REPORT ON THE NOVEMBER 2018 EXAMINATIONS

PIABC LEVEL 3 CERTIFICATE IN PACKAGING
(QN: 600/0455/1)
AND
PIABC LEVEL 5 DIPLOMA IN PACKAGING TECHNOLOGY
(QN: 600/0017/X)

This report is concerned with the November 2018 examinations of both the PIABC Level 3 Certificate in Packaging (QN: 600/0455/1) and the PIABC Level 5 Diploma in Packaging Technology (QN: 600/0017/X).

Version: 12 February 2019

PIABC LEVEL 3 CERTIFICATE IN PACKAGING

Unit A: The Fundamental Principles of Packaging

This Unit is assessed by a 2-hour examination in which candidates have to answer five questions.

Learning Outcome 1: Understand the role and functions of packaging

QUESTION 1

(This question is worth 25% of the marks for this unit)

A) Using tomato ketchup packed in a glass bottle as your example; describe how the primary pack fulfils the functions of packaging from the packer filler to the end user. (13 marks)
B) Considering the primary, secondary and tertiary packaging for the packed product above; describe THREE of the main mechanical hazards (3 x 1 mark), how they are caused (3 x 1 mark), and what their effects are (3 x 1 mark). Explain what can be done to mitigate the effects of these hazards in the supply chain. (3 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A - Establish the needs of the product then relate the functions show how the pack contains, protects and preserves. Be convenient at all stages of the supply chain. Inform, sell, be economically viable with due regard to the impact on the environment. Part B - Main hazards are Shock (bottle breaks), Vibration (label scuffs), Puncture (damage to pack), Compression, both static and dynamic (clamp truck pressure or stack resonance).
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Generally well answered, important to identify and discuss as marks lost when no discussion.

Learning Outcome 2: Understand the major packaging materials and how they are combined to form packaging components

QUESTION 2

(This question is worth 25% of the marks for this unit)

A) Glass, metals and plastics are used to pack instant coffee. For EACH of these materials:
   a) Describe a typical container and closure mechanism, including decoration. (3 x 2 marks)
   b) Identify the production processes involved to manufacture the container and closure. (3 x 2 marks)
   c) Explain the functional characteristics of the materials used which make them suitable to pack the product. (3 x 3 marks)
B) For ONE of the pack types; describe a typical secondary/tertiary packaging solution for this product. (4 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A - The question asks for descriptions of a typical container to hold instant coffee in glass, metal and plastic containers, identifying the production process and the materials' functional requirements. For example: a glass jar with a plastic screw cap/foil seal and paper label. Bottle is made by the press and blow process and glass is an absolute barrier to gas, moisture and odour. Part B - A typical secondary/tertiary pack could be a shrinkwrapped corrugated tray with ID label, palletised using layer pads, stretchwrap and pallet ID.

2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   There were some poor answers; marks were lost because process and material characteristics were missing or incorrect.

Learning Outcome 3: Understand the packaging development processes

QUESTION 3

(This question is worth 20% of the marks for this unit)

A) Identify SEVEN fundamentally different reasons why a company would change the packaging of an existing product. Use examples for each reason. (7 x 1 mark)

B) a) Describe the key steps required to develop a packed product from concept to product launch. (10 marks)
   b) List SIX disciplines (e.g. departments/functions) that would be involved in this process. (6 x ½ mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A – reasons include update of product's image with changing market demand (e.g. new graphics or change of container), add a seasonal message (e.g. Christmas graphics). Part B – steps to be described include defining the objective, developing the packaging brief, develop solutions, establish packaging materials and carry out pack testing, finalise the specifications, launch and review. Disciplines include marketing, sales, R&D, commercial etc.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Part A – well answered. Part B – reasonably well answered but some candidates did not fully describe what was happening at each stage so lost marks.

Learning Outcome 4: Understand packaging costs and quality systems

QUESTION 4

(This question is worth 15% of the marks for this unit)

A) a) Explain the difference between fixed and variable costs. (2 marks)
   b) In the manufacture of a glass bottle; identify FOUR of the most significant costs faced by the business (4 x ½ mark) and state whether they are fixed or variable (4 x ½ mark).

