Sector Qualifications Strategy for the Bioscience sector

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Contents

SECTION 1: Executive Summary

In line with the Semta Bioscience Sector Skills Agreement and Semta's licence agreement, the Bioscience Sector Qualifications Strategy (SQS) relates to the following areas:

- Research based pharmaceutical companies that discover, develop, market and distribute medication and drugs
- Research and development in pharmaceutical manufacturing companies
- Bioscience companies that are a spin-off from universities
- The application of bioscience to produce innovative medicines and therapeutics
- The application of bioscience for the processing and production of materials i.e. the use of bioscience in engineering industries. This currently excludes agricultural biotechnology and bioscience that is for the processing and production of chemicals and energy.
- Research and experimental development

The above list covers the application of bioscience to produce vaccines, biomedical devices and medical diagnostics

The Bioscience SQS represents the interests of approximately 50,000 employees and is designed to support 14 to 19 year olds, apprentices, graduates, postgraduates, new entrants and the development of the existing workforce.

The SQS includes consideration of:

- Higher Education
- GCSEs and Vocational GCSEs
- GCE AS / A-Level
- Scottish Standard grade, intermediate and higher awards
- Diplomas
- Baccalaureates
- Current vocational qualifications in and outside the National Qualifications Framework which are relevant
- Apprenticeships and
- Post-entry and non formal provision – including short courses and CPD

In the development of action plans to support implementation of the SQS, account will be taken of national and regional priorities and economic strategies.

The major skills shortages in the bioscience sector are substantially higher than the UK average across all industries. These are having serious consequences for companies – including loss of products in pipeline, and projects not taken forward. This makes a prima facie case that the education and training system is not delivering the quantity and quality of recruits needed.

With scientific developments proceeding rapidly, there are also some highly specialist skills that employers are seeking, which require specialist training and courses. These areas include for example bioprocessing and biomanufacturing, as the sector increasingly develops biopharmaceuticals.

Employers are responding to the recruitment difficulties in a variety of ways, and coupled with efforts to improve the image and attractiveness of work in the sector, are striving to ensure talent is recruited into and retained in the sector.

With the exception of the Science Diploma which is currently under development, in general employers to not perceive the need for the development of new types of qualifications. There is, however, a need to encourage the development of a responsive FE and HE system such that the rapidly changing requirements of the sector can be met and any new qualifications can be established in a timely manner.

To ensure a vibrant sector in the UK, the bioscience sector's skills requirements have been defined in **four industry generated goals and objectives.**

1. Top Quality Workforce

Objectives:

To close the skills gap by increasing the supply of quality people

To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills

Associated development requirements

There is a need to:

- Improve **Practical Skills** as an integrated component of the education system at all levels.
- Help embed appropriate practical training and skills into the curriculum and course design from schools through FE and HE, and strengthen the number studying STEM subjects with a balance of practical learning.
- Encourage a **responsive FE and HE system** by encouraging the development of new qualifications that meet the needs of employers in a timely manner.
- Explore options for developing the existing workforce in order to keep pace with changing technologies and bioprocessing methods.
- Encourage learning provision to incorporate relevant aspects of GxP standards.
- **Engage with HE** to encourage the design of degrees so that they are delivered in a format whereby students are building knowledge cumulatively.
- Develop and maintain strong links with the **academic community** and funding stakeholders to influence and develop curriculum
- Actively promote the requirements of a 'good' chemistry course (detailed in the Skill Needs Assessment)
- Work with government and other partners to encourage the delivery of improved mathematical education.
- Design qualification frameworks to reflect key skills such as communication, team working, creative thinking and project management.
- Engage with partners to ensure opportunities, to build on standards and qualifications, and the ability to work in interdisciplinary teams, are available.
- Respond to the acute lack of suitable National and Scottish Vocational Qualifications (N\SVQs) for candidates who work in laboratories and manufacturing facilities, by creating a suite of qualifications that can be used in N/SVQs, the Science Diploma and other awards relevant and credible for the sector.
- Where relevant it is important that we engage the workforce with the new credit based frameworks to recognise individual achievement, for example the accreditation of short courses and CPD.
- Support mechanisms that encourage employers to offer students appropriate opportunities to gain industrial experience through placements.
- Lead on the development of the **Science Diploma** to ensure a fit for purpose qualification which contains a good balance of both practical and theoretical learning.

2. Leadership & Entrepreneurship:

Objective

To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.

Associated development requirements

There is a need to:

- Facilitate leadership training and development dialogue between employers and HE.
- Promote the design and development of flexible qualifications and ensure that employers are effectively engaged in the qualifications development process, for example with MBA modules.
- Work with partners to encourage the design and delivery of appropriate CPD and qualifications or certification that is valued by employers and individual adult learners.

3. Networks and Clusters:

Objective

To ensure that qualifications meet the needs of the sector employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.

Associated development requirements

There is a need to:

- Encourage Universities to play to their strengths in the provision of different types of bioscience courses, and properly finance the funding of lab based courses.
- Work with institutions to develop improved collaborative provision of expensive components of courses.
- Support sharing best practice and working with key stakeholders.
- Work with employers, networks and HE to assess current provision and facilitate the development of any new bioscience clusters deemed necessary.

4. Image and attractiveness:

Objectives

To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain

To encourage young people aspire to a career in science and engineering.

To increase the attractiveness to employees in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.

Associated development requirements

There is a need to:

- Work with providers to encourage the provision of more information, advice and guidance at all levels of the education and training system
- Design and develop qualifications frameworks that enable career progression.
- Increase the number of bioscience technicians and develop a Modern Apprenticeship framework to provide a nationally recognised route for training and a career path.
- Explore opportunities to expand capacity to increase the number of technicians coming into the industry via Foundation Degree, HNC/Ds and BTEC National routes

Top five priority areas for Semta to action:

1. Explore how increasing the use of Apprenticeships could free up graduate resources
2. Improve practical skills as an integrated component of the education system at all levels
3. Promote and develop a responsive system; to design short courses to address emerging specialist areas and upskilling requirements for the existing workforce
4. Enable young people to aspire to a career in science by establishing a clear set of career pathways
5. Explore how qualification developers can utilise a number of existing and emerging Competence Standards that could be of value to bioscience employers

The Bioscience SQS acts as the foundation for future Action Planning work, which will set the direction of travel for future qualification and learning development.

SECTION 2: Scope of the SQS

2.1 This section provides details of the UK-wide scope of the SQS in terms of:

- *sector coverage*
- *occupations covered*
- *population of learners*
- *range of provision and types of current qualifications, including HE, apprenticeships, sector/employer training schemes*

Differences and similarities between the four UK nations impacting on the scope are highlighted, as well as overlaps with other SSCs.

Sector Coverage:

In line with the Semta Bioscience Sector Skills Agreement and SEMTAs licence agreement, the Bioscience SQS relates to the following areas:

- Research based pharmaceutical companies that discover, develop, market and distribute medication and drugs.
- Research and development in pharmaceutical manufacturing companies.
- Bioscience companies that are a spin-off from universities.
- The application of bioscience to produce innovative medicines and therapeutics.
- The application of bioscience for the processing and production of materials i.e. the use of bioscience in engineering industries. This currently excludes agricultural biotechnology and bioscience that is for the processing and production of chemicals and energy.
- Research and experimental development

The above areas include the application of bioscience to produce vaccines, biomedical devices and medical diagnostics.

Therefore, the Bioscience SQS does not attempt to cover the pharmaceuticals industry *per se* (SIC 24.4: Manufacture of pharmaceuticals, medicinal chemicals and botanical products), which is covered by Cogent SSC. Even so, it has not been entirely possible to separate pharmaceutical research and development from pharmaceutical manufacturing.

Semta estimates that based on the best available data from both industry and official statistics, that there are some 50,000-55,000 employees in the Bioscience sector. It is important to note that this figure excludes pharmaceutical manufacturing employees.

Table 1: Estimates of Bioscience Sub-sector Employment

S U B – S E C T O R	Estimate of employment within the Bioscience Sector (Based on ABI 2005)
Science & Engineering Research and Development (SIC 73.1)	23,760
Manufacture of Pharmaceutical Preparations (24.42)	26,040
Manufacture of medical and surgical equipment (33.1)	2,625
Total Bioscience sector for this analysis:	**52,425**

Source: Semta Bioscience Sector Skills Agreement Stage 1

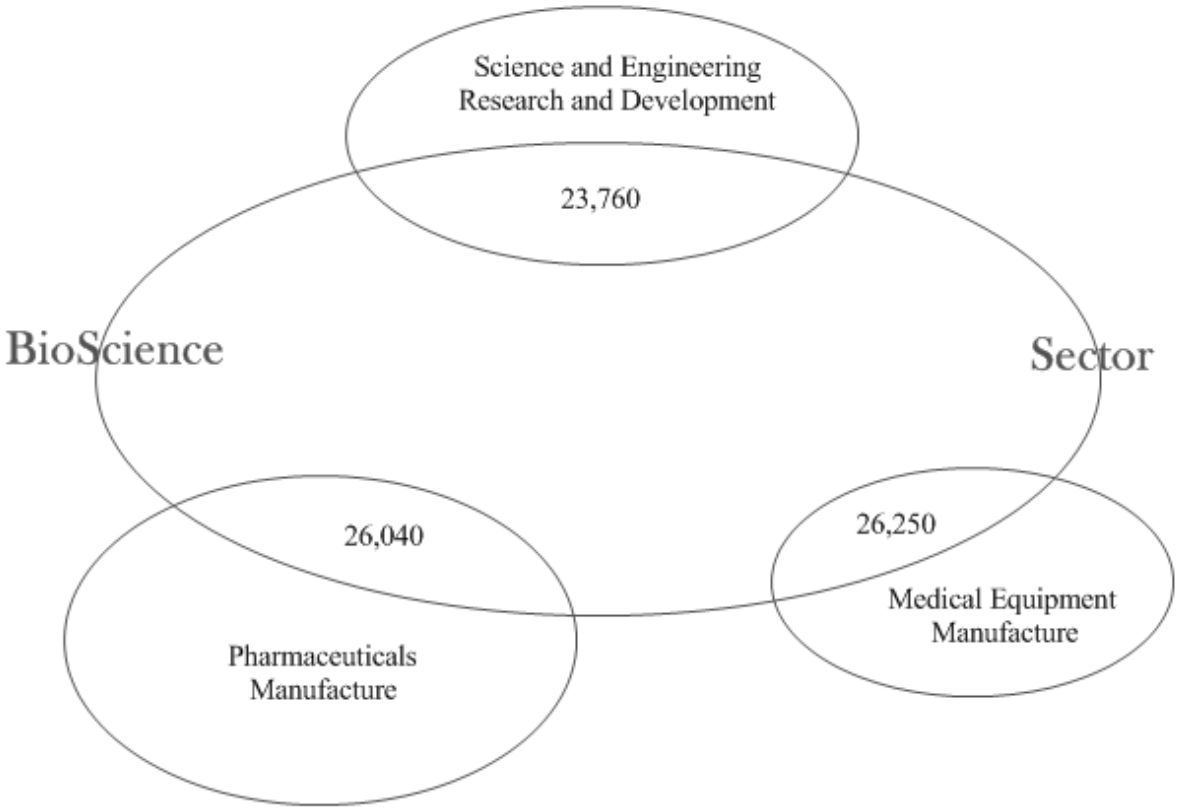

Figure 1: The structure of the Bioscience sector, number of employees. Semta Bioscience SSA Stage 1

The Semta database, using a comparatively broad definition of Bioscience and Pharmaceuticals, comprises 1,460 establishments. A feel for the geographical distribution can be gained from the breakdown of this total by Nation and English Regions:

Table 2: Distribution of *Bioscience and Pharmaceutical* companies

Scotland	**16%**
Wales	5%
Northern Ireland	3%
England (Regional Breakdown):	
North East	4%
North West	8%
Yorkshire and the Humber	6%
East Midlands	2%
West Midlands	2%
East of England	**22%**
South East	**18%**
South West	5%
London	9%

Source: Semta Labour Market Survey 2006

Bioscience-related companies are located in clusters, the most significant ones around the 'golden triangle', around Cambridge, Oxford and London; in Scotland centred around the Dundee, Edinburgh, Glasgow triangle; and in the North West of England, where there is a long established pharmaceutical industry.

Occupations Covered:

The SQS provides coverage of general, vocational, academic and professional provision that is relevant to a wide range of occupations and roles including the following:

1. Science Managers
2. Other Managers
3. Senior Scientists
4. Senior Researchers
5. Laboratory Scientists
6. Process or Product Design Engineers
7. Laboratory Technicians
8. Science Related IT
9. Packers Assemblers Machine Ops
10. Admin, Clerical
11. Sales and Marketing

Source: Semta Bioscience SSA Stage 1, Skill needs assessment 2007.

Population of Learners:

The Scope of the Bioscience SQS represents the interests of approximately 50,000 current employees in addition to new entrants into the sector. This SQS is intended to support 14 to 19 year olds, apprentices, graduates, postgraduates, new entrants and development of the existing workforce.

Bioscience Age Profile
In terms of the age profile of the survey sites, the majority of employees fall into the 25-44 age group (56%), while 13% are aged under 25, 22% are aged between 45 and 54, and 8% are aged over 55. This is a young age profile compared with other sectors e.g. in engineering 48% of employees are over 45 years of age and only 9% are aged under 25.
Even so, loss of crucial scientific staff due to retirement is reported as a problem in 17% of sites. This is an issue across a range of occupations from senior scientists, managers, laboratory scientists and technicians, researchers and production and design engineers, to sales and marketing staff.

Bioscience Gender Profile
Women account for approximately 42% of the workforce covered by the survey. 30% of establishments employ a majority of women in their workforce. However, looking at the gender breakdown by occupational group, there are large variations. While women account for 59% of laboratory technicians and 52% of laboratory scientists, they account for only 36% of senior researchers and 27% of science managers.

Range of Provision and current types of qualifications:

The SQS includes consideration of:

- Higher Education provision including:
  - Foundation degrees (England only) / HNC/Ds
  - Honours Degrees
  - MScs
  - Post Graduate Qualifications
  - Professional Qualifications

- GCSEs and vocational GCSEs
- GCE AS / A-Level
- Specialised Diplomas
- Baccalaureates
- Scottish standard grade, intermediate higher and advanced higher awards
- Current vocational qualifications in and outside the National Qualifications Framework which are relevant.
- Post-entry and non-formal provision – including short courses and CPD.
- Apprenticeships – specifically aimed at developing the skills, knowledge and career objectives of people entering the industry.

