DTBase©

# Design & Technology
# Eduqas GCSE

# Polymers: surface treatments and finishes

## 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**. Why do scratches on a self-coloured plastic product not show a different colour underneath?

**A** The pigment is added before moulding, so the colour goes all the way through

**B** The product is given a clear coat of varnish

**C** Plastics cannot be scratched

**Q2**. How does a moulded plastic product get a high gloss surface?

**A** It is sanded with wet and dry paper after moulding

**B** It copies the finish of a highly polished mould

**C** It is dipped in a plastic primer

**Q3**. Which finish places a printed label in the mould so that it fuses to the product?

**A** Pad printing

**B** Vinyl decals

**C** In-mould labelling

**Q4**. What must be done before a plastic can be painted?

**A** Key the surface with light sanding and apply a plastic primer

**B** Heat it until it is soft

**C** Polish it on a polishing mop

**Q5**. Which of these is a disadvantage of self-finishing plastics?

**A** Paints and solvents are needed

**B** The colour can fade in sunlight

**C** Every product has a different finish

**Q6**. Which machine cuts self-adhesive vinyl to make decals?

**A** Strip heater

**B** Lathe

**C** CNC plotter (vinyl cutter)

**Q7**. A step block is used in fitness classes at the gym. The step and its risers are injection moulded from polypropylene. The top of the step is covered with a textured surface pad.

**Q7a.** Give two reasons why the material or surface finish used for the step block is suitable for its intended purpose. **(2 marks)**

**Q7b.** Describe how either a surface finish or a logo could be applied to the step block. **(3 marks)**

**Q8**. A small polymer spoon fits underneath the lid of an ice cream tub. One end of the spoon has a textured surface finish. Explain one reason for having a textured surface finish at one end of the spoon. **(2 marks)**

**Q9**. A piece from a child's puzzle is made from high impact polystyrene (HIPS). The word 'BLUE' appears on the face of the puzzle piece. Name one surface finish or surface treatment that could be used to create the word 'BLUE' on the puzzle piece. **(1 mark)**

**Q10**. A teaching aid for use in schools has number wheels manufactured from acrylonitrile butadiene styrene (ABS). Give two different surface finishes or treatments that could be used to show the numbers on the ABS number wheels. Explain one advantage of using each surface finish or treatment. **(6 marks)**

**Q11**. An electric light switch has been decorated with vinyl stickers. Use notes and sketches to show how the stickers are produced using a CNC vinyl cutting machine. **(4 marks)**

**Q12**. A small decorative house for a battery-powered candle has been manufactured from acrylic.

**Q12a.** Explain one surface finish or treatment that could be used to personalise the house with a name or number. **(2 marks)**

**Q12b.** Name the hand tool used to shape and smooth the cut edges of the sheet acrylic. **(1 mark)**

**Q13**. A different polymer house has been finished with a screen printed brick and tile pattern on its walls and roof. Explain two reasons for using screen printing to apply the brick and tile finish to the polymer house. **(4 marks)**

**Q14**. A wall-mounted plant holder is made from rigid polystyrene. The edges of the frame and the plant pot holders have been polished. Explain two benefits of polishing the edges of the frame and plant pot holders. **(6 marks)**

**Q15**. Choose one of these finishes for a polymer product: painting, printing or vinyl decals. Using notes and/or sketches, describe how your chosen finish is produced. **(6 marks)**

**Answers**

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

**Q7a.**

One mark for each of two reasons. They must be about the material and/or surface finish and link to the step block's purpose. For example:

- Available in a range of colours
- Tough and flexible
- Good chemical resistance
- Can be easily moulded
- Does not need a surface finish, as it is self-finishing
- Good grip

**Q7b.**

Up to 3 marks for a description. For example:

- The step block has a self finish from the mould and is trimmed by hand (1)
- A logo can be built into the injection moulding tool, or applied after the step has been formed by screen printing or a heated die (1)
- The logo is created using different colours or a texture, from the detail in the steel tool (1)

Allow vinyl stickers to apply a logo. Credit any other suitable method of finishing or applying a logo.

