

**SUMMER EXAMINATIONS 2017**

**EXAMINATION:**

**UNIT 1 Fundamentals of Packaging Technology and Packaging in the Supply Chain**

**COURSE:**

**CPD Diploma in Packaging Technology**

**DATE:**

**10th May 2017**

**10 am to 12pm**

**EXAMINERS: Colm Munnelly, Tony Duffy**

**TIME ALLOWED: 2 hours**

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

**PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO**

**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.**

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**Question 1 (25 marks)**

1. **Briefly describe 4 methods of preserving foods. What are the packaging requirements of each of these methods?**

**(16 marks - 4 x 4 marks)**

**Discuss how the primary pack for cooked ham performs the functions of packaging. (9 marks)**

**Question 2 (25 marks)**

**a)** **Briefly describe the functions of packaging**

**(7 marks)**

1. **Describe how a supermarket own brand paracetamol tablet is packed. How does this pack perform the functions of packaging?**

**(11 marks)**

1. **Using the primary pack described in part (b) above, describe how the secondary and tertiary packaging contribute to the packaging system performing the functions of packaging.**

**(7 marks)**

**Question 3 (25 marks)**

1. **Products can be distributed through various distribution channels. Describe 5 ways how different distribution channels will change the risks of damage to product.**

**Distribution channel examples could include.**

**Industrial bulk delivery,**

**Direct home delivery through courier,**

**Delivery to consumers through major national retailers,**

**International deliveries by sea freight**

**Business to Business transfers**

**Cash and Carry Operations**

**(15 marks, 5 x 3 marks)**

1. **Identify 5 hazards faced by a bottle of whiskey during distribution. How can these be mitigated or managed?**

**(10 marks, 5 x 2 marks)**

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**Question 4 (25 marks)**

1. **Calculate the fragility factor, G for a cup dropped from a height of 1 metre that decelerates to 0 on impact in 0.002 seconds.**

**Note: v2 =u2 + 2as and v =u + a τ where:**

1. **final velocity (m/s)**
2. **initial velocity (m/s)**
3. **acceleration (m/s/s)**
4. **distance travelled (m) τ: time taken(s)**
5. **acceleration due to gravity (9.81m/s/s)**

**(13 marks)**

1. **What thickness of Polyethylene foam (EPE) would be required to protect this cup, knowing that the cushion factor for EPE is 3.1**

**(4 marks)**

1. **What are the internal dimensions of a case required to pack this cup in EPE if the dimensions of the cup are 140 x 120 x 100 mm**

**(4 marks)**

**d) Name 4 typical types of testing carried out on finished packages.**

**(4 marks)**

**Question 5 (25 marks)**

1. **Briefly discuss five ways in which packaging has supported the development of modern societies.**

**(5 x 3 marks)**

1. **Packaging is often considered to be environmentally wasteful by the general public. Discuss how packaging can become more environmentally friendly.**

**(10 marks)**

## Contribution of Packaging to Modern Societies (5 x 3 marks)

1. **Preservation and Shelf Life:** Packaging protects products from spoilage, extending shelf life and reducing food waste. This ensures year-round availability and avoids seasonal limitations.
2. **Safe Transport and Distribution:** Packaging safeguards goods during transportation, preventing damage and ensuring they reach consumers in usable condition.
3. **Portion Control and Convenience:** Packaging allows for pre-measured portions and single-serve options, catering to busy lifestyles and reducing waste.
4. **Marketing and Branding:** Packaging acts as a marketing tool, conveying brand identity, product information, and promoting informed consumer choices.
5. **Hygiene and Sanitation:** Packaging protects products from contamination during handling and storage, promoting hygiene and public health.

## Eco-Friendly Packaging Solutions (10 marks)

The environmental impact of packaging is a growing concern. Here's how it can become more sustainable:

1. **Reduce, Reuse, Recycle:** Minimize packaging use. Encourage reuse through refillable containers and returnable systems. Prioritize materials with strong recycling infrastructure.
2. **Sustainable Materials:** Shift towards recycled content packaging, biodegradable or compostable options made from plant-based materials, or even edible coatings.
3. **Optimized Design:** Design packaging to use minimal material while ensuring product protection. Consider right-sizing packages to fit product dimensions and utilizing efficient shapes.
4. **Clear Labeling:** Provide clear instructions on recycling or composting disposal on packaging to educate consumers and improve waste management practices.
5. **Sustainable Sourcing:** Partner with manufacturers who use sustainable forestry practices for paper-based packaging and minimize the environmental footprint throughout the supply chain.