Differences across the four nations:

The following table highlights the differences in availability and provision of vocational qualifications across the UK:

Table 3: Difference in availability of provision across the UK

	NVQs / SVQs	*NCs / NDs*	*HNCs / HNDs*	*FDs*	*Other VQs (e.g. Access / Entry qualifications)*	*YAs*	*WBL*
England	✓	✓	✓	✓	✓	✓	✓
Scotland	✓	✓	✓				✓
Wales	✓	✓	✓	✓*	✓		✓
Northern Ireland	✓	✓	✓	✓*	✓		✓

**Foundation Degrees exist in Wales and Northern Ireland but there are currently no Bioscience related courses available. Source: Semta 2007*

Overlaps with other SSCs:
The Bioscience Sector overlaps with other SSCs footprints. Semta are responsible for the Biotechnology industry, the Research and Development part of the Pharmaceutical industry, and a small part of Medical Diagnostics, Devices and Equipment Manufacture.
Skills relating to applications of Bioscience to agricultural products are handled by the Sector Skills Council for the Environmental and Land-based Sector (*Lantra*). Skills issues considered in this report are also of importance to *Cogent,* the Sector Skills Council for the Chemicals and Pharmaceuticals, Oil and Gas, Nuclear, Petroleum and Polymer Industries, *Skills for Health*, the Sector Skills Council for the UK health sector, Improve, the Sector Skills Council for food and drink manufacture, and Proskills, the Sector Skills Council for UK Process and Manufacturing.
Where appropriate Semta will work in partnership with other SSCs and stakeholders.

2.2 This section highlights the key priorities for the sector in terms of qualifications and other learning provision, and how existing government policies in each of the four UK nations have been taken into consideration in the production of the SQS; including a synopsis of how the relevant government policy aligns with the sector's strategy.

To ensure a vibrant bioscience sector in the UK the sector's skills requirements have been defined in the following industry generated goals:

1. **Top quality workforce:** Closing the skills gap by increasing the supply of quality people. Identify 'CORE' subjects and activities within the curriculum i.e. the STEM subjects and a focus on Practical skills.
   There is a need to improve practical skills at all levels of the curriculum, to encourage a responsive FE and HE system, and to lead the development of the new Science Diploma.

2. **Leadership & Entrepreneurship:** Viewed as a significant area of opportunity and improvement for the sector, not only in the large companies, but also in the smaller biological labs where often technically competent and academically strong young entrepreneurs require improved support and business acumen/skills to grow and develop the business. We need to encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.

3. **Networks and Clusters:** are viewed as a CRITICAL enabler and cluster development is central to the growth of bioscience and has been supported by the government since the 1999 Sainsbury report (Biotechnology Clusters - Report of a team led by Lord Sainsbury, Minister for Science). Skills are an important component of successful clusters, along with proximity to suppliers and markets. Delivery of provision will be more successful if pursued through the clusters and networks already developed.

4. **Image and attractiveness:** To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain i.e. industry take a more participative role in this area. Encourage young people to aspire to a career in science and engineering. Increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.

Government Policies:

The SQS is concerned with the implementation of the Qualifications and Credit Framework, Scottish Credit and Qualifications Framework and the Credit and Qualifications Framework for Wales. As the Qualifications and Credit Framework develops (and the vocational reform programme is implemented) the implications for the qualifications strategy will be considered and necessary changes implemented.

Account has also been taken of initiatives and reports including:

UK

- the Leitch report;

England

- World Class Skills: Implementing the Leitch review of skills in England;
- Delivering World-class Skills in a Demand-led system;
- the 14 to 19 Skills White Paper (2005);

Northern Ireland

- Success through skills: The Skills Strategy for Northern Ireland;
- Economic vision for Northern Ireland;

Scotland

- Developing the workforce, learning in and for the workplace;
- The Framework for Economic Development in Scotland;
- Skills for Scotland;
- A smart, successful Scotland: Ambitions for the Enterprise Networks;

Wales

- Skills and Employment Action Plan for Wales;
- Wales: A vibrant economy;
- Wales: A better country.

Also of importance to Bioscience

- Race to the Top (Lord Sainsbury's report)
- Science and Innovation Framework – Next Steps
- Bioscience Innovation and Growth Team BIGT 2015
- Royal Society report on practical skills

The UK-wide Leitch Review of Skills highlights 'A compelling vision for the UK', within which a commitment to becoming a world leader in skills by 2020 requires major progress in literacy and numeracy; greater achievement at levels 2 and 3 linked to a substantial increase in the numbers of apprentices; and substantially increased numbers of adults qualifying at Level 4.

The Science and innovation investment framework 2004-2014[1] was launched in July 2004 and a discussion paper on the Next Steps[2] was published in March 2006 for consultation. It outlined the Government's commitment to raising science spending faster than the rate of growth of the economy as a whole and increasing UK R&D investment as a proportion of national income and 'put particular emphasis on stimulating business-university collaboration and making the science base more responsive to the needs of the economy'.

The SQS addresses the needs of learners and employers in the sector: this covers knowledge, skills and competence based qualifications.

In the development of action plans to support implementation of the SQS, account will be taken of national and regional priorities and economic strategies.

In the tables below, a selection of key Government policies in the four UK nations have been mapped to the SQS Strategic Objectives:

[1] HM Treasury/DTI/DfES, July 2004, *Science & innovation framework 2004-2014*.
[2] HM Treasury/DTI/DfES/Dept of Health, July 2004, *Science and innovation framework 2004-2014: next steps.*

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Table 4: Government Policy Matrix - England

ENGLAND SQS Strategic Objectives	World Class Skills: Implementing the Leitch review of skills in England	Delivering World-class Skills in a Demand-led system	14-19 Education and Skills Implementation Plan
Top quality workforce: To close the skills gap by increasing the supply of quality people. To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills.	To deliver England's share of the UK ambition of 500,000 people a year in Apprenticeships by 2020 Employers to clearly articulate what their skills needs and priorities are, in order to support business development. We will make it easier for employers to have their own in-house training programmes accredited through the QCF. More than 90% of adults to have gained at least a level 2 qualification by 2020. By 2014, 36% of adults to be qualified to level 4 and above HEFCE Will fund an additional 5,000 student places in 2008/9, co-funded with employers.	Employers will influence the design and delivery of Diplomas and Apprenticeships. Employers will have much greater influence on the FE system, advising on curriculum design offering work placements. To support a demand led system we need to ensure that the vocational qualifications we support reflect the needs of employers and learners. Capacity building funding to develop new providers and support private provision where existing provision fails to meet the learners' needs. National entitlement to 14 Specialised Diplomas by 2013 More learners and employers to engage with skills training, and a system that purposely sets out to give more choice and control to its customers in order to enhance their individual and business competitiveness.	More young people will complete Apprenticeships National entitlement to 14 Specialised Diplomas by 2013
Leadership & Entrepreneurship: To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.	To shift the balance of intermediate skills from level 2 to level 3, with 1.9 million people achieving level 3 by 2020 By 2014, 36% of adults to be qualified to level 4 and above More than 40% of all adults to have a higher education qualification, with a commitment to achieving world-class levels by 2020.	To support a demand led system we need to ensure that the vocational qualifications we support reflect the needs of employers and learners.	

	HEFCE Will fund an additional 5,000 student places in 2008/9, co-funded with employers. Employers to clearly articulate what their skills needs and priorities are, in order to support business development.		
Networks and Clusters: To ensure that qualifications meet the needs of the sector. Employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.	Employers to clearly articulate what their skills needs and priorities are, in order to support business development. Continue to encourage more HE institutions to collaborate with employers to develop programmes and delivery methods that meet their higher level skills needs.	More learners and employers to engage with skills training, and a system that purposely sets out to give more choice and control to its customers in order to enhance their individual and business competitiveness.	
Image and attractiveness: To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain To encourage young people aspire to a career in science and engineering. To increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.	The new careers service will ensure that everyone is able to access the help they need to take stock of where they are in achieving their goals and ambitions and to get the support they need to advance themselves and achieve their full potential. Skills Accounts will give individuals greater ownership and choice over their learning, motivating them to gain skills and achieve qualifications, enter work and progress in employment.	National entitlement to 14 Specialised Diplomas by 2013	

Table 5: Government Policy Matrix – Northern Ireland

NORTHERN IRELAND SQS Strategic Objectives	Success through skills: The Skills Strategy for Northern Ireland	Economic Vision for Northern Ireland
Top quality workforce: To close the skills gap by increasing the supply of quality people. To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills.	Improve the relevance, coherence, response and quality of current education and training provision. Promote the acquisition of skills with particular emphasis, initially, on those who have not yet achieved a level 2 qualification or require assistance with essential skills; The Department will also pilot all age, adult Modern Apprenticeships, for those aged 20 and over, as well as Modern Apprenticeships in the public sector from 2005.	Better and stronger links between the HE/FE/training sectors and industry/business, greater transfer of knowledge and technology between the research base and industry and greater commercialisation of R&D at university level. Utilise public expenditure in ways that promote and deliver central aspects of the vision: in particular, continued investment in innovation, enterprise, skills through education, training and learning, and infrastructure.
Leadership & Entrepreneurship: To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.	The Department will also pilot all age, adult Modern Apprenticeships, for those aged 20 and over, as well as Modern Apprenticeships in the public sector from 2005.	Exploit greater partnership between the public and private sectors for the delivery of mutually beneficial services and facilities, through, for example, public private partnerships (PPPs), and innovation in the delivery of high quality public services. Utilise public expenditure in ways that promote and deliver central aspects of the vision: in particular, continued investment in innovation, enterprise, skills through education, training and learning, and infrastructure. Better and stronger links between the HE/FE/training sectors and industry/business, greater transfer of knowledge and technology between the research base and industry and greater commercialisation of R&D at university level. Support to Northern Ireland universities is focused on those areas of research where Northern Ireland firms are world class and/or have the potential to compete with the very best in the world.
Networks and Clusters:	Improve the relevance, coherence, response and quality of current education and training provision;	Better and stronger links between the HE/FE/training sectors and industry/business, greater transfer of

To ensure that qualifications meet the needs of the sector. Employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.		knowledge and technology between the research base and industry and greater commercialisation of R&D at university level.
Image and attractiveness: To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain To encourage young people aspire to a career in science and engineering. To increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.	The Department will also pilot all age, adult Modern Apprenticeships, for those aged 20 and over, as well as Modern Apprenticeships in the public sector from 2005.	

Table 6: Government Policy Matrix - Scotland

SCOTLAND SQS Strategic Objectives	Skills for Scotland	A smart, successful Scotland: Ambitions for the Enterprise Networks	The Framework for Economic Development in Scotland
Top quality workforce: To close the skills gap by increasing the supply of quality people. To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills.	To ensure that employers have a say in the design and development of learning at all levels and in all settings, not just in vocational qualifications. Improving the utilisation of skills in the workplace, through: ▪ Supporting job design that encourages autonomy, makes better use of	We need to offer vocational and high level technical and IT skills at a comparable level to international competitors. Increasing the range of vocational learning opportunities which smooth transition from school to work and reducing the number of young people	We must improve the skills of the whole population through further support for the basic education system, by strengthening lifelong learning, and by nurturing higher and further education. This must include a concern for raising our manual and vocational skills.

	employees and stimulates enterprise and innovation in the workplace; ▪ Improving links between skills and the other drivers of productivity, such as investment in technology and infrastructure; and ▪ Ensuring that individuals can use the skills they have acquired through learning in a way that immediately benefits their employer.	who leave school and are neither in employment, education or training. Tackling the skills needs of today, while anticipating and planning for the needs of new and emerging opportunities.	Seek to respond to market failure in the exploitation by business of science and research; Ensure that Scotland has a physical and electronic infrastructure that supports growth; and provide through the education system at all levels for the skills which the competitive economy of the future will require.
Leadership & Entrepreneurship: To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.	Stimulating increased demand for skills from employers, both public and private, by: ▪ Encouraging employers to develop ambitious business strategies from which a need for higher level skills will flow; ▪ Helping employers to articulate what they need now and what they are going to need in the future;	Improving the capacity of our businesses to learn from, and innovate based on, scientific endeavour. Tackling the skills needs of today, while anticipating and planning for the needs of new and emerging opportunities. Joint work with higher education institutions and research institutes to assist our scientists to understand business and see their research successfully commercialised.	Seek to respond to market failure in the exploitation by business of science and research; Ensure that Scotland has a physical and electronic infrastructure that supports growth; and provide through the education system at all levels for the skills which the competitive economy of the future will require. We must improve the skills of the whole population through further support for the basic education system, by strengthening lifelong learning, and by nurturing higher and further education.
Networks and Clusters: To ensure that qualifications meet the needs of the sector. Employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.	Stimulating increased demand for skills from employers, both public and private, by: ▪ Encouraging employers to develop ambitious business strategies from which a need for higher level skills will flow; ▪ Helping employers to articulate what they need now and what they are going to need in the future; ▪ Supporting the capacity of learning providers to engage with employers and understand and respond to their needs.	The cluster approach has improved interactions between the Scottish Biotechnology industry and its academic community. Biosolutions – an innovative e learning project is providing web based learning tools and auditing systems for specialist biotechnology staff development created in partnership with the University of Strathclyde. Joint work with higher education institutions and research institutes to assist our scientists to understand business and see their research successfully commercialised.	

Image and attractiveness: To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain To encourage young people aspire to a career in science and engineering. To increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.		Increasing the range of vocational learning opportunities which smooth transition from school to work and reducing the number of young people who leave school and are neither in employment, education or training.	

