**Occupational Specialist** **Content**

Specialist content is structured into different occupational specialisms, which correspond to the apprenticeship standards listed on the relevant occupational map. Occupational specialisms ensure students develop the knowledge and skills necessary to achieve a level of competence needed to enter employment in the occupational specialism, and are organised around ‘performance outcomes’ that indicate what the student will be able to do, as a result of learning and applying the specified knowledge and skills.

**Occupational Specialism in Science for the Animal Care and Management T Level**

**Performance Outcome 1: Apply research methods to collect and analyse scientific information on animal conservation and husbandry**

**Knowledge specific to Performance Outcome 1**

For this performance outcome the expectation is that students research an animal with which they are unfamiliar.

**Sources of knowledge**

* Internal sources including the importance of confidentiality.
* External sources.
* Characteristics of reliable sources, e.g., accuracy, availability of references, acknowledgement of peer review.
* Fact, opinion and bias: what each means and the differences between them.
* Scientific nomenclature of taxa used for gathering information.

**Research process, methods and design**

* Research briefs including instructions, objectives, context, target audience, format of output.
* Research methods including the differences between qualitative and quantitative collection methods and how they are used.
* Design characteristics, e.g., descriptive, comparative, single animal case studies.
* Primary and secondary research methods.
* Hazards associated with undertaking primary research
	+ associated risks
	+ organisational and personal control measures used to manage risks.
* The importance of animal research, the types of research undertaken, key stakeholders involved in research and the contribution they make to conservation and improved animal care and welfare.

**Data collection, handling and processing**

* Purpose of data collection including its role in answering questions, making decisions and implications of findings.
* Formats including:
	+ those requiring future accessibility, for example, non-proprietary, open, with documented standards
	+ appropriate formats, for example, image, text, audio, database.
* Data analysis methods and techniques including quantitative (e.g., descriptive statistics, mathematical) and numerical (e.g., graphs, tables, charts and diagrams) and qualitative, e.g., themed.

**Animal conservation**

* Ethics of human-animal interaction, the freedoms and opportunities that are available and restricted and how these are applied in conservation activities.
* Ethical concerns of the public and how actions of key stakeholders mitigate those concerns.
* The changing role of zoos and other national and international organisations (e.g., International Union for Conservation of Nature (IUCN), One Plan) in conserving species and breeds and their habitats and techniques and actions that are used (e.g., IUCN red listing, ZSLs Edge programme, and Biodiversity Action Plan (BAPS)).
* Techniques (e.g., direct observation, genetic mapping) and technologies (drones, GPS) used to assess the conservation status of a species and breeds and habitats
* how key stakeholders apply them
* factors that affect the need for conservation
* methodologies for resolving conservation issues including captive population management and its effectiveness (e.g., same sex groups, breed and cull)
* impact of conservation action and lack of action on biodiversity and ecosystems.

**Animal husbandry and welfare**

* Husbandry and welfare considerations
	+ Feeding and watering including dietary needs and ways of presenting food
	+ Grooming and bathing including practical methods and equipment used as appropriate to species
	+ Exercise needs including type, frequency and quantity, environment

**Validation and presentation**

* How to interpret findings from research including validity, reliability, limitations and how to draw conclusions.
* Presentation methods for example graphical, tabular, reports, presentation software and including awareness of audience type.

**Skills specific to Performance Outcome 1**

* Identify and source suitable information for analysis.
* Use appropriate primary and secondary research methods to gather information for scientific analysis.
* Use appropriate tools to gather information including survey tools, key word research tools, scientific nomenclature and desktop research.
* Check and verify information to ensure it is complete, accurate, appropriate and of good quality.
* Present research data to inform conservation and improved animal care and welfare.
* Interpret research briefs.
* Assess the validity of research findings against original proposal or brief.
* Present scientific research findings in an appropriate format for the information obtained and target audience.

**Performance Outcome 2: Observe the behaviour, security and population management of animals**

Students must develop knowledge about a range of mammals, birds, herptiles, aquatics and invertebrates.

**Knowledge specific to Performance Outcome 2**

**Legislation**

* Legislative requirements for breeding animals including the Animal Welfare Act and species’ specific legislation.

