



# **PIABC LEVEL 5 DIPLOMA IN PACKAGING TECHNOLOGY**

(Qualification Number: 600/0017/X)

## **EXAMINATION PAPER**

**November 2018**

**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

**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)

***INSTRUCTIONS TO CANDIDATE: YOU ARE REQUIRED TO ANSWER  
TWO QUESTIONS FROM THE FOLLOWING THREE QUESTIONS ONLY***

**Question 1**

- A) Discuss FOUR properties of paper and board which make it a suitable material to use for packaging applications. (4 x 2 marks)
- B) a) Discuss TWO characteristics that limit the use of paper and board in packaging applications. (2 x 2 marks)
- b) How can these limitations be overcome? (2 x 2 marks)
- C) Discuss how the material source will impact on the characteristics of paper-based packaging. (4 marks)

**Question 2**

- A) Identify the KEY ingredients and their relative proportions used to make container glass. (3 marks)
- B) Pharmaceutical glass can be identified as types I, II and III. Explain how they differ from each other and justify the application of where they are used. (3 x 3 marks)
- C) Identify, with reasons, FOUR characteristics/properties of a glass jar containing instant coffee that need to be evaluated to ensure it meets the needs of the product, packing line and distribution chain. (4 x 2 marks)

**Question 3**

Discuss why the properties of the following polymeric materials make them suitable for the given application:

- High density polyethylene (HDPE) as used for extrusion blow moulded bottle to contain bleach. (4 x 1 mark)
- Metallised biaxially oriented polypropylene (BOPP) film as used for the packaging of potato based snack food. (4 x 1 mark)
- Polyethylene terephthalate (PET) as used for an injection stretch blow moulded bottle to contain carbonated water. (4 x 1 mark)
- An ionomer (e.g. Surlyn) as coextruded onto high density polyethylene (HDPE) for the manufacture of a vertical form fill seal bag for a dusty dry cereal product. (4 x 1 mark)
- A thermoformed sheet of polyvinyl chloride (PVC) coated with polyvinylidene chloride (PVDC) as used for moisture sensitive tablets packed on a high speed blister line. (4 x 1 mark)

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

***INSTRUCTIONS TO CANDIDATE: YOU ARE REQUIRED TO ANSWER THIS QUESTION***

**Question 4**

- A) Define a polymer. (1 mark)
- B) Describe the following types of polymer; giving an example of each type and where they might be used in packaging:
- Thermoset (3 marks)
  - Thermoplastic (3 marks)
  - Thermoplastic Elastomer (3 marks)
- C) Explain how EACH of the following affects the properties of a polymer:
- Copolymerisation (2 marks)
  - Chain branching (2 marks)
  - Glass Transition Temperature (2 marks)
  - Orientation (2 marks)
  - Crystallinity (2 marks)

**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)

***INSTRUCTIONS TO CANDIDATE: YOU ARE REQUIRED TO ANSWER TWO QUESTIONS FROM THE FOLLOWING THREE QUESTIONS ONLY***

**Question 5**

- A) Describe, with the aid of diagrams, the construction and manufacture of Folding Box Board (FBB) using the Foudrinier process from prepared fibres to slit reels ready for despatch to printer. Note the important elements which contribute to the properties of the finished board. (18 marks)
- B) What offline treatments or coatings could be added to this material and what properties will they add? (2 marks)

**Question 6**

Dried fruits are stored in a gusseted base resealable closure pouch. The pouch is constructed from a polyethene (PE) and metalized polyethylene terephthalate (PET) laminate.

- A) Describe the production of blown polyethene (PE) film from polymer granules to reels of film ready for lamination. (12 marks)
- B) a) Describe how polyethylene terephthalate (PET) film is metalized. (2 marks)  
b) How is the thickness of the metalised controlled? (1 mark)
- C) Describe and justify the lamination process for combining the metallised polyethylene terephthalate (PET) and polyethene (PE). (2 marks)
- D) Describe how the closure is added and gusseted pouch is formed. (3 marks)

**Question 7**

- A) What are the FIVE main processes for producing rigid hermetically sealed metal packaging? Provide a product example for each. (5 marks)
- B) With the use of diagrams, describe the production of a commemorative embossed and printed rectangular metal container with a lid to pack 1.5 kg of luxury chocolate biscuits. Start with coil material arriving and finish with containers ready for despatch to the customer. Provide full descriptions of the forming and the seaming processes. (15 marks)

