



## **SUMMER EXAMINATIONS 2020**

**EXAMINATION: UNIT 3 Packaging Materials and Containers 2**

**COURSE: CPD Diploma in Packaging Technology**

**DATE: 14<sup>h</sup> May 2020  
10am to 12pm**

**EXAMINERS: Tony Duffy, Ron Gardiner**

**TIME ALLOWED: 2 hours**

**INSTRUCTIONS: Please answer four questions. All questions carry equal marks**

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The use of programmable or text storing calculators, smart phones etc are expressly forbidden. Please note that where a candidate answers more than the required number of questions, the examiner will mark all questions attempted and then select the highest scoring ones.

### **Question 1 (25 marks)**

- a) Describe the polymerisation of low-density polyethylene (LDPE). **(9 marks)**
- b) Discuss how the production of high density polyethylene (HDPE) and linear low density polyethylene (LLDPE) is different from that of LDPE and what impact this has on the materials' properties? **(2 x 3 Marks)**
- c) Briefly explain the meaning of the following polymer characteristics and describe how they can influence their properties.
- Chain Branching
  - Crystallisation
  - Orientation
  - Glass transition
  - Melt flow index
- (5 x 2 marks)**

### **Question 2 (25 marks)**

- a) Describe the following three types of adhesion: Chemical, Mechanical and Diffusion Adhesion. **(10 marks)**
- b) Adhesives set after application. Describe three processes by which adhesives set and provide an example of use for each. **(10 marks)**
- c) Corrugated cases are often constructed using a different adhesive for construction of the corrugated board, the creation of the manufacturers joint and closing the flaps once the case is filled. Justify the use of an adhesive for each of these applications **(5 marks)**

### **Question 3 (25 marks)**

- a) Describe the production of bi-axial orientated case polypropylene film from granules of material to rolls of film ready for dispatch. **(20 marks)**
- b) Briefly describe how the production of blown film production for Polyethylene film is different from that of bi-axial orientated case polypropylene film. **(5 marks)**

#### **Question 4 (25 marks)**

- a) Briefly describe what a laminate structure is and why materials are laminated together. Then describe two methods of laminating plastics to board.

**(5 marks)**

- b) A typical carton for a juice product such as Ribena, is laminated from PE/Aluminium Foil/PE/Board/Lacquer. What are the functions of each of these laminate layers?

**(10 marks)**

- c) Briefly note & justify how each layer is bonded to the next.

**(5 marks)**

- d) As a packaging technologist describe how you could make this juice laminate pack more 'environmentally friendly'

**(5 marks)**

#### **Question 5 (25 marks)**

A bottle of beer is labelled with a glue applied metallised label, which has been printed and embossed.

- a) Describe an appropriate glue and label for this application

**(6 marks).**

- b) Discuss the material properties to be considered when specifying, manufacturing and applying this label

**(4 marks).**

- c) Why has the spirits industry seen the move from paper to plastic labels?

**(9 marks)**

- d) Discuss the benefits of using in-mould labelled containers for butter and yellow fat products

**(6 marks)**