OCR
Oxford Cambridge and RSA

Monday 13 May 2024 – Afternoon

AS Level in Design and Technology: Product Design

H006/01 Principles of Product Design

Time allowed: 1 hour 45 minutes

You can use:
- a ruler (cm/mm)
- a scientific calculator
- geometrical instruments

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

1 A computer mouse is a handheld device that works on a flat surface and controls a cursor or pointer on a computer screen.

Fig. 1.1 shows a wireless computer mouse.

Fig. 1.2 shows the wireless computer mouse in use.

Fig. 1.1

Fig. 1.2

(a) Explain **two** features of the wireless computer mouse that have been designed for inclusivity.

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[4]

(b)

(i) Identify **two** improvements to the design of the wireless computer mouse that would increase its inclusivity.

Justify **each** of your answers.

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[4]

(ii) For **each** of the improvements you have identified in **part (b)(i)** describe how the improvement in design could be physically modelled.

Identify specific materials in your answer.

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[4]

(c) Technological developments often lead to the evolution of familiar products.

Evaluate the influence of technological developments on the evolution of a computer mouse.

[8]

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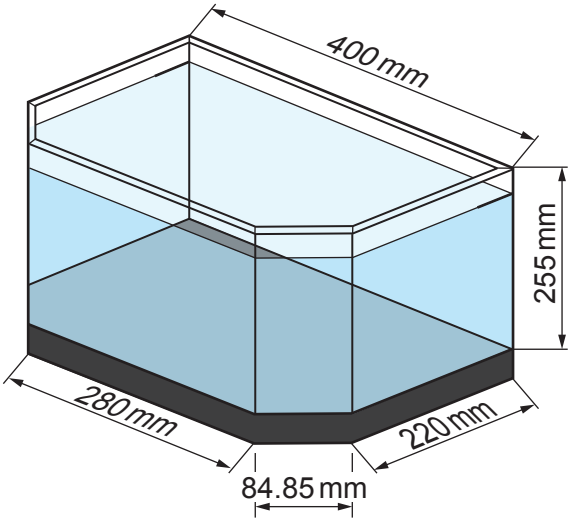
2 **Fig. 2.1** shows a fish tank which contains water. Fish can live in this tank in the home.

The side panels and the floor of the fish tank are made from glass. They are joined by a sealant.

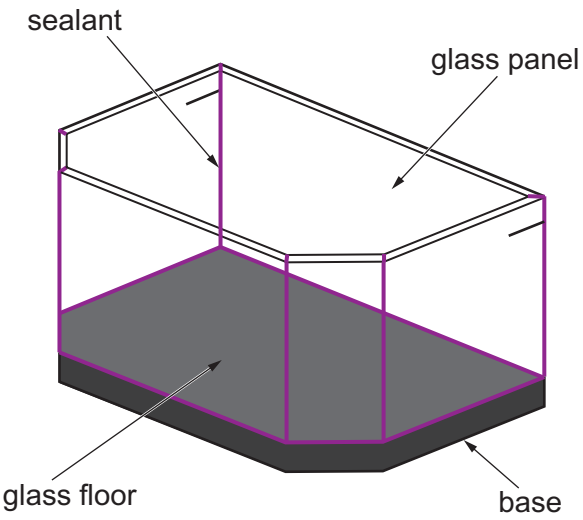
Fig. 2.2 shows an empty fish tank. The sealant joining the panels of glass to each other and the glass floor is highlighted.

Fig. 2.1



(not to scale)

Fig. 2.2



(a) Calculate the length of sealant needed to join the glass panels together and to the floor of the fish tank.

Give your answer to the nearest cm. Show your working. **[5]**

Length of sealant ..... cm

(b) The manufacturer of the fish tank is looking into how much glass it will need to meet various customer orders.

Calculate the external surface area of the glass that would be required to manufacture the side panels of one fish tank.

Give your answer in mm^2. Show your working.

You do not need to include the floor of the fish tank in your calculation. **[4]**

External surface area ..... mm^2

(c) The fish tank is filled with 22.5 litres of water. A layer of gravel will be placed in the bottom of the tank.

0.5 kg of gravel will be required for every 4.5 litres of water.

Calculate the ratio of gravel to water.

Use this ratio to calculate the total amount of gravel required in kg. Show your working. **[2]**

Ratio .....

Total amount of gravel ..... kg

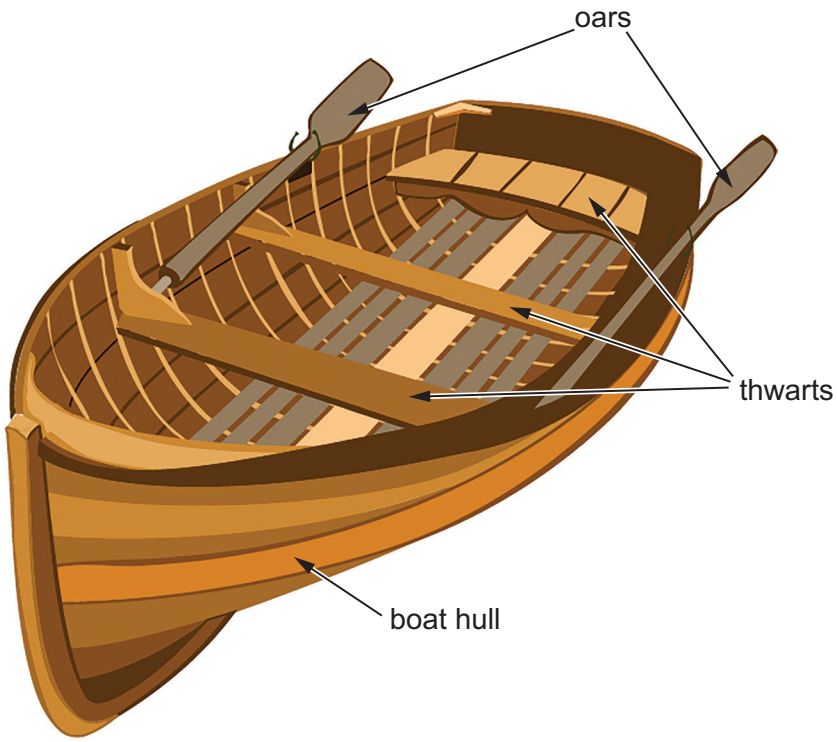
(d) One of the fish tanks will contain 10 Goldfish, 35 Neon Tetras and 45 Guppies when it is used in the home.

