



VETERINARY SCIENCES VOCATIONAL TO ACADEMIC PROGRESSION ROUTES

An investigation and scoping study around stretching the more able “vocational” learners following the National Diploma in Animal Management (particularly in relation to the development of core science and its parity with those “A” Level outcomes required by Veterinary Science Higher Education)

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Terminology

AQA	Assessment and Qualifications Alliance
Elite	English Land-based Institute of Training and Education
GCSE	General Certificate of Secondary Education
HE	Higher Education
HEI	Higher Education Institution
LLN	Lifelong Learning Network
ND	National Diploma
OCR	Oxford Cambridge and RSA Examinations

Learners Throughout this report we use the term “learner” to describe those people following programmes at our member colleges. We acknowledge that universities use the term “students”

Useful Websites

www.bishopburton.ac.uk	www.vetnetlln.ac.uk
www.hartpury.ac.uk	www.cultiva.ac.uk
www.moulton.ac.uk	www.aqa.org.uk
www.myerscough.ac.uk	www.ocr.org.uk
www.sparsholt.ac.uk	www.edexcel.org.uk

1. Project Overview

1.1. Project Background

The English Land-based Institute of Training and Education (Elite Consortium Ltd) is an alliance which brings together Bishop Burton, Hartpury, Moulton, Myerscough and Sparsholt Colleges. By working together, the colleges offer access to learning at regional locations throughout England and facilitate the joint working of subject specialists who together can offer a national overview in relation to the veterinary nursing, animal science, animal care and equine studies areas of learning, from vocational through to undergraduate levels.

(Please Note - In July 2008, Elite Consortium Ltd was re-named as Cultiva Limited although throughout this report the terms "Elite" will be used on account of the majority of research being conducted prior to the name change)

This project seeks to meet the VETNET LLN key objective of increasing opportunities for vocational learners to progress into veterinary and animal related higher education and specifically the VETNET LLN aim to "***develop, through work with institutions, curriculum that will allow vocational learners to progress smoothly into veterinary and animal science related degree courses***"

This project is around stretching the more able learners, particularly through collaboration with Vet Schools whereby "higher flying" learners following vocational programmes (such as the BTEC Diploma in Animal Management) can be identified early enough for additional learning and development to be established as a means of facilitating their progress to veterinary and animal related higher education. This is **stage one** of a three stage project, as detailed below

Stage 1

To conduct an investigation and scoping study around stretching the more able "vocational" learners – particularly in relation to the development of core science and its' parity with those "A" Level outcomes required by Vet Schools for entry.

Stage 2

To introduce a "stretching the more able learners" pilot programme with joint working of Elite Consortium member colleges and selected Vet Schools.

Stage 3

To evaluate the effectiveness of the pilot programme to stretch the more able learners with dissemination of information critical to the success of mainstream programmes.

1.2. Project Aims

- To understand the difference between "A" Levels in Chemistry and Biology and BTEC ND Animal Management Programmes in terms of their development of the core science required for entry to Vet School.
- To investigate and design curriculum which allows vocational learners to progress smoothly into veterinary and animal science related degree courses.
- To connect the colleges of Elite Consortium to selected Vet Schools and providers of veterinary science related higher education

1.3. Specific Objectives

- To compare/map the content of the BTEC ND Animal Management suite of programmes offered at the five Elite Consortium Colleges with the “A” Level Chemistry and Biology syllabuses with a view to identifying the “top-up” requirements for vocational learners if they are to progress to Vet School or similar HEI.
- To engage in dialogue between Vet Schools and Elite Consortium Colleges to establish the level and extent of additional science input to facilitate progression from vocational programmes.
- To establish the additional learning support requirements for learners following an enhanced programme – up to the point of progression and during initial Vet School training.
- To design a curriculum offer which provides a “top-up” for vocational learners identified as being capable of progression to Vet School or similar HEI.
- To identify key staff in colleges and Vet Schools/HEI and their role in ensuring the success of the proposed programme
- To establish the level of interest and likely participation from potential vocational learners to participate in an enhanced programme of learning.

1.4. Project Methodology

The project was conducted between March and July 2008 in two stages.

The first stage was to build a picture as to the current position and likely demand. There were three aspects to this stage, namely:

- Identifying the level of interest in, and potential for progression to Veterinary Science Higher Education from vocational learners following the National Diploma in Animal Management.
- A mapping exercise which seeks to identify gaps in the National Diploma in Animal Management when compared to “A” Levels in Chemistry and Biology.
- Consultations with HEI offering Veterinary Science with a view to identifying perceived gaps in knowledge and understanding, to identify which Chemistry and Biology is essential, and to consider additional learning support provision for vocational learners progressing.

The second stage was to bring together key practitioners from the five colleges forming Elite Consortium Ltd with a view to identifying the characteristics of a top-up curriculum suitable for those learners choosing to progress from vocational programmes to Veterinary Science Higher Education. This stage focused on the following aspects:

- The nature and shape of the top-up curriculum required to prepare vocational learners for progression into Veterinary Science Higher Education.
- Mechanisms for marketing the top-up programme to potential learners, and managing the expectations of these and associated stakeholders.
- Arrangements for identifying those vocational learners who are appropriate for the top-up programme.
- The likely pitfalls of delivering a top-up curriculum and suggested remedies to deal with these.
- Early ideas to form an implementation plan which in turn will inform a second stage project

2. Information from current learners

2.1. Research Activity

- Identifying the level of interest in, and potential for progression to Veterinary Science Higher Education from vocational learners following the National Diploma in Animal Management.

2.2. Introduction

To gather information around the level of interest and potential participation from vocational learners, we have visited the five colleges forming Elite Consortium and met with learners following the National Diploma in Animal Management. Whilst the original plan was to talk to first year learners, the sample has been expanded to include final year learners. Furthermore, in one case, although this is outside of the scope of this study, we have arranged for the views of learners following agriculture livestock and equine science to be collected. As well as meeting with learners, we have gathered information from college tutors around progression rates and what they perceive to be the various challenges around increasing progression from vocational programmes to higher education, be that Veterinary Science, or animal management related Higher Education in general.

Throughout this process, a range of questions arose, many of which were important in informing the later stages of the project. These were flagged as **matters for further consideration** with the view that they would be considered during the second stage of the project where the top-up curriculum is designed. In some cases, although the point is noteworthy, there is no clear answer.

2.3. The Interview Schedule

The interview schedule focused on the following:

- The number of learners who are considering progressing to Higher Education
- The Higher Education courses that learners are considering
- Whether this will be at the same college as the National Diploma and why
- Whether any learners had considered progressing to a Veterinary Science degree
- The extent to which learners are aware that it is possible to progress from the National Diploma to a Veterinary Science degree.
- The extent to which learners would seriously consider progressing to a Veterinary Science degree (assuming they met the necessary criteria)
- Learner perceptions of Veterinary Science Higher Education in terms of work levels, academic requirements, etc
- The features of additional “top-up” learning which might be needed by those learners wishing to progress to Veterinary Science Higher Education
- The level of interest in such a programme if it was offered.