Table 7: Government Policy Matrix - Wales

WALES SQS Strategic Objectives	Wales: A better country	Wales: A Vibrant Economy	Skills and Employment Action Plan for Wales	Developing the workforce – Learning In and For the workplace
Top quality workforce: To close the skills gap by increasing the supply of quality people. To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills.	To ensure that everyone has the skills and qualifications to find work … and that our skills and abilities as a whole increase so that Wales is able to attract the kind of high value employment that is needed to fulfil our vision. Pilot free skills training for adults up to NVQ level 3	Supply new entrants to the labour market with the skills they need Work with employers/ employees to improve skills – apprenticeships highlighted Improving our skills base and using the opportunities created by the mergers to deliver more demand led training tailored to the needs of businesses.	Ensure that the content of the new learning frameworks associated with the DCELLS all-age programme are unit based, flexible and meet the economic needs of Wales and its employers	A vocational education and training system, that is responsive to the demands of employers and the economy at large for particular skills and education and learning provision that is responsive to the demand of individuals and employers, for when and where learning should take place. Ensure all work–based learning programmes (such as Modern Skills Diplomas and Modern Apprenticeships) are

				designed to provide maximum choice and flexibility as defined within the CQFW to reflect the needs of business and particularly of SMEs in Wales e.g. incorporating job specific learning for employers
Leadership & Entrepreneurship: To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.	Further develop the knowledge economy through stronger links between FE and HE and businesses We have potential to build on the competitive strength that we have evolved in areas such as aerospace and automotive, telecommunications and creative IT industries, renewable energy and tourism.	Improving our skills base and using the opportunities created by the mergers to deliver more demand led training tailored to the needs of businesses. Supply new entrants to the labour market with the skills they need.	To design a more flexible unit-based programme.	A vocational education and training system, that is responsive to the demands of employers and the economy at large for particular skills and education and learning provision that is responsive to the demand of individuals and employers, for when and where learning should take Employers take responsibility for development of their workforce through improved understanding of their skills' needs.
Networks and Clusters: To ensure that qualifications meet the needs of the sector. Employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.	To ensure that everyone has the skills and qualifications to find work … and that our skills and abilities as a whole increase. Pilot free skills training for adults up to NVQ level 3 Further develop the knowledge economy through stronger links between FE and HE and	Work with employers/ employees to improve skills – apprenticeships highlighted		Employers articulate demand and participate in the mapping of skills needs and shortages to develop action to overcome skills issues in co-operation with Sector Skills Councils and where appropriate, Trades Unions Employers share the investment in job – specific training place. Enhance collaboration between Higher

	businesses			Education/Further Education and other providers to explore the potential of Foundation Degrees as a key outward progression point at 19
Image and attractiveness: To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain To encourage young people aspire to a career in science and engineering. To increase the number of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.	Further develop the knowledge economy through stronger links between FE and HE and businesses To ensure that everyone has the skills and qualifications to find work … and that our skills and abilities as a whole increase so that Wales is able to attract the kind of high value employment that is needed to fulfil our vision.	Supply new entrants to the labour market with the skills they need Work with employers/ employees to improve skills – apprenticeships highlighted		

SECTION 3: Sector Working Environment

Special features of the working environment:

The purpose of this section is to point out the special features of the working environment within the bioscience sector that impact on how qualifications need to be tailored to meet the needs of the sector.

The sector is subject to extensive regulation by a variety of regulatory bodies. A wide range of good practice requirements covering research, development, production and manufacturing, typically described as GxP are required by the sector. In addition, managing compliance is a critical factor.

GxP is a general term for *Good Practice* quality guidelines and regulations, used in many fields, including the pharmaceutical and food industries. The titles of these good practice guidelines usually begin with "Good" and end in "Practice", with the specific practice descriptor in between.

It is important that all regulations embodied in GxP are taken into account during the design, delivery and assessment of learning provision. Wherever possible and appropriate, GxP should be embedded into qualification structures at all levels.

The first two examples below describe some practices and procedures that must be adhered to when *working in the Bioscience environment*:

Good Manufacturing Practice:
Good Manufacturing Practice (GMP) is a part of quality assurance which ensures that medicinal products are consistently produced and controlled to the quality standards appropriate to their intended use and as required by the marketing authorisation or product specification. GMP is concerned with both production and quality control, and must be adhered to when working in the Bioscience sector. Lean Sigma is typically an approach adopted. Lean compliance and quality by design incorporating 6-Sigma methodology are increasingly important. Upskilling the relevant workforce in this area would lead to significant enhancements.

Good Laboratory Practice:
Good Laboratory Practice (GLP) embodies a set of principles that provides a framework within which laboratory studies are planned, performed, monitored, recorded, reported and archived. These studies are undertaken to generate data by which the hazards and risks to users, consumers and third parties, including the environment, can be assessed for pharmaceuticals, agrochemicals, veterinary medicines, industrial chemicals, cosmetics, food and feed additives and biocides. GLP helps assure regulatory authorities that the data submitted are a true reflection of the results obtained during the study and can therefore be relied upon when making risk/safety assessments. When working in the Bioscience environment, it is important not only to understand the principles of GLP but to use them appropriately in everyday working situations.

Intellectual Property (IP):
The Bioscience sector is subject to an increasingly rapid speed of change, technological advancement and development of new products and services. An awareness and appreciation of IP rights and responsibilities is considered to be valuable when working in the bioscience environment. A number of providers currently offer short courses in this area.

Practical Science Skills:
Practical science skills are critically important to the sector and it is essential that relevant skills are embedded within courses, training and qualifications.

The HE Sector:
The Sector typically recruits at the graduate and post graduate level. The sector is heavily reliant on the HE sector both for a source of potential recruits and ongoing scientific collaboration. Working with the HE sector to develop a system that is responsive to the needs of employers is critically important.

3.2 This section provides an analysis of sectoral workforce trends for the future and changes forecast to the working environment.

Sectoral workforce trends:

The Semta Labour Market Survey conducted in 2006 looked at workforce trends for the Bioscience sector. When employers were asked what they expected to be the major changes in their organisation in the next 3 years, the most common response is 'general expansion/growth in staff numbers' (34%). 16% suggested a 'move into new product/service/research areas'. Expansion and recruitment of new staff and a shift into new research areas to develop new products and services will require training, upskilling and where relevant achievement of appropriate qualifications.

Table 8: Organisational changes anticipated in the next 3 years

Base 178	**%**
General expansion/growth in staff numbers	34
Move into new product/service/research areas	16
Anticipate merger or re-structuring	10
Development of new technology/increasing use of technology	6
More sales and marketing activity/sales and marketing staff	7
Changing skill needs	4
Anticipate closure/bankruptcy	4
Increasing Research and Development	4
Change of location	3
Other	18
Nothing/none	6

Source: Semta Labour market survey 2006

NEPIC is an organisation that represents 500 Pharmaceutical, Biotechnology, Speciality, Polymer & Rubber, Petrochemical & Commodity Chemical companies based in North East England. In addition to these companies represented, there are at least an equal number of companies in the supply chain of these industries based in this region making this a major economic Cluster, of critical importance to the Bioscience sector.
In 2005, NEPIC reflected upon the changes within the bioscience industry and identified an increased demand for manpower within the Bioscience sector. The report indicates a requirement of 600 new employees within three years and 1000 within 5 years; of which NEPIC anticipate 45% to be at a technical level and 30% within the area of specialist biotechnician roles. The NEPIC survey estimates that 300 more bioscience technicians will be needed in the North East alone by 2010.

The skills affected by this increased demand for manpower are estimated to be primarily at the NVQ Level 3.

NEPIC also looked at changes at the senior & expert level. It is claimed that "for many smaller Companies, senior experts are not required all of the time but for specific projects or periods of time.' Examples are given as projects & process engineers, development chemists, business development or marketing campaigns, HR, legal, IP specialists etc.
It is reported that a considerable amount of in-house training is undertaken but there are additional problems in that many SME's are not in a position to fund meaningful CPD (Continuous Professional Development).
Source: NEPIC Market Research Survey into the Training Needs within the Biotechnology Bioscience Cluster in the North East

The above analysis is still considered current with the SQS steering group, however this information will be updated following the publication of new reports during the SQS refreshment process.

The Association of British Pharmaceutical industries Skills report published in 2005, and the new ABPI skills review that will report in October 2008 examine the skills landscape in the UK pharmaceutical and biopharmaceutical industries. This includes trends in skills needs, and thereby strategic opportunities for the UK, as well as current and imminent skills shortages which negatively impact these UK Industries.
Source: ABPI: Sustaining the Skills Pipeline in the Pharmaceutical and Biopharmaceutical industries 2005.
Evidence from these reports will be considered in a timely manner following publication of the updated report in October 2008.

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SECTION 4: Summary of current qualifications and other learning provision

4.1 This section describes the main qualification types, and other learning provision as appropriate, for the sector for all relevant levels and highlights:
purposes
interrelationships (including progression routes)
availability from different providers
and differences in the main types of qualifications within scope across the four UK nations.
AND
4.2 Also provides an appropriate analysis of the available information about qualifications and other learning provision within the scope of the SQS to support the information presented in this section.

The public infrastructure in the UK that develops knowledge and skills for the bioscience sector, especially laboratory/research scientists, is concentrated in Higher Education (HE) – largely universities, particularly those with established scientific research departments. These universities teach first and post-graduate (p-g) degrees in science, mathematics and engineering.
Technical skills for Laboratory Technicians, bio-manufacturing technicians and other skilled occupations at Level 3 are generally provided by colleges of Further Education (FE). Relevant qualifications in secondary level education are a requirement of entry into courses in either HE or FE.
There is also a range of specialist private training companies offering courses in specific technical topics and continuing professional development. Senior scientific staff often keep their skills up to date through more informal specialist networks and conferences.

The purpose of this section is to summarise current provision in sufficient detail to put in context the proposals made in section 6.1 of this strategy.
The table below provides a summary of the purpose and availability of qualifications used within the Bioscience sector, current learner volumes, as well as highlighting the differences in these qualifications across the UK.

The main qualification types for the bioscience sector are:

Academic (Pre-HE)
- GCSEs and vocational GCSEs
- GCE AS / A Level
- Scottish standard grade, intermediate, higher and advanced higher awards
- Specialised Diplomas
- Baccalaureates

Higher Education Provision including:
- Foundation Degrees (England Only)
- HNC/Ds
- Honours Degrees
- MScs
- Post Graduate Qualifications
- Professional qualifications

Vocational

- NVQs/SVQs
- Apprenticeships
- NC/NDs

Academic / Pre-entry qualifications (Pre-HE):

Academic qualifications exist in general subjects *(e.g. science and maths)*. The level of availability around the UK is high, particularly for general subjects, which form part of the National Curriculum entitlement in all four countries of the UK.

Across the UK there are differences between the qualifications available. Within England, Wales and Northern Ireland GCSEs and GCEs (A/AS levels) are the most common form of general academic pre-entry qualification. Vocational versions are also available in some areas.
In England the new Diploma qualifications will provide an occupationally linked alternative to GCSEs and A Levels. Semta will lead on the development of the new Science Diploma.
In Scotland Standard Grade, Higher, and Scottish Progression Awards provide the equivalent qualifications.
Within Wales learners have access to the Welsh Baccalaureate.

Higher Education Provision:

Undergraduate
The main entry to the bioscience sector, especially for laboratory scientists and research scientists, is from universities, particularly those with established scientific Research Departments.

Access to higher education programmes may be enabled through qualifications such as the UK-wide HNC/HND, and the Foundation Degree, currently only offered in England. These qualifications provide learners with the technical underpinning knowledge, theories and concepts behind an area of work, and offer a gateway into other higher education for those who may not have the traditional entry requirements.

The sector is served with a large number of traditional Bachelor Degree programmes in subjects such as Biological Sciences, Chemistry, and subjects allied to medicine. These are accessed through Higher Education Institutions across the UK, however the number of institutions offering courses such as biological sciences has decreased since 2004.

Postgraduate
Masters and PhD qualifications are available in many subject areas relevant to the Bioscience sector. The greatest numbers of post graduate opportunities are to be found in Biological Sciences. These opportunities are accessed through Higher Education Institutions across the UK.

Vocational:

N/SVQs
S/NVQs are competence based qualifications, assessing the skills and knowledge needed to perform a particular job role effectively. They are available from a variety of publicly and privately funded providers including private training providers, Further Education Colleges, and in-house company training centres.
A qualification review (outlined in section 4.3) reveals the acute lack of suitable National and Scottish Vocational Qualifications (N\SVQs) for candidates who work in laboratories and manufacturing facilities.

Apprenticeships
Apprenticeships are aimed at 16 to 24 year-olds and enable young people to learn on and off the job, build up knowledge and skills, achieve nationally recognised qualifications and earn money at the same time. Apprentices will typically gain a relevant S/NVQ, key or core skills, and a vocationally linked qualification.
Semta has Apprenticeship Frameworks based on the LATA N/SVQ, and a Young Apprenticeship in Science.

Table 9: Current Qualifications, purposes, availability and volumes

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS
(Full Geographic Breakdown is available in Semta Bioscience SSA Stage 2)</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr><td colspan="5">Academic (Pre-HE)</td></tr>
<tr><td>GCSEs</td><td>Pre-requisite levels / measures for Apprenticeships, employment and/or FE/HE</td><td>Schools and Colleges of FE</td><td>GCSE in:
Biology
Chemistry
Physics
Science (new specification)
Applied Science double award
Applied Science
Additional Science (new specification)
Mathematics</td><td>GCSE achievement in the UK in 2008 (England, Wales and Northern Ireland only) Source: JCQ 2008
<table><tr><th>Subject area</th><th>Taking GCSE</th><th>No. Achieving A*-C</th></tr><tr><td>Biology</td><td>85,521</td><td>77,910</td></tr><tr><td>Chemistry</td><td>76,656</td><td>72,057</td></tr><tr><td>Physics</td><td>75,383</td><td>70,483</td></tr><tr><td>Double award</td><td>16,866</td><td>14,555</td></tr><tr><td>Single award</td><td>4,445</td><td>2,809</td></tr><tr><td>Science (new spec)</td><td>537,606</td><td>318,800</td></tr><tr><td>Additional Science (new spec)</td><td>433,468</td><td>273,952</td></tr><tr><td>Maths</td><td>738,451</td><td>415,748</td></tr></table></td></tr>
<tr><td>GCEs (A/AS Levels)</td><td>Pre-requisite levels / measures for Apprenticeships, employment and/or FE/HE</td><td>Schools and Colleges of FE</td><td>GCE in:
Biology
Chemistry
Physics
Applied Science
Applied Science double award
Human Biology
Mathematics
Pure Mathematics
Further Mathematics</td><td>GCE ‘A’ Level achievement in the UK in 2008 (England, Wales and Northern Ireland only) Source: JCQ 2008
<table><tr><th>Subject area</th><th>Taking ’A’ level</th><th>No. Achieving A-C</th></tr><tr><td>Biology</td><td>56,010</td><td>38,759</td></tr><tr><td>Chemistry</td><td>41,680</td><td>31,802</td></tr><tr><td>Physics</td><td>28,096</td><td>19,835</td></tr><tr><td>Maths</td><td>64,593</td><td>52,514</td></tr><tr><td>Further Maths</td><td>9,091</td><td>8,081</td></tr></table></td></tr>
</table>