B) a) What is the purpose of a specification? (3 marks)
   b) How would you decide on the acceptability of the product? (3 marks)
   c) How does unacceptable quality affect profit? (3 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A - Variable costs include raw material and packaging component costs along with labour, storage and energy. Fixed costs include rent and rates, equipment cots with depreciation plus indirect labour. Part B – the purpose of a specification is to communicate exact needs, it provides a basis for judging production, allows for a fair basis for quotations and gives a benchmark for improvement. Acceptability by measurements, agreeing sampling and defect regimes. Unacceptable quality could cause loss of sales/customer confidence and possibly prosecution.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Part A - was well answered. Part B – some confusion on the purpose of a specification.

Learning Outcome 5: Understand the relationship between packaging and the environment

QUESTION 5

(This question is worth 15% of the marks for this unit)

The news media has been raising concerns about the impact of single use plastic and its effect on the environment.

A) Describe THREE ways in which plastic packaging can have a damaging effect on the environment. (6 marks)
B) Describe THREE ways in which plastic packaging can have a positive contribution on the environment. (6 marks)
C) Briefly describe how the environmental impact of a change in packaging can be assessed. (3 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A & B – damaging effects include unsightly litter, breakdown of polymer into micro particles affecting organisms in the food chain. Positive contribution includes extension to product shelf life with less going to waste. Plastic is also lightweight and transport costs are lower in comparison to some other materials. Part C – Could use LCA to calculate the impact of the product / pack from raw materials to disposal.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Parts A & B generally well answered. Part C needed more detail in the description.

PIABC LEVEL 5 DIPLOMA IN PACKAGING TECHNOLOGY

Unit 1: Packaging in Today's World

This unit is assessed by a 3 hour examination and candidates have to answer six questions.

Learning Outcome 1: Understand the role of packaging in the modern society

QUESTION 1

(This question is worth 10% of the marks for this unit)

A) Identify FIVE current social or economic changes that are impacting the way in which brand owners are using packaging. (5 x ½ mark)
B) Briefly discuss EACH factor explaining how the brand owner has responded. (5 x 1½ marks)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Factors for change include environmental concerns, globalization, mass customization, demographic changes, aging populations etc, with a description of how the packaging industry has responded to these changes.
   Marker 2: Candidates were expected to identify five social or economic changes and for each change consider how packaging has been modified to produce products which retail relevance.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Reasonably well answered but marks lost because it was important to identify and discuss.
   Marker 2: Generally this question was answered well with most candidates achieving high marks. A key issue for high marks was to have a wide range of issues and to clarify discuss the packaging response.

Learning Outcome 2: Understand the structure and interactions of elements in the packaging supply chain

QUESTION 2

(This question is worth 20% of the marks for this unit)

A) Define the terms primary, secondary and tertiary packaging; describing typical packaging for beer packaged in glass bottles to illustrate your answer. (9 marks)
B) For 12 bottles of beer packed in a wraparound corrugated case; explain how the case helps to overcome shock, vibration and compression hazards. In each case, comment on the contribution of the packaging in overcoming these hazards. (6 marks)
C) Describe some of the typical pre-shipment testing equipment used to evaluate the ability of packaged goods to survive storage and distribution process. (5 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Definitions of primary, secondary and tertiary packaging related to the packaging of beer in a bottle. For example, a corrugated case helps to cushion against shock by collapsing itself. There is little or no contribution from the fragile glass bottle. Tests include environmental chambers, drop test equipment, vibration and compression testing and actual transit test.
   Marker 2: Part A – candidates were expected to define primary, secondary and tertiary packaging and provide an example from beer packaging. Part B – candidates were expected to discuss how the suggested packaging could overcome shock, vibration and compression. Contributions from all parts of the pack should be considered. Part C – candidates were

expected to describe distribution testing equipment. The focus here is on the equipment rather than its use.

2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Definitions well answered except many students forgot to include a case and/or a pallet label. A reasonable description of the tests was required, not a simple identification.
   Marker 2: Most candidates provided good answers with several gaining high marks.