**Q8.**

A reason (1) plus a linked justification (1). For example:

- The ice cream tub will be cold, wet or slippery (1), so the textured surface makes the spoon easier to hold or grip (1)

- The texture increases the surface area (1), making the spoon easier to hold or grip (1)

**Q9.**

Any one (1): a textured mould or a raised or recessed profile; laser engraving or etching; vinyl stickers; printing (e.g. sublimation, silk screen or pad printing); paint. Do not accept “injection moulding” on its own.

**Q10.**

For each of two finishes: the finish or treatment (1), plus two linked justifications (1) + (1). Do not accept laser engraving. For example:

- The numbers could be applied using vinyl stickers (1), so the wheels can be manufactured separately (1), which means the colour, font or font size can be changed easily (1)
- The numbers could be moulded directly into the wheel during moulding (1), so no secondary process is needed (1), which speeds up the overall manufacturing time (1)
- The numbers could be applied using paint (1), so they can be different colours, sizes or fonts (1), which means different wheels could be different colours so they stand out from each other (1)

**Q11.**

Cap at 3 marks if there are no sketches, or sketches with no notes. One mark for each:

- The vinyl is put into the cutter or plotter (1)
- The pressure of the blade is adjusted to suit the material (1)
- The vinyl is cut from a CAD file (1)
- The vinyl is removed from the machine (1)
- The waste is removed (“weeded”) to leave the stickers behind (1)

**Q12a.**

A surface finish or treatment (1) and a linked justification (1). For example:

- The acrylic can be etched or engraved with a laser (1), so the name or number is physically burnt into the surface (1)

- Vinyl can be cut out on a plotter or cutter (1), so stickers can be applied to the surface with transfer tape (1)
- A stencil can be made and used (1), so spray paint or paint can be applied (1)

**Q12b.**

A file (1). Accept hand file, flat file or half round file only.

**Q13.**

For each of two reasons: a reason (1) and a linked justification (1). For example:

- Screen printing can be applied to a range of surfaces (1), so the design can be printed on both the walls and the roof of the house (1)
- Screen prints can be applied after the house has been assembled (1), so assembly is not held up while the ink dries (1)
- Screen printing gives solid blocks of colour (1), so the brick and tile patterns look more effective and attractive (1)

**Q14.**

For each of two benefits: the benefit (1), plus two linked justifications (1) + (1). For example:

- Polishing the edges gives a smoother finish (1), so there are no rough edges (1), which means the user will not hurt or cut themselves when putting plants in or taking them out (1)
- Polishing the edges gives a glossy, high sheen (1), so the plant holder looks better (1), which adds value and attracts more customers (1)

## Q15. (6 marks)

| Marks | Descriptor |
|---|---|
| 5 to 6 | A detailed description making several correct points about how to apply a quality finish, using notes and/or sketches. Specific, clear stages in a sequenced order. |
| 3 to 4 | A good description showing some understanding of how to apply a quality finish, using notes and/or sketches. Some of the different stages given in the correct order. |
| 1 to 2 | Basic notes or a sketch showing limited understanding of the finish. |
| 0 | No response or nothing worthy of credit. |

Indicative content:

**Painting**

- All surfaces should be free of dust, dirt and grease
- Fill and sand back any surface imperfections; work in a dust-free area, as dust sticks to wet paint
- Lightly sand back (flat back) between coats to remove any imperfections
- For a full response: primer and/or undercoat, then a top coat, by roller, brush or spray, allowing each layer to dry

**Printing**

- Methods include screen printing, dye sublimation printing, laser printing, block printing and offset litho printing

**Vinyl decals**

- The surface must be free of dirt, dust and grease so the sticker sticks well
- The sticker is designed in a CAD package and sent to a plotter cutter (CAM), where a blade cuts the design out
- The blade is set to cut the vinyl but not the backing paper, otherwise the sticker is hard to remove from the backing
- Layout tape or film (frisk film) is put over the sticker to lift it off the backing paper and helps place and line it up accurately
- Air bubbles are carefully removed with a soft edged rubbing strip or squeegee