If a fish was selected at random, calculate the probability of it being a Goldfish or a Neon Tetra. Show your working. **[3]**

Probability .....

3 **Fig. 3** shows a traditional wooden boat and the oars used to steer it through the water.

Fig. 3



(a) Traditional boat hulls are made from wood.

(i) Identify a suitable wood for a boat hull.

..... **[1]**

(ii) Identify **one** property of the material you named in **part (a)(i)** that makes it suitable for the boat hull.

Justify your answer.

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..... **[2]**

(b) Explain how structural integrity is achieved in the boat hull.

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(c) Composites are now replacing more traditional materials. Identify a suitable composite material to create a boat hull.

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(d) Explain **two** disadvantages to the user of a boat hull made from a composite material rather than a boat hull made from wood.

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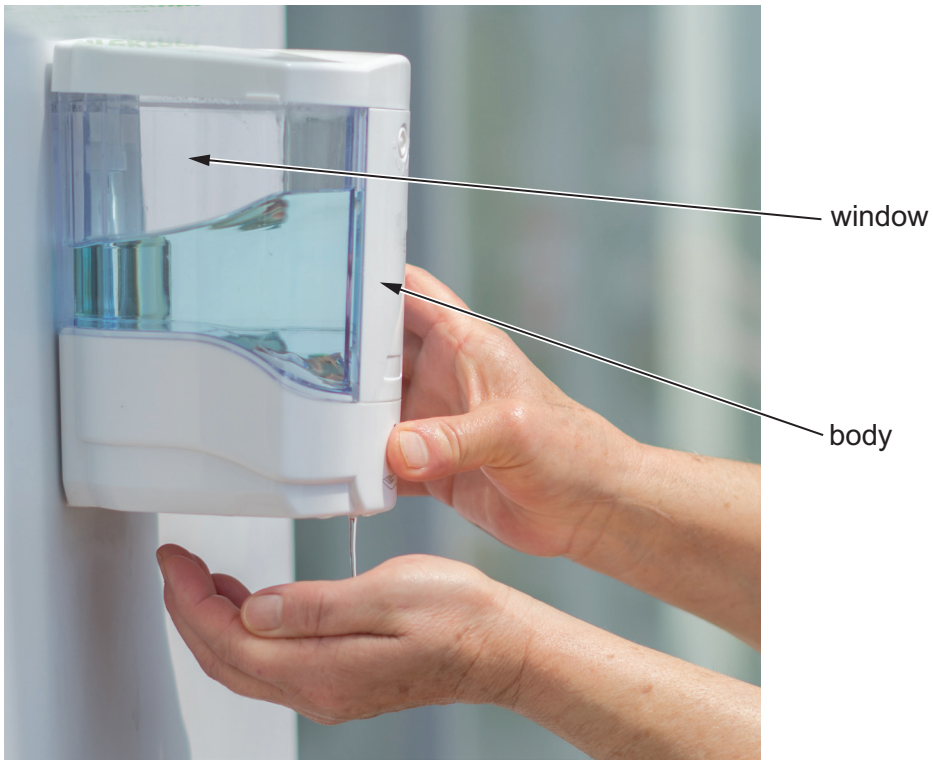
(e) Use annotated sketches and/or notes to show how a boat hull could be manufactured using a composite material.

Identify any relevant equipment, machinery or materials. **[8]**

4 **Fig. 4** shows a wall mounted soap dispenser which releases a measured amount of soap into the user's hand.

Fig. 4



(a)

(i) Identify a suitable thermoplastic for the body of the soap dispenser.

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(ii) Identify **one** property of a thermoplastic that makes it suitable for the body of the soap dispenser.

Justify your answer.

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..... **[2]**

(iii) Identify a suitable commercial process for the manufacture of the body of the soap dispenser.

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(b) Describe **two** potential problems with the design of the soap dispenser.

For **each** problem, identify a possible solution. Justify **each** of your solutions.

Problem 1 .....

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Possible solution .....

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Problem 2 .....

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Possible solution .....

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[8]

(c) The designer must consider how the soap dispenser can be fixed to a wall and removed when needed.

Use annotated sketches and/or notes to show how the design of a soap dispenser of the type shown in **Fig. 4** allows it to be mounted to a wall.

Identify any relevant equipment, machinery or materials. **[6]**

(d)* Regular handwashing in schools and workplaces is important. It requires a supply of soap which is a consumable product. The soap has to be packaged and distributed to the consumer.

Discuss the environmental impact of using refillable soap dispensers as a means of providing soap for handwashing.

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5 Designers use information from specialist websites and data gathered from primary and secondary sources to support design development.

(a) Describe how designers select and interpret technical data and information.

Refer to a minimum of **two** specific websites or publications in your answer.

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(b)* Discuss how information from specialist websites and data gathered from primary and secondary sources is used to support the design development of a familiar product.

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