Interviews were conducted through visits to the five colleges by the project co-ordinator and were conducted by the project co-ordinator and key members of staff from the Animal Management departments of the five colleges forming Elite Consortium.

The views of learners were gathered through group tutorials and individual interviews. Those interviewed included learners in the first year of the National Diploma in Animal Management as well as those towards the end of the programme. In addition, a few learners following the National Diploma in Agriculture were interviewed to gauge the level of interest from these.

Overall, the views of over 200 current learners were collected.

2.4. Findings

In reporting these findings, we seek to set down the facts on the basis of what learners told us at the same time as highlighting any particular key challenges and other considerations which will need to be addressed during the later stages of this study where we will identify the features of a top-up curriculum.

2.4.1. The number of learners who are considering progressing to Higher Education

In general terms, between a third and a half of learners are considering progressing to higher education and of these, approximately half chose to follow a programme at the same institution as they followed the National Diploma. Table 1 shows details of progression for the year 2006/07

Table 1

College	Progression %	Same college %
Bishop Burton	48	27
Hartpury	44	15
Moulton	53	26
Myerscough	34	26
Sparsholt	14	6

First year learners are often vague about their precise progression plans and generally view this as a decision they will make during the second year of the programme. A few understand the need to plan early particularly if this necessitates the need to set targets in terms of grades. Second year learners are much clearer as to their progression plans and but many comment that they wish they had considered their options earlier. In dealing with first year and second year learners it was observed that they mature greatly during this relatively short period.

Matters for Further Consideration

- The provision of relevant information, advice and guidance would need to be introduced much earlier for learners considering progression to Veterinary Science Higher Education
- Coping with the immaturity of first year learners and whether they would be able to cope with any higher level studies.
- The extent to which progression to higher education should be covered in any detail at the recruitment stage and whether this would be a considered a unique selling point

2.4.2. The Higher Education courses that learners are considering

For those learners interviewed, these courses are all related to the area of animal management and include Higher Education programmes in:

- Animal behaviour
- Complementary therapy
- Veterinary Nursing
- Animal Science
- Zoology
- Equine Dentistry
- Veterinary Science

2.4.3. Whether this will be at the same college as the National Diploma and why

Around half of all learners considering progressing to Higher Education plan to do this at the same college as they studied their National Diploma. The reasons they gave were around familiarity of surrounding, the opportunity to remain in contact with peers, ease of travel, accommodation costs, the ability to live at home, and the opportunity to continue with part-time jobs.

Whilst it is not surprising that so many planned to stay at the same college, a number of learners were very clear that to study a programme which fitted in with their career plan would necessitate

moving to a university some distance from their home. These learners are characterised by their clear motivation to reach a planned goal and their knowledge that to achieve this, they would need to follow a particular higher education programme.

It was not fully clear that learners understood the financial implications of university study, particularly if this involved moving away from home. It was evident that a few had unrealistic expectations as to the cost of this.

Some learners considered that their home college discouraged them from applying elsewhere on account of their need to maintain numbers on local higher education provision.

Matters for Further Consideration

- The provision of information around the cost of attending a university where the learner will be living away from home.

2.4.4. Whether any learners had considered progressing to a Veterinary Science degree

A significant number of learners had been interested in becoming a veterinary surgeon whilst at school. At the same time, they often acknowledged that this would be difficult given projected GCSE grades and the perceived need to follow “A” Levels as a means of entry.

Many learners were critical of the careers advice they had received whilst in years 10 and 11. In some cases, they had been steered away from Veterinary Science on account of its perceived exclusivity. For others it had been made clear to them that projected GCSE results would not be sufficient for “A” Level entry.

A minority of learners had been successful in making an application to a “Vet School”. For these, they had not been advised by school careers advisors that it was possible to progress from the National Diploma to a Veterinary Science degree. In one case, the learner had been advised that she must stay on at school and that she would be ill advised to take the vocational route. For these learners, the National Diploma had proved to be a satisfactory entry qualification for “Vet School”

Matters for Further Consideration

- It would appear that there needs to be a greater level of understanding in schools careers advisors as to the value of the National Diploma and its parity with “A” Levels when it comes to university entry.
- The extent to which progression to higher education can be promoted at the recruitment stage – particularly for those learners with a more vocational focus. It is acknowledged that the various options available for school leavers at year 11 make this a highly competitive market.

2.4.5. The extent to which learners are aware that it is possible to progress from the National Diploma to a Veterinary Science degree.

In general, there was a low awareness of this progression opportunity. However, some learners were very aware and had carefully researched their options post National Diploma. Learners view the best source of information as being university websites which they feel are helpful in advising them on the entry requirements.

Most course tutors, whilst aware that it is possible to progress in this way, also understood that this option would be suitable for only a small proportion of the more talented learners. They understood the need to carefully manage learner’s expectations around progression – particularly if this is to a Veterinary Science Degree.

2.4.6. The extent to which learners would seriously consider progressing to a Veterinary Science degree (assuming they met the necessary criteria)

Learners had a mature understanding of the criteria deemed necessary for progressing to a Veterinary Science Degree and many did not consider themselves as being “up to the necessary standard”

The number of learners who indicated that they would seriously consider progression to a Veterinary Science Degree (based on the current curriculum arrangements) was limited to two or three at each college. These learners were fully aware of the time and cost considerations associated with this

2.4.7. Learner perceptions of Veterinary Science Higher Education in terms of work levels, academic requirements, etc

Many learners had an unrealistic perception as to Veterinary Science Higher Education in terms of work levels, academic requirements, etc. Many imagined that they would be taught everyday of the week. However, many learners were clear that it would be very different to the National Diploma on account of the following perceptions:

- A higher academic standard – particularly around mathematics and science
- More formal lectures with the need for independent note taking – less variety in teaching methods and less variety in learning resources and media such as handouts, etc
- Fewer practical sessions during the early part of the programme (other than laboratory sessions)
- The need for more independent study with commensurate study skills, research methods, use of journals, proper referencing etc
- An assessment regime which places a greater emphasis on written examinations and the need to pass these if they are to remain on the programme
- There was some anxiety from some learners around how they would fit in with learners who join the Veterinary Science following the A Level route.

2.4.8. The features of additional “top-up” learning which might be needed by those learners wishing to progress to Veterinary Science Higher Education

At this stage, some ideas around a top-up curriculum were shared with learners as a means of establishing whether they viewed this as appropriate to their needs. Through discussion, it was established that:

- It is probable that the National Diploma goes a long way towards delivering an appropriate level of biology essential to Veterinary Science. National Diploma units such as animal health, animal biology, animal anatomy and physiology, animal nutrition, and animal breeding and genetics, were all considered as essential. It was thought that the National Diploma was unlikely to cover aspects of plant biology although learners and tutors questioned the extent to which this was necessary for a Veterinary Science Degree. It was agreed however, that some higher level biology might be needed.
- It was thought that the National Diploma covered little chemistry although there are optional units around bio-chemistry which might fit the bill. Learners and tutors asked questions around which chemistry is essential for a Veterinary Science degree.
- In discussions around mathematics, learners were concerned as to whether they would have a sufficient level of numeracy. There was general acceptance that Key Skills Application of Number at Level 3 might be a necessary additional qualification together with other higher level Key Skills such as Communication and “wider” key skills
- It was generally agreed that a top-up curriculum would need to include higher level study skills such as advanced note taking, research methods, study skills, advanced writing skills, etc. There was a view that this might be achieved through higher level Key Skills study.