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**Question 1 (25 marks)**

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**(16 marks - 4 x 4 marks)**

**Discuss how the primary pack for cooked ham performs the functions of packaging. (9 marks)**

Methods of Preserving Foods and Packaging Requirements:

1. High Temperature Processing (Canning/Retorting):

- Description: Heating the food to reduce microbial activity, sealing it in a hermetically sealed container, and then subjecting it to heat to achieve commercial sterility.

- Packaging Requirements: Rigid, airtight containers (e.g., metal cans, glass jars) that can withstand the high temperatures and pressure during the thermal processing.

2. Freezing:

- Description: Lowering the temperature of the food to suspend microbial activity and enzymatic reactions.

- Packaging Requirements: Moisture-resistant and oxygen-barrier packaging (e.g., plastic films, laminated pouches) to prevent dehydration and oxidation during frozen storage.

3. Drying/Dehydration:

- Description: Removing moisture from the food to inhibit microbial growth and enzymatic reactions.

- Packaging Requirements: Moisture-barrier packaging (e.g., plastic films, foil pouches) to maintain the low moisture content and prevent rehydration during storage.

4. Chemical Preservation:

- Description: Adding specific chemicals (e.g., preservatives, curing agents) to inhibit microbial growth and chemical reactions.

- Packaging Requirements: Barrier packaging (e.g., plastic films, coated paperboard) to prevent the migration of chemicals and maintain the desired atmosphere within the package.

Packaging Functions for Cooked Ham:

1. Containment: The primary pack for cooked ham, typically a plastic film or tray, provides a physical barrier to contain the product and maintain its shape.

2. Barrier Protection: The packaging acts as a barrier to prevent the ingress of oxygen, moisture, and other contaminants, which could lead to spoilage and quality degradation of the cooked ham.

3. Preservation: The packaging, in combination with other preservation methods like curing and refrigeration, helps extend the shelf life of the cooked ham by inhibiting microbial growth and chemical reactions.

4. Convenience: The packaging, such as resealable or easy-open features, provides convenience for the consumer in terms of accessing, storing, and using the cooked ham.

5. Branding and Information: The packaging displays the product's brand, nutritional information, and other relevant details, which are important for consumer communication and marketing.

6. Tamper Evidence: The packaging may incorporate tamper-evident features to ensure the product's integrity and safety.

Overall, the primary pack for cooked ham plays a crucial role in preserving the product's quality, safety, and convenience, while also serving as a platform for branding and communication.

**Question 2 (25 marks)**

**a) Briefly describe the functions of packaging**

**(7 marks)**

1. **Describe how a supermarket own brand paracetamol tablet is packed. How does this pack perform the functions of packaging?**

**(11 marks)**

1. **Using the primary pack described in part (b) above, describe how the secondary and tertiary packaging contribute to the packaging system performing the functions of packaging.**

**(7 marks)**

### Functions of Packaging:

Packaging serves several essential functions in the food industry and beyond:

1. \*\*Containment\*\*: Packaging holds and protects the product, ensuring it remains intact and undamaged during handling, transportation, and storage.

2. \*\*Protection\*\*: Packaging shields the product from external factors like physical damage, contamination, light, moisture, and temperature variations, preserving its quality and safety.

3. \*\*Preservation\*\*: Packaging helps extend the shelf life of products by preventing spoilage, microbial growth, and chemical degradation through suitable barriers and protective measures.

4. \*\*Information\*\*: Packaging provides essential details about the product, including ingredients, nutritional information, usage instructions, expiry dates, and safety warnings, aiding consumers in making informed choices.

5. \*\*Convenience\*\*: Packaging offers convenience in handling, storage, and usage, with features like resealable closures, easy-open designs, and portion control options.

6. \*\*Presentation\*\*: Packaging plays a crucial role in product presentation, enhancing the visual appeal, branding, and marketing of the product on the shelf or in the consumer's hands.