Learning Outcome 3: Understand the functions of packaging

QUESTION 3

(This question is worth 30% of the marks for this unit)

A) Using examples; describe FIVE different preservation techniques by which the shelf life of food is extended and the packaging implications. (5 x 2 marks)
B) Discuss how fruit filled biscuits in a plastic tray and flow-wrapped in a printed plastic film fulfils the functions of packaging for an internationally traded brand of biscuits. Include economic and environmental/legal factors. (8 x 2 marks)
C) For a packet of potato crisps; discuss how Modified Atmosphere Packaging (MAP) can be applied to extend the shelf life of the product. (4 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A - Methods included reducing the temperature which slows down chemical activity and development of micro-organisms. Therefore, the packaging must withstand being in a fridge or freezer, eg coated board, plastic copolymers to reduce brittleness in a freezer. Part B – a reasonable discussion of all the functions of packaging. Eg Contain - HFFS film with adequate cold seal or heat seal. Film tight against tray to prevent biscuits falling out. Tray designed not to puncture flow wrap and can give visual count (e.g. 3 biscuits per cavity). MAP for crisps requires an explanation about the product and how it will deteriorate with exposure to oxygen and moisture, then how the pack and the change in gases will extend shelf life.
   Marker 2: Part A - Candidates were expected to describe 5 different preservation techniques. This should include a statement on how the techniques aid the preservation e.g. chilling slows micro growth. For each technique the packaging implication should be identified and discussed e.g. dried food needs packaging in good moisture barrier with good seals. Part B – Candidates should discuss how the pack described performed all the packaging functions, including economic and environmental. A discussion is required at each point to demonstrate the relevance to this product and pack format. Part C – Candidates were expected to discuss how MAP is applied to crisps. The gas used; the effort on the product and the packaging used should all be considered.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Part A - Some students misunderstood techniques of preservation and described how packaging with improved barrier layers could improve shelf life. Although correct, marks were lost because the question asked for methods of preservation and the implications for packaging. Part B – generally well answered. Part C candidates did not always explain the needs of the product and then relate it to the pack and process.
   Marker 2: Most candidates provided good answers. Many lacked the detail to gain the highest marks. In Part A packaging requirements were omitted. Some candidates included similar issues as different techniques, MAP, vacuum, barrier materials and O^2 scavengers, so did not achieve full marks.

Learning Outcome 4: Know the principles of the key legislation, regulations and standards relating to the packaging supply chain

QUESTION 4

(This question is worth 15% of the marks for this unit)

A) Discuss how the intellectual property created during the development of packaging can be protected by legislation. (5 marks)
B) Discuss how changes in legislation, regulations and standards have influenced packaging practice. Use FOUR examples to illustrate your answer. (4 x 2 marks)
C) Identify FOUR possible consequences of failing to comply with legislation. (4 x ½ marks)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A. A discussion on how patents, trademarks and copyrights can be used to protect IP. Part B. An example could be that Food Information Regulations have introduced changes in how allergen advice and nutritional information are displayed on packs. Part C. Consequences include fines, impact on reputation and loss of sales.
   Marker 2: Part A – Required a discussion of legal protection for IP e.g. trademarks, patens and copywrite. The packaging implications must be considered. Part B – Any 4 legislation/standards changes could be considered. There must be a significant packaging related implication, this implication should be discussed. Part C – Four possible consequences of not complying with legislation should be identified.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Most students answered this well. It is important to include appropriate examples to illustrate the answer.
   Marker 2: Generally this question was answered well with many students obtaining good marks. The main reason for loosing marks was not providing a relevant packaging example.

Learning Outcome 5: Understand the factors that affect the impact of packaging on the environment

QUESTION 5

(This question is worth 15% of the marks for this unit)

A) Using examples; discuss SEVEN environmental factors that need to be considered when making packaging choices. (7 x 1 mark)
B) Identify FOUR methods of managing consumer packaging after its first use (4 x ½ mark) and describe the relevant considerations for each method (4 x 1½ marks).

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A. Environmental considerations include depletion of the earth's resources, energy consumption during extraction and production, air/water/land pollution, transportation issues etc. Part B. Descriptions of the 4 R's with appropriate considerations e.g. incineration with energy recovery involves, collection and sorting – materials must have a high calorific value, capital investment – high capital cost, environmental – issues with disposal of incinerated waste, social impact – local population often suspicious of process, economics.
   Marker 2: Part A required identification of 7 different considerations from an environmental viewpoint and examples of these. Part B was considering 4 methods of post consumer waste treatment. The issues to be considered for each should be described.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Reasonable answers but marks lost when answer lacked depth.
   Marker 2: Most students provided reasonable answers. Some lack of detail limited the marks awarded.