- Learners considered that an opportunity to experience higher education level work (perhaps through joining relevant sessions at their college and/or a “summer school” at an appropriate Veterinary Science university would be helpful in giving learners experience at higher education. Some learners expressed an interest in meeting Veterinary Science undergraduates.
- Some learners were highly perceptive around top-up curriculum in relation to all learners choosing to progress to higher education. It was made clear to them that this initiative is around a top-up curriculum specifically for learners considering Veterinary Science.
- There was debate around the make up of the National Diploma at different colleges and how the range of optional and essential units is not always the same. It was agreed that any learner considering progressing to a Veterinary Science degree would need to follow a similar portfolio of National Diploma units and that colleges may need to align the curriculum accordingly.
- It was agreed that a top-up curriculum would need to commence relatively early during the first year of the National Diploma and run through to late in the second year. The level of additional work was noted by all.

Matters for Further Consideration

- In talking to “Vet Schools” we need to establish what aspects of Biology and Chemistry are deemed to be an essential requirement.
- The make up of National Diplomas as they are offered at the five colleges needs to be established in order that a standard pathway for progression to Veterinary Science degrees is made clear.
- The extent to which higher level key skills will sufficiently prepare learners for progression to Veterinary Science Degrees.

2.4.9. The level of interest in such a programme if it was offered.

Amongst those learners interviewed, there was a general acceptance that the proposed top-up curriculum would be a helpful development for those learners interested in progressing to Veterinary Science. It was accepted that this route would not suite everyone but at each college, three or four learners were identified as being interested.

Through general discussions it was identified by final year learners, that this is something they would have seriously considered during their first year had been available. First year learners expressed interest but were concerned as to how a top-up curriculum would be delivered given their already busy timetable.

Upon being asked if they would be prepared to pay for a top-up curriculum, there was a mixed response although a significant number of learners agreed that if they were very keen to progress to a Veterinary Science degree, then this would be essential.

As part of this exercise, learners following animal management related programmes in the agriculture sector were canvassed, with the following comments The majority of learners are likely to progress to HE but stay within the field of Agriculture, as they are from working farming backgrounds. Vet school is not the first option. Their perceptions of vet school were that of a high level degree, very in depth with high entry requirements. They would be interested in a top up as they felt it would prepare them for HE.

3. Mapping of National Diploma to “A” Levels in Biology and Chemistry

3.1. Action

- A mapping exercise which seeks to identify gaps in the National Diploma in Animal Management when compared to “A” Levels in Chemistry and Biology.

3.2. Introduction

This aspect was conducted by staff employed in the Hartpury College “A” Level Centre. These were subject specialists for both Biology and Chemistry. At an early stage, it was decided to map the National Diploma in Animal Management against the “A” level standards which are due to commence use from 2008/09. These were the AQA standards for Biology and the OCR standards for Chemistry. These were chosen on account of them being viewed as the most common awarding body standards used for Biology and Chemistry.

The results of the “A” Level mapping exercise consist of factual information showing where units of the “A” Level relate to units of the National Diploma in Animal Management. These are included as *Appendix B* and *Appendix C*

At the same time, a separate exercise was conducted to identify which units from the National Diploma in Animal Management are offered by the five colleges forming ELITE Consortium Ltd together with a suggestion as to those which might be most appropriate for those learners hoping to progress to Veterinary Science Higher Education. This revealed a range of pathways in use by the five colleges, together with different levels of work required to achieve the National Diploma.

3.3. Findings

3.3.1. Key Points from Biology “A” Level Mapping

It is suggested that there is a good level of overlap between various units of the National Diploma in Animal Management and the various units and elements of the “A” level. *Appendix B* points out the “A” Level units and elements which are not covered by the National Diploma in Animal Management and during the later stages of the project, the relevance of these, together with mechanisms for delivering them will be considered.

Whilst there is some overlap between the Biology “A” level and the National Diploma in Animal Management, the overall view is that the National Diploma puts the emphasis on structure of biological organisms where the “A” level looks at structure but uses this to lead into the underlying biological concepts and principles. At the end of each unit in the AS and A2 specifications the Biological principles candidates should understand are clearly listed.

Learners on the National Diploma would have to study parts of several units from the National Diploma in Animal Management and still would not cover all the “A” level Biology specification. (See *Appendix B* for the aspects not covered). The units concerned are:

- Unit 1 - Animal Health
- Unit 2 - Animal Biology
- Unit 3 - Animal Anatomy and Physiology
- Unit 8 - Animal Nutrition
- Unit 11 - Animal Welfare and Breed Development
- Unit 13 - Animal Breeding and Genetics
- Unit 15 - Biochemistry and Microbiology in Animal Management
- Unit 18 - Principles of Ecology
- Unit 29 - Genetics and Genetic Engineering

Both the AS and A2 Biology specifications have identified practical skills they expect candidates to have covered. National Diploma learners may not cover these. For the Investigative and Practical skills assessed unit, it is an important part of the specification and an area that is not really

matched by the National Diploma. The diploma does have an investigative unit, Unit 23, but the emphasis of this unit is different to the “A” level.

A very important difference is that the A level specifications now include ‘How Science Works’ which is an underpinning set of concepts and is the means whereby learners come to understand how scientists investigate scientific phenomena. It also recognises the contributions scientists have made to their own disciplines. Learners are expected to be proficient in matters given in A to L. (See pages 44-47 in the specification). These concepts should be integrated into the subject content as the specification is taught. This approach is not taken in the National Diploma

3.3.2. Key Points from Chemistry “A” Level Mapping

This indicates that Chemistry is found in just two units of the National Diploma in Animal Management and that when this is mapped in detail, these cover only a few aspects of the “A” Level in Chemistry. This is shown in much more detail in *Appendix C*. The units are:

- Unit 27 – Fundamentals of Science
- Unit 28 - Chemistry for Biology Technicians

The overall impression of the “A” Level Chemistry expert is that the Chemistry identified in the National Diploma in Animal Management is largely based on the old Nuffield syllabus, which was later distributed between AS and A2. Although *Appendix C* shows where the National Diploma maps with the content of the A Level, it does not make clear the extent to which the National Diploma meets the same standards as the A Level and there is a risk that fundamental underlying theories will not be covered in sufficient detail.

