

Unit 10: Understand the Principles of Animal Nutrition

Unit code:	M/600/9810
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The learner will be able to describe the main components of an animal's diet and understand the requirements of a balanced diet. The learner will be able to explain how specialist feeders obtain their nutrition. The learner will be able to describe the effects of nutritional disorders and deficiencies.

● Unit introduction

Nutrition is an integral aspect of animal husbandry and the pet food trade now makes up a substantial proportion of the animal care industry. Providing animals with the appropriate feeds in the correct quantities, taking into account factors such as species, breed, activity level and age, requires an understanding of the fundamentals of animal nutrition. A balanced diet is vital to the maintenance of animal health and welfare in a captive environment.

The focus of this unit is on the main components of animal feeds and learners will examine the source, structure and function of the major nutrients, as well as their nutritional value and the detrimental effects of dietary imbalances.

On completion of this unit, learners will be able to transfer both their knowledge and practical skills from the classroom to the workplace. Studying the nutritional analysis and components of feeds, combined with an understanding of how to assess individual animal's dietary requirements, will enable learners to compare and evaluate feeding systems.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand the functions of the main components of an animal's diet
- 2 Understand the nutritional values and properties of different food types
- 3 Understand the feeding requirements of animals to ensure they receive a balanced diet
- 4 Know common animal nutritional problems.

Unit content

1 Understand the functions of the main components of an animal's diet

Major nutrients: carbohydrates (sugars, starches, disaccharides and polysaccharides); proteins (amino acids, peptides and polypeptides); lipids (fats, oils, triglycerides); vitamins (fat and water soluble forms); minerals (micro and macro classes); fibre; water; dietary sources

Function in the body: energy, growth and repair, insulation, specific vitamin and mineral functions; simple metabolic pathways; gut mobility; cell function and hydration

Digestion: single stomach digestion (foregut and hindgut fermentation digestive systems); ruminant digestion; digestive system organs eg stomach and small intestine; movement of foodstuffs through digestive tract; physical and chemical digestion eg dentition, enzymes, microbial action; acid; bile; faeces formation

2 Understand the nutritional values and properties of different food types

Nutritional value: energy content (kcal); protein content; fat content; carbohydrate content (including fibre); digestibility; palatability eg taste, texture and smell

Comparison of feeds: ingredients; nutritional value; cost analysis

3 Understand the feeding requirements of animals to ensure they receive a balanced diet

Dietary requirements: assessing energy and protein needs; effect of life stage eg growth, pregnancy, lactation and work level; effect of feeding strategy eg herbivore, omnivore and carnivore

Dietary calculations: analysis of foodstuffs (nutrient content); balancing rations (meeting requirements by balancing energy and protein content of feeds); bone and raw food diets

4 Know common animal nutritional problems

Nutritional deficiencies, excesses and disorders: malnutrition eg dietary obesity and anorexia; constipation; diarrhoea; diabetes; specific nutrient deficiencies eg scurvy and rickets; specific nutrient excesses eg chocolate and onion toxicity; cause and symptoms of nutritional problems

Treatment: dietary correction; removal of causal factor; clinical treatment (veterinary intervention); prevention eg supplements, prophylactic treatments, suitably balanced diet and exercise

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<p>P1 review the contribution of the major nutrients of an animal's diet to maintain health and wellbeing</p>	<p>M1 illustrate the location of the digestive organs within the body in single stomached and ruminant digestive systems</p>	<p>D1 compare in detail the efficiency of the single stomached digestive system to that of the ruminant digestive system</p>
<p>P2 evaluate the functions of the major nutrients within the animal's body [IE, CT]</p>		
<p>P3 describe where and how the major nutrients are digested and absorbed within the body:</p> <ul style="list-style-type: none"> ◇ single stomached ◇ ruminant 		
<p>P4 examine the requirements for a balanced diet:</p> <ul style="list-style-type: none"> ◇ nutritional content ◇ digestibility ◇ palatability 	<p>M2 discuss how palatability can affect the behaviour of a specified animal</p>	
<p>P5 analyse the nutritional values of different foods and food types [IE, CT]</p>		
<p>P6 compare the suitability of different types of fresh and prepared foods for feeding a range of animals [IE, CT]</p>	<p>M3 justify the use of a specified prepared food for feeding a specified animal</p>	

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P7 explain the requirements for a balanced animal diet	M4 explain how the calculation of rations can benefit a specified animal's health and welfare.	
P8 calculate rations for a range of animal diets [CT]		
P9 explain the dietary requirements for animals at different life stages		
P10 describe the causes and signs of animal nutritional deficiencies, excesses and disorders		D2 compare the use of prevention to that of treatment in the management of nutritional deficiencies, excesses and disorders.
P11 explain how nutritional deficiencies, excesses and disorders can be treated.		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

In order to study this unit, learners should have a basic understanding of chemistry, biology and animal husbandry. Tutors should deliver this unit in a vocational context, wherever possible, through the use of site visits, industrial experience and supervised laboratory practicals. Where practical delivery is not possible, learners should be inspired and motivated through well-planned discussions, lectures, seminars, guest speakers and research projects.

