Qualifications

Diploma in Packaging

Module 3

Examination Syllabus 2019

Unit 1: Resource Management

Topic	Candidates should understand and be able to demonstrate using detailed examples:

Environment	• Sustainability and climate change
	• Energy conservation
	  ○ principle energy consuming activities
	  ○ energy reduction strategies
	• Water conservation
	  ○ purposes for water in packaging operation
	  ○ water conservation strategies
	• Waste minimisation
	• Packaging waste

Health and safety	• Fundamental considerations
	  ○ health and safety in the food and drink industry
	  ○ relevant national and local legislation and regulations
	  ○ principle of duty of care
	• Management
	  ○ organisational structure and responsibilities regarding health and safety
	  ○ measuring and reviewing performance and training
	• Understanding of workplace hazards and precautions
	  ○ techniques for assessing hazards and risks
	  ○ safe working practices
	  ○ accident investigation and reporting

Utilities	• Water use and treatment
	  ○ different types of water and their uses
	• Effluent use and treatment
	• Compressed air
	  ○ common systems for compressed air production
	  ○ components of air distribution systems
	  ○ quality requirements for packaging operations
	• Managing utilities
	  ○ typical utilities usage figures for packaging
	  ○

Maintenance	• Aims of maintenance
	• Approaches to maintenance
	• Maintenance tasks
	  ○ types and variety of maintenance tasks in packaging
	• Organisation
	  ○ planning of maintenance activities
	• Performance improvement
	  ○ principle performance initiatives

Unit 2: Fluid Mechanics

Topic	Candidates should understand and be able to demonstrate using detailed examples:

Principles of fluid mechanics	• Forms of fluid and fluid energy
	• Properties of moving fluids
	• Friction loss
	• Pumps
	  ○ centrifugal pumps
	  ○ positive displacement pumps
	  ○ cavitation and net positive suction head (NPSH)
	• Valves
	  ○ design features and merits of different types of valves

Process gases	• Gases used and typical applications
	• Gas laws
	  ○ equations relating to pressure, temperature, volume and density using the perfect gas laws
	  ○ universal gas law and gas constant
	  ○ Dalton's law of partial pressures
	• Gas solubility
	  ○ Henry's law and the concept of gas/liquid equilibrium
	  ○ gas/liquid solubility and temperature
	  ○ effects of hydrostatic head
	• Gas dissolution
	  ○ principles of dissolving gases in liquids
	  ○ typical equipment for measurement and control
	  ○ effects of temperature and pressure on carbonation levels in beer
	• Carbon Dioxide
	  ○ CO_2 recovery and pre-treatment
	  ○ liquid CO_2 storage and vaporisation methods
	• Nitrogen
	  ○ nitrogen specifications
	  ○ supply, storage and vaporisation

Unit 3: Heat Transfer

Topic	Candidates should understand and be able to demonstrate using detailed examples:

Principles of heat transfer	• Forms of heat energy
	  ○ definition of specific heat
	  ○ latent heat and exothermic heat
	  ○ calculations of energy change
	• Heat transfer mechanisms
	  ○ conduction, convection and radiation
	  ○ calculation of the overall heat transfer coefficient
	  ○ effects of fouling and scaling
	• Heat exchanger sizing
	  ○ concept of the heat balance and heat transfer across a temperature gradient
	  ○ co-current and counter-current flow in a heat exchanger
	• Plate heat exchanger designs
	  ○ construction, components and configuration of a heat exchanger
	  ○ importance of fouling/scaling problems
	  ○ CIP techniques
	  ○ heat exchanger calculations
	  ○ heat exchanger applications in packaging
	• Jacketed vessels
	• Shell and tube heat exchangers
	  ○ shell and tube heat exchanger designs and configurations
	  ○ applications in packaging
	• Insulation
	  ○ function of insulation
	  ○ choice of materials

Steam	• Steam properties
	  ○ reasons for using steam
	  ○ temperature-energy relationship as illustrated in the Mollier chart
	  ○ steam tables
	  ○ specific heat of liquid water
	  ○ latent heat of vaporisation
	• Steam raising and distribution
	  ○ boiler design
	  ○ pipe sizes, arrangements and design velocities
	  ○ insulation
	  ○ steam traps
	  ○ control valves, reducing vales and relief valves
	  ○ legal requirements in having a properly designed, safe system with the correct protection measures

	• Principal steam applications

Refrigeration	• Refrigeration theory
	  ○ definition of refrigeration
	  ○ concept of pressure/temperature equilibrium in relation to the vapour-compression refrigeration process
	  ○ refrigeration cycle
	  ○ function of evaporator, compressor, condenser and expansion valve
	• Refrigeration practice and the refrigeration cycle
	• Principal plant items
	  ○ compressors
	  ○ condensers
	  ○ evaporator and expansion devices
	• Primary refrigerants
	  ○ purpose, design and choice
	  ○ available refrigerant types and costs
	  ○ physical and chemical properties
	• Secondary refrigerants
	  ○ purpose, design and choice
	  ○ chemical properties
	  ○ safety and environmental concerns
	• Refrigeration applications

Unit 4: Process Control

Topic	Candidates should understand and be able to demonstrate using detailed examples:

Process control	• Basic control elements
	  ○ Sensors, controllers and actuators
	• Basic on/off control
	  ○ Timers, thermostats, pressure switches, proximity switches and others
	• Sequence control
	  ○ description of programmable logic controller (PLC)
	  ○ examples of plc applications
	• Aim of process control
	• Principles of process control
	• Control arrangements
	• Typical control systems
	• Actuation
	• Control system arrangements
	  ○ self-actuating controllers
	  ○ individual electronic analogue controls
	  ○ small local computer control
	  ○ Supervisory Control and Data Acquisition (SCADA), Management Information Systems (MIS) and other large digital systems
	  ○ comparative costs

Instrumentation	• Factors determining the choice of sensors
	• Typical conventional sensors
	  ○ including pressure, volume flow, temperature, mass flow level and vessel contents
	• Typical analytical sensors
	  ○ including CO_2, O_2, optical devices, pH, density and alcohol content

Unit 5: Materials of Construction

Topic	Candidates should understand and be able to demonstrate using detailed examples:
Classification, properties and duties of materials	• Carbon and low alloy steels • Stainless steels • Other metals including copper (and alloys), aluminium and cast iron • Plastics and glass • Civils finishes • Corrosion