3.3.3. National Diploma Units allocated by Elite Consortium Colleges

Mapping of National Diploma units identified that those which would appear to be the most appropriate as pre-requisites for a learners wishing to progress to Veterinary Science Higher Education, are generally not being included in current National Diploma provision. When linked to the “A” Level mapping activity, it can be seen that these National Diploma units contain much of the Biology and Chemistry found in the “A” Levels required for entry to Veterinary Science Higher Education. It is suggested that these units are:

- Unit 15 - Biochemistry and Microbiology in Animal Management
- Unit 27 - Fundamentals of Science
- Unit 28 - Chemistry for Biology Technicians

Appendix A gives details of the National Diploma in Animal Management units offered by the five Elite Consortium Colleges, together with an indication as to those units which have been identified by the Biology and Chemistry experts as containing aspects of the science found in these units. It is noted that several units viewed as being key, in terms of Biology and Chemistry are not currently being offered by Elite Consortium Colleges. It is important that these should be properly acknowledged in any top-up curriculum

Matters for Further Consideration

- The extent to which the Biology and Chemistry gaps identified are essential to Veterinary Science Higher Education
- Mechanisms for delivering the identified gaps in Biology and Chemistry
- Wider gaps such as higher level mathematics, communication and study skills.
- The level of National Diploma in Animal Management investigative and practical skills

4. Comments from the Higher Education Sector

4.1. Activity

- Consultations with HEIs offering Veterinary Science with a view to identifying perceived gaps in knowledge and understanding, to identify which Chemistry and Biology is essential, and to consider additional learning support provision for vocational learners progressing to HE.

4.2. Introduction

A group was formed comprising key staff from the Royal Veterinary College and Liverpool Veterinary School together with representatives from two Elite Consortium Colleges and one from VETNET LLN. These met during June 2008 to consider the information gathered so far.

A background to the curriculum mapping project was provided and an update on progress to date given. The purpose of the meeting was to review the outcomes of the mapping exercise, to identify essential prior knowledge for entry to vet school and Higher Education more generally and to consider how this essential prior knowledge might be provided.

4.3. Findings

4.3.1. Observations in relation to mapping of 'A' level Biology and National Diploma in Animal Management

The nature of knowledge developed in the National Diploma in Animal Management was considered to be too applied, meaning that learners had often failed to grasp the underpinning scientific principles. An understanding of these principles allows learners to apply knowledge in different situations. (For example, it is more valuable to understand how enzymes function generally and by application, enzyme function in body systems rather than just learning about enzymes involved in digestion in isolation of general principles.)

This lack of underpinning knowledge in National Diploma learners was apparent in interviews where their ability to discuss scientific issues is often restricted to a relatively shallow approach. For example, in discussing genetic engineering a National Diploma learner would tend to focus on ethical or "softer" issues and not be able to apply an understanding of gene structure and function to arguments about ethics and welfare.

It was recognized that National Diploma learners spend a smaller percentage of their time on science than those studying science 'A' levels and that this percentage is in turn heavily influenced by the module mix of the National Diploma being offered.

In considering the "A" Level Biology to National Diploma mapping exercise it was felt that some of the gaps identified may well be covered on the National Diploma but that since the knowledge was not specified explicitly in the syllabus, the extent to which this was the case could vary depending on the subject expertise of the lecturer.

Particular areas of essential knowledge identified in the mapping included:

- Enzyme properties and action
- Cellular transport (diffusion, osmosis, active transport, plasma membrane structure)
- Muscle structure and function
- Electrical control of heart contraction
- Molecular genetics (DNA, RNA, gene structure, expression and function, DNA and protein structure, gene mutation and its effects). Underpinning principles rather than practical animal breeding are important here.
- Antibiotics and genetic variation in bacteria (antibiotic resistance)
- Population genetics (underpinned by an understanding of genetic principles)
- Response to internal and external stimuli
- Nervous and hormonal communication

- Principles of homeostasis
- Sliding filament theory of muscle contraction
- Negative and positive feedback

It would also be beneficial for learners to have experience of planning and carrying out an investigative project as familiarity with techniques of data collection, handling and presentation are important skills. An understanding of the scientific process is also important.

4.3.2. Observations in relation to mapping of 'A' level Chemistry and National Diploma in Animal Management

Chemistry was acknowledged as a problem area for all applicants regardless of entry qualification. The important knowledge was felt to be focused around aspects of biochemistry and the chemistry underpinning biological function. Chemistry 'A' level was also perceived to have high levels of academic rigour and thus could be used to give an indication of an applicant's intellectual ability.

It was felt that some of the gaps identified in the mapping activity may well be covered by Unit 15 - Biochemistry and Microbiology in Animal Management.

Essential Prior knowledge was identified as:

- Atomic structure
- Moles and Equations
- Acids, bases and buffers
- Enthalpy changes, reaction rates and equilibrium
- Principles of organic chemistry including functional groups and biologically important molecules (nucleic acids, carbohydrates, proteins)

4.3.3. Observations of gaps in National Diploma learner's wider knowledge and learning.

General discussion followed in relation to other areas where National Diploma learners would benefit from further development. Significant areas included:

- Familiarity with and experience of exam based assessment
- Ability to discuss scientific issues both verbally and in written form. This was felt to be a result, in part, of a lack of understanding of underpinning scientific principles.
- Independent learning and study skills. This was acknowledged as a problem in many learners and not specifically a feature of vocational applicants.
- Problem based learning and scientific enquiry.

4.3.4. Consideration of existing provision that may address knowledge gaps

Participants were referred to the summary table provided showing the National Diploma units delivered by each college in Elite Consortium. The structure of the National Diploma course was outlined and colleagues explained the rationale behind the choice of units offered. Issues of timetabling, learner interest and success rates were all noted.

Four units drawn from the approved National Diploma programme were then reviewed in terms of their ability to supply some of the essential knowledge identified above.

Unit 15: Biochemistry and Microbiology in Animal Management

This unit is currently offered at only one of the Elite Consortium colleges.

The unit content was felt to provide relevant biochemistry knowledge and it was felt that vet schools would look more favourably on National Diploma applicants who had studied this unit. A number of practical issues were raised around viable group sizes etc but it was felt that collaboration within the Consortium and a consideration of alternative forms of delivery (distance and on-line learning) may offer a way forward.

Unit 23: Scientific Investigation in Animal Management

This unit is not currently delivered by the Elite colleges although learners might complete small scale investigations as part of the assessment of other units.

It was felt that this unit could be extremely valuable in terms of developing independent study, problem solving skills and an understanding of the scientific process. It would be better for potential veterinary applicants to have completed this unit rather than subsuming an investigation into the assessment of another unit. It was stressed that the unit would need to be resourced properly and that to fully exploit the learning opportunities, contact time was likely to be more one to one rather than in the form of lectures. The possibility of HEIs offering summer placements with their research teams was suggested as a potential option in supporting the delivery of this unit.

Unit 27: Fundamentals of Science

This unit is not currently delivered by the Elite colleges.

The unit was felt to have limited value as the useful content could be covered in other units.

Unit 28: Chemistry for Biology Technicians

This unit is not currently delivered by the Elite colleges.

This unit was felt to be valuable in covering some of the principles of chemistry underpinning chemical activity in biological systems. The content maps well to the 'A' level chemistry syllabus and would provide good evidence of a learner's ability to cope with the rigours of the veterinary curriculum.

4.3.5. Summary Recommendation

In summary, an National Diploma learner whose unit profile included units 15, 23 and 28 in place of some of the 'softer' specialist units (e.g. kennel and cattery management, pet store management, wildlife rehab) would be considered more favourably in the application process for veterinary courses.