Throughout the unit, learners will need to study the components of foodstuffs, analyse their nutritional value and make dietary recommendations for a range of animals. These are skills which are transferable to a wide range of workplaces. An awareness of nutrition will enable learners to actively manage animal health and welfare.

Learners should be encouraged to undertake independent study using available resources to enhance their understanding of the unit content. It may be useful to supervise learners in researching, planning and preparing a raw food diet for a specified animal as an additional activity to complement the unit content.

The use of evaluative skills should be encouraged. Tutors will need to give learners feed packaging designed for a range of animals and support them in making comparisons based on nutritive value and cost. Other areas where there are opportunities for evaluation include identifying the differences between carnivorous, omnivorous and herbivorous feeding systems and discussions on the efficiency of single stomached digestion compared to that of ruminant digestion.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take the average learner** to achieve the learning outcomes. It is **indicative and is one way of achieving the credit value**.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction and overview of the unit.
Assignment 1: Study of Essential Nutrients (P1, P2) Tutor introduces assignment brief.
Major nutrients – introduce structure, source and function of carbohydrates, proteins, lipids, vitamins and minerals.
Practical laboratory sessions – investigate chemical components of foods.
Metabolic pathways – introduce simple pathways of the absorption and utilisation of carbohydrates, proteins and lipids.
Assignment 2: Digestion and Metabolism (P3, M1, D1) Tutor introduces assignment brief.
Single stomached digestion – introduce foregut and hindgut fermentation digestive tracts, organs, movement of food and nutrient breakdown.
Ruminant digestion – introduce digestive tract, organs, movement of food and nutrient breakdown.

Topic and suggested assignments/activities and/assessment

Practical laboratory sessions – dissection of a range of digestive systems.

Digestive efficiency – introduce the differences between single stomached and ruminant digestion, discuss and evaluate the efficiency of each digestive system.

Assignment 3: Nutritional Value of Feeds (P4, M2, P5, P6, M3)

Tutor introduces assignment brief.

Nutrient content of feeds – introduce techniques for determining energy, fat, protein, vitamin and mineral content, analysis of feed packaging.

Digestibility and palatability – introduce concept of taste, texture and smell and the effects on appetite and behaviour.

Comparison of feeds – introduce different types of fresh and prepared foods, link to nutritional content.

Assignment 4: Feeding Requirements (P7, P8, M4, P9)

Tutor introduces assignment brief.

Requirements for a balanced diet – introduce the assessment of individual animal's nutritional requirements for energy, protein, fat, vitamins and minerals.

Calculate rations – introduce life stages, balancing energy and protein requirements, health and welfare benefits.

Practical ration calculations – workshop session to balance a range of animal rations.

Assignment 5: Nutritional Disorders (P10, P11, D2)

Tutor introduces assignment brief.

Nutritional deficiencies – introduce a range of deficiencies, their causes, symptoms, treatment and prevention.

Nutritional excesses – introduce a range of excesses, their causes, symptoms, treatment and prevention.

Nutritional disorders – introduce a range of disorders, their causes, symptoms, treatment and prevention.

Treatment versus prevention – introduce a group discussion comparing treatment and prevention, health, welfare, costs, ethics.

Unit review.

Assessment

For P1 and P2, learners will need to identify all nutrients necessary for the health and wellbeing of a selected animal species. This could be assessed via a series of practical laboratory activities where learners investigate the chemical components of foodstuffs. The use of workbooks to record practicals may also be a useful form of assessment. Learners should describe the structure, source and function of carbohydrates, proteins, fibre, water and lipids and produce a flow diagram demonstrating the absorption and utilisation of feed components in the body.

For P3 and M1, learners must demonstrate an understanding of the single stomached and ruminant digestive systems. To achieve these criteria, learners should produce clearly annotated diagrams showing the location of organs along the digestive tracts for at least one single stomached species and at least one ruminant species. Annotations should include labels and descriptions of organ functions and sites of digestion and absorption as well as a brief explanation of the physical and chemical breakdown of feeds. Evidence could be in the form of laboratory dissections with a comprehensive write-up of findings, oral presentations or poster making activities.

For D1, learners must compare single stomached and ruminant digestive systems in terms of efficiency. This could include the animal's ability to break down feeds or utilise energy. Evidence could be a written report or, if possible, a group discussion.

For P4 and M2, learners are required to identify the requirements for a balanced diet. In order to do this, they must explain the importance of the nutritional value of feeds, digestibility and palatability. Palatability should be discussed in further detail (M2) to include details of its effects on the behaviour of one species. Learners could produce written evidence to demonstrate their understanding in the form of a research project or, if possible, a group discussion.