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr>
<td>Scottish:
<table>
<tr><th>Scottish NQ</th><th>SCQF Level</th></tr>
<tr><td>Access 1</td><td>1</td></tr>
<tr><td>Access 2</td><td>2</td></tr>
<tr><td>Access 3 / Foundation Standard Grade</td><td>3</td></tr>
<tr><td>Intermediate 1 / General Standard Grade</td><td>4</td></tr>
<tr><td>Intermediate 2 / Credit Standard Grade</td><td>5</td></tr>
<tr><td>Higher</td><td>6</td></tr>
<tr><td>Advanced Higher</td><td>7</td></tr>
</table>
</td>
<td>Pre-requisite levels / measures for Apprenticeships, employment and/or FE/HE</td>
<td>Schools and Colleges of FE</td>
<td>
<table>
<tr><th></th><th colspan="5">SCQF Level</th></tr>
<tr><th>Subject</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th></tr>
<tr><td>Biology</td><td></td><td>x</td><td>x</td><td>x</td><td>X</td></tr>
<tr><td>Chemistry</td><td></td><td>x</td><td>x</td><td>x</td><td>X</td></tr>
<tr><td>Physics</td><td></td><td>x</td><td>x</td><td>x</td><td>X</td></tr>
<tr><td>Human Biology</td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>Maths</td><td>X</td><td>x</td><td>x</td><td>x</td><td>X</td></tr>
<tr><td>Science</td><td>X</td><td>x</td><td>X</td><td></td><td></td></tr>
<tr><td>Biotechno-logy</td><td></td><td></td><td>x</td><td>X</td><td></td></tr>
<tr><td>Applied Maths</td><td></td><td></td><td></td><td></td><td>x</td></tr>
</table>
</td>
<td>
<table>
<tr><th colspan="6">Scotland: Achievement at levels 5, 6 and 7 of SCQF (2004-5) Source: SQA 2006</th></tr>
<tr><th>Subject area</th><th>No. taking course (SCQF 3-5)</th><th>No. Achiev-ing level 5</th><th>Level 5 Success rate (%)</th><th>No. Achiev-ing Level 6 (Highers)</th><th>No. Achiev-ing Level 7 (Advanced Highers)</th></tr>
<tr><td>Biology</td><td>22,952</td><td>10,792</td><td>47</td><td>5,012</td><td>902</td></tr>
<tr><td>Chemistry</td><td>21,231</td><td>11,354</td><td>53</td><td>5,368</td><td>1,042</td></tr>
<tr><td>Physics</td><td>17,214</td><td>9,573</td><td>56</td><td>5,219</td><td>836</td></tr>
<tr><td>Human Biology</td><td>n/a</td><td></td><td></td><td>1,623</td><td>n/a</td></tr>
<tr><td>Maths</td><td>52,791</td><td>16,640</td><td>32</td><td>10,233</td><td>1,366</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Science</td><td>6,312</td><td>455</td><td>7</td><td>n/a</td><td>n/a</td></tr>
</table>
</td>
</tr>
<tr>
<td>Welsh Baccalaureate</td>
<td>It combines personal development skills with existing qualifications like A Levels, NVQs and GCSEs to make one wider award valued by employers and universities.
Students become better prepared for further and higher education, as well as employment.</td>
<td>Schools, Colleges and work-based training providers (centres) throughout Wales</td>
<td>The Welsh Baccalaureate Qualification consists of two parts:
Core - consisting of four components i.e. Key Skills, Wales, Europe and the World, Work-related Education and Personal and Social Education.
Options - courses/programmes currently offered e.g. GCSE, VGCSE, AS/A levels, VCE (Vocational A levels), NVQ, BTEC.
Together, the Core and Options make up the Welsh Baccalaureate Qualification.</td>
<td>N/A</td>
</tr>
</table>

QUALIFICATION TYPE	PURPOSE	AVAILABILITY FROM PROVIDERS	EXAMPLES	CURRENT VOLUMES
International Baccalaureate (IB)	The International Baccalaureate (IB) offers three programmes of international education for students aged 3 to 19.	2,378 schools in 128 countries teach at least one of the three programmes offered by the IB.	The Primary Years Programme (PYP) for pupils aged 3 to 12 focuses on the development of the whole child in the classroom and in the world outside. The Middle Years Programme (MYP) for students aged 11 to 16 provides a framework of academic challenge and life skills through embracing and transcending traditional school subjects. The Diploma Programme for students aged 16 to 19 is a demanding two-year curriculum that meets the needs of highly motivated students, and leads to a qualification that is recognized by leading universities around the world.	N/A
Higher Education / Professional				
Foundation Degrees	Innovative degrees designed and delivered in partnership with employers, to equip people with the relevant knowledge and skills for business. Provide progression opportunities to further learning, honours degrees, and professional qualifications.	Colleges of FE Employers Universities	Bioscience (both Human and Medical) Chemistry and Chemical Sciences Chemistry and Bioscience-related Technologies Science Technicians Laboratory Technologies Microbiology and Applied Microbiology Technical Support in Laboratories	

Foundation degree qualifiers in 2005-06 in UK Source: HESA 2007	Total number
Subjects allied to medicine	70
Biological sciences	30
Physical sciences	5
Total Science subjects	105

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr><td>HNC/HNDs</td><td>They provide both the practical skills needed to do a job and the theoretical knowledge employers expect. Some HNCs allow direct entry into the second year of a degree programme, and some HNDs allow direct entry to third year. These qualifications also allow entry into some professional institutions.</td><td>HE Institutes
Universities</td><td>Applied Biology
Applied Chemistry
Applied Physics
Biomedical Sciences

Plus, in Scotland:
HNC in Applied Science
HND in Biotechnology</td><td>
<table>
<tr><td>HND/DipHE Achievement in UK. Source: HESA 2006/06</td><td>Total number</td></tr>
<tr><td>Subjects Allied to Medicine</td><td>60</td></tr>
<tr><td>Biological Sciences</td><td>190</td></tr>
<tr><td>Physical Sciences (Chemistry)</td><td>45</td></tr>
<tr><td>Total</td><td>295</td></tr>
</table>
<table>
<tr><td>HNC/D Awards in Scotland. Source: SQA 2006</td><td>Total number</td></tr>
<tr><td>Applied Biological Sciences</td><td>2</td></tr>
<tr><td>Applied Bioscience</td><td>3</td></tr>
<tr><td>Applied Science</td><td>6</td></tr>
<tr><td>Biological Sciences</td><td>11</td></tr>
<tr><td>Biomedical Sciences</td><td>11</td></tr>
<tr><td>Biotechnology</td><td>1</td></tr>
<tr><td>Total</td><td>24</td></tr>
</table>
</td></tr>
<tr><td>Degrees

First Degrees</td><td>First (Bachelor and ‘Integrated Master’) degrees provide the starting knowledge base for Research scientists, and are an important part of the development of more senior and research posts.</td><td>HE Institutes
Universities</td><td>Chemistry Courses

Biological Sciences (biology, molecular biology, microbiology, genetics and others that are relevant e.g. natural sciences)

Subjects allied to medicine (Anatomy, Physiology & Pathology courses excluding clinical courses; Pharmacology and toxicology courses excluding pharmacy, and Medical technology)</td><td>
<table>
<tr><td>First Degrees HESA 2004-05</td><td>Chemistry</td><td>Biological Sciences</td><td>Subjects Allied to Medicine</td><td>Total</td></tr>
<tr><td>England</td><td>8,880</td><td>25,020</td><td>34,710</td><td>68,610</td></tr>
<tr><td>NI</td><td>125</td><td>445</td><td>1,830</td><td>2,400</td></tr>
<tr><td>Scotland</td><td>1,340</td><td>4,890</td><td>4,620</td><td>10,850</td></tr>
<tr><td>Wales</td><td>485</td><td>2,145</td><td>1,390</td><td>4,020</td></tr>
<tr><td>Total UK</td><td>10,830</td><td>32,500</td><td>42,550</td><td>85,880</td></tr>
</table>
</td></tr>
<tr><td>Postgraduate Degrees</td><td>Many universities offering first degrees also offer postgraduate courses in the same subject area, leading to Masters or Post-Graduate qualifications.</td><td>HE Institutes
Universities</td><td>Chemistry Courses

Biological Sciences (As above)

Subjects allied to medicine (As above)</td><td>
<table>
<tr><td>Postgraduate Degrees HESA 2005-2006</td><td>Physical Sciences (Chemistry)</td><td>Biological Sciences</td><td>Subjects Allied to Medicine</td><td>Total</td></tr>
<tr><td>Total Higher Degree and other PG qualifications</td><td>922</td><td>1926</td><td>814</td><td>3,662</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr><td>Research Degrees</td><td>Research Degrees, generally PhDs, also provide an important source of scientists for recruiting Bioscience companies in terms of skills in relevant fields.</td><td></td><td>Chemistry Courses

Biological Sciences (biology, molecular biology, microbiology, genetics and others that are relevant e.g. natural sciences)

Subjects allied to medicine (Anatomy, Physiology & Pathology courses excluding clinical courses; Pharmacology and toxicology courses excluding pharmacy, and Medical technology)</td><td>
<table>
<tr><td>Research Degrees:

Doctorate Qualifiers by specified subject HESA 2005/06</td><td>Total
(Fractions arise from cross-disciplinary research projects – proportion allocated to each relevant subject category)</td></tr>
<tr><td>(B1) Anatomy, physiology & pathology</td><td>221.0</td></tr>
<tr><td>(B2) Pharmacology, toxicology & pharmacy</td><td>294.0</td></tr>
<tr><td>(B8) Medical technology</td><td>12.0</td></tr>
<tr><td>(B9) Others in subjects allied to medicine</td><td>222.8</td></tr>
<tr><td>(C1) Biology</td><td>628.8</td></tr>
<tr><td>(C4) Genetics</td><td>92.0</td></tr>
<tr><td>(C5) Microbiology</td><td>134.7</td></tr>
<tr><td>(C7) Molecular biology, biophysics & biochemistry</td><td>435.0</td></tr>
<tr><td>(C9) Others in biological sciences</td><td>174.3</td></tr>
<tr><td>(F1) Chemistry</td><td>971.5</td></tr>
<tr><td>(G1) Mathematics</td><td>353.3</td></tr>
<tr><td>(G3) Statistics</td><td>71.0</td></tr>
<tr><td>(G4) Computer science</td><td>584.5</td></tr>
<tr><td>(G5) Information systems</td><td>125.5</td></tr>
<tr><td>(H8) Chemical, process & energy engineering</td><td>233.0</td></tr>
<tr><td>Grand Total</td><td>4553.5</td></tr>
</table>
</td></tr>
<tr><td>Professional Qualifications</td><td>In addition to the formal (education policy-led) arrangements, many HE courses intended to lead to professional qualification of graduates in due course, are also</td><td>HE Institutes
Universities
Professional Institutes / bodies</td><td>Many professional Bodies carry out course accreditation/quality assurance for professional qualifications.
Examples of Professional qualifications relevant to Bioscience include:
Institute of Animal Technology (IAT)
Royal Pharmaceutical Society of</td><td>N/A</td></tr>
</table>

QUALIFICATION TYPE	PURPOSE	AVAILABILITY FROM PROVIDERS	EXAMPLES	CURRENT VOLUMES
Professional Qualifications (Continued)	Quality Assured by the relevant professional body/bodies.		Great Britain (RPSGB) TOPRA Msc and Postgraduate Diploma for Regulatory Affairs professionals Institute for Clinical Research Msc in Clinical Research ABPI medical representatives examination In addition to formal course accreditation, some bodies carry out approval for CPD courses, without formal accreditation. E.g. The Institute of Biology Approval Scheme.	

Vocational

The following table summarises the types of vocational qualifications available across the four nations of the UK:

	NVQs / SVQs	*NCs / NDs*	*HNCs / HNDs*	*FDs*	*Other VQs*	*YAs*	*WBL*
England	✓	✓	✓	✓	✓	✓	✓
Scotland	✓	✓	✓				✓
Wales	✓	✓	✓	✓*	✓		✓
Northern Ireland	✓	✓	✓	✓*	✓		✓

**Foundation Degrees exist in Wales and Northern Ireland but there are currently no Bioscience related courses available. Source: Semta 2007*

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr>
<td>NVQs / SVQs</td>
<td>National/Scottish Vocational Qualifications (N/SVQs) are work-related, competence-based qualifications. They reflect the skills and knowledge needed to do a job effectively, and show that a candidate is competent in the area of work the NVQ represents.</td>
<td>Colleges of FE
National and Local Training Provides
Employers</td>
<td>
<table>
<tr><th>Title</th><th colspan="5">Level(s)</th></tr>
<tr><td>Laboratory and Associated Technical Activities (Industry & Education routes)</td><td>1</td><td>2</td><td>3</td><td>4</td><td></td></tr>
<tr><td>Clinical Laboratory Support (to be replaced by Laboratory Science)</td><td></td><td>2</td><td></td><td></td><td></td></tr>
<tr><td>Pharmacy Services</td><td></td><td>2</td><td>3</td><td></td><td></td></tr>
<tr><td>Clinical Trials (Not yet available from UK Awarding Body)</td><td></td><td></td><td></td><td>4</td><td></td></tr>
<tr><td>Analytical Chemistry</td><td></td><td></td><td></td><td></td><td>5</td></tr>
</table>

Additional N/SVQs within other SSCs footprints may also be of relevance, for example the Chemical, Pharmaceutical and Petro-chemical Operations (CPPO) NVQ (Cogent SSC) and the Animal Technology N/SVQ (Lantra SSC).