4.3.6. Preparing to Study at a Higher Level

Attention was drawn to the City and Guilds Level 4 Certificate in Higher Level Study Skills. The coverage of this qualification was very useful and would have a place within the year one undergraduate curriculum. One ELITE consortium college was considering offering the certificate as an additional qualification for Level 3 learners wishing to progress to higher education.

4.3.7. Learner Support, Information, Advice and Guidance Issues

The document summarizing interviews with National Diploma learners was considered.

It was recognized that when providing information about acceptable entry qualifications for veterinary courses, it is necessary to provide guidance in respect to specific units that should be studied. This information needs to be much clearer in publicity information.

Information sources about the financial cost of university study were perceived to be poorly used by learners. Many useful resources already exist (eg the learner calculator on the UniAid website www.uniaid.org.uk) which could be more widely promoted. A current project relating to the development of an IAG resource for vocational learners interested in veterinary medicine was outlined.

It was felt that routes into HE could be used as a means to promote vocational courses with learners and their parents. The importance of effectively managing learner's expectations was noted, particularly with regard to progression to highly competitive courses. The value of vocational routes into HE as an alternative to 'A' levels would benefit from being more strongly promoted with careers advisors and schools.

5. The nature and shape of the top-up curriculum

5.1. Activity

Activity during this stage focused on the following elements:

- The nature and shape of the top-up curriculum required to prepare vocational learners for progression into Veterinary Science Higher Education.
- Mechanisms for marketing the top-up programme to potential learners, and managing the expectations of these and associated stakeholders.
- Arrangements for identifying those vocational learners who are appropriate for the top-up programme.
- The likely pitfalls of delivering a top-up curriculum and suggested remedies to deal with these.
- Early ideas to form an implementation plan which in turn will inform a second stage project

A group of five staff from across ELITE Consortium Colleges received the information gathered during the earlier stages of the project and used this, together with their own knowledge and experience of dealing with National Diploma in Animal Management learners to devise a top-up curriculum and to establish associated arrangements for promotion and recruitment. At the same time, they considered the various challenges which will need to be addressed as part of any pilot activities.

5.2. The nature and shape of the top-up curriculum required to prepare vocational learners for progression into Veterinary Science Higher Education.

In the project specification agreed with VETNET LLN, it was agreed that where possible, components of the top-up curriculum should be nationally accredited units and qualifications. The research stage of this project has identified a range of components as being essential to the top-up curriculum for those vocational learners considering progression into Veterinary Science Higher Education. Through the mapping exercise which compared the National Diploma in Animal Management with A Levels in Chemistry and Biology, together with dialogue with various key stakeholders, the following top-up components have been identified.

National Diploma in Animal Management Units:

- Unit 15: Biochemistry and Microbiology in Animal Management
- Unit 23: Scientific Investigation in Animal Management
- Unit 28: Chemistry for Biology technicians

Key Skills at Level 3 (to be replaced by Functional Skills)

- Application of Number
- Communication
- Information Technology

Wider Key Skills

- Problem Solving
- Working with Other
- Improving own Learning and Performance

City and Guilds Level 4 Certificate in Higher Level Study Skills

5.2.1. Delivery Plan for top-up curriculum

The following is proposed

Stage	Content
Pre-Course	<ul style="list-style-type: none"> Promotion of top-up curriculum to new learners. Confirm progression accord with partner “Veterinary Schools” – particularly in relation to required National Diploma in Animal Management grades
Year 1 – Term 1	<ul style="list-style-type: none"> Learners commence core units of National Diploma. Tutorial support and monitoring of performance for eligible learners
Year 1 – Term 2	<ul style="list-style-type: none"> Learners continue with core units of National Diploma. Further Tutorial support and monitoring of performance for eligible learners. February to March (and no later than Easter) – Assessment Centre for those learners eligible and interested in the top-up programme. The assessment centre will focus on a common range of work completed plus additional content agreed by all in advance of the Assessment Centre
Year 1 – Term 3	<ul style="list-style-type: none"> On-going tutorial support and mentoring Top-up learners commence Level 3 Key/Functional Skills Top-up learners commence National Diploma Unit 15 - Biochemistry and Microbiology in Animal Management*
Mid Course Placement	<ul style="list-style-type: none"> Top-up learners participate in two week “summer school” delivered in partnership with the partner “Veterinary School”. Learners from colleges across the country participate. The “summer school” will deliver an intensive combined programme covering National Diploma Unit 23 - Scientific Investigation in Animal Management, and Unit 28 – Chemistry for Biology Technicians At this stage all parties will make a further assessment of learners with a view to setting targets, identifying additional support, and agreeing next steps Where identified, learners will receive support with their application to Veterinary Science including requirements around the Biomedical Admissions Test (BMAT)
Year 2 – Term 1	<ul style="list-style-type: none"> On-going tutorial support and mentoring Top-up learners continue with Level 3 Key/Functional Skills Top-up learners continue with National Diploma Unit 15 - Biochemistry and Microbiology in Animal Management.* Top-up learners complete assessments and course work required for Units 23 and 28
Year 2 – Term 2	<ul style="list-style-type: none"> On-going tutorial support and mentoring Top-up learners complete Level 3 Key/Functional Skills Top-up learners complete the National Diploma Unit 15 - Biochemistry and Microbiology in Animal Management.

Stage	Content
Year 2 – Term 3	<ul style="list-style-type: none"> Review of learner progress. Top-up learners commence City and Guilds Level 4 Certificate in

	Higher Level Study Skills
Post Course	<ul style="list-style-type: none"> Progressing learners linked to "Veterinary School" learners.
Year 1 of Veterinary Science Degree	<ul style="list-style-type: none"> Top-up learners complete City and Guilds Level 4 Certificate in Higher Level Study Skills Additional support and coaching from Veterinary School tutors

* as an alternative, Unit 15 will be covered during the Easter Holiday of Year 1

5.2.2. General comments on the delivery plan for the top-up curriculum

- Some colleges have moved to a position whereby "higher flying" learners are streamed accordingly – this programme would suite this group. However, this approach needs to be approached with caution on account of some colleges equality and diversity policies whereby "streaming" goes against college policy.
- Some colleges are offering a National Diploma in Animal Management which comprises 18 units whilst others require 21 units. Similarly, the working week varies from college to college. There may be some benefit in "top-up" learners dropping some non-essential units to make time for the top-up units. This would be decided on a case by case basis.
- In order that potential learners are treated fairly, participating colleges will need to establish a common policy on which National Diploma units should be dropped.

5.3. Mechanisms for marketing the top-up programme to potential learners, and managing the expectations of these and associated stakeholders.

5.3.1. Marketing

In the short term, the following was considered:

- A bespoke leaflet describing the programme
- An information pack for parents/guardians
- Work with learner cohort to promote the top-up option

In the long-term, once the programme has been piloted

- Promoted as a mainstream option available as an alternative to A Levels and Vocational Diplomas.
- Activities to influence schools based careers advisors and Connexions staff.

5.3.2. Managing Expectations

- Information which is straight about the facts and that does not artificially raise expectations and highlights benefits re progression to HE science based programmes, not exclusively veterinary science
- A clear learning plan which is signed by all parties and monitored frequently.
- Early intervention where learners are at risk of opting out of the top-up programme.