7. \*\*Brand Communication\*\*: Packaging communicates the brand identity, values, and messaging through design elements, colors, logos, and text, influencing consumer perception and loyalty.

### Supermarket Own Brand Paracetamol Tablet Packaging:

The packaging for a supermarket own brand paracetamol tablet typically involves blister packs or bottles with child-resistant closures. The pack performs the following functions:

1. \*\*Containment and Protection\*\*: The blister pack or bottle securely holds the tablets, protecting them from physical damage, moisture, and contamination.

2. \*\*Preservation\*\*: The packaging safeguards the tablets from environmental factors that could affect their efficacy, ensuring they remain safe and potent until consumed.

3. \*\*Information\*\*: The packaging includes essential details like dosage instructions, active ingredients, expiry date, and safety warnings, providing crucial information to the consumer.

4. \*\*Convenience\*\*: Features like easy-to-open blister packs or child-resistant closures enhance user convenience and safety during handling and storage.

5. \*\*Presentation\*\*: The packaging design and labeling convey a professional and trustworthy image, influencing consumer perception and purchase decisions.

### Contribution of Secondary and Tertiary Packaging:

1. \*\*Secondary Packaging\*\*: The secondary packaging, such as cartons or boxes, provides additional protection, branding opportunities, and information display for multiple primary packs. It enhances the product's shelf presence and facilitates efficient handling during transportation and stocking.

2. \*\*Tertiary Packaging\*\*: Tertiary packaging, like pallets or shrink wrap, ensures stability, security, and ease of handling for bulk quantities of primary and secondary packs. It optimizes storage space, facilitates transportation, and protects the products during distribution, contributing to efficient logistics and supply chain management.

**Question 3 (25 marks)**

1. **Products can be distributed through various distribution channels. Describe 5 ways how different distribution channels will change the risks of damage to product.**

**Distribution channel examples could include.**

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**Direct home delivery through courier,**

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**International deliveries by sea freight**

**Business to Business transfers**

**Cash and Carry Operations**

**(15 marks, 5 x 3 marks)**

1. **Identify 5 hazards faced by a bottle of whiskey during distribution. How can these be mitigated or managed?**

**(10 marks, 5 x 2 marks)**

## Distribution Channels and Product Damage Risks (15 marks)

The chosen distribution channel significantly impacts the risk of damage to a product. Here's how different channels can influence this risk:

| **Distribution Channel** | **Risk of Damage** | **Reasoning** |
| --- | --- | --- |
| **Industrial Bulk Delivery** | Lower | Large, sturdy containers and secure handling practices minimize damage. |
| **Direct Home Delivery (Courier)** | Moderate | Packages may be subjected to multiple handling points and potential rough treatment. |
| **Delivery to Retailers** | Moderate | Pallet stacking, loading/unloading processes, and potential warehouse storage can increase risk. |
| **International Sea Freight** | High | Extended transportation times, potential for extreme weather conditions, and container movements at sea pose a higher risk. |
| **Business-to-Business Transfers** | Moderate | Similar to deliveries to retailers, with potential for damage during palletization, loading/unloading, and storage. |
| **Cash and Carry Operations** | Lower | Products are typically pre-packaged and less prone to handling during distribution compared to direct deliveries. |

## Hazards Faced by a Bottle of Whiskey During Distribution (10 marks)

| **Hazard** | **Mitigation/Management Strategies** |
| --- | --- |
| **Impact:** Bottles hitting each other or against other products during transport. | Proper cushioning materials within the box, dividers to separate bottles, and secure strapping on pallets. |
| **Vibration:** Constant vibrations during transport can loosen caps or damage labels. | Secure caps and closures, additional internal bracing within the box to minimize bottle movement. |
| **Temperature:** Extreme temperatures can affect the quality of whiskey. | Temperature-controlled transportation (refrigerated containers) for heat-sensitive products. |
| **Moisture:** High humidity can damage labels or cause mold growth on packaging. | Moisture-resistant packaging materials, proper ventilation during container shipping. |
| **Rough Handling:** Accidental drops or improper handling during loading/unloading. | Clear handling instructions on packaging, training for personnel involved in handling, using appropriate lifting equipment. |

By implementing these mitigation strategies, the risks of damage to whiskey bottles during distribution can be significantly reduced.