Learning Outcome 6: Understand the relationship between packaging and marketing

QUESTION 6

(This question is worth 10% of the marks for this unit)

A) Describe the FIVE activities that a marketing professional must complete when developing a new product. (5 x 1 mark)

B) a) Identify the FOUR P's of marketing in the marketing mix. (1 mark)
b) Briefly describe how packaging relates to each of the FOUR P's. (4 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A - Functions of Marketing include. Identify the need for a product or service. Identify the market sector. Determine the price. Decide the strategy for distribution. Decide the product and pack attributes (or brand values). Part B – The 4 'P's of marketing are Product, Price, Promotion and Place.
   Marker 2: Part A required the candidates to describe "the" 5 marketing activities associated with NPD. A brief discussion of the issues associated with each activity was expected. Part B State the 4 P's. For each P describe how it has an impact on packaging. There must be a clear relationship to the packaging.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Generally well answered but marks lost when answer lacked depth.
   Marker 2: Generally answered well. Some students lost marks in Part A for only focusing on 1 aspect of the role e.g. 5 methods of conducting market research.

Unit 2: Packaging Materials and Components (Paper A)

Paper A is worth 70% of Unit 2 and is assessed by a 3 hour examination. Candidates have to answer five questions. Candidates have the option to answer two out of three question for both Learning Outcomes 1 and 3.

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 and candidates were required to answer two of the following three questions: 1, 2 & 3

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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A – Properties included tear, tensile strength, deadfold, rigidity/weight, stiffness etc. Part B – discussion on the gas and moisture barriers could have been used. Part C – discussion required about the differences between hard, soft and recycled fibres and their impact on the pack.
   Marker 2: Part A - Candidates were expected to discuss 4 properties of paper which make it suitable for packaging. The properties expected were the intrinsic properties. Some detail was expected e.g. the applications where this is important, the factors with affect this property. Part B - Candidates were expected to discuss 2 characteristics of paper which limit use, and then to identify how these can be overcome. Part C – Candidates were expected to discuss the impact of different materials e.g. hard/soft woods and recycled papers on the properties.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Parts A and B were not well answered. There needed to be much more detail in the discussion.
   Marker 2: Most candidates provided reasonable answers however none provided excellent answer. Points were stated with limited if any discussion of the issue. In Part B only coating or laminations were considered, other additives or processes were not considered.

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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A required the key ingredients and and a % of their proportions eg Silca sand 68-72%. Part B expected candidates to explain the difference between Type I borosilcate glass used in vials, Type II dealkalized glass used for alkali sensitive drugs like eye drops and TypeIII

normal soda glass used in cough syrups etc. Part C characteristics /properties included gas, odour and moisture barriers, dimensions for fit of closure and line running, compression and squeeze strength.
Marker 2: Part A – Candidates were required to identify the main ingredients required to make glass, and provide approximate proportions. Part B – Candidates were expected to provide a description of the three types of pharmaceutical glass. For each type, the description should be supported with an example of where this would be used and how this is different from other glass. Part C – Candidates had to identify 4 characteristics of a glass jar for instant coffee. These could be intrinsic (e.g. clarity) or extrinsic (e.g. dimensions). For each characteristic selected the reasons why this is important should be discussed.

2. Overall comment on students' performance, quality of answers and how students could answer better in the future
Marker 1: Part B was poorly answered; candidates did not know the main differences between the three types of glass.
Marker 2: Few students answered this question. Some answers demonstrated an excellent understanding of the topic, while others were poor, demonstrating that the candidate did ot understand the issues.

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)

Examiners Comments

1. Summary of what was expected in the answer
Marker 1: Properties of HDPE which make it suitable to hold bleach include a MFI suitable for extrusion blow moulding which is much more cost effective than injection blow moulding. A good moisture and vapour barrier with good chemical resistance. It is stiff when moulded and has good impact strength. It is also susceptible to environmental stress cracking which might mean that it is unsuitable for some chemicals and will require testing against the chemicals being used.
Marker 2: Candidates were expected to justify the use of the given polymer material for the specified application. The answers needed to take into consideration the particular requirements of the application. The properties of the material which make the material suitable need to be identified and discussed in relation to the application.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
Marker 1: Marks were lost because candidates needed to discuss the polymer properties in detail for the given application. Saying a material has a good barrier to something, it then needs to be linked to the product and explained why.
Marker 2: Most students made reasonable attempts however few scored high marks. Properties were not considered with respect to the product (e.g. O^2 barrier for carbonated water) or were not a material property (e.g. the provision of handles for a bleach bottle).

