



PIABC LEVEL 5 DIPLOMA IN PACKAGING TECHNOLOGY
(Qualification No. 610/0740/7)

**SAMPLE EXAMINATION PAPER
(WITH SUGGESTED SOLUTIONS)**

L/650/2135 UNIT 3

**UNDERSTAND THE MANAGEMENT OF
PACKAGING, PRODUCTION AND BUSINESS PROCESSES**

INSTRUCTIONS TO CANDIDATES

Write your answers in the answer book provided.

Wherever possible, use diagrams to illustrate your answer.

This is a closed book examination.

100 marks are available in total for this examination.

The number of marks is given in brackets () at the end of each question or part question.

Leave time at the end to check your answers.

Examination Time: 2 Hours

Issued under the authority of the
PACKAGING ASSESSMENT BOARD
14 September 2023

SECTION 1

TWO QUESTIONS - 20 MARKS EACH

Question 1

- A) Pain relief tablets for retail are packed in a blister pack with a leaflet and carton. Describe a packaging operation for this product from bulk tablets to packed product ready for despatch to major retailer's distribution hub. (14 marks)
- B) Discuss the benefits and risks with a Just in Time (JIT) manufacturing philosophy (6 marks)

Suggested Solution

Packing operation as follows:

- Components checked into store and QC checked
- Line cleared and checked
- Material presented to the line
- HFFS to create blister cavity
- Tablets transferred to cavities; camera checks every blister is full
- Cavities are sealed/foiled, Coding of blister packs
- On-line checks, fill and metal detection.
- Blisters collated
- Cartons and Patient Information Leaflet (PIL) brought to line
- Cartons erected, Cartons and PIL 100% verified by bar code/camera systems
- Blisters and PIL inserted into carton and closed
- Coded with QC checks
- Cartons collated into corrugated case
- Labelled or coded
- Palletized, labelled stabilised.

A discussion around the following points:

- Reduced inventory
- Improved cash flow
- Highlights any processing delays
- Reduced risk from obsolete products or components.
- Vulnerable to supply chain disruption
- Increased lower volume transport
- Encourage faster product changeover

Question 2

- A) Define and discuss what is meant by quality in a quality management system. (3 marks)
- B) Explain the purpose of a specification for incoming goods. (6 marks)
- C) Describe what tolerance is on a measurement (1 mark) and explain why it is important to set correct tolerance levels (2 x 2 marks).
- D) Explain what is meant by the term Acceptable Quality Levels (AQL's). (6 marks)

Suggested Solution

- A)
 - The totality of characteristics and features which bear upon the ability of a product or service to meet customers' requirements or expectations.
 - Meeting specification is a narrow definition as this does not determine if the specification is correct and will deliver the customer requirements.
- B)
 - Communicates needs to suppliers.
 - Serves as the contractual benchmark in disputes.
 - Provides staff with basis for accepting materials and components.
 - Provides supplier with basis for judging production.
 - Serves as the benchmark for improvement.
 - Allows for equal quotations from different suppliers.
- C)
 - A tolerance is the permissible maximum and minimum deviation from the specified dimensions or qualities.
 - Too broad a tolerance can cause aesthetic problems or machine problems as the machine has to cope with wide variations in material or running parameters.
 - Too narrow a tolerance may limit the number of potential suppliers and significantly increase costs to try and reach the standard required.
- D)
 - AQLs are the proportion of defects that are acceptable within a batch, which will not result in the rejection of that batch. AQLs must be agreed between supplier and user during the development stages of any packaging material.
 - It is common to classify defects into critical, major and minor and different AQLs are agreed for each type. This means that there will be a maximum number of defects allowable within each category. Exceeding this will result in rejection of the batch.

Defects can be classified into three categories:

- **Critical defects:** Those defects that prevent the packaging component from fulfilling its purpose or render the product unsafe. For example, an incorrect dimension, or contaminated materials.
- **Major defects:** Those defects that are likely to seriously reduce the performance of the packaging component under stressed conditions, although it may perform adequately under most conditions. For example, a corrugated case with compression strength slightly below specified levels.
- **Minor defects:** These are mostly aesthetic defects that do not substantially reduce pack function.
A specification may, for example, allow up to 5% of level C defects, 2% of level B defects, and 0% of level A defects.

SECTION 2

SIX QUESTIONS - 10 MARKS EACH

Question 3

A packaging design brief can be used to provide the information required prior to developing a pack.

Using examples, discuss the information which should be included in such a design brief.
(10 marks)

Suggested Solution

Product

Product details, fragility, physical state, viscosity, size, biological requirements, moisture sensitivity, oxygen sensitivity, UV sensitivity, storage conditions, odour sensitivity, Storage conditions, Weight.

