**Design & Technology**

**AQA A-Level** Logo

Description automatically generated with low confidence

**Performance characteristics of polymer based sheet and film**

**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 polymer-based sheet is commonly used for model making due to its lightweight and rigid structure?

**A** Fluted polypropylene

**B** Foam board

**C** Cellulose acetate

**Q2.** What key property makes fluted polypropylene suitable for outdoor signs?

**A** Flexibility

**B** Water resistance and durability

**C** Biodegradability

**Q3.** Translucent polypropylene sheets are ideal for packaging applications because they:

**A** Block all light transmission

**B** Allow partial light transmission

**C** Are fully transparent

**Q4.** Which polymer-based material is biodegradable and used for eco-friendly packaging?

**A** Low-density polyethylene (LDPE)

**B** Styrofoam

**C** Polylactide (PLA)

**Q5.** Name a specific application for the following materials **(3 marks)**

Cellulose acetate

Fluted polypropylene

Styrofoam

**Q6.** Styrofoam and high-density modelling foam are often used in modelling. Compare and evaluate the suitability of each material for the manufacture of a block model that represents aesthetic appearance to a potential client **(6 marks)**

**Q7.** Explain why foam board is a suitable material for the manufacture of an architectural model **(4 marks)**

**Answers**

**Q1**. B

**Q2**. B

**Q3**. B

**Q4**. C

**Q5**.

Cellulose acetate:

* overhead projector (OHP) transparency film
* photographic film
* transparent film on packaging.
* biodegradable cutlery

Fluted polypropylene:

* art portfolio cases
* point of sale structures
* signage – eg ‘For Sale’ signs, construction site signs.

Styrofoam:

* aesthetic block models
* formers for laminating and moulding
* modelling of ergonomic handles.

**Q6**.

Styrofoam:

* can be easily shaped with workshop tools such as rasps and surforms, allowing for the rapid manufacture of an aesthetic model
* can be sculpted using a hot wire cutter or sculpting bow, creating organic shapes or customised profiles
* can tear/shred and rip if shaped with course abrasive tools or abrasive paper reducing the quality of the surface finish
* the density of the material limits the accuracy in which a hole or recess can be created limiting the complexity of the block model
* models can be coloured to represent an aesthetic model, but cellulose paints can melt the surface of the Styrofoam, so often a Polyfilla coating is needed
* models can be quickly produced allowing for more regular feedback from a potential client.

High-density modelling foam:

* can be shaped with hand tools, but the density of the material limits how effective hand tools can be
* can be easily machined using a CNC router or lathe etc, allowing for quick and accurate manufacture from a CAD drawing
* the density of the material allows for recesses and holes to be accurately produced so features such as screens and buttons could be easily represented on the block model
* the density of the material allows the client to have a more realistic idea of the weight of product when interacting with the model
* the dense nature of the material means that a high-quality surface finish can be achieved, which can then be filled and sprayed to a standard that could represent the aesthetics of the final product to the client.

**Q7.**

* foam board is a lightweight rigid material that make it suitable for representing walls, roofs and other flat architectural features
* foam board can be easily cut and joined allowing for models to be manufactured without the need for expensive machinery
* foam board is usually supplied in white, making it suitable for architectural models where often decisions regarding colour and external materials are made at a subsequent time
* accurate shapes and voids can be cut out from foam board, allowing various scales of models to be accurately represented.