Learning Outcome 2: Understand the synthesis and properties of polymers

QUESTION 4

(This question is worth 20% of the marks for this paper)

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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A – for example thermoset polymers are long molecules bonded together by cross links and once melted and set, they cannot be re-melted. Degradation temperature is lower than meting temperature. Examples: Phenol formaldehyde, Urea formaldehyde, Epoxy, Polyurethane, Cross Linked PE and used in closures, lamination adhesives and foams. Part B – for example, orientation of the molecules by stretching will align the molecular chain in the direction of stretch and can affect properties such as gas transmission rate, tensile strength and crystallinity.
   Marker 2: Part A – Candidates were required to define what a polymer is. Part B – Candidates required to describe the three polymer types. For each description some indication should be provided of their properties and how these are achieved. An example of a polymer example for each type was required with a typical application. Part C – For each property a brief description should be provided to explain how this affects the performance of the polymer. Some description is to how this effect is achieved would be expected.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: The differences between thermoset, thermoplastic and thermoplastic elastomers was not answered well because of lack of detail. There was confusion of polymer properties especially with glass transition temperature and crystallinity.
   Marker 2: Most candidates demonstrated some understanding of the differences in thermoplastics and thermosets. TPE understanding was less clear. Few candidates appeared to have a good understanding of the glass transitation temperature. Several candidates were confused with chain branching, suggested more branching increased density.

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 and candidates were required to answer two of the following three questions: 5, 6 & 7

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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A required a description of the construction of folding boxboard (chemical and mechanical plies) and the process of manufacture. Part B requireda short discussion on coatings, extrusions and laminations.
   Marker 2: Part A – Candidates were expected to describe the make-up of FBB, describing the layers of material. The manufacturing process was required to be described using a foudrinier machine. The various steps of this process from the pulp in the headbox through the wire, pressing in the felts, drying and surface coating. Candidates were expected to discuss how the process affected the board properties. Part B Candidates were required to describe how additional off line processes could be used to modify the material properties (e.g. lamination or metalisation).
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Generally answered poorly because the steps in the foudrinier process were not covered in enough detail nor in the right sequence.
   Marker 2: This question was in general answered very poorly. Candidates did not focus on the required elements of the process, pulping and conversion to cases was not required. Some answers displayed a poor concept of the paper making process with paper being stretched to orientate fibres or the pulp rolled between rollers to make thinner paper.

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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A – A description of raw material and additives used though the plasticating extruder, into the circular extrusion die, blowing, cooling, collapsing and reeling up. Followed by QC checks and packing ready for dispatch. Part B – a description of vacuum metalizing. Part C – dry bond or adhesive lamination techniques. Part D an explanation of how a gusseted bag is formed.
   Marker 2: Part A – Candidates were expected to describe the manufacture process for a PE blown film including extruder, blown film and winding. Part B – Candidates were expected to

describe the metalisation process for PET film. This was not lamination. Part C – Candidates were expected to describe a solventless or dry bond lamination process for producing laminate sheet. Part D – Candidates were expected to describe the application of a zip lock type strip to the film and then pouch forming process.

2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Part A was poorly answered because there was not enough detail about the plasticating extruder and the blowing of the bubble.
   Marker 2: In general this question was answered poorly. Very little detail was provided for the manufacturing processes when the correct process was described. Many students described alternative processes (e.g. lamination with aluminum rather than metalisation). A diagram of the process, even of correct is not sufficient to gain high 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)

Examiners Comments

1. Summary of what was expected in the answer
   Marker 1: Part A – the 5 main processes include 3 piece cans, drawn can, draw and redraw, draw and wall iron and impact extrusion along with suitable examples. Part B – a description of how a general line can is decorated, embossed and printed.
   Marker 2: Part A - Candidates were expected to identify 5 processes for producing hermetically sealed metal packs and provide an example of the use for each one. Part B required the candidates to provide a detailed description of the manufacturing process for an embossed printed general line can. This should formation of the walls, base and lid, and the seaming of the base to the walls.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Marker 1: Students lost marks because they did not describe the process correctly, often getting the sequence wrong.
   Marker 2: Most candidates provided a description of a reasonable process however few provided enough detail to gain high marks. Listing in the correct order the processes used is not a description of the manufacturing process.