Market

Target user profile, culture, age, social economic status, market size, how the product will be used, where will it be sold, shelf size, consumer expected features, other products in range, cost.

Distribution

Distribution environment and hazards. Risks of theft, counterfeiting etc.

Other information required

- Packaging line requirements in terms of Material / Machinery constraints and time constraints.
- Competitive products for comparisons.
- Legal requirements to ensure that they are met.

Question 4

Discuss the factors that need to be considered in determining optimum stock holding levels.
(10 marks)

Suggested Solution

A discussion around the following points on ideal stock control levels depend on:

- Demand, and reliability of demand data
- Consequence of stock outs e.g lost orders
- Minimum order quantity
- Lead time
- Supplier performance
- Purchase Transaction costs e.g. order processing
- Quantity discounts e.g. Bulk discounts
- Space available to hold stock /Storage costs e.g. store rent, heat
- Working capital cost e.g cost of financing working capital/ Finance available to buy and hold stock
- Obsolesce costs e.g out of date product
- Production inefficiency costs

Question 5

- A) What is the design speed of a packaging machine and how can it be measured?
(2 mark)
- B) Outline how accumulators can improve the efficiency of a filling line. (2 marks)
- C) Discuss the factors which contribute to this line's overall equipment effectiveness (OEE) and for each factor provide an example how the OEE could be improved.
(6 marks)

Suggested Solution

- A) Design speed is the theoretical running speed of a station or machine under perfect running conditions. Usually defined by as the number of containers the station can process in a minute (cpm).
- B) Accumulators isolate section of the line. Each section can operate even if other sections have stopped for a period of time. Usually used to isolate the slowest parts to ensure that this provides maximum output.
- C) OEE
 - Line availability - The amount of time the line is available for production. Improved maintenance, faster line setup e.g offline equipment preparation can improve availability
 - Line speed - Identification and removal of bottle necks. Increasing speed of line. Addition of accumulators, removal of causes of minor stoppages
 - Quality - Specification of materials, equipment maintenance, running the line slower may increase quality output. Training.

Question 6

- A) Describe with examples, SIX factors which contribute to the total packed cost of a product from raw materials to finished goods. (6 marks)
- B) Briefly discuss how improving product quality can improve the company's profitability. (4 marks)

Suggested Solution

- A) Factors relating to total packed cost include:
- Raw materials and packaging materials costs
 - Labour cost of making and packing the product
 - Energy costs of both the manufacturing process and packaging operation
 - Storage and distribution costs – this could include multiple handling in distribution centres
 - The cost of complying with legislation
 - Treatment and disposal of waste
 - Monitoring and analysis
 - Quality of RM's and PM's
 - Pkg machine efficiencies
- B) If quality standards are in place and accepted inside the company, this can lead to:
- Higher staff motivation
 - Reduced errors
 - Less rework means greater productivity and reduces operating cost

Outside the company, if quality increases then:

- Reliability of products increase.
- Image of company increases.
- Higher price possibly charged for customer viewed better quality product.
- Increased sales/market share.

Question 7

- A) Evaluate the advantages and disadvantages of pre-formed polymeric trays with a tray sealer compared with trays manufactured using thermoform fill seal equipment. (5 marks)
- B) Discuss the relative merits of stretch and shrink wrapping for stabilising pallet loads of unitised products. (5 marks)

Suggested Solution

A) Pre-formed trays

- Wider range of materials available e.g. CPET, EPS, PP
- More advanced thermoforming techniques available e.g. plug assist
- Easy change in tray if sealing head same size

Thermoformed trays

- Rolled stock unlikely to be contaminated
- Efficient use of transport and storage for raw material
- One reel of material may make several tray types

B) Shrinkwrap

- Requires heat to shrink material. Once shrunk the material will not shrink more unless more heat is applied.
- Often used as a hood which provides good weather protection.
- Often heavy gauge material
- More expensive compared to stretchwrap

Stretchwrap

- Usually lighter weight of material.
- Can be applied automatically or manually
- Tension can be adjusted
- Material used can be adjusted by varying overlap
- Cost effective

Question 8

- A) Identify and describe the roles and responsibilities of FIVE associated disciplines involved in the packaging development process. (5 marks)
- B) Identify, and briefly explain, FIVE different tests that could be used to show the compatibility of a short shelf-life food product and packaging through its life. (5 marks)

Suggested Solution

- A) Roles include:
- Marketing,
 - Design,
 - R&D,
 - Packaging Technology,
 - Engineering,
 - Production,
 - Procurement,
 - Planners,
 - QA,
 - Legal,
 - Finance,
 - Training.
- B) Tests can include drop tests, compression tests, panelling, stress cracking, taint testing, odour testing, micro checks, textural, print resistance to product and rubbing, pallet stability, compliance with food contact regulations

END OF EXAMINATION PAPER