marks)**

Q11a. Describe, using annotated sketches, the rotational moulding process **(4 marks)**

Q11b. Explain **two** benefits of rotational moulding for parts of a children's toy car **(6 marks)**

1.

2.

Q12. Explain why injection moulding is **not** a suitable manufacturing method for large products **(6 marks)**

Answers

Q1. B
Q2. A
Q3. C
Q4. B
Q5. C
Q6. C
Q7. A
Q8. B

Q9a.

Two materials from:

- Polyethene / PE / HDPE / LDPE / XLPE (1)
- Polypropylene / PP (1)
- Polyvinyl chloride / PVC (1)
- Nylon (1)
- Thermoplastic Polyester Elastomers / TPE (1)
- Polycarbonate / PC (1)

Q9b.

Any **two** of the following explanations that include identification of a benefit (1) and linked justifications of that benefit (1):

- The board would be made hollow (1) reducing the weight of the game (1)
- It uses less material (1) reducing costs / cost of the game (1)
- Cheap moulds / reduced capital outlay (1) as they are quicker to produce / made from sheet metal / need to draft angles (1)
- No sprues / runners present (1) so no secondary processing needed / no waste / no unsightly marks (1)
- Mouldings are stress free / less likely to split or crack (1) so the game is stronger / tougher / more durable / likely to withstand rough handling / dropper (1)

Answers just stating ‘cheaper’ will not be accepted unless qualified

Q10.

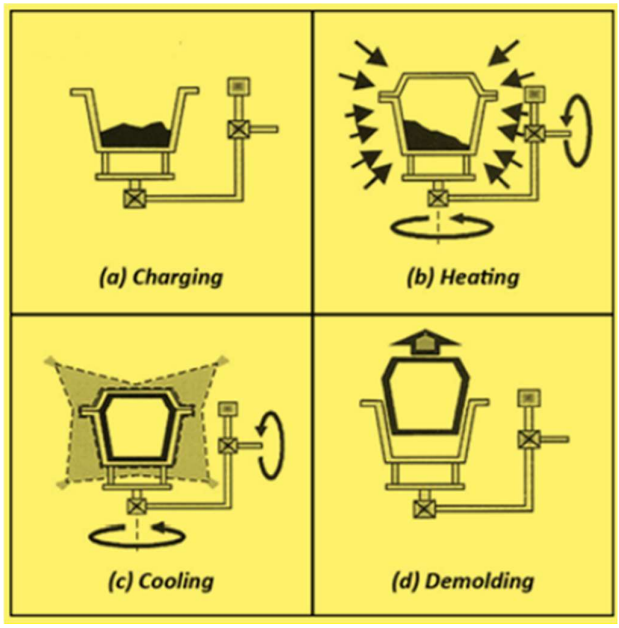
Any **six** of the following stages:

- Screw turns drawing granules in
- Heaters melt granules / polymer melted
- Polymer gathered at the front of the screw
- Screw plunges forward
- Polymer injected into die
- Die cooled with water channels
- Die opened

Q11a.

Marks awarded as follows (maximum 4 marks):

- Release agent is applied to the mould (1)
- Mould is charged / closed / plastic is placed into the mould (1)
- Heat is applied externally to the mould whilst rotating about two axes (1)
- Mould is cooled with air (or water) (1)
- Mould is opened / completed moulding is removed (1)



If no sketch, or a sketch without annotations, a maximum of **three** marks will be awarded

Q11b.

Any **two** of the following explanations that include identification of a benefit (1) and linked justifications of that advantage (1) + (1):

- Can be used for the large parts of a toy car (1) because the moulding is hollow (1) resulting in a lightweight product / low mass to volume (1)
- The finished toy car has no seams (1) which improves the aesthetics / safety of the surface finish (1) and means that flash removal / secondary finishing is not required (1)
- The wall of the toy car has uniform thickness (1) resulting in less stress at the corners of the product (1) reducing the possibility of weak points (1)
- Metal inserts can be included in the moulding (1) allowing other components (e.g. the wheels) to be easily attached / connected via mechanical fixings (1) increasing the strength and versatility of joints (1)
- Rotational moulding produces uniform thickness throughout (1) which eliminates weak spots (1) producing a tougher / higher strength toy car (1)

Q12.

- The weight and scale of the mould can make large tooling prohibitive to handle when being manufactured (1)
- 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 (1)
- The polymer cooling too quickly means the cavities of the mould may not fill completely (1)
- A large mould with thick walls increases problems associated with shrinkage (1)
- Injection moulding may prove challenging to design a successful large moulding with a thin wall thickness (1)