For P5, P6 and M3, learners should carry out supported independent study using a selection of fresh and prepared animal feeds in order to analyse their nutritional value for three animals. The results from this study should then be compared and recommendations made as to the most appropriate feed for a chosen species of animal. Techniques used should be described in detail to fully support learners' understanding and, as a result, the validity of their findings. A written research project or oral presentation may be a good way of evidencing achievement of these criteria.

For P7, P8, M4 and P9, learners must research the specific dietary requirements for at least one species. This should include the animal's requirements for energy, fibre, protein, water, at least three vitamins and at least three minerals. Learners need to undertake calculations with a view to balancing dry matter, protein and energy content of at least one feed for at least three species of animal at different life stages. Learners must include their rough mathematical workings with their completed assessment and explain their actions throughout. Oral questioning may suffice but learners could produce written evidence. On completion of these calculations, learners must summarise their work by explaining how understanding these calculations can benefit a specified animal's health and welfare. It may be possible to assess these criteria through a timed in-class assessment.

For P10, P11 and D2, learners must describe the cause and signs of at least one nutritional deficiency, at least one nutritional excess and at least one nutritional disorder. Each problem should be described and its treatment and prevention explained. This lends itself well to an oral activity such as a presentation or group discussion. Learners' understanding can also be demonstrated through a written assessment or research project.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2	Study of Essential Nutrients	Undertake a range of laboratory practicals to demonstrate your understanding of the chemical components of food, produce a written report to substantiate your findings and describe the skills and techniques used.	Practical laboratory observation and assessment. Written evidence. Timed in-class assessment.
P3, M1, D1	Digestion and Metabolism	Produce a diagram of a single stomached digestive system and of a ruminant digestive system. Annotate the diagrams to explain the location and function of the organs.	Laboratory dissection, observation and assessment. Written report. Poster presentation.

Criteria covered	Assignment title	Scenario	Assessment method
P4, M2, P5, P6, M3	Nutritional Value of Feeds	Undertake a research project to compare a selection of animal feeds and make recommendations for a selected species.	Written evidence. Research project. Group discussion observation.
P7, P8, M4, P9	Feeding Requirements	Perform dietary calculations to balance the dry matter, energy and protein content of more than one feed to meet a selected animal's dietary requirement.	Written evidence. Timed in-class assessment.
PI0, PI1, D2	Nutritional Disorders	Plan and prepare a presentation to describe and explain the cause, signs, treatment and prevention of three nutritional problems. Discuss methods of treatment and prevention and decide which is most favourable.	Oral presentation observation. Group discussion observation. Written evidence.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC land-based sector suite. This unit has particular links with:

Level 2	Level 3
Understand the Basic Principles of Animal Biology	Understand the Principles of Animal Biology
Undertake Practical Animal Feeding	Understand Animal Anatomy and Physiology
	Undertake Animal Handling and Safe Working
	Understand the Principles of Animal Nursing

Essential resources

Learners will need access to a laboratory and an animal collection with a varied range of animal species.

Employer engagement and vocational contexts

The focus of this unit is on the practical aspects of animal nutrition enabling learners to study animal feeds and their origins from raw components to being part of a balanced diet. Centres are encouraged to develop links with local animal feed producers, retail outlets and sales representatives. This could be via guest lectures, visits and the provision of resources. Learners should be encouraged to seek work placements within the animal feed industry to gain experience in this area.

Indicative reading for learners

Textbooks

Ackerman N – *Companion Animal Nutrition: A Manual for Veterinary Nurses and Technicians* (Butterworth-Heinemann, 2008) ISBN 9780750688987

Burger I H – *The Waltham Book of Companion Animal Nutrition, 2nd Edition (Illustrated Reprint)* (Butterworth-Heinemann, 1996) ISBN 9780750633376

Edwards R A, Greenhalgh J F D, McDonald P and Morgan C A – *Animal Nutrition* (Pearson Education, 2002) ISBN 9780582419063

Fuller M F – *The Encyclopedia of Farm Animal Nutrition* (CABI Publishing, 2004) ISBN 9780851993690

Journals and magazines

Cage and Aviary Birds

Farmers Weekly

Fur and Feather

Reptiles Magazine

Websites

www.hillspet.com	Hills Science diets
www.iams.co.uk	IAMS/EUKANUBA
www.mars.co.uk	Mars Petcare
www.waltham.com	Waltham centre for pet nutrition

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	evaluating the functions of the major nutrients within the animal's body
Creative thinkers	evaluating the functions of the major nutrients within an animal's body.

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	researching animal feeds for comparative purposes making feed recommendations
Creative thinkers	researching new feeds and feeding technologies
Reflective learners	communicating skills and techniques learned through the practical, oral and written assessments
Team workers	working in groups to discuss the differences between digestive systems working in groups to discuss the pros and cons of prevention and treatment
Self-managers	choosing feeds for analysis making feed recommendations
Effective participators	describing the health benefits of feeds making feed recommendations.