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Design & Technology
AQA A-Level

Biodegradable polymers

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 biodegradable polymer is ideal for loose-fill packaging (e.g., foam peanuts) due to its mouldability and compostability?

A Corn starch polymers

B Biopol

C PHA

Q2. What is the primary role of Biopol (bio-batch additive) in conventional plastics?

A To increase flexibility

B To accelerate biodegradation in landfills

C To enhance colour retention

Q3. Potatopak is often used for disposable food containers because it is made from:

A Potato starch

B Petroleum by-products

C Recycled plastic

Q4. Which biodegradable polymer is produced by microorganisms and degrades naturally in soil?

A PHA

B PLA

C Biopol

Q5. Explain why bio-batch may be added to a polymer used in the manufacture of single-use carrier bags **(2 marks)**

Q6. Evaluate the suitability of the lactide used to manufacture the dishwasher detergent packaging shown **(4 marks)**

Q7. Explain why ‘potatopak’ is a suitable material for the manufacture of disposable cutlery **(3 marks)**

Answers

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

Q5.

- Carrier bags are single-use products so a bio-batch additive will help accelerate the breakdown of the carrier bag after it has been disposed of.
- Carrier bags generally have an oxy-degradable additive where the breakdown will begin with exposure to oxygen limiting their contribution to landfill.
- The inclusion of a bio-batch additive means that the carrier bag can decompose in between 3 and 6 months leaving no toxic residue or plastic particles.

Q6.

- Lactide is a water-soluble biopolymer which quickly breaks down when exposed to the water in the dishwasher but is not broken down by the detergent stored inside.
- As the capsule is biodegradable there is no waste packaging produced or negative environmental impact.
- Lactide can break down prematurely if picked out of the bulk packaging with damp hands, resulting in the detergent capsule leaking.
- If the capsule becomes compressed during transportation, damage could occur resulting in the detergent capsule leaking.

Q7.

- 'Potatopak' can be easily formed into the shape of cutlery using a heated compression mould
- 'Potatopak' is a bio-polymer that will naturally decompose when disposed of
- 'Potatopak' is a starch based material that is food safe
- Disposable cutlery is a single use product and wont contribute to landfill waste when disposed of.
- The use of 'Potatopak' reduces the demand for oil based polymers