The majority of Science NVQs being delivered in the workplace are either in Laboratory and Associated Technical Activities for Science laboratory technicians, or in Pharmacy services – however the latter are only used in the Pharmacy sector, which falls outside of the remit of this SQS.
</td>
<td>
<table>
<tr><td>NVQ Learners in FE 2005-06</td><td></td><td>NVQ in Laboratory and Associated Technical Activities</td></tr>
<tr><td>Grand Total</td><td></td><td>195</td></tr>
<tr><td rowspan="4">Level</td><td>1</td><td>1</td></tr>
<tr><td>2</td><td>68</td></tr>
<tr><td>3</td><td>103</td></tr>
<tr><td>4</td><td>23</td></tr>
<tr><td rowspan="4">Completion</td><td>Continuing</td><td>63</td></tr>
<tr><td>Completed</td><td>127</td></tr>
<tr><td>Withdrawn</td><td>3</td></tr>
<tr><td>Transferred</td><td>2</td></tr>
<tr><td rowspan="5">Outcome</td><td>Achieved</td><td>93</td></tr>
<tr><td>Partial Achievement</td><td>5</td></tr>
<tr><td>No achievement</td><td>31</td></tr>
<tr><td>Exam imminent</td><td>3</td></tr>
<tr><td>Continuing</td><td>63</td></tr>
</table>

<table>
<tr><td>Work Based learning in Science NVQ enrolment – LSC ILR data (England) 2005-6</td><td>All areas</td></tr>
<tr><td>All NVQs</td><td>375</td></tr>
<tr><td>NVQ in Clinical Laboratory Support</td><td>4</td></tr>
<tr><td>NVQ in Laboratory And Associated Activities</td><td>1</td></tr>
<tr><td>NVQ in Laboratory And Associated Technical Activities</td><td>221</td></tr>
<tr><td>NVQ in Laboratory Operations Chemical And Pharmaceutical</td><td>1</td></tr>
<tr><td>NVQ in Laboratory Technician Working in Education</td><td>1</td></tr>
<tr><td>NVQ in Laboratory Technician Working In Education</td><td>1</td></tr>
<tr><td>NVQ in Pharmacy Services</td><td>142</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr>
<td>England:
Apprenticeships/ Advanced Apprenticeships

Wales:
Foundation Modern Apprenticeships / Modern Apprenticeships

Northern Ireland:
Modern Apprenticeships</td>
<td>Apprenticeships are aimed at 16 to 24 year-olds and enable young people to learn on and off the job, build up knowledge and skills, achieve nationally recognised qualifications and earn money at the same time. Apprentices will typically gain a relevant S/NVQ, key or core skills, and a vocationally linked qualification.</td>
<td>Colleges of FE
Employers</td>
<td>Apprenticeship / Advanced Apprenticeship Laboratory Technicians (Generic)

Apprenticeship / Advanced Apprenticeship Pharmacy Technicians (Cogent SSC)

Also of interest to the Bioscience sector is the Animal Technology Apprenticeship (Lantra SSC) however this lies outside the remit of this SQS.</td>
<td>
<table>
<tr><td>Source: LSC</td><td colspan="2">2006/2007 (to period 12)</td><td>Total</td><td colspan="2">2007/2008 (* to period 9)</td><td>Total</td><td>Total 2006 to date</td></tr>
<tr><td></td><td>App</td><td>Adv App</td><td></td><td>App</td><td>Adv App</td><td></td><td></td></tr>
<tr><td>Laboratory Technicians (Generic)</td><td>0</td><td>4</td><td>4</td><td></td><td></td><td>N/A</td><td>4</td></tr>
<tr><td>Pharmacy Technicians</td><td>22</td><td>40</td><td>62</td><td>27</td><td>42</td><td>69</td><td>131</td></tr>
<tr><td colspan="3">Total 2006/2007</td><td>66</td><td colspan="2">2007/08 (to period 9)</td><td>69</td><td>135</td></tr>
</table>
</td>
</tr>
<tr>
<td>Scotland:
Skill Seekers / Modern Apprenticeships</td>
<td>As above</td>
<td>Colleges of FE
Employers</td>
<td>Biotechnology (Life Sciences) MA: LATA (Industrial Pathway)

Laboratory Technician MA: LATA (Educational Pathway)</td>
<td>
<table>
<tr><td>Scotland MAs
Source: Semta 2007</td><td>Total number of candidates registered</td></tr>
<tr><td>Biotechnology (Life Sciences) MA: LATA (Industrial Pathway)</td><td>8</td></tr>
<tr><td>Laboratory Technician MA: LATA (Educational Pathway)</td><td>5</td></tr>
</table>
</td>
</tr>
<tr>
<td>Young Apprenticeships</td>
<td>Young Apprenticeships are offered to the 14-16 age group alongside general curriculum subjects, include 50 days of work experience over two years and are only available to those with around average or above average results from the national tests in mathematics, English and science at age 14.</td>
<td></td>
<td>Young Apprenticeship in Science</td>
<td>
<table>
<tr><td>YA Achievement:</td><td>3rd Cohort 2006</td><td>4th Cohort 2007</td><td>TOTAL</td></tr>
<tr><td>YA in Science</td><td>56</td><td>90</td><td>146</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th>QUALIFICATION TYPE</th><th>PURPOSE</th><th>AVAILABILITY FROM PROVIDERS</th><th>EXAMPLES</th><th>CURRENT VOLUMES</th></tr>
<tr><td>NC/NDs</td><td>The National Certificate / Diploma is a vocational qualification at Level 3.
They give students a specialist work-related focus, enabling them to extend key sector knowledge and practical skills. This can add immediate value in the workplace or aid progression to BTEC HND/HNC, BTEC Foundation Degree or a university degree.</td><td>Colleges of FE</td><td>BTEC First Certificates / Diplomas in Applied Science

BTEC National Awards / Certificates / Diplomas in Applied Science</td><td>
<table>
<tr><td>First/National Awards, Certificates and Diplomas 2005/06 by Level. Source: LSC</td><td>By Level</td><td></td><td></td></tr>
<tr><td></td><td>All</td><td>2</td><td>3</td></tr>
<tr><td>BTEC First Certificate in Applied Science</td><td>43</td><td>43</td><td></td></tr>
<tr><td>BTEC First Diploma in Applied Science</td><td>809</td><td>809</td><td></td></tr>
<tr><td>BTEC National Award in Applied Science</td><td>248</td><td></td><td>248</td></tr>
<tr><td>BTEC National Certificate in Applied Science</td><td>1,190</td><td></td><td>1,190</td></tr>
<tr><td>BTEC National Diploma in Applied Science</td><td>2,311</td><td></td><td>2,311</td></tr>
<tr><td>BTEC National Certificate in Pharmacy Services</td><td>792</td><td></td><td>792</td></tr>
<tr><td>All qualifications</td><td>5,393</td><td>852</td><td>4,541</td></tr>
</table>
</td></tr>
</table>

New Baccalaureates for Scotland

New qualifications in science and languages are to be introduced for S5 and S6 pupils in Scotland's schools. The first Baccalaureates will be awarded in August 2010.

Proposed structure of the Scottish Science Baccalaureates:
Interdisciplinary project at Advanced Higher
Maths at Higher
2 sciences at Higher
1 science at Advanced Higher

An example of a topic that could be studied within the interdisciplinary element of the Science Baccalaureate is how the life sciences are used in industry, the engineering industry and ethical issues in science.

New Diploma for Science
Semta has been supporting the development of the Diplomas in Engineering, and Manufacturing and Product Design, and will be the lead Sector Skills Council for the development of the new Science Diploma, available from 2011. The membership of the Diploma Development Partnership is being established.

Diplomas are designed to:

- provide young people with a higher-level education based on an industry driven curriculum
- ensure employment readiness – whichever industry the Diploma student may ultimately choose to enter – via the Diploma's core learning elements; comprising Maths, English, ICT, and personal learning and thinking skills
- allow young people to explore what industry is about and examine the different opportunities it has to offer – without restricting their future education or career choices
- give them an insight into what work is really like
- provide them with the thinking and learning skills they need for future employment and for self development
- give them a general foundation in subject principles
- enable them to progress to further and/or higher education if that's what they want to do
- allow them to make better informed choices.

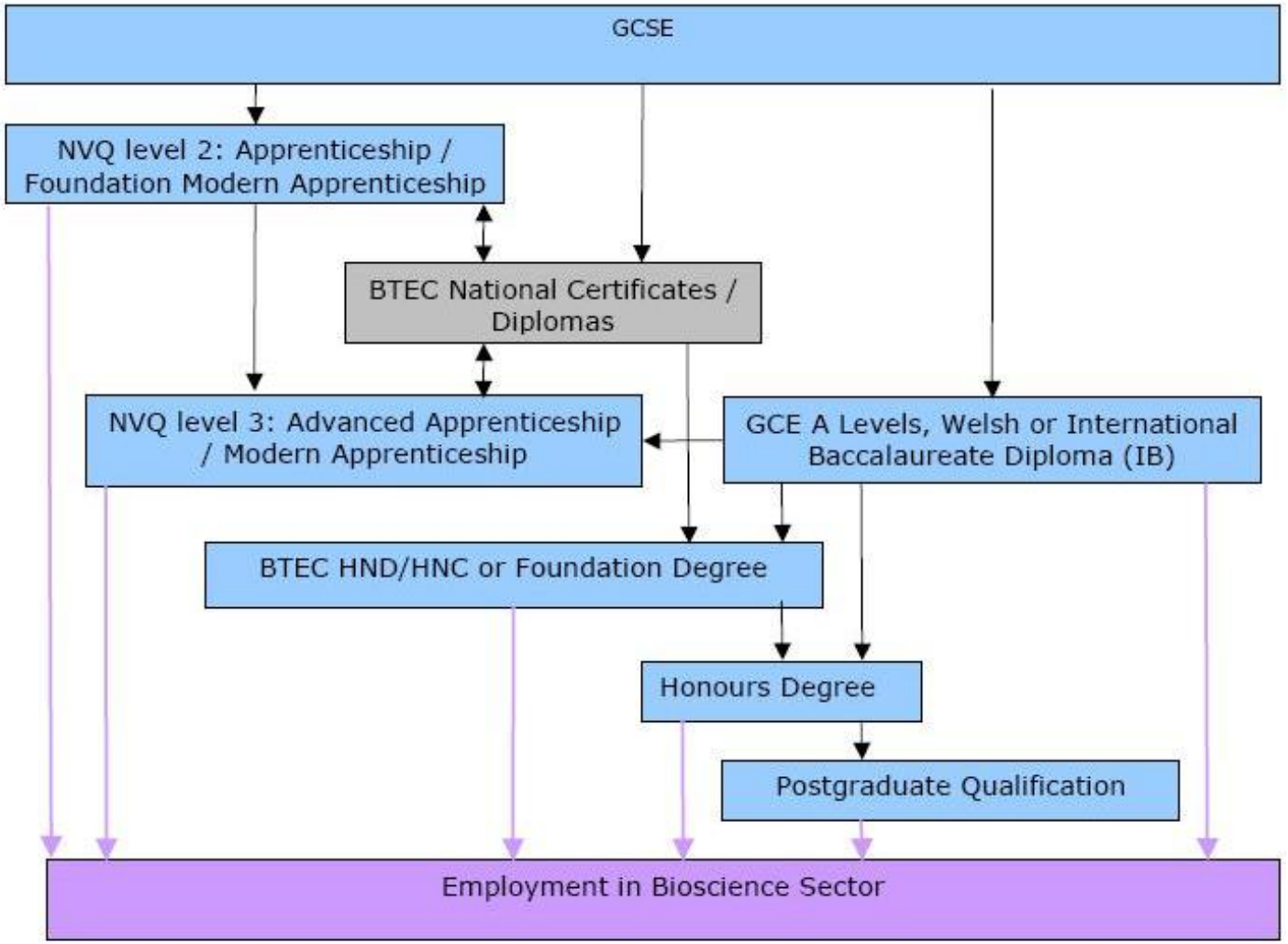
The new science Diploma will be available across all three Diploma levels – Foundation, Higher and Advanced, built from the best of existing GCSE and A level qualifications combined with specially-designed content, developed by a group of leading academics and employers.

Interrelationships

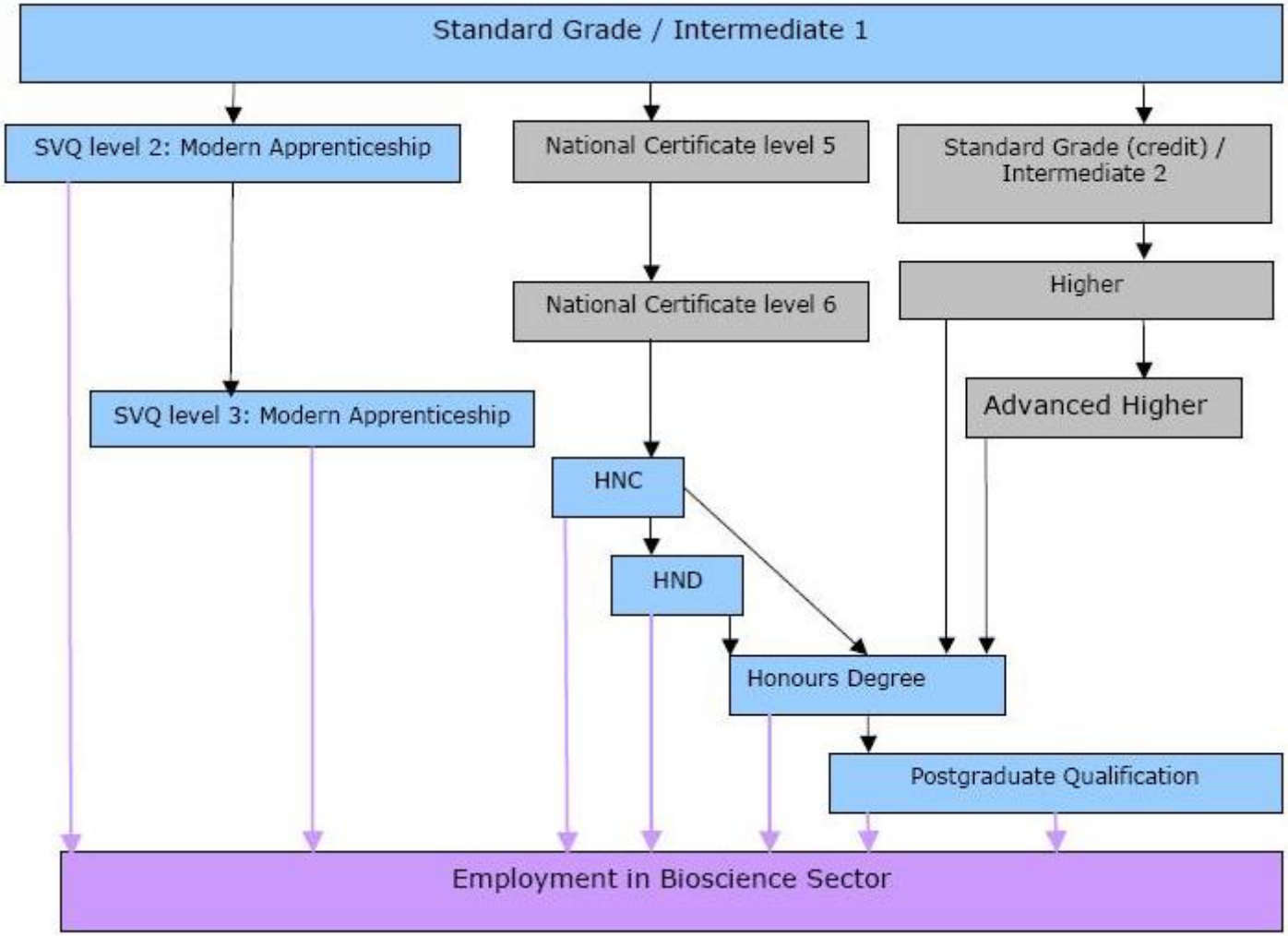
Interrelationships between qualifications available in the four UK nations are shown below

Many occupations within the Bioscience sector can utilise skills held by a range of applicants, from school leavers to postgraduates and professionals. For this reason the Bioscience SQS Steering group have approved the following routes which show the interrelationships between the different qualifications available, but demonstrate that these can lead to employment in the bioscience sector in a variety of occupations, with varying levels of qualifications achieved and experience held.

Interrelationships England, Wales, Northern Ireland



Interrelationships – Scotland



4.3 This section provides detail of:
What qualifications and other learning provision are currently used/valued and accepted by employers for pre-entry and entry to the sector <u>at all levels</u> and for the existing workforce at all levels, including professional development at higher levels.
Any gaps between the qualifications or learning provision available and what employers want and need
Where there are gaps/needs what needs to be done to address those gaps/needs
Details of where there is employer driven evidence for the rationalisation or development of (new) qualifications or learning provision

Gaps in Provision and Issues to address:

The major skills shortages in the bioscience sector are substantially higher than the UK average across all industries. These are having serious consequences for companies – including loss of products in pipeline, projects not taken forward. This makes a *prima facie* case that the education and training system is not delivering the quantity and quality of recruits needed. Many companies are actively pursuing recruits from outside the UK for skilled science posts.

