**Design & Technology**

**AQA A-Level** Logo

Description automatically generated with low confidence

**Polymer enhancement**

**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 primary role of UV stabilisers in polymers?

**A** Enhance flexibility

**B** Prevent degradation from sunlight

**C** Increase biodegradability

**Q2.** Bio-batch additives are incorporated into polymers to:

**A** Improve resistance to high temperatures

**B** Speed up the decomposition process

**C** Enhance electrical conductivity

**Q3.** Which product would most likely contain UV stabilisers?

**A** Disposable cutlery

**B** Patio furniture

**C** Milk bottles

**Q4.** Carrier bags designed to decompose more quickly often include which additive?

**A** Bio-batch materials

**B** UV stabilisers

**C** Plasticisers

**Q5.** Describe the purpose of the following polymer additives:

* fillers
* plasticisers **(2 x 2 marks)**

Fillers

Plasticisers

**Q6.** Explain why bio-batch may be added to a polymer used in the manufacture of single-use carrier bags **(2 marks)**

**Answers**

**Q1**. B

**Q2**. B

**Q3**. B

**Q4**. A

**Q5**.

Two marks for a detailed response that clearly describes the purpose of the named polymer additive.

Fillers:

* can be used to add bulk to a product therefore reducing the amount of raw polymer needed
* can be used to reduce the cost of the product, as fillers are generally cheaper than the raw polymer
* can be used to improve the performance characteristic of a polymer, such as the tensile strength of nylon being improved by using a glass filler.

Plasticisers:

* can be added to a polymer to improve its plasticity therefore making it less brittle. This allows the polymer product to flex or stretch, eg PVC hose pipe can be easily coiled for storage.
* can be added to a polymer to reduce its viscosity therefore improving its ability to flow when in a liquid state, eg a polymer being used in redistribution manufacturing process such as injection moulding.

**Q6.**

* 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.