5.4. Arrangements for identifying those vocational learners who are appropriate for the top-up programme.

5.4.1. Pre-entry qualifications

It is considered essential that any learner joining the top-up programme should have a similar GCSE profile to one considering the A Level route. This will be a minimum of 5 GCSE including Mathematics, English and Science at grades no lower than B.

Some consideration has been given to First Diploma learners considering progressing to the National Diploma via a National Certificate or National Award route. It was considered to be unlikely that any of these learners would meet the criteria above although individuals would be considered on a case to case basis.

5.4.2. Assessment Centre

Those learners who meet the pre-entry qualification requirements, have the desire to progress to a Veterinary Science Higher Education programme, and have demonstrated sufficient ability during the first term and a half of the first year of the National Diploma in Animal Management will participate in an assessment centre. This would be held during the Second half of term 2 in the first year (March/April).

It is essential that learner participating in the assessment centre have all completed the same core units and elements of the National Diploma in Animal Management in order that they can be assessed (by written examination). This will require all participating colleges to share information on work undertaken. An alternative approach is to give all learners some common core text which they must study as part of their preparation. Veterinary Schools would be given the opportunity to contribute to this process.

5.4.3. The role of the Veterinary School Progression Accord

Whilst individual colleges suggested that a very high National Diploma grade profile should be achieved – such as Distinction Grades across the board or the accumulation of a set number of points, it was agreed that the Veterinary Schools are the ones who should set any such criteria and confirm these through a Progression Accord. This needs to be consistent across Veterinary Schools.

The overall aim of the “top-up” programme should be for potential learners to, at least, be invited for interview. It is acknowledged that these learners should expect no special favours and that at the interview stage; they may not progress on account of factors outside of this proposal.

5.5. The likely challenges of delivering a top-up curriculum, and suggested remedies to deal with these

The following points were identified. It was considered that any pilot activities would offer an opportunity to deal with these on a case by case basis.

- Dealing with the relatively small numbers at each college (2 or 3 anticipated) given the pressure on staff time. However, key skills at a higher level, and additional tutoring and mentoring was considered to be possible.
- Some concerns about staff capacity and capability in respect of the higher level work although for the most part this was seen as something which could be overcome. The need for dedicated tutors who talk to each other and are supported by college management was considered important
- Scope for distance learning was identified as a possible solution.
- The intensity of the summer school was considered to be a risk although the learners involved would need to demonstrate strong overall performance hence this would be an important test of ability.

- The cost and challenge of summer school attendance. This needs to be identified and shared with participating learners early on. Some thought that Veterinary Schools may be in a position to offer support as part of their widening participation initiatives.
- Funding of the additional elements provided during the National Diploma, particularly where staff input over and above the “normal” National Diploma curriculum is needed. Unless additional funds can be secured, it will be necessary to ask participating learners to contribute to the cost.
- Ensuring the university registrars and other relevant managers are properly informed about any additional top up study was considered to be key.
- Ensuring that learners joining the top-up curriculum from different colleges and National Diploma programmes feel that they are part of a group.
- In offering a “top-up” programme, it must be acknowledged that not all candidates will be successful and that a range of fall-back options and alternative pathways should be identified. For example, these might include degrees in applied science, possibly at a highly ranked university.

5.6. Early ideas to form an implementation plan which in turn will inform a second stage project

In the original project proposal, it was always planned that the second stage will consist of some pilot activities commencing Autumn 2008 through to early 2010. Whilst the details of this have not been discussed with VETNET LLN, the following broad elements are proposed:

- One college from Elite Consortium will lead on the second stage and a project co-ordinator will be appointed. A group of “champions” from the five colleges and from participating Veterinary schools will be formed. These in turn will form the “Veterinary School Progression Management Group”
- The top-up programme will be formalised together with marketing, recruitment and initial assessment arrangements. During autumn 2008, a development team will be identified. The various challenges identified in 5.5. above will be analysed and appropriate remedies identified
- Through partnership activities involving participating “Vet Schools, VETNET LLN, and Elite Consortium Colleges, Progression Accords specific to the aims and objectives of this project will be established. These will define the level of achievement required on the National Diploma in Animal Management.
- A pilot will be delivered during 2009/10. This will include regular monitoring and reporting of progress together with the sharing of best practice.
- Whilst it is hoped that VETNET LLN funds will be secured for pilot activities, the Veterinary School Progression Management Group will seek to establish funding arrangements for future “top-up” programmes. It is hoped that a programme of this nature, given its focus on the widening of participation might attract sponsorship or a bursary.

6. Conclusion

For those current learners included in the interview sample, there was some interest in progressing into Veterinary Science although their comprehension of what would be needed in terms of academic requirements and the likely format of Higher Education was often unrealistic. Many learners were critical of the information, advice and guidance which they received at school (and sometimes during their National Diploma) and for many, this aspect represents a significant factor if progression to Veterinary Science through the vocational route is to be increased.

Learners were interested in the concept of a “top-up” curriculum to help them progress to a Veterinary Science Higher Education but were unsure as to the financial implications of following this option. Some learners were confused by the concept in terms of Higher Education in general and expressed the need for formal input to help them progress – whatever the chosen area is. Colleges need to note this expectation and manage learner’s expectations accordingly.

In examining the correlation between A Levels in Biology and Chemistry and the National Diploma in Animal Management, it was found that Biology is better covered than Chemistry. This lack of Chemistry input represents a significant barrier to progression although two units from the National Diploma in Animal Management “Microbiology and Biochemistry” and “Chemistry for Biology Technicians” were noted as being a suitable substitute, even though they were somewhat incomplete and some essential gaps in knowledge and understanding remain.

In terms of the shape of the current National Diploma in Animal Management, it was found that few colleges include those units which would be useful as substitutes for A Levels in Biology and Chemistry. Colleges often select those units which will give learners the maximum opportunity to succeed in employment rather than progression to Veterinary Science Higher Education. Colleges would need much convincing to move away from this successful approach which matches the needs of the majority of their students. Some colleges expressed concerns over staff capacity and capability in relation to Biology and Chemistry

Universities closely examined the format of the National Diploma in Animal Management and considered the content of those units which develop learners Biology and Chemistry knowledge and skills. A recurring concern was around learner’s knowledge in relation to underpinning scientific principals. Whilst an A Level Chemistry equivalent was viewed as desirable, it was considered that potential learners would also benefit from experience in planning and carrying out and investigate approach as a means of developing familiarity with data collection and analysis.

In the interests of promoting progression and widening participation, universities noted the need to develop a progression accord which uses the relevant units from the National Diploma in Animal Management, combined with other higher level certificates and qualifications as a means of offering new progression opportunities for vocational learners. Furthermore, universities expressed the need for clear information, advice and guidance for potential learners. They noted the need for much intervention in terms of managing the expectations of learners and other stakeholders.

A core “top-up” curriculum is proposed. This includes additional National Diploma in Animal Management units, Functional Skills at level 3, Wider Key Skills and a Certificate at Level 4 in Study Skills. All parties agree that this represents a significant additional burden for learners and may not give them much advantage when they apply for Veterinary Science Higher Educations. A partnership approach and clear progression accords are viewed as essential components if a successful outcome is to be reached.