In addition to the traditional disciplines that will always be required (e.g. physiology, pharmacology, toxicology), in bioscience, with scientific developments proceeding rapidly, there are also some highly specialist skills that employers are seeking, which require specialist training and courses, (including for example the 'omics' disciplines, such as genomics, proteomics, metabolomics, etc).
In addition as the sector increasingly develops biopharmaceuticals there is a need to encompass bioprocessing and biomanufacture within some course design and content. Knowledge of relevant regulation and compliance are also key facets.

In depth knowledge of subject areas is still required in addition to practical science skills. There is also a need for multidisciplinary approaches to solve problems that require input from specialist areas such as genetics, life sciences molecular biology, biochemistry, IT, mathematics and statistics. There is a growth in the use of *in silico* design tools and *in silico* modelling.

The main areas of Hard to Fill Vacancies and skills shortages cover a wide range of generally scientific skills:

- Biological and medical sciences
- Chemical sciences
- Process engineering
- Mathematics and statistics.

In terms of specific scientific areas, the greatest skills shortages are in:

- Clinical/pharmacology/translational medicine
- Bioscience
- Analytical and physical chemistry
- Process and chemical engineering
- *In vivo* sciences
- Bioinformatics.

There are also long term, structural issues in the lack of in vivo and other practical skills, the depth of first degrees and the dearth of skilled technicians, which raise questions of education policy.
These include:

- mathematics education
- how science is taught at school
- funding regimes
- how targets affect behaviour

The above evidence has been taken from the Bioscience Sector Skills Agreement. There are, however, other ongoing skills reviews; one example is the ABPI Skills Landscape which will report in October 2008. Emerging skill areas identified in these reviews will be considered in a timely manner and incorporated into the SQS going forward.

The Biosciences Federation has published reports highlighting issues to address for the Bioscience sector. The main issues highlighted are careers advice and recruitment issues. The recruitment issues site a lack of appropriate training, and insufficient take up of appropriate courses, often resulting in potential recruits being ill-equipped for careers in bioscience.

Careers Advice:

- Much careers advice is poor, and consequently students do not appreciate the range of jobs for which a science education fits them[3]

Recruitment Issues:

- Many bioscience students are weak in chemistry, mathematics and physics, and are thus ill-equipped to cope with the cross-disciplinary of modern bioscience[4];
- Some core bioscience disciplines (e.g. pharmacology, biochemistry and microbiology) are not recruiting as well at university as they used to. It would be unwise to assume that because overall bioscience numbers at university are being maintained – due chiefly to the popularity of courses such as psychology and sports science – there is no problem[5].
- Bioscience research is increasingly cross-disciplinary and quantitative, yet too few people are studying physical sciences or maths[6];
- Students are not receiving sufficient practical training either at school or university, leaving them ill-equipped for R&D careers[7];
- There are insufficient numbers pursuing technical courses, making it difficult for industry to recruit good quality technicians[8]
- The pharmaceutical industry has pointed out that it is increasingly having to recruit science graduates from abroad because insufficient graduates with appropriate knowledge and skills are emerging from UK universities[9];

Employers are responding to the recruitment difficulties in a variety of ways. Many employers report hiring people with higher degrees, mainly PhDs, thus

[3] Biosciences Federation: Enthusing the next generation 2005
[4] Biosciences Federation: Enthusing the next generation 2005
[5] Biosciences Federation: Enthusing the next generation 2005
[6] Biosciences Federation: Building on Success 2005
[7] Biosciences Federation: Building on Success 2005
[8] Biosciences Federation: Building on Success 2005
[9] Biosciences Federation: Building on Success 2005

limiting the availability of candidates with this qualification. This results in increasing levels of cost, and sometimes frustration for the PhDs, where the roles do not meet the expectations of the individual[10].

Demand for skilled technicians:

The NEPIC survey estimates that 300 more bioscience technicians will be needed in the North East alone by 2010. More recent work by Mersey Bio has identified specific competencies needed by operational staff in bio-processing and biopharmaceuticals. The study also calls for skills in measuring efficiency, statistical process control and improving overall equipment effectiveness.
Sources: NEPIC Market Research Survey into the Training Needs within the Biotechnology Bioscience Cluster in the North East. Merseyside Bio Analysis of Skills Needs in Life Sciences Sector in Merseyside & Halton

There is no doubt that fewer young people now consider an **HNC route** into bioscience post A-level, preferring to seek out a degree course. Consequently that blend of practical know-how and science understanding that comprises the technician is being eroded because graduates, with less 'hands-on' backgrounds, are taking up the posts and have difficulty coming up to employers' expectations.

Foundation Degrees (which, as employer-led qualifications should produce highly relevant skills) are now beginning to emerge, and their contribution is beginning to be assessed.

The take up of Foundations Degrees, HNC/Ds and BTEC National Certificates is low and there may be opportunities to expand capacity in this area to increase the number of technicians coming into the industry by this route. In collaboration with four universities, the Engineering Council has developed a "Work-based Masters Degree" thus giving technicians / engineers in the workplace an opportunity to study at Masters Level at work and gain Chartered Engineer Registration. Semta has had early dialogue with the Science Council, who have expressed an interest in exploring similar routes for HNC/D or Bachelors Degree technicians and scientists in the Bioscience Sector to study at Masters Level at work and gain Chartered Scientist Registration.

The number of people achieving a combination of a relevant HNC/HND and practical skills in industry has declined. Employers are concerned that an increasing number of science students are graduating without the skills and knowledge they need to go on to be employed as scientists. Some of these graduates become technicians, but are discontented with carrying out this level of work, or do not have the practical skills necessary. As the biotechnology industry continues to mature and expands into manufacture, this problem will grow.

The need for **skilled technicians** has been highlighted above. Such technicians may have practical skills combined with scientific knowledge, often they would have been studying for a Higher National Certificate (HNC) while working. The NEPIC study cited earlier specifically highlights the need for bioscience technicians and for a Modern Apprenticeship framework to provide a nationally recognised route for training and a career path.
The Science Diploma is also expected to offer a new and alternative route to address the current gap in provision.

Priority Areas identified during SQS development:

Four key themes for the industry have been identified during SSA development and these are highlighted throughout this report. Much of the qualification specific information will link to key theme 1: Top Quality Workforce. The SQS focus group detailed in section 6.2 looked at priority areas to be actioned through the Sector Qualifications Strategy. In order to look at more detailed qualification and learning issues, it was necessary to review preceding evidence from the Sector Skills Agreement and extract relevant areas for discussion at the focus group. Participants at the focus group were asked to agree or disagree with the following statements taken from the SSA and amend or add to the list as necessary. Once the list was agreed participants voted on the

[10] ABPI/Biosciences Federation: In Vivo sciences in the UK: Sustaining the supply of skills in the 21st century.

order of priority.

The following areas have been identified, in order of priority;

Priority Areas

1. Apprenticeships are under utilised by the Bioscience sector and these could be used more in the future. This could free up graduate resources for work that draws more on their broader, deeper knowledge

2. Improve practical skills as an integrated component of the education system at all levels (School through to HE)

3. Promote and develop a responsive system – to design short courses to address emerging specialist areas and upskilling requirements for the existing workforce

4. Enable young people to aspire to a career in science by establishing a clear set of career pathways – develop route map

5. Qualification developers should utilise a number of existing and emerging Competence Standards that could be of value to Bioscience employers and these should be explored

6. Change the metrics for undergraduate and university outputs to make them more responsive to employer needs

7. Emphasise importance and value of all science subjects with linkage to associated career paths

8. Ensure Qualifications address the main areas of hard to fill vacancies and skills shortages as defined in the SSA

9. Design and deliver a scheme to identify, nurture and develop the next generation of bio-innovation leaders

10. By expanding capacity in Foundation Degrees (FDs), Higher National Certificates and Diplomas (HND/Cs) National Certificates (NCs) and Scottish Ordinary and Higher Awards could increase the number of "technicians" entering the sector by this route?

Much of the available evidence on entry into industry points towards academic provision and higher education as the main qualification route into the sector. The above priorities highlight an interest in the possibility of utilising vocational provision to improve the skills base of the bioscience sector, for example the use of apprenticeships and competence standards. Further investigation is needed to identify the demand and industry support for vocational routes for technicians. This is something Semta can explore on behalf of the sector.

Qualifications and provision used / valued and accepted by employers; gaps between qualifications available and what employers require; and issues to address

The main entry to the bioscience sector, especially for laboratory scientists and research scientists, is from universities.

Within the vocational education and training system there are a range of relevant courses and qualifications: although this relatively new provision has not yet found strong take-up by employers there may be opportunities examine how those achieving on these courses might be able to provide good candidates

in certain occupational areas.
Therefore, this section focuses on aspects valued, gaps, and issues to address with higher education.

Qualifications Valued: First Degrees

The main entry to the bioscience sector, especially for laboratory scientists and research scientists, is from universities, particularly those with established scientific Research Departments.

In general, courses involving an industrial placement are strongly favoured by employers because they enable students to gain direct workplace experience, a wide range of skills, awareness of the industry and become familiar with industry standards.

Practical science skills are highly valued by the sector and are critical for some scientific roles. The sector is concerned by the decline in relevant practical science in under graduate courses and school science. It is important that steps are taken to improve the situation.

Gaps: First Degrees

First Destination data indicate that a minority of graduates from these courses enter the sector. Among Biology graduates 3% join the pharmaceutical sector, 6% take up jobs in research and 8% go into HE. For Microbiology the figures are each 9%. In Molecular Biology the figures are 9%, 9% and 16%, while for Chemistry they are 13%, 8% and 13%. The proportions are far smaller for graduates in Pharmacology, Toxicology & Pharmacy graduates and for Anatomy Physiology and Pathology, however many of these subjects are mainly concentrated at postgraduate level entry into industry.

Employers within the Bioscience sector appear to recruit comparatively very low fractions of the First Degree graduates from relevant HE subjects – many good graduates go to work in other sectors (it is known that many talented Science graduates are recruited at high salaries into Financial Services). This suggests that effort to improve the attractiveness of work in the Sector is probably needed, to be focused both at university students, and probably, in order to ensure that negative stereotypes are overcome, at secondary school students.

Issues to address: First Degrees

Since 2004, the number of universities offering courses in biological sciences has gone down. There are 20 fewer universities offering for Biology-related subjects; 13 fewer offering Microbiology, and 19 fewer universities offering Chemistry. The decline in provision of Chemistry has triggered action but the situation for biological sciences has not received great attention to date due to the fragmented nature of bioscience.

While sizes of cohorts through the relevant courses, in particular within Higher Education provision, have waxed and waned between specific subjects, overall many of the courses of relevance to Bioscience have suffered since the 1990s from a fall in the numbers of young people wanting to study highly technical subjects, not least since they are often perceived to be (too) difficult. However this picture is aggregated. In some areas, UCAS application data shows a 30% increase in Chemistry since 2003, and a 15% increase in Physics (after a decrease in 2004).

However, the analysis of HE statistics relevant to the bioscience sector is complicated by the subject categorisation. For example 'Biological Sciences' often includes psychology and sports science in published figures.

Science is cross-disciplinary; insights from chemistry and physics are increasingly important for research in the biosciences. The present decline in popularity of the chemical and physical sciences is thus a threat to future progress in the biosciences. The government must ensure that the levels of expertise in the

physical, chemical and mathematical sciences are sustained.
Source: Biosciences Federation, Science Policy Priorities 2005-2009

Qualifications valued: Research Degrees

The science base is critically important to the health of the bioscience sector in the UK. Complex interdependencies exist between academic bioscience research and the bioscience sector.
The Association of the British Pharmaceutical Industry surveys its members biennially to monitor the collaborative research which UK pharmaceutical companies are undertaking with universities. The 2007 survey of 11 major UK-based pharmaceutical companies, show that 606 PhD studentships and 327 postdoctoral grants were conducted in collaboration with 78 British universities.

Gaps: Research Degrees

The studentship figures above are down from 2003 – by nearly 14 per cent on PhD studentships and almost 25 per cent for postdoctoral grants – and this is a cause for concern.

Underlying reasons for the declining collaboration include escalating costs, and the increasing difficulty in negotiating contracts, including the issue of intellectual property ownership.

Issues to address: Research Degrees
Given the interdependence between pharmaceutical sector research and academic bioscience, the ABPI believes it is critical not only to address these issues but also to restore industry's overall confidence in the UK as a place to conduct research – shown in a recent CBI/ABPI survey to have fallen to a worryingly low level.

There are three main types of collaboration between industry and universities:
1. PhD studentships, where students carry out research projects jointly between a university and a company.
2. Postdoctoral grants, where jointly funded research programmes are undertaken between companies and universities, including exchanges of personnel.
3. Industrial placements, where undergraduate students work within companies for usually one year as part of their degree studies.

The total value of all of the collaborations reported in the survey is in excess of £65 million.
Source: Threat To Pharmaceutical Industry Support for University Research; http://www.abpi.org.uk/press/press_releases_08/220408.asp

Employer driven evidence for rationalisation and/or development of qualifications or learning provision

NOS Development:

The increasing demand for skilled technicians with appropriate practical training has been highlighted earlier.

In 2006, Semta's Bioscience NOS Framework Review looked at over 550 individual NOS with **employers and representatives** from the Biopharmaceutical and Bioscience sectors. This exercise has identified gaps in our current provision of current National Occupational Standards, which include the following:

- researching (experimental protocols/ideas, chemical process, biological, preclinical, clinical)

- developing (discovery {translational research}, analytical methods, quality assurance, scale-up)
- bio-manufacturing (process control/development, biopharmaceutical operations {testing operations, protein separation, fermentation, virus incubation & harvesting), technical support, process validation, process data collection)
- regulatory validation (good laboratory practice and good manufacturing practice).

Employers also identified sixty skill areas where new National Occupational Standards are needed to cover Laboratory skills in the sector.

Some employers from Biopharmaceutical and Bioscience companies who have reviewed the National Occupational Standards in the LATA qualifications have indicated that they are not suitable for the skills needs of their companies. They are keen to work with Semta to develop additional qualifications for Laboratory staff.

Semta are recommending that the LATA qualifications are retained for use in sectors where they are valued, for example the Engineering sector for laboratory testing as part of quality control, and for use in other sectors. Semta propose to update the LATA National Occupational Standards and Vocational Qualifications when they come up for review.

