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Design & Technology
Eduqas GCSE

Systems: 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. What is the functional purpose of tinning PCB tracks?

A It stops the copper oxidising and makes soldering easier

B It labels component positions

C It gives the board grip

Q2. What does solder resist (the green coating on a PCB) do?

A Insulates high voltage components

B Stops solder bridging between tracks

C Adds logos and branding

Q3. In powder coating, how is the dry polymer powder made to stick to the metal?

A The metal is dipped in a fluidised bath

B It is brushed on as a liquid

C It is sprayed on with an electrostatic gun

Q4. For plastic dip coating, a metal part is heated to around:

A 230°C

B 50°C

C 1000°C

Q5. Which of these is a disadvantage of PCB lacquering (conformal coating)?

A It prevents short circuits

B It is difficult to repair once cured

C It protects against moisture

Q6. What does an anodised aluminium casing give a product such as a laptop?

A A soft, grippy coating

B Printed labels for the controls

C A hard, corrosion resistant, coloured metallic finish

Q7. The material of a printed circuit board (PCB) is modified to make it suitable for its purpose.

Q7a. Name one modification technique used on the material in a PCB. **(1 mark)**

Q7b. Why does the material need modifying to make a more effective product? **(2 marks)**

Q8. The aluminium front panel of a building alarm system has been anodised. Explain one reason why an anodised finish has been applied to the front panel. **(2 marks)**

Q9. A remote-controlled drone has an aluminium motor case and aluminium plates holding the rotor arms. Explain one reason for anodising the aluminium components. **(2 marks)**

Q10. A bicycle light can be unclipped from the handlebars and used as a torch. It has a textured handle. Explain one reason for adding texture to the handle of the bicycle light. **(2 marks)**

Q11. A teaching aid for schools has a case made from polymers with the words 'LEARN TO ADD' on the front. Give two different surface finishes or treatments that could be used to show the words 'LEARN TO ADD' on the polymer case. Explain one advantage of using each surface finish or treatment. **(6 marks)**

Q12. A wall-mounted lamp has a steel bracket and a bulb that is connected using wires with an insulated coating. Explain two benefits of using an insulated coating for the wire. **(6 marks)**

Q13. This question is about surface finishes.

Q13a. Explain why surface finishes are applied to materials for aesthetic reasons. **(3 marks)**

Q13b. Explain why surface finishes are applied to materials for functional reasons. **(3 marks)**

Q14. Materials frequently need to be surface treated or have a finishing technique applied.

Q14a. Name two different surface treatments or finishes applied to materials. **(2 marks)**

Q14b. Explain why materials may need a surface treatment or finish applied. **(3 marks)**

Answers

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

Q7a.

Any one (1): adding a photosensitive layer (makes the surface light sensitive); etching; lamination; varnishing (lacquering).

Q7b.

2 marks for a correct point explained in detail, possibly with a specific example; 1 mark for a correct simple point. For example:

- So a circuit diagram can be developed on the surface of the PCB
- So unwanted copper between the tracks can be etched away to isolate different areas of the board
- Varnishing protects the board from oxidation
- Tinning the contact areas gives good soldered joints

Q8.

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

- Anodising makes the surface harder (1), so the panel is more resistant to wear (1)
- Anodising allows a colour to be applied (1), making the product more attractive (1)
- Anodising creates an insulated surface (1), reducing the risk of electrocution and protecting the user (1)

Q9.

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

- It gives a durable finish with better abrasion resistance (1), so parts are not damaged when assembled, in flight or when landing (1)

- It gives effective corrosion resistance in harsh environments (1), as it creates a thicker protective oxide layer (1)
- It makes the drone look more appealing (1), encouraging more people to buy it (1)

Q10.

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

- It adds grip (1), so the torch will not slide out of the hand, which is useful outside or in wet conditions (1)
- It creates friction when gripped (1), so the parts can be twisted apart to change the batteries (1)
- It adds visual, aesthetic or ergonomic appeal (1), leading to more customer interest and sales (1)

Q11.

Two finishes or treatments (1 mark each), each with two linked justifications (1) + (1). For example:

- Vinyl stickers (1): made separately (1), so the colour, font or size can be changed easily (1)
- Moulded into the case during moulding (1): no extra processing is needed (1), speeding up manufacture (1)
- Paint, screen printing or pad printing (1): the letters can be different colours, sizes or fonts (1), making them stand out (1)
- Laser or mill engraving (1): cuts the words into the surface, with paint rubbed in (1), creating a highlight or texture (1)

Q12.

Two benefits (1 mark each), each with two linked justifications (1) + (1). For example:

- The coating stops the wires touching each other (1), so there are no short circuits (1), so the lamp is not damaged (1)
- The coating gives a durable finish (1) that stops the wires touching the metal bracket or lampshade (1), protecting the user from electric shock (1)

- The coating allows wires to be colour coded (1), so the purpose of each wire is easy to identify (1), so wires are connected to the correct terminals (1)

Q13a. (3 marks)

Marks	Descriptor
3	Detailed aesthetic reason(s) for applying finishes, with at least one appropriate example.
2	One aesthetic reason and one appropriate example, or two reasons with no example.
1	One basic aesthetic reason, with no example.
0	Nothing worthy of credit.

Indicative content: to change the colour of a product; to improve its appearance and make it look more attractive; to change the look and feel. Examples: anodising to produce brightly coloured aluminium products; a self-finished surface, e.g. injection moulding can build in a textured surface; painting products different colours to suit different customer tastes.

Q13b. (3 marks)

Marks	Descriptor
3	Detailed functional reason(s) for applying finishes, with at least one appropriate example.
2	One functional reason and one appropriate example, or two reasons with no example.
1	One basic functional reason, with no example.
0	Nothing worthy of credit.

Indicative content: to make the product more suited to its use and improve durability; to protect from moisture or water; to resist corrosion; to give a textured, non-slip finish. Examples: anodising aluminium to improve durability; dip or powder coating metals to stop corrosion; a self-finished textured surface moulded in to give grip.

Q14a.

1 mark for each correct surface treatment or finish named, e.g. printing, painting, varnishing, dip coating, powder coating, galvanising, polishing, vinyl decals, PCB lacquering, lubrication. Accept any other correct response.

Q14b.

1 mark for each simple point, up to 3. Allow 2 marks for a point explained in more detail. For example:

- To improve function (1)
- To protect the material (1) by providing a barrier against moisture, UV, fungi or insects (2)
- To stop deterioration (1)
- To enhance properties (1) by making them tougher or more resistant to wear (2)
- To make them easier to clean (1) and stop liquids soaking in and staining (2)
- To improve aesthetics and appearance (1)