Unit 2: Packaging Materials and Components (Paper B)

Paper B is worth 30% of Unit 2 and is assessed by a 2 hour examination. Candidates have to answer three questions.

Learning Outcome 4: Understand the raw materials, properties and applications of packaging adhesives

QUESTION 1

(This question is worth 30 marks for this paper)

A) Describe the TWO theories of adhesion. (5 marks)
B) Justify why the adhesive identified below is appropriate for each application (4 x 2 marks) and describe the process of how the adhesive bond is achieved (4 x 2 marks):
- A starch adhesive used for construction of corrugated board.
- A polyvinyl acetate (PVA) used for the manufacture of a manufacturer's joint on a carton board box.
- A hot melt adhesive for closing the flaps on corrugated cases.
- An acrylic based adhesive for a self-adhesive label

C) A laminated film has delaminated in places; discuss possible reasons for this. (9 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A – Required a description of mechanical and chemical adhesion theories. Part B – For each situation presented a justification as to why the adhesive was appropriate for this application was expected. The justification required a description of why the adhesive is good for this application. The description of the bonding process required some information on what is done to achieve a bond and the chemical process going on within the adhesive as the bond is achieved.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   The quality of the answers were variable. Some candidates provided good description, while others appeared to have little understanding of how these adhesives worked. Some candidates failed to state obvious points e.g. hotmelts achieve bond by cooling.

Learning Outcome 5: Understand the different types of labels and the materials used

QUESTION 2

(This question is worth 30 marks for this paper)

A soft drink is packed in a glass bottle with an oval shaped label.

A) a) Discuss FIVE important properties of the paper substrate for an oval wet glue paper label. (5 x 1 mark)
   b) How would these properties be assessed? (5 x 1 mark)
B) Describe the production process for an oval wet glue paper label from concept to labels ready for despatch. (10 marks)
C) Discuss the advantages and disadvantages of the following as an alternative method of decoration:
- Pressure sensitive labels (5 x 1 mark)
- Shrink sleeves (5 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A – This required a discussion of 5 different paper properties for a label. This is just the base paper not the finished label. Part B – Description of the manufacturing process for wet glue label from concept through design, pre-press, printing, cutting and packaging for despatch. Part C – Comparison of wet glue labels with both PSL and shrink sleeves.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Part A was in general answered poorly with few candidates concentrating on the paper properties. Many included issues for the label e.g. orientation size, etc. Part B – few students provided well balanced answers. Few described the typical manufacture method. Most answers concentrated on pre-press activities. Part C was in general answered well by most candidates.

Learning Outcome 6: Understand closure systems and the factors that affect seals

QUESTION 3

(This question is worth 30 marks for this paper)

A) Discuss, using examples, FIVE key requirements of closure systems. (5 x 2 marks)
B) Describe how an effective closure is achieved for each of the following packs:
   - A food can (5 marks)
   - A linerless cap on carbonated drink bottle (5 marks)
   - A locking tuck flap carton (5 marks)
   - A flexible retortable pouch (5 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A required the identification of 5 different functions of a pack closure and an example of each to be described. Part B required a discussion of 4 different closure type and for each type the closure should be described. For each type the candidate is expected to describe how an effective closure is achieved e.g. crimping metal layer of food can with filler between layers to provide seal. A description of how the closure mechanism is achieved should be provided.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Part A – A wide variation in performance was evident. Candidates scoring highly tended to provide clear structured answers. Part B – Again some variation in quality of answers however most candidates provided some reasonable descriptions. Tuck flat cartons was the least well answered section.

Unit 3: Packaging Processes

This unit is assessed by a 2 hour examination and candidates have to answer five questions.

Learning Outcome 1: Understand the packaging design and development process

QUESTION 1

(This question is worth 20% of the marks for this unit)

A) A packaging design brief can be used to provide the information required prior to developing a pack. Briefly discuss the information which should be included in such a design brief. (10 marks)
B) Discuss why good project management is important in the packaging development process. (6 x 1 mark)
C) Discuss how packaging design can make counterfeiting packs more difficult and identification of counterfeit packs easier. (4 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A. A discussion on the requirements of the product, the market and its distribution. Part B. Good project management will identify all relevant personnel and their roles, map activities and ensure plan is kept on track. Can also assist in budget monitoring. Part C. Anti-counterfeiting activities include customized packaging, difficult to copy features and hidden additives.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Generally well answered, important to use examples to illustrate the answer as part of the discussion.