Working with employers to develop two new qualifications for Laboratory Science and Scientific Manufacturing, at Levels 2, 3 and 4, Semta aims to meet the UK-wide qualification interests of employers of the Science sector.

An important part of the SQS development process was to consult on priority actions. The main focus being on those qualifications required in higher and further education that will enable the sector to train a top quality workforce. (See section 6.2)

SECTION 5: Other Sector Uses of Qualifications

5.1 This section describes use made of qualifications for the regulation of practice within the sector, including different uses in each of the four UK nations, as appropriate.
AND
5.2 Describes specific use made of qualifications to promote customer confidence and to protect consumers / the public within the sector, including any different uses in each of the four UK nations, as appropriate.

Use of qualifications for regulation of practice and to promote customer confidence:

The Bioscience Sector is subject to a high degree of regulation by a variety of regulatory bodies. Organisations will need to gain approval from one or more regulatory bodies depending on business requirements. A wide range of good practice requirements covering research, development, production and manufacturing, typically described as GxP are required by the sector Compliance with regulation is critically important and can impact business performance, consequently a number of facets need to be incorporated into the training and qualifications required. There is an increasing requirement for the workforce to be aware of changes in regulatory requirements. During development of qualification structures and assessment strategies, consideration must be given to legislative and regulatory requirements. The strict regulation that governs the sector helps to promote customer confidence.

Some are examples are presented below:

MHRA Regulations:
The MHRA regulates a wide range of materials from medicines and medical devices to blood and therapeutic products/services.
Licences for medicines are granted only when a product meets high standards of safety and quality and works for the purpose intended. The regulatory system also imposes rigorous standards on medicines manufacturers and wholesale dealers who trade in them. The pharmaceutical company and any wholesalers must also be able to satisfy the MHRA that the manufacture, distribution, and supply of the medicine meet the required safety and quality standards. It is therefore necessary for the manufacturers and dealers to have the appropriate skills and training and the necessary level of understanding of the implications of the regulations.
The agency has been working with professional education and training bodies in the UK to raise awareness of the importance of regulation and safe use of products in medical training and continuing professional development programmes. The MHRA is working on an accreditation scheme with the medical Royal Colleges to grant a 'licence to practice' for the safe use of particular pieces of equipment for different specialties.

Animals (Scientific Procedures) Act 1986:
Legal controls on the use of animals in experiments have existed in Britain since 1876. These controls were significantly extended with the introduction of the Animals (Scientific Procedures) Act 1986, which is overseen by the Home Office. The Act's provisions are designed to balance the legitimate needs of research with the welfare of laboratory animals.
The Act requires that before a researcher can use an animal, three special authorisations must be obtained. These are granted only if:

- the research laboratory has the necessary facilities and staff to house and care for the animals properly,
- the individual researcher is considered to have the **necessary skills and training**, and
- the object of the research cannot be achieved in other ways and the likely benefits of the research justify any likely distress to the animals.

Regulations mean that knowledge is required within the areas of:

- GxP (including GMP/c, GCP, GMP, GLP)
- Managing and understanding clinical trials
- Knowledge of regulatory processes and
- Preparation for FDA/MHRA inspections.

Good Laboratory Practice:
As stated in section 3.1, Good Laboratory practice provides a framework for planning, performing, monitoring recording and reporting on laboratory studies. These studies generate data to assess and reduce the risk to users consumers and third parties. GLP provides a true reflection of laboratory studies for quality assurance. Laboratory staff must possess the necessary skills and knowledge to adhere to this practice.

SECTION 6: How the SSC or SSB Will Help Realise the Future

6.1 This section describes the sector's view of the future in terms of qualifications and other learning provision. This includes the anticipated outcomes of implementing any action the sector intends to take.

Vision of qualifications for the Bioscience sector:

In general employers do not perceive the need for the development of new types of qualifications. There is, however, a need to encourage the development of a responsive FE and HE system such that any new qualifications can be established in timely manner, e.g. the Science Diploma and existing offerings can be shaped appropriately – e.g. the need to increase and improve the development of practical science skills.

The main entry to the bioscience sector, especially for laboratory scientists and research scientists, is from universities. There appears to be variation in the number of Universities offering Biology related subjects. (E.g. Royal Society's report 'A Degree of Concern?' 2006 found that between 96/97 and 03/04 there had been a slight increase in the number of institutions offering biology and The Semta gap analysis 2007 states that there are 20 fewer universities offering biology-related subjects *since 2004*) Analysis is further complicated by the subject categorisation. The take up of Foundation degrees and HNC/Ds is low and there may be opportunities to expand capacity in this area. Ways to create a meaningful dialogue with the university sector need to be identified

Within the vocational education and training system there are a range of relevant courses and qualifications: although this relatively new provision has not yet found strong take-up by employers there may be opportunities examine how those achieving on these courses might be able to provide good candidates in certain occupational areas.

Considerable refinement and improvements have been made over recent years to science learning in schools. Cohorts of those choosing relevant A Level (and equivalent) courses have recently been growing, but there remains a challenge to encourage more young people to take these subjects. Since 2003, numbers choosing Biology, Chemistry, and Maths have increased, and have returned to higher levels seen in the late 1990s.

As set out in section 2.2 dealing with the sector's skills issues is clearly critical now and for the future. The areas for focus are described out below in four industry-generated goals:

Top quality workforce:
Closing the skills gap by increasing the supply of quality people. Identify 'CORE' subjects and activities within the curriculum i.e. the STEM subjects and a focus on Practical skills.

Leadership & Entrepreneurship:
Viewed as a significant area of opportunity and improvement for the sector, not only in the large companies, but also in the smaller biological labs where often technically competent and academically strong young entrepreneurs require improved support and business acumen/skills to grow and develop the business. We need to encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.

Networks and Clusters:
Networks and Clusters are viewed as a CRITICAL enabler and cluster development is central to the growth of bioscience and has been supported by the government since the 1999 Sainsbury report (Biotechnology Clusters - Report of a team led by Lord Sainsbury, Minister for Science). Skills are an important component of successful clusters, along with proximity to suppliers and markets. Delivery of provision will be more successful if pursued through the clusters and networks already developed.

Image and attractiveness:
To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain i.e. industry take a more participative role in this area. Encourage young people aspire to a career in science and engineering. Increase the number

of adults employed in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.

The principal area in which the development of a qualifications strategy for the bioscience sector can help to respond to the issues and concerns set out in section 4.3 and in the SSA is in connection with addressing and promoting the availability of a top quality workforce. In order to achieve a comprehensive, comprehensible and coherent frame of qualifications for the future we need to achieve a number of objectives. In this regard the vision for the sector has been developed in terms of a number of objectives and a range of associated development requirements all of which link to the foregoing industry-generated goals.

Top quality workforce:

Objectives

To close the skills gap by increasing the supply of quality people.

To identify 'core' subjects and activities within the curriculum i.e. the STEM subjects and a focus on practical skills.

Associated development requirements

Improve **Practical Skills** as an integrated component of the education system at all levels. We should identify the range of practical skills required to enrich the curriculum and learning process. In addition, for R&D manufacturing we should identify the CORE skills required to function effectively.

We need to work closely with partners to help embed appropriate practical training and skills into the curriculum and course design from schools through FE and HE, and strengthen the number studying STEM subjects with a balance of practical learning. Opportunities for industrial placements may be valuable in the development of practical skills.

We need to encourage a **responsive HE and FE system** by encouraging the development of new qualifications that meet the needs of employers in a timely manner. It is important that individuals within the bioscience sector receive relevant training at all levels to allow for skills acquisition in addition to obtaining qualifications.

In some areas of manufacturing, developing the existing workforce in order to keep pace with changing technologies and bioprocessing methods is important. Options for this should be explored.

Employers are required to work to GxP standards, so we must encourage learning provision to incorporate relevant aspects. Understanding relevant **regulation and compliance** as required needs to become an embedded part of training at appropriate levels and delivered via the FE and HE qualifications. Compliance with regulation is essential and we should work with regulators and awarding bodies to build on best practice and support qualifications and associated delivery to cover relevant requirements

We must engage with HE by working with the Higher Education Academy (HEA) and its Subject Centres of Bioscience, Physical Sciences and Mathematics. The HEA works across the 4 Nations of higher education provision and its aforementioned Subject Centres has potential to run workshops within relevant Universities to disseminate the outcomes / demands / needs of both the Sector Skills Agreement and Sector Qualification Strategy of the Bioscience Sector. These workshops would aim to develop plans and actions within each individual University to rectify current weaknesses within higher education provision as identified by the Bioscience Sector.

We shall also work with the Quality Assurance Agency (QAA) to develop Benchmark Statements that reflect the demands and needs of the Bioscience Sector and with the Higher Education Academy Subject Centres of Bioscience, Physical Sciences and Mathematics to encourage the design of degrees so that they are delivered in a format whereby students are building knowledge cumulatively and are not able to avoid more 'difficult' elements.

Employers in bioscience do not value combinations that do not provide the necessary depth of knowledge and skills they need of a graduate e.g. a science with many of the arts subjects. Employers do value 4 year degrees and sandwich degrees and these should be encouraged in collaboration with HE partners.

The **academic science base** is critically important to this sector for collaborative research and post

graduate training. It is important that we develop and maintain strong links with the academic community and funding stakeholders to influence and develop curriculum,

Chemistry is the conceptual base required for many specialisations relevant for work in Bioscience. Chemistry graduates and those who have taken chemistry components of other degrees are essential to the sector. A detailed list of what employers seek from a good chemistry course is given in the Skill Needs Assessment and knowledge of these requirements should be actively promoted.

Mathematical skills are a prerequisite for physical chemistry, and a good understanding of mathematics is increasingly important for bio-scientists, e.g. biochemistry graduates need the mathematical ability to understand and carry out basic enzyme kinetics. The newer disciplines such as genomics and proteomics and systems biology all demand considerable mathematical and statistical knowledge and we must work with government and other partners to encourage the delivery of improved mathematical education.

The ability to communicate verbally and in writing is essential for both scientific and managerial roles. In addition, other 'key skills' like team-working, creative thinking and project management are important. We must therefore design qualification frameworks to reflect these skills and encourage others to do so.

Standards and qualifications that promote breadth of knowledge have to be built on depth in a first discipline, and the ability to work in interdisciplinary teams is essential in research. We should engage with partners to ensure that opportunities are available.

A qualification review (outlined previously) reveals the acute lack of suitable National and Scottish Vocational Qualifications (N\SVQs) for candidates who work in laboratories and manufacturing facilities and we must respond to this by creating a suite of qualifications that can be used in NVQs, the Science Diploma and other awards relevant and credible for the sector. Where relevant it is important that we engage the workforce with the new credit based frameworks to recognise individual achievement, for example the accreditation of short courses and CPD.

Experience in industry is regarded as valuable and we must support mechanisms that encourage employers to offer students appropriate opportunities to gain such industrial experience through placements.

Semta will lead on the development of the **Science Diploma,** to ensure a fit for purpose qualification which contains a good balance of both practical and theoretical learning. We will seek to ensure that resources to support the implementation and future of the science diploma will provide coverage of Bioscience.

Leadership & Entrepreneurship:

Objective

To encourage leadership at a regional/local level in partnership and through existing clusters and networks in order to develop a critical mass of influence.

Associated development requirements

Training and support for potential and existing leaders is typically at Master's level or through accreditation by professional bodies where they exist.

There is a need to facilitate leadership training and development dialogue between employers and HE.

There is a need to promote the design and development of flexible qualifications and ensure that employers are effectively engaged in the qualifications development process, for example with MBA modules.

There is a need to work with partners to encourage the design and delivery of appropriate CPD and qualifications or certification that is valued by employers and individual adult learners.

Networks and Clusters:

Objective

To ensure that qualifications meet the needs of the sector employers have stated that it is vital that they are designed, structured and delivered in ways that will help to build capacity.

Associated development requirements

Universities must be encouraged to play to their strengths in the provision of different types of bioscience courses, and the funding of lab based courses should be properly financed.

We should work with institutions to develop improved collaborative provision of expensive components of courses.

There is a need to support sharing best practice and working with key stakeholders.

We need to work with employers, networks and HE to assess current provision and facilitate the development of any new bioscience clusters deemed necessary.

Image and attractiveness:

Objectives

To help the public at large have a better informed understanding of science generally (science literacy) and Bioscience as a consequence of improved general education and a more balanced representation of information in the public domain

To encourage young people aspire to a career in science and engineering.

To increase the attractiveness to employees in other sectors to consider Bioscience as an attractive and rewarding sector when retraining and up-skilling as a consequence of redeployment and/or career advancement.

Associated development requirements

The Biosciences Federation, Enthusing the next generation report found Much careers advice to be poor, and consequently students do not appreciate the range of jobs for which a science education fits them. There is a need therefore to encourage the provision of more information, advice and guidance at all levels of the education and training system, working with existing providers such as the National careers Co-ordinator and FutureMorph as appropriate.

The take up of Foundations Degrees, HNC/Ds and BTEC National Certificates is currently low. There may be opportunities to expand capacity in this area to meet the demand for an increased number of technicians coming into the industry.(see section 4.3 for supporting evidence for exploring these routes)

The NEPIC study cited earlier specifically highlights the need for bioscience technicians and for a Modern Apprenticeship framework to provide a nationally recognised route for training and a career path.

We should seek to design and develop qualifications frameworks that enable career progression.

Semta will lead on the development of the Science Diploma and will seek to ensure that resources to support the implementation and future delivery of the science diploma will provide coverage of bioscience.

6.2 This section summarises how Semta has worked with partners to arrive at its current provision, and how it will continue to work with partners to realise its view of the future and action plans through dialogue, as appropriate, with

- *employers*
- *government departments*
- *funding agencies in the four countries*
- *review authorities (e.g. QAA), accrediting authorities (e.g. professional bodies that grant exemptions for university courses), and the qualifications regulators (i.e. SQA, CCEA, DELLS and QCA)*
- *awarding bodies*
- *learning providers*

Past and Future Dialogues:

Semta has a well established track record of liaison and joint-working with key employers and

stakeholders particularly through the following forum/group(s):

- Awarding Body Forum
- Training Provider Forum
- Sector Qualifications Strategy Steering Groups
- Sector Strategy Groups
- Four Nations Group

In addition, the Semta Board includes directors, chief executives and senior managers representing key employers across the Semta sector.