In considering next steps, it is concluded that anything introduced should be sustainable. A rushed response might have a negative impact for those learners participating. The excessive raising of learners expectations is a real danger and every step should be taken to avoid this. The next step should be to use the next few months to establish “top-up” arrangements which will work not just in

the short term, but for the long term also. In the way, the legacy will be more vocational learners progressing into Veterinary Sciences Higher Education.

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**Appendix A - BTEC Level 3 in Animal Management Units
Allocation by Elite Consortium Colleges**

Unit	Title	BB	HY	MN	MY	SP
1	Animal Health	Y	Y	Y	Y	Y
2	Animal Biology	Y	Y	Y	Y	Y
3	Animal Anatomy and Physiology	Y	Y	Y	Y	Y
4	Practical Animal Handling	Y	Y	Y	Y	Y
5	Investigative Project in the Animal Mgmnt Sector	Y	Y	Y	Y	Y
6	Work Related Experience in the Animal Mgmnt Sector	Y	Y	Y	Y	Y
7	Business Management for Land-based Industries	Y		Y		Y
8	Animal Nutrition	Y	Y	Y	Y	Y
9	Animal Nursing	Y	Y	Y	Y ¹	Y
10	Land-based Industries Customer Care and Retail	Y	Y		Y	
11	Animal Welfare and Breed Development	Y		Y	Y	Y
12	Animal Behaviour	Y	Y	Y	Y	Y
13	Animal Breeding and Genetics	Y		Y	Y	Y
14	Pet Store Management		Y	Y	Y	
15	Biochemistry and Microbiology in Animal Management					Y
16	Aquatics Management	Y			Y	Y
17	Exotic Animal Management	Y		Y	Y	Y
18	Principles of Ecology		Y		Y ²	Y
19	Wildlife Rehabilitation	Y ¹		Y	Y	Y
20	Farm Livestock Management	Y	Y	Y	Y ³	Y
21	Kennel and Cattery Management	Y ²		Y	Y	Y
22	Animal Grooming Parlour Management	Y ²				
23	Scientific Investigation in Animal Management					
24	Animal Collection Management	Y ¹	Y	Y	Y	Y
25	Land-based Estate Construction, Repair & Maintenance					
26	Environmental Interpretation in the Land-based Industries					
27	Fundamentals of Science					
28	Chemistry for Biology Technicians					
29	Genetics and Genetic Engineering					

BB = Bishop Burton College
 HY = Hartpury College
 MN = Moulton College
 MY = Myerscough College
 SP = Sparsholt College

Y = Yes – this unit is included
Core units are shown in bold

Units where some “A” Level Biology is found are shown in yellow

Units where some “A” Level Chemistry is found are shown in green

Y(n) – Optional Pathway

Appendix B - Mapping of “A” Levels to National Diploma in Animal Management

For this exercise, we have used the “new” AQA standards. These will be used from September 2008

The National Diploma in Animal Management **does not cover** these Units and Elements of Biology A Level:

Alongside each section of a unit the name only of the topic not covered is stated. There is more detail given in the specification as to what is required for each topic.

AS Biology

AS Unit 1 Biology and disease – some overlap with National Diploma units 1, 2, 3, 8, 15 but the following is not covered:

- 3.1.1 Covered
- 3.1.2 Enzyme action and properties, ,biochemical tests for sugar and starch
- 3.1.3 Detailed structure of plasma membrane,diffusion,osmosis,active transport,absorption and cholera and oral rehydration therapy
- 3.1.4 The biological basis of lung disease
- 3.1.5 Myogenic stimulation of heart ,role of SAN AVN and bundle of His,the biological basis of heart disease
- 3.1.6 Covered

Specified practicals

- Effect of specific variable on rate of reaction of enzyme controlled reaction
- The effect of a specific variable on human heart rate or pulse rate
- The effect of solute concentration on uptake of water by plant tissue

AS Unit 2 The variety of living organisms – some overlap with Units 15, 13, 2, 18, 12 but the following is not covered:

- 3.2.1 Investigating variation and causes of variation
- 3.2.2 Genes and polypeptides
- 3.2.3 Similarities and differences in DNA results in genetic diversity
- 3.2.4 Variety of life is reflected in the similarities and differences in biochemical basis and cellular organisation (haemoglobin, starch, glycogen, cellulose and plant cells)
- 3.2.5 Covered
- 3.2.6 Covered
- 3.2.7 Size and surface area,gas exchange in single celled organism,insects,fish and dicot plants, the passage of water through a plant
- 3.2.8 Covered
- 3.2.9 Genetic comparisons between species looking at DNA and proteins
- 3.2.10 Antibiotics and genetic variation in bacteria
- 3.2.11 Biodiversity including species diversity,& index of diversity

Specified practicals

- Collection and analysis of data relating to intraspecific variation
- Use of optical microscope to examine temporary slides
- Measurement of rate of water uptake using a photometer

AS Unit 3 Investigative and practical skills in AS Biology

- 3.3.1 Investigating biological problems involves changing a specific factor, the independent variable and measuring the changes in the dependent variable that result
- 3.3.2 Implementing involves the ability to work methodically and safely demonstrating competence in required manipulative skills and efficiency in managing time. Raw data should be collected and recorded over the course of the investigation
- 3.3.3 Raw data may require processing. Processed data should be used to plot graphs which illustrate patterns and trends from which appropriate conclusions may be drawn. Scientific knowledge from AS spec should be used to explain these conclusions
- 3.3.4 Limitations are inherent in the material and apparatus used and procedures adopted. These limitations should be identified and methods of overcoming them suggested.

A2 Biology

Unit 4: Populations and environment- some overlap with units 15,18,13,11 but the following topics are not covered:

- 3.4.1 Populations and ecosystems, investigating populations, variation in population size, human populations
- 3.4.2 Covered
- 3.4.3 Photosynthesis, light dependent reaction, light independent reaction, limiting factors
- 3.4.4 Covered
- 3.4.5 Energy and food production
- 3.4.6 Covered
- 3.4.7 Succession
- 3.4.8 The Hardy Weinburg equation

Specified practical work:

- Effect of limiting factors on rate of photosynthesis
- Effect of named factor on rate of respiration
- Ecological fieldwork and application of statistical analysis to data

Unit 5: Control in Cells and Organisms – some overlap with units 2.3

- 3.5.1. Stimuli both internal and external are detected and lead to a response. This covers topics such as tropisms, taxes and kinesese, reflex arcs, control of heart rate and structure of receptors eg Pacinian
- 3.5.2. The principles of nervous and hormonal coordination and the role of growth factors in plants. The establishment of resting potentials and passage of nerve impulses and factors affecting speed of conductance. Detailed structure of synapse, transmission (unidirectional, temporal and spatial summation and inhibition)
- 3.5.3. The sliding filament theory of muscle contraction and muscles as effectors
- 3.5.4. Covered
- 3.5.5. Principles of negative feedback and positive feedback
- 3.5.6. The sequence of bases in DNA determines the structure of proteins including enzymes. Gene mutations and oncogenes
- 3.5.7. Gene expression is controlled by a number of features
- 3.5.8. Gene cloning technologies allow study and alteration of gene function in order to better understand organism function and to design new industries and medical processes (gene cloning, gene therapy, medical diagnosis ,genetic fingerprinting)

Specified practical work

- The effect of external stimuli on taxes and kineses in suitable organisms

Unit 6: Investigative and practical skills in A2 Biology.