Learning Outcome 2: Understand the main printing and decoration processes used in packaging

QUESTION 2

(This question is worth 20% of the marks for this unit)

A) Define and explain the following printing terms:
   a) Hue (1 mark)
   b) Brightness (1 mark)
   c) Saturation (1 mark)
B) Describe, with the aid of diagrams, the gravure print process explaining:
   a) the construction and manufacture of the printing cylinders and the TWO main methods of engraving. (2 mark)
   b) the type and composition of ink used. (2 marks)
   c) the printing and finishing process itself to create a reel of film for despatch to the packer. (8 marks)
C) Identify FIVE advantages (5 x ½ mark) and FIVE disadvantages (5 x ½ mark) of the gravure print process.

Examiners Comments

1. Summary of what was expected in the answer
   Part A. Definitions of Hue, Brightness and Saturation. Part B. A full explanation of the gravure printing process including how a gravure cylinder is made, the types of inks and their constituents and the printing process itself. Part C. Advantages include high quality of print and very high printing speeds whilst disadvantages are cost of cylinders and high set up costs.

2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Reasonable answers but most marks lost on how gravure cylinders are made.

Learning Outcome 3: Understand packaging machinery and packaging line operations

QUESTION 3

(This question is worth 20% of the marks for this unit)

A) Describe the packing operation for packaging six individual apple pies (pre-baked in single aluminium trays) from receipt of packaging components to product ready for despatch to customer. (14 x 1 mark)
B) Outline how accumulators can improve the efficiency of a filling line. (3 marks)
C) Discuss the relative merits of shrink and stretch film to stabilizing pallet loads (3 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A. Description of process – check components into store/line, de-nest trays and feed onto line, fill with pies, may or may not be flow wrapped etc. A flow diagram helped to ensure stages were not missed out. Part B. Accumulators isolate a section of a line to production can continue with any line stoppages. Part C. Shrink films require heat and films are generally thicker but can provide almost complete protection. Stretch films is a lot thinner but can adjust to movement in transit due to its nature.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   The process was well answered but a better understanding of the difference between shrink and stretch films was required.

QUESTION 4

(This question is worth 20% of the marks for this unit)

Frozen prawns are automatically packed into film based 1kg bags.

A) Describe how the correct amount of product can be metered. (6 x 1 mark)
B) The frozen prawns are filled on a vertical form fill seal bagging machine. Describe the operation of this equipment and any specific considerations required for this product. (10 x 1 mark)
C) a) Describe the factors to be considered to ensure a good heat seal. (2 x 1 mark)
   b) How can this seal be assessed? (2 x 1 mark)

Examiners Comments

1. Summary of what was expected in the answer
   Part A. A description of multi head weighing process is probably to optimal solution although manual systems may work. Part B. A full description of VFFS noting film tensioning, enough time to ensure seal has cooled before heavy product is dropped onto seal. Part C. A description of the time, temperature and pressure factors linked to type of film and product used. Assess by tensile test and leak testing.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Generally well answered but important to note the considerations of the filling process.

Learning Outcome 4: Understand how quality systems impact on packaging

QUESTION 5

(This question is worth 20% of the marks for this unit)

A) Describe the role of a Quality Management System (2 marks) and identify FOUR key principles of such a system (4 x 1 mark).
B) What are the purposes of a specification and why are they important? (4 marks)
C) Identify and briefly describe the technical information you would expect to see on a purchasing specification for a printed reel of film intended for direct food contact. (7 marks)
D) How would you decide on the acceptability of the deliveries? (3 marks)

Examiners Comments

1. Summary of what was expected in the answer
   Part A. A QMS allows an organisation to identify and reduce non conformances against a specification and meet customer expectations in a cost effective and consistent manner. This can be achieved by adopting appropriate principles to improve performance, the involvement of all staff and continual improvement etc. Part B. A specification can communicate a company's exact needs to their supplier, it gives a basis for accepting components, serves as a benchmark for improvement and is a legal document. Part C. A brief description covering film construction, materials, dimensions, decoration, performance requirement, delivery and storage with basis for acceptance. Part D. Acceptability of delivery by using measurements, AQL's, sampling regimes etc.
2. Overall comment on students' performance, quality of answers and how students could answer better in the future
   Reasonable answers but a better understanding of a QMS and what was expected on a specification would have gained more marks.