SSA Consultation:
The SQS builds upon the research and consultation carried out as part of the SSA process. In particular, phase 3 of the SSA process involved extensive consultation with employers over the period February to June 2007 through a series of five scenario planning workshops. Additional methods of consultation were included at all stages of the SSA:

- Scenario planning workshops – included review and consultation of the Critical Success Factors
- Skills Needs Analysis consultation presentations, questionnaire and interviews with employers
- Stage 2 supplementary employer questionnaire
- Stage 2 training provider questionnaire
- Stage 2 HE interviews

Semta also facilitated a two-day workshop to develop the draft action plan with the SSG members on the 27th and 28th of June 2007. This workshop explored the sector intelligence resulting from:

- Labour Market Intelligence and Research
- Stage 1 – Skills Needs Analysis
- Stage 2 – Analysis of Provision

SQS Consultation:
Building on the SSA research and consultation, an additional piece of desk research was conducted to identify any further information or more recent sources of data to inform the SQS. This secondary research paper was used in conjunction with the draft vision for the Bioscience SQS to consult with employers and stakeholders to ensure the vision for the future of Bioscience qualifications is fit for purpose and able to exploit opportunities that government policies may offer.

Following identification and analysis of available information, an Independent Focus Group was held with employers and other interested parties with regard to developing and inputting into the vision for the Bioscience sector.

The use of a focus group was an excellent way to promote discussion on topical issues and to ensure the attitudes of employers, regulatory bodies, higher education, further education, awarding bodies and other target groups were captured in the strategy.

The purpose of the event was to develop and consult on, the vision for the Bioscience Sector Qualification Strategy and to gain feedback from all those with an interest in developing the sector in establishing a short to medium and long term view on the main issues. Using Future Focus (part of BERR) gave an opportunity for up to 20 participants to use the interactive facilities at the venue.

Collaboration with Bio networks and clusters and further dissemination through associations' member lists allowed over 300 participants to be invited to give 20 representatives from:

- all four UK nations
- employers
- training providers HE and FE
- awarding bodies
- professional institutions and associations
- Bio networks and clusters
- a student perspective
- recruitment agencies
- SSCs and other interested parties.

The day was used to address the following points:

- What is driving change in Bioscience?
- What are the implications for the qualifications?

- Examples of types of university degrees Semta should be championing on employers' behalf.
- What opportunities and qualifications should exist or be developed to ensure high quality technicians?
- What types of in house courses do you need Semta to recognise?
- Action Planning under the four industry priorities
- Voting on Results of the priority areas of focus for Semta

The top five priority areas of focus for Semta were as follows:

1. Apprenticeships: Apprenticeships are under utilised by the Bioscience sector and these could be used more in the future. This could free up graduate resources for work that draws more on their broader, deeper knowledge
2. Practical Skills: Improve practical skills as an integrated component of the education system at all levels (School through to HE)
3. Short Courses: Promote and develop a responsive system – to design short courses to address emerging specialist areas and upskilling requirements for the existing workforce
4. Career Pathways: Enable young people to aspire to a career in science by establishing a clear set of career pathways – develop route map
5. Use of NOS: Qualification developers should utilise a number of existing and emerging Competence Standards that could be of value to Bioscience employers and these should be explored

Following development and agreement of the above priorities at the Focus Group, the list of priorities was circulated for wider consultation to over 200 additional organisations, and through collaborative work with the Centre for Bioscience, members of the centre were also invited to provide any additional feedback and comment. Seven organisations across the four nations provided comments; the vast majority strongly supported the priorities.

National Occupational Standards:
Semta will continue its programme of work for the development and review of NOS (and where relevant, the development of qualifications structures). This, by its nature, involves working closely with employers, stakeholders and practitioners to ensure the NOS are fit for purpose. Semta will also continue to work with other SSCs on cross-sector projects to develop NOS.

6.3 This section describes how Semta will prepare or help with the preparation of information and materials, including the areas that action plans are likely to focus on at UK, national and regional levels. For example:

UK-wide (e.g.):

- *NOS related work, including e.g.*
  - *Updating of NOS and other related products (assessment strategies, qualifications structures etc)*
  - *Development of new NOS*

Nation-specific (e.g.):

- *Modern Apprenticeships in Scotland*
- *Review of level 2 entitlement in England*
- *CQFW in Wales*
- *Welsh language-medium qualification provision*

Practical Help:

Semta has already established an internal sector qualification reform project team to ensure that the overall vision of the SQS addresses the needs of England (and its regions), Northern Ireland, Scotland and Wales. This will ensure there is an integral sector skills council approach to the implementation of the strategy.

Sector Strategy Groups for each sector have already been established and they will help to review specific elements of the reform e.g. new qualification development, apprenticeship frameworks.

Semta has been engaging the higher education sector with the aim of explaining employers' workforce development needs via Sector Skills Agreements for higher education provision that offers employers bespoke learning delivered in flexible ways to suit both employers and employees. Higher Education is now building capacity and infrastructure to engage with employers and to develop /

deliver education, including higher level skills learning to meet employer demand. Employers' now need to respond by exploring the higher education offer and demonstrating tangible demand for this new higher education provision.

For undergraduate development Semta has been lobbying Government departments and higher education funding councils for an increase in the number of sandwich degree courses as the most cost effective and sustainable way of developing employability skills among the undergraduate population.

For graduate development Semta is lobbing for a standardised graduate development framework funded by higher education for use by employers, particularly SME employers.

Semta has established an excellent relationship with Higher Education Academy Subject Centres of Bioscience, Physical Sciences and Materials. The HEA Subject Centres work with higher education teaching practitioners and departments across the UK to identify and disseminate good practice in learning and teaching and. As such, they provide a potential route for the dissemination of practice and influencing curriculum content. Semta will now need employers to articulate their detailed learning needs for dissemination within the higher education sector and via these subject centres.

Semta has developed an Action Plan to cover initiatives and programmes in relation to Higher Education.

As previously stated there are a number of areas in which gaps and the need for incremental change – for National Occupational Standards and S/NVQs - have been identified. A programme of work has been specified for the coming year to address these gaps. It is hoped that there will be funding available to support this work.

The following points cover some emerging examples of movement toward delivering the themes of the Action Plans for Bioscience across the UK.

Overall UK wide changes and activity

The Sector Qualification Strategy (SQS) is being developed and chaired by industry.
National Occupational Standards (NOS) are being developed to ensure there are relevant occupational standards in place for the bioscience and laboratory environment.
Top Quality Workforce sub-group has been established.
Leadership & Entrepreneurship sub-group has been established
UK Regional contacts meetings arranged and held through DBERR

England
Project Enthuse, launched in the March 2008 Budget speech, will be a significant step forward in improving the confidence of all science teachers in secondary and further education. This is a joint Wellcome Trust, Industry and Government initiative that has ring-fenced £30 million to provide teaching staff with free access to high quality CPD courses over the next 5 years. The scheme is being delivered via the National Science Learning Centre network and outputs will be monitored by a board composed of the contributors.

14 to 19 Science Diploma
Semta have been chosen to lead on the development of the Science Diploma and lead the Diploma Development Partnership.

Northern Ireland
Some inputs for NI that Engineering Training Council and Semta have initiated as a result of the Bio SSA Action Plan:

Currently working with BiobusinessNI to develop a Bioscience academy for Northern Ireland.
Working with Southern Regional College and relevant Bioscience companies to develop a Lab Technician apprenticeship for NI.
Workshop seminar for a group of NI Bioscience Stakeholders on competencies for Lab Skills and Biotechnology Skills.
Initial meetings have taken place with BiobusinessNI and some companies are exploring Business Improvement Techniques.

Scotland

Life Sciences MA Framework
On March 31 2008 the Scottish Government announced its desire to create a Modern Apprenticeship Framework and recognising the work Semta has already undertaken through its Bioscience SSA, the Government has asked Semta to lead on the development of this Framework. A proposal to develop the Framework has gone to the Government with a view to start the development work in July 2008 with the Framework to be submitted to the Modern Apprenticeship Approvals Group for approval in the spring of 2009.

Science SSC Strategy
In Scotland, Semta Chair the Science based Sector Skills Councils (SSCs) Sub Group on behalf of the Skills For Business Network. One of the aims of this Group is to develop a Science Strategy and Implementation Plan on behalf of the Science based SSCs in Scotland in order to engage with stakeholders across a range of 'common areas' e.g. improving the image and attractiveness of the science sector, encouraging more young people to participate in science subjects at school, developing clearer career paths and developing the workforce.

More recently Semta, on behalf of the Science Based SSCs in Scotland, has engaged with the Scottish Government over the development of a Science Skills Forum in Scotland involving a much broader range of stakeholders in order to:
develop, prioritise and sustain science skills throughout secondary education, vocational, academic and professional settings to match employer need
enhance collaboration between Business, Stakeholders and Providers

Wales
Bioscience Action Plans were agreed with all stakeholders in Wales early in 2008, actions to date include:

Partnerships have been formed with Glamorgan University to take forward actions relating to leadership and entrepreneurship and to work in collaboration with other Higher Education Institutions (HEIs) in Wales
Welsh employers and Welsh Assembly Government representatives are active members in the development of new occupational standards with links being made with Medi Wales to help disseminate the progress of this work to employers.

6.4 This section describes how the SQS will be monitored and evaluated to ensure that it is successfully implemented and kept up to date, accounting for potential changes in legislation etc.

Monitoring and evaluation arrangements:

Bioscience SQS Steering Group:
An SQS Steering Group has been established to oversee the development of the SQS and implementation of the action plans intended to carry through the strategic aims, including the instigation of projects, and the creation of partnerships and agreements necessary to achieve these aims. This is chaired by an employer member of the Semta Bioscience Sector Strategy Group in addition to employer and trade representatives, regulators and funding agencies. The SQS Steering Group will monitor the SQS through the achievement of the strategic priorities and work streams detailed on the resulting Action Plans.

The SQS has been given a high priority by the Senior Management Team of Semta. A post has been specifically created to ensure that the strategy is realised through the associated action plan and that this co-ordinated with other Semta activity, such as the refinement delivery of the Sector Skills Agreement Action Plan, the development and revision of NOS, the Apprenticeship Strategy, and employer engagement. The Senior Management Team will review activity under the strategy against Semta's Master Schedule as a routine item under monthly Technical Department meetings and will report progress to the Board.
Semta will review the action plans from this SQS at least annually. The impact of sector qualification strategies as a whole will be evaluated against their contribution to the achievement of the targets as actions set out in the Sector Skills Agreements in the four nations.

Bioscience Sector Strategy Group:

Semta's Sector Strategy Groups (SSGs) drive every aspect of our work. Made up of senior employers, there is one SSG for each sector that Semta represents.

As well as being the principal advisory bodies to the Semta Board, each SSG provides strategic leadership in the work of Semta and drives the delivery programmes such as the Sector Skills Agreement (SSA) and Sector Qualifications Strategy on behalf of the sector.

The Bioscience Sector Strategy Group will oversee the work of the SQS group and as the advisory body to the board, will ultimately have the responsibility for final approval of the SQS and recommendations.

The Sector Qualifications Strategy acts as the foundation for future Action Planning work, which will set the direction of travel for future qualification and learning development. The Bioscience SQS Steering Group and Sector Strategy Group will monitor activities against plans, from an industry perspective.

Membership includes:

Bioscience SQS Group:
ABPI
AstraZeneca
Association for Science Education
Association of Colleges
Bio Industry Association
Biosciences Federation
Biotechnology and Biological Sciences Research Council
CCEA
Centre for Bioscience
Chiron
City and Guilds
Edexcel
GlaxoSmithKline
Learning and Skills Council
OCR
PAA/VQSET
Pfizer
Qualifications and Curriculum Authority
Royal Society
SCORE
Scottish Qualifications Authority (Awarding Body and Regulation)
UKCES
University of Glasgow

Bioscience SSG:
GlaxoSmithKline (Global Manufacturing and Supply)
Bio Industry Association
Cogent SSC
UKCES
Prospect
Pfizer
ABPI
Novartis Vaccines
BBSRC
BERR
AstraZeneca

Glossary of Terms

A levels	Advanced levels
ABI	Annual Business Inquiry
ABPI	Association of British Pharmaceutical Industries
ALP	Average Labour Productivity
APS	Annual Population Survey
BERR	Department for business Enterprise and Regulatory Reform
BIA	Bio Industry Association
BIGT	Bioscience Innovation and Growth Team
BSc	Bachelor of Science
CBI	Confederation of British Industry
CPD	Continual Professional Development
CQFW	Credit and Qualifications Framework Wales
DCELLS	Department for Children, Education, Lifelong Learning and Skills (Wales)
DCSF	Department for Children Schools and Families
DDP	Diploma Development Partnership
DELNI	Department for Employment and Learning of Northern Ireland
DIUS	Department for Innovation, Universities and Skills
FD	Foundation Degree
FE	Further Education
GCE	General Certificate of Education
GCSE	General Certificate of Secondary Education
GLP	Good Laboratory Practice(s)
GMP	Good Manufacturing Practice(s)
GXP	Good X Practice(s) (X can mean: Clinical, Laboratory, Manufacturing, Pharmaceutical, etc)
GVA	Gross Value Added
HE	Higher Education
HEFCE	Higher Education Funding Council England
HEFCW	Higher Education Funding Council Wales
HEI	Higher Education Institution
HNC	Higher National Certificate
HND	Higher National Diploma
HtFV	Hard to Fill Vacancies
IAG	Information Advice and Guidance
ICT	Information and Communications Technology
IDBR	Inter-Departmental Business Register
IER	Institute of Employment Research (University of Warwick)
IP	Intellectual Property
IPR	Intellectual Property Rights
LMS	Labour Market Survey
LSC	Learning and Skills Council
MChem	Master of Chemistry

MHRA	Medicines and Healthcare products Regulatory Agency
MPhys	Master of Physics
MRes	Master of Research
MSc	Master of Science
NEPIC	North East Process Industry Cluster
NESS	National Employer Skills Survey
NHS	National Health Service
NICE	National Institute of Clinical Excellence
NOS	National Occupational Standard
NQF	National Qualifications Framework
NVQ	National Vocational Qualification
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
PG	Post Graduate
PhD	Doctor of Philosophy
QA	Quality Assurance
QAA	Quality Assurance Agency (Higher Education)
QCA	Qualification and Curriculum Authority
QCF	Qualifications and Credit Framework
QIA	Quality Improvement agency (Further Education)
R&D	Research and Development
RDA	Regional Development Agency
SCQF	Scottish Credit and Qualifications Framework
Semta	Sector Skills Council for Science, Engineering and Manufacturing Technologies
SFC	Scottish Funding Council
SIC	Standard Industrial Classification
SME	Small and Medium sized Enterprise
SNA	Skill Needs Assessment
STEM	Science, Technology, Engineering and Mathematics
SOC	Standard Occupational Classification
SQA	Scottish Qualifications Authority
SQS	Sector Qualifications Strategy
SSA	Sector Skills Agreement
SSC	Sector Skills Council
SSG	(Semta) Sector Strategy Group
SVQ	Scottish Vocational Qualification
UKCES	United Kingdom Commission for Employment and Skills
VQRP	Vocational Qualification Reform Programme
WAG	Welsh Assembly Government
WBL	Work Bases Learning