Design & Technology
(Product Design)

DTBase©

OCR A-Level

Finishes to Prevent Corrosion and Decay (6.2b)

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 is anodising a common finish on aluminium window frames?

A To increase the electrical conductivity of the aluminium

B To enhance corrosion resistance while enabling decorative colouring

C To reduce weight compared with uncoated aluminium

Q2. Why is decorative chrome plating applied to steel automotive parts?

A To provide a corrosion-resistant and reflective surface finish

B To significantly increase the structural strength of the steel

C To eliminate the need for any cleaning during service life

Q3. Powder coating is used for bicycle frames instead of wet paint. What is its key advantage?

A It produces a durable, UV-resistant and uniform protective finish

B It eliminates all curing stages after application

C It reduces the weight of the frame compared to other finishes

Q4. Why might a clear varnish fail when applied to an outdoor softwood bench without proper preparation?

A The varnish absorbs moisture and swells with the wood

B The varnish weakens the surface by softening the fibres

C UV exposure and moisture ingress cause peeling if the surface is not sealed correctly

Q5. The image shows a children's climbing frame.

Explain why powder coating is an appropriate finish for the climbing frame shown in the image. **(6 marks)**

Q6. Identify a suitable finish for a tennis racket frame made from an aluminium alloy.

Justify your response **(2 marks)**

Q7. Give three reasons why a product may have an anodised finish. **(3 marks)**

Q8. Explain why galvanising is an appropriate finish for the low carbon steel scaffolding. **(6 marks)**

Q9. The steel handles on the desk drawers have been electro-plated with brass. Explain two reasons why the handles would be electro-plated with brass. **(4 marks)**

Answers

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

Q5.
Indicative content:

- Powder coating provides a hard, durable finish which will resist the wear from children's shoes.
- Thicker coats can be achieved than feasible with liquid paint finishes.
- A wide range of colours are available, as pigments can be added.
- Powder coating will protect the frame from oxidising.
- Powder coating gives an even coat of material around cylindrical shapes.
- Overspray from the climbing frame can be recycled and reused.
- Powder coated finishes are less prone to fading from UV degradation due to the use of stabilisers.
- Powder coated finishes are less likely to chip than traditional paint finishes.
- Powder coated finishes are not affected by extremes of temperature found outdoors during summers and winters.

Q6.
Possible finishes may include:

- Anodising (1) This will give the racket a different colour that will not chip or peel when being continuously hit (1).
- Any other valid suggestion.

Q7.
Indicative content

- Anodising can increase the resistance to corrosion.
- Anodising can be used to add a pigment, colour, or decorative surface finish.
- Anodising increases the hardness of the aluminium product's surface.
- Anodising increases the toughness of the aluminium product's surface.
- Anodising can increase the resistance to wear when in contact with other materials.

Q8.

Indicative content

- The scaffold is a functional object, where aesthetics are not as important as function therefore the inconsistent galvanised patterned finish causes no issue.
- Galvanising protects the low carbon steel from corrosion.
- The galvanising process is hardwearing so will resist the scratching likely to occur from assembly, storage and transportation.
- The cathodic protective nature of galvanising means that the scaffold would continue to be protected even if damage did occur.
- The dip coating nature of galvanising means that the hollow steel structure of the scaffold is protected on all surfaces.
- Galvanising provides a zinc protective layer to the low carbon steel which provides cathodic protection for the base metal.
- Galvanising provides a surface finish that requires little or no maintenance allowing for extend use and reducing any ongoing costs to the scaffold user.

Q9.

Any two explanations that include a correct reason (1) and a linked justification of that reason (1).

- To improve the aesthetics / makes the desk more appealing (1) so that it sells more (1)
- To prevent corrosion (1) resulting from moisture on skin / moisture /oxygen in the air. (1)
- Because it is a durable finish (1) it will not flake, peel or chip over time / so the handle will retain its good aesthetics. (1)
- Cost effective finish (1) for the economic / low priced market. (1)