**Animal biology**

* Classification, including the use of modern technologies for classification, of living organisms and their evolutionary relationships
	+ the basic principles of natural selection and evolution that lead to speciation
	+ different classification systems and how they may change in response to new evidence
	+ distinguishing features used to establish evolutionary relationships between animals

**Breeding captive animals**

* Planning considerations for population management.
* Reproductive strategies and conditions needed for breeding for species
	+ mate recognition systems, survival strategies and how these are used to benefit species, maternal and paternal care of neonates and strategies used by mammalian and avian species.
* How animal evaluation before mating can maximise breeding success.
* Breeding programmes
	+ selection and mating schemes and response to selection
	+ breeding value estimation
	+ pedigrees and inbreeding
* Breed profiles, sources of information, use of equipment, handling techniques

**Breeding management**

* Factors to consider when selecting and managing breeding stock
	+ management of female from conception to birth
	+ potential problems that could occur in the management of the female from conception to birth
	+ the care requirements of offspring from birth to weaning and the problems that could occur in the offspring from birth to weaning
	+ care plans and implementation including the monitoring and recording progress of the offspring’s first 24–48 hours of life and development to weaning or adulthood
	+ Lifetime reproductive performance

**Genetics and genetic manipulation**

* Reproductive technologies including
	+ infertility treatments
	+ superovulation
	+ ovulation indicators
	+ embryo transplants
	+ artificial insemination
	+ genetic engineering, pregnancy diagnosis and gene therapy.
* Gene interactions, mutations (spontaneous and induced mutations) and gene manipulation techniques used including the advantages and disadvantages
* Mendelian inheritance and genetics including the interpretation of Punnett Squares.

**Animal behaviour**

* Characteristics and causes of natural, atypical, desirable and undesirable behaviour for a species.
* How required behavioural changes are identified, including through observation sampling techniques, scrutiny of records, the types of information provided and how these are used to support planning and evaluating impact of activities to influence behaviour.
* The impact that nutrition (e.g. type of nutrients, diet, timing of food and water intake) can have on animal behaviour and how this can be managed to positively influence behaviour.
* Relationship between environmental factors (e.g. bedding, noise), health, wellbeing, learning and positive behaviour.
* Social needs of animals, how they may vary at different life stages, different ways in which they can be met and how they affect the behaviour and potential for learning.

**Ethics**

* Regulatory issues and regulation of genetic technologies in animals including the role of the Food Safety Authority (FSA).
* Ethical considerations of changing animals through genetic modification.
* Use of animals that have been genetically transformed in biotechnology including advantages and disadvantages.

**Skills specific to Performance Outcome 2**

* Create plan(s) for population management
* introductory meeting of a species
* individual suitability
* practical set up
* potential issues.
* Identify the uses for reproductive technologies.
* Examine how genetic manipulation advances animal breeding in captive animal populations.
* Observe, record, report and interpret the behaviour of captive or wild animals in response to a range of stimuli.
* Investigate how the development of behaviour in captive or wild animals has led to evolutionary benefits for the species.
* Show how the inherited characteristics of domestic animals are the result of gene interactions.
* Consider the regulatory and ethical dimensions of the genetic manipulation of animals.

**Performance Outcome 3: Plan for and manage the good health and welfare of animals**

Students must develop knowledge about a range of mammals, birds, herptiles, aquatics and invertebrates.

**Knowledge specific to Performance Outcome 3**

**Animal biology**

* How body systems function when in good health including the circulatory, respiratory, reproductive, excretory and musculoskeletal systems and adaptations to lifestyle and diet.
* Cells and tissues and how they are controlled, how substances are transported in and out of cells and how they contribute to the normal functioning of body systems in animals.

**Animal diseases**

* Typical diseases, their clinical signs, treatments and prevention including measures to control the spread of disease and which diseases are notifiable and zoonotic.
* Typical disorders in domestic animals including nutritional, endocrine and metabolic.
* Growth and reproduction of pathogens, parasites and how organisms defend against disease.

**Nutrients**

* Types and sources of nutrients required by animal species
	+ functions of major nutrients within the animal’s body
	+ digestion and absorption of the major nutrients
	+ how they may change over different life stages
	+ additional supplements and their sources
	+ how different nutrients affect the health and welfare of animals
	+ how nutrients and supplements are used to manage weight.
* Causes, signs and treatment of animal nutritional deficiencies, excesses and disorders.

**Skills specific to Performance Outcome 3**

* Identify and assess severity of and report potential health issues in animals.
* Monitor changes in health of animals and report findings e.g. signs of ill health or injury, behaviour monitoring, body condition scoring, faecal scoring, food intake.
* Collect, document and store information as part of health monitoring.
* Identify and assess the need for basic treatments
* Record and monitor the effectiveness of treatment plans.
* Interpret nutritional information.
* Record, monitor and evaluate diets for animals.
* Propose modifications in diet to meet nutritional needs of a given animal.

**Performance Outcome 4: Carry out safe animal handling practices**

Students must develop knowledge about a range of mammals, birds, herptiles, aquatics and invertebrates.

