The Irish Packaging Society
Affiliated to the Institute of Materials, Minerals and Mining

SUMMER EXAMINATIONS 2022

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

COURSE: **CPD Diploma in Packaging Technology**

DATE: **12th May 2022**
10am to 12pm

EXAMINERS: Tony Duffy, David Little

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) The definition of packaging encompasses three general aspects. Discuss these three aspects and their importance to a finished packed product.

(10 marks)

b) Choose three of the following and state whether the following statements are True or False and briefly explain why.

1. Recycling is placing packaging material in your green bin.
2. Recycled material is economical.
3. We should recycle everything.
4. Incineration is environmentally unsound.

(3 x 5 marks)

Question 2 (25 marks)

a) Compare and contrast the difference in the supply chain hazards experienced if one is distributing an FMCG product to a multiple, compared to the delivery of an on-line order of one item to someone's home.

(10 marks)

b) The Hazards of Distribution can have a major effect on packaging and product damage. Discuss five of the general impacts, experienced by packaging in the Supply Chain.

(15 marks)

Question 3 (25 marks)

a) Discuss how vibration can be measured and processed.

(9 marks)

b) Describe what the natural frequency is and its importance in causing vibration damage in distribution.

(5 marks)

c) Shock from drops can be measured with an accelerometer. Discuss how the shock pulse can be analysed with the aid of the damage boundary curve to determine if the shock is likely to have caused damage.

(7 marks)

d) Briefly describe the factors which will impact on the frequency and intensity of shock which a pack will experience in distribution.

(4 marks)

Question 4 (25 marks)

a) A computer specification states that the product has a fragility of 50G. Explain what this means and describe how a packaging engineer should use this information in designing the distribution packaging.

(4 marks)

b) The concept of an ideal cushion material can be used to design appropriate cushioning. Discuss the characteristics of an ideal cushioning material.

(6 marks)

c) A laptop weighs 1.5 kg. It is estimated that it has a fragility of 100G. The manufacturer wants to protect this product from falls of up to 2 m during distribution using expanded polystyrene. Product data states that the expanded polystyrene has a cushioning factor of 3.1 and has a maximum static stress of 13.7 kPa.

Calculate the thickness and the area of cushioning required.

(6 marks)

d) A pack falls from 1 m hits the ground and rebounds 250 mm. Calculate the impact velocity, the rebound velocity, and the coefficient of restitution.

(9 marks)

Note:

$t = Ch/G$

Where
t is Cushion thickness
C is cushion factor
h is drop height
G is fragility factor

$V^2 = U^2 + 2as$

Where
V is final velocity
U is initial velocity
a is acceleration due to gravity, (9.8 ms^{-1})

s is the distance travelled.

(15 marks)

Question 5 (25 marks)

a) Describe the various methods of preserving cooked foods produced industrially. Pick one method and describe and illustrate the process in more detail.

(15 marks)

b) Identify and briefly describe FIVE abiotic mechanisms for product spoilage. Explain how the effect of these spoilage mechanisms can be reduced giving examples to illustrate your answer.

(10 marks)