- 3.6.1 Investigating biological problems involves changing a specific factor, the independent variable and measuring the changes in the dependent variable that result
- 3.6.2 Implementing involves the ability to work methodically and safely demonstrating competence in required manipulative skills and efficiency in managing time. Raw data should be collected and recorded over the course of the investigation
- 3.6.3 Raw data may require processing. Processed data should be used to plot graphs which illustrate patterns and trends from which appropriate conclusions may be drawn. Scientific knowledge from AS spec should be used to explain these conclusions
- 3.6.4 Limitations are inherent in the material and apparatus used and procedures adopted. These limitations should be identified and methods of overcoming them suggested.

Appendix C - Mapping of National Diploma to OCR A Level Chemistry

Background Context

For OCR A level Chemistry, the new specifications which commence in September 2008 have been used for matching purposes.

There are 2 content units at AS – F321 and F322 (F323 is practical assessment) and 2 content units at A2 - F324 and F325 (F326 is practical assessment)

Chemistry Content of National Diploma in Animal Management

For Units 1 to 26 of the National Diploma, there are no matches with the A Level in Chemistry

Two specific units refer to Chemistry, namely

- Unit 27 – Fundamentals of Science
- Unit 28 - Chemistry for Biology Technicians

Mapping of National Diploma Units to A Level in Chemistry

Unit 27 Fundamentals of Science (60 hours)

27.1 Quantities involved in chemical reactions	
Periodic Table, Periodicity	F321 1.3.1
Groups	F321 1.3.2 /1.3.3 (Groups 2 / 7)
Atomic mass, atomic number	F321 1.1.1
Electronic structure of the atom	F321 1.2.1
Bonding of elements	F321 1.2.2
Quantities in chemical reactions	F321 1.1.2
Balanced equations	F321 1.1.2
Moles, molarity, titrations	F321 1.1.2
27.2 Structures in biological systems	
	No match
27.3 Types of energy and their interactions	
Types of energy	No match
Measurement of energy Units Use of calorimeter	F322 2.3.1
Examples of energy transfer	
27.4 Electricity and Electromagnetic radiation	
Electrical terminology	No match
Electrical circuits and components	No match
Electromagnetic radiation	F324 4.3.2 (spectroscopy)
Use of colorimeter	F325 5.3.1 (transition metals)

Unit 28 Chemistry for Biology Technicians (60 hours)

28.1 Be able to relate enthalpy changes to the bonding in a range of substances	
Bonding No specific reference to hydrophilic or hydrophobic substances Substances No specific reference to emulsions Enthalpy and enthalpy changes Henderson -Hasselbalch equation	F321 1.2.2 No match F321 1.1.3 F322 2.1.1 No match F322 2.3.1 F325 5.1.3
28.2 Understand how rates of reaction are affected by varying conditions	
Description of reaction rate Definition of reaction order, units, rate constant Factors influencing rate. Collision theory Quantitative chemistry Beer- Lambert Law Gas pressure, partial pressure, units	F322 2.3.2 F325 5.1.1 F322 2.3.2 F321 1.1.2 F323 4.3.2 (in part) No match
28.3 Understanding chemical equilibrium	
Chemical equilibrium, principles, reversible processes Equilibrium constant Proton concentration, pH, Kw Concentration on either side of a membrane Redox processes Strength of acids and bases, Ka, pKa Calculations of pH from Ka and vice-versa Conjugate acid and base Effect of pH on amino acids Buffer solutions Concentration either side of a membrane Redox processes oxidation/reduction Half-cell reactions E standard	F322 2.3.2 F325 5.1.2 F325 5.1.3 No match F325 5.2.3 F325 5.1.3 F325 5.1.3 F325 5.1.3 F324 4.2.1 F325 5.1.3 No match F321 1.1.4 F325 5.2.3
28.4 Know the structure and properties of organic molecules	
Functional groups Alkanes, tetrahedral carbon Alkenes, trigonal planar carbon Isomerism Optical isomerism, chiral molecules Structure of sugars Solubility of sugars Alcohols, properties Simple reactions of organic molecules Carboxylic acids, esters, amines, amides	F322 2.1.1 F322 2.1.2 F322 2.1.3 F322 2.1.1/2/3 No match F324 4.2.3 No match F322 2.2.1 F322 2.1.2/3 and 2.2.1/2 F324 4.1.1/2/3/4

Mapping of A Level to National Diploma

F321: Atoms, Bonds and Groups		Unit 27	Unit 28
Module 1	Atoms and Reactions		
1.1.1	Atoms	✓	
1.1.2	Moles and equations	✓	✓
1.1.3	Acids		✓
1.1.4	Redox		✓
Module 2	Electrons, Bonding and Structure		
1.2.1	Electron Structure	✓	
1.2.2	Bonding and Structure	✓	
Module 3	The Periodic Table		
1.3.1	Periodicity	✓	
1.3.2	Group 2	✓	
1.3.3	Group 7	✓	
F322: Chains, Energy and Resources		Unit 27	Unit 28
Module 1	Basic Concepts and Hydrocarbons		
2.1.1	Basic Concepts		✓
2.1.2	Alkanes		✓
2.1.3	Alkanes		✓
Module 2	Alcohols, Halogenoalkanes and Analysis		
2.2.1	Alcohols		✓
2.2.2	Halogenoalkanes		
2.2.3	Modern Analytical Techniques		
Module 3	Energy		
2.3.1	Enthalpy Changes	✓	✓
2.3.2	Rates and Equilibrium		✓
Module 4	Resources		
2.4.1	Chemistry of the Air		
2.4.2	Green Chemistry		
F324: Rings Polymers and Analysys		Unit 27	Unit 28
Module 1	Rings Acids and Amines		
4.1.1	Arenes		✓
4.1.2	Carbonyl Compounds		✓
4.1.3	Carboxylic Acids and Esters		✓
4.1.4	Amines		✓
Module 2	Polymers and Syntheses		
4.2.1	Amino Acids and Proteins		✓
4.2.2	Polyesters and Polyamides		
4.2.3	Synthesis		
Module 3	Analysis		
4.3.1	Chromatography		
4.3.2	Spectroscopy	✓	✓
F325: Equilibria, Energetics and Elements		Unit 27	Unit 28
Module 1	Rates, Equilibrium and pH		
5.1.1	How Fast?		✓
5.1.2	How Far?		✓
5.1.3	Acids, Bases and Buffers		✓
Module 2	Energy		
5.2.1	Lattice Enthalpy		
5.2.2	Enthalpy and Entropy		
5.2.3	Electrode Potentials and Fuel Cells		✓
Module 3	Transition Elements		
5.3.1	Transition Elements	✓	✓

Units F23 and F26 – Practical Skills for Chemistry 1 and 2 are not shown above. It must not be assumed that the National Diploma should develop the necessary Practical Skills at an appropriate level.