



PIABC LEVEL 5 DIPLOMA IN PACKAGING TECHNOLOGY

(Qualification Number: 600/0017/X)

EXAMINATION PAPER

June 2022

J/502/5923 UNIT 02

Packaging Materials and Components

Paper A

INSTRUCTIONS TO CANDIDATES

You are required to pass **ALL** the learning outcomes

Write your answers in the answer book provided

Wherever possible, use diagrams to illustrate your answer

This is a closed book examination

This examination paper is worth 70% of the total marks for Unit 2

Reading Time: 5 minutes

Examination Time: 3 Hours

Issued under the authority of the
PACKAGING ASSESSMENT BOARD
30 April 2022

PIABC Level 5 Diploma in Packaging Technology
Unit 2 – Packaging Materials and Components (Paper A)
June 2022

INSTRUCTIONS TO CANDIDATE

You are required to answer **TWO QUESTIONS** from the following three questions only

Learning Outcome 1

Understand the properties of materials which make them suitable for packaging

(This learning outcome is worth 40% of the marks for this paper)

Question 1

A carbonated orange drink can be packed in glass and metal containers.

- A) a) Identify the important properties of the drink which may impact on how it is packed. (2 marks)
- b) Briefly describe a glass and metal container to pack this product. (2 marks)
- c) Compare and contrast the relevant properties of these materials. (4 marks)
- B) Discuss the advantages and disadvantages of using glass to contain this product from an operational, environmental, commercial and aesthetic perspective. (4 x 3 marks)

Question 2

Using examples to illustrate your answer, discuss how the properties of each of the following polymers relate to their use in packaging applications:

- A) Low density polyethylene (4 marks)
- B) Polypropylene (4 marks)
- C) Polyethylene terephthalate (4 marks)
- D) Polystyrene (4 marks)
- E) Polyamide (nylon) (4 marks)

Question 3

- A) For each of the following applications describe and justify an appropriate paperboard material. Comment on how the key properties for each material is achieved.
- Wrap around case for 12 cans of beer (5 marks)
 - Carton for frozen fish fingers (5 marks)
 - Carton for tube of toothpaste (5 marks)
- B) a) Explain the process of beating and refining in the preparation of paper pulp. (1 mark)
- b) Briefly discuss how this modifies properties. (2 marks)
- C) Corrugated board can be prone to warping. Explain why this may occur. (2 marks)

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INSTRUCTIONS TO CANDIDATE

You are required to answer this question

Learning Outcome 2
Understand the synthesis and properties of polymers
(This learning outcome is worth 20% of the marks for this paper)

Question 4

- A) Briefly describe the following THREE polymerisation processes (3 x 2 marks) and provide an example of one material produced from each (3 x 1 mark):
- Free radical initiated addition polymerisation
 - Co-ordination addition polymerisation (catalyst initiated)
 - Condensation polymerisation
- B) Explain what a copolymer is (1 mark) and describe THREE different structures which are possible (3 x 1 mark).
- C) Give an example of copolymer and its application. (1 mark)
- D) Define THREE of the following FOUR polymer characteristics (3 x 1 mark) and explain how they influence material properties (3 x 1 mark):
- Crystallisation
 - Orientation
 - Glass transition
 - Melt flow index

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INSTRUCTIONS TO CANDIDATE

You are required to answer **TWO QUESTIONS** from the following three questions only

Learning Outcome 3
Understand the conversion of raw materials into packaging materials
and packaging components

(This learning outcome is worth 40% of the marks for this paper)

Question 5

- A) Identify the FIVE main manufacturing methods for producing rigid, hermetically sealed metal packaging and provide a product example for each. (5 marks)
- B) With the use of diagrams, describe the production of a printed and embossed square metal container with a lid to contain tea. Start with coil material arriving at the factory and finish with containers ready for despatch to the customer. Provide full descriptions of the forming and the seaming processes. (15 marks)



Question 6

A drinks company wishes to use a paperboard carton pack to promote a bespoke 70cl glass bottled product in airport retail outlets.

- A) Propose a suitable design of carton to hold the bottle (2 marks) and justify the grade and properties of board (5 marks). Describe, with the aid of diagrams, the manufacture of this carton from receipt of board to despatch of cartons to the drinks company. (9 marks)

Note: A full description of the printing process is not expected.

- B) Identify the likely performance criteria that would be on the carton specification. (4 marks)

Question 7

- A) Describe in detail the production of an injected moulded 500ml container for fresh cream from granular polymer to finished product. (8 marks)
- B) Compare and contrast the processes involved in the manufacture of a fresh cream container by injection moulding and thermoforming and the effect on the properties of the container. (6 x 1 mark)
- C) Identify and justify the key performance information to be included on a specification of an injection moulded fresh cream container. (6 marks)

END OF EXAMINATION PAPER