

# Design & Technology

# Polymers

## Materials required for questions

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- Pencil
- Rubber
- Calculator

## Instructions

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- Use black ink or ball-point pen
- Try to 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

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- Marks for each question are in brackets
- Read each question fully
- Don't spend too much time on one question

# Good luck!

**Q1.** What is an advantage of all thermoplastics?

- A** Resist UV degradation
- B** Can be reheated and reshaped
- C** Easy to finish

**Q2.** What might acrylic be used for?

- A** CD cases
- B** Piping
- C** fizzy drinks bottles

**Q3.** What is an advantage of using Polyvinyl Chloride?

- A** Scratch resistant
- B** Easy to recycle
- C** Available in a range of colours

**Q4.** ABS is used in motorcycle helmets for what reason?

- A** Its chemical resistant
- B** Its heat resistant
- C** It's tough

**Q5.** What is epoxy resin used for?

- A** Adhesives
- B** Domestic appliances
- C** Garden furniture

**Q6.** What is a disadvantage of using Urea formaldehyde?

- A** Emits toxic gases when manufactured
- B** Poor heat resistance
- C** Causes allergic reactions

**Q7.** What non-renewable resource are polymers made from?

- A** Natural gas
- B** Crude oil
- C** Petrol

**Q8.** What is a common disadvantage of most thermosets?

- A** Soft
- B** Brittle
- C** Poor corrosion resistance

**Q9.** Disposable forks can be manufactured from polystyrene. Polystyrene is chosen since it is lightweight and readily accessible in a variety of colours.

List **six** additional characteristics of polystyrene that make it a good choice for throwaway forks **(6 marks)**

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**Q10.** PVC has many characteristics, including strength and the ability to be made in a variety of colours.

Explain **three** additional characteristics that this polymer has that make it a good choice for making drainpipes **(6 marks)**

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**Q11.** Packaging frequently makes use of polymers.

Analyse and evaluate the use of plastics in packaging **(6 marks)**

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**Q12.** A bathtub plug is made from rubber. Explain one reason why rubber is a suitable material for the bathtub plug. **(3 marks)**

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## Answers

Q1. B

Q2. A

Q3. C

Q4. C

Q5. A

Q6. A

Q7. B

Q8. B

Q9.

- Tough (1)
- Easily mass produced (1)
- Inexpensive polymer (1)
- Chemical resistant (1)
- Non-toxic (1)
- Heat resistant to food temperatures (1)
- Recyclable (1)
- Thermal insulator (1)
- Smooth surface finish (1)

Q10.

- Corrosion resistant (1) so that it is not affected by outside conditions (1)
- UV resistant (1) so will not become brittle as quickly as other polymers (1)
- Tough (1) so can withstand knocks (1)
- Sufficiently hard (1) not worn away by flowing contents (1)
- Easily extruded (1) so it can be mass produced economically (1)
- Flexible (1) so can be fitted to uneven surfaces (1)
- Lightweight (1) does not require substantial mountings (1)
- Easily cut/joined (1) so fitting is simple (1)
- Relatively cheap (1) so it can be sold at a high margin (1)
- Self-finishing (1) reducing maintenance procedures (1)
- Recyclable (1) so does not contribute to land fill (1)
- Can be textured (1) to blend with existing architectural styles (1)
- Sufficiently high melting point (1) so is not softened by boiling water/ bright sunlight (1)



**Q11.**

**Advantages (max 5)**

- Lightweight so will not increase weight of product (1)
- Strong (1)
- Water resistant (1)
- Can be formed into intricate shapes (1)
- Easily printed on (1)
- Inexpensive in comparison to other materials (1)
- Greater speed of production than other materials (1)
- Impact resistant (1)
- Recyclable (1)
- Can be transparent so contents can be seen (1)
- Does not affect flavour of the contents as they are unreactive (1)
- Self-finishing (1)
- Comes in a wide range of colours (1)
- Chemically resistant (1)

**Disadvantages (max 5)**

- Consume large amounts of energy in production (1)
- Use up non-renewable resources (1)
- Pollute environment (1)
- Uneconomical (1)
- Add to land fill (1)
- Can be hazardous to health (1)
- Creates toxic fumes when burnt (1)
- Some plastics cannot be recycled (1)

**Q12.**

- Rubber is waterproof (1) and will expand into the plug hole (1) providing a watertight seal (1)
- Rubber is a renewable material (1) because it can be harvested continuously without damaging the tree (1) so does not deplete natural resources (1)
- Rubber is chemically resistant to soaps/shampoo (1) so it can be used in a domestic environment (1) without degrading (1)