**Knowledge specific to Performance Outcome 4**

**Legislation**

* The aims and purposes of relevant (and current) legislation that applies to the animal care sector and related to the safe handling of animals for example Animal Welfare (Licensing of Activities Involving Animals) (England) Regulations 2018, The Veterinary Surgeons Act 1966,The Animals (Scientific Procedures) Act, 1986.

**Health and safety**

* Risks and hazards of working with animals including the importance of risk assessments, high risk groups of those handling animals, variety of hazards of handling animals e.g., allergens, physical injury.
* Safe working practices.

**Handling animals**

* Reasons for handling, moving and restraining animals.
* Techniques for safe and welfare-orientated animal handling.
* Equipment used for handling animals.

**Movement of animals**

* The principles and methods for the movement, restraining and transportation of animals
	+ the factors to be considered for the most suitable approach e.g., species, duration, animal welfare considerations, health and safety, related legislation
	+ the types of equipment that might be required e.g., carry cage, crate
	+ the techniques used minimise stress to the experience
	+ how these are applied
	+ the effects these have on animal health and welfare.

**Environment**

* Influencing factors, types of accommodation design (including enhanced accommodation) and materials to meet animal welfare needs, and their practical implications.
* Suitability and maintenance of accommodation to meet animal welfare and human safety and stakeholder needs.

**Skills specific to Performance Outcome 4**

* Follow current/relevant health and safety legislation and work place policies.
* Contribute to risk assessments and respond according to level of risk.
* Monitor risks in line with safe working practices.
* Identify which equipment, methods of approach, capture, handling, restraint and loading are best for specific situations and species.
* Create plans for and make informed decisions to facilitate best approach, capture, handling, restraint and loading for specific situations and species.
* Apply appropriate force when restraining animals e.g., when moving animals, when preparing animals for transportation.
* Demonstrate physical dexterity with delicacy when interacting with animals.
* Identify the most appropriate methods of successfully transporting animals considering species, level of risk, duration, animal welfare considerations, health and safety, legislation.
* Assess the strengths and weaknesses of different accommodation designs from the point of view of each stakeholder group (e.g., animals, keepers, vet team, visitors, educators, researchers).

**Performance Outcome 5: Plan, perform, record and communicate findings of scientific investigations in animal science**

**Knowledge specific to Performance Outcome 5**

**Investigation**

* Principles for design of and controls for scientific investigations.
* Planning criteria including objectives, hypothesis, milestones and resources required.
* How to work safely in laboratories including
	+ hazard identification and risk management
	+ personal protective equipment
	+ laboratory safety symbols
	+ setting up of equipment
	+ use of bench space
	+ safe working policies
	+ Good Laboratory Practice (GLP)
	+ Good Clinical Practice (GCP).
* Recording and analysis of data, use of log books and evaluation techniques.
* Scientific communication methods including standard format of scientific reports, scientific representation and terminology.

**Microbiology**

* Concepts of bacterial identification, media and growth needed to carry out useful microbial investigations.
* Techniques required for microbial investigations.
* Hazards and uses of microorganisms.
* Techniques required for effective use of microscopes.

**Biochemistry**

* Working safely with chemicals
	+ Selection of correct glassware.
	+ Measuring mass, and liquid/gas volumes to specified accuracy, producing standard solutions and serial dilutions.
	+ Applying pH indicators, including universal and paper.
	+ Determining the end-points of reactions using simple acid/base titration.
	+ Varying reaction conditions including temperature changes, different concentrations, reactant surface area, differential pressure, employing chemical and biological catalysts.
	+ Measuring rates of reaction using chemical and biological catalysts.
	+ Selection of adequate eye, hand and other specified personal protection equipment.
* Basis of biochemical reactions
	+ Principles of biochemical reactions.
	+ Atomic structure and ion formation including bonding and attractive forces.
	+ Rates of reaction, the role of enzymes as biological catalysts, the state of equilibrium.
* The production of adenosine triphosphate in cellular respiration for animals to utilise energy
	+ Aerobic respiration, Anaerobic respiration, Other respiratory substrates.

**Skills specific to Performance Outcome 5**

* Design and implement scientific investigation(s); including a small number of variables or indicators, using tried and tested research methods e.g., single animal case studies.
* Analyse results and summarise findings using reporting tools including
	+ descriptive statistics
	+ listing methods of dissemination of results including where the investigation(s) might be published
	+ consideration of the implications of findings for practices.
* Measure quantities for chemical reactions.
* Measure the size of an object viewed with an optical microscope.
* Use microscopes to make observations (of biological specimens).
* Interpret the key features of equilibrium processes using the principles of good experimental design.
* Identify structures and functions in different tissue types.
* Record, retrieve and communicate scientific information.