

Intermediate GNVQ Science Online Course

Powered by Digitalbrain, the computer-based package can be used to teach and manage the complete Intermediate GNVQ in Science course

Why the Intermediate GNVQ in Science?

- the Intermediate GNVQ in Science is a course approved by QCA for delivery at Key Stage 4. The Examination Boards (AQA, OCR and Edexcel) provide detailed mapping against the National Curricula
- it is equivalent to 4 GCSEs, A*-C facilitating a 100% A*-C “pass rate” to appear in league tables
- can be used with students of all abilities
- it provides vocational science relevant to life in the twenty-first century
- it is scientifically rigorous – there is no prescribed threshold to learning, but it will also benefit students (approximately 55% nationally) for whom the system is currently failing
- it provides real scientific research questions and emulates “what scientists do”
- it can be delivered in time comparable with a typical GCSE science course, e.g. four hours per week over two years
- at Kingshurst we believe that the course has greatly enhanced the performance of students of all abilities since its implementation, and developed an increased and wider range of the skills required by HE establishments and employers

Why opt for Intermediate GNVQ in Science on-line?

The on-line course consists of:

- material accessed on-line, through CD-ROM or printable material
- animated teaching materials covering detailed scientific information and concepts
- laboratory tasks
- proformas for students to write up activities for assessment
- detailed teacher guidance including full schemes of work for all units and detailed lesson plans for Units 1, 2 and 3.

The course minimises teacher preparation:

- with its depth of information and up-to-date and topical material, it minimises teacher preparation
- the package is broken down into individual units, then divided into specific activities aligned to the QCA/OCR Assessment Evidence grids
- each unit carries the appropriate information to deliver the course, along with detailed notes and appropriate up-to-date vocational settings
- full teacher guidance – including practical details, support material and discussion material - is offered for each activity

Intermediate GNVQ Science Online Course

The course provides unique learning activities:

- the teacher can deliver the curriculum content on an electronic whiteboard, or the student can access this independently, either in the laboratory, a computer room or at home
- the student can work through material at their own pace
- the student can conduct practical investigations on-line, accumulate data, draw up experimental reports, evaluate experimental technique and cross reference to vocational scenarios
- the student is directed towards appropriate material from industry through websites cited in the package
- activities carried out or simulated on-line can be replicated in the laboratory
- materials will enable able students to attain Distinction level
- on-line material enables students to catch up work missed through absence

The course facilitates the on-line production of portfolios for assessment:

- powered by Digitalbrain, the student can make notes, produce files and copy and paste information from website
- proformas aid in the write up of practical reports
- planning skills, report writing, evaluation and research skills developed formatively and summatively through online material
- portfolio developed, and could be assessed, online
- student portfolios secure and cannot be lost
- entire student portfolios can be printed off for moderation
- facilitates production of Key Skills portfolios

The online course consists of exemplar material:

- written by experienced science teachers with publications record
- all practical and written materials have been trialed with students
- established track record of progression - approximately 93% of Kingshurst students stay on into Post 16, embarking on either AVC courses or the International Baccalaureate (A Level Standard). 63% of these went on to university last year, and we have Oxbridge candidates every year

Accessing the course on-line:

- should present no problems - the main pages should take a maximum of 3 seconds to download. In order to view the interactive materials, you need the Macromedia Flash Player 5, free to download from www.macromedia.com/go/getflashplayer/ . The link is on the website.

Biology

General guidance

Portfolio of evidence

Within the portfolio of evidence you should include the results of monitoring the activity of an organism under controlled conditions, including those that enable the organism to function well and contribute to successful growth and development. The record of the activities should show how you applied your knowledge and understanding to solve scientific problems.

You will need to:

- correctly follow instructions to monitor the activity of an organism under controlled conditions
- produce a detailed plan of your investigation
- identify the observations and measurements you need to make
- describe the procedures, processes and conditions that you applied to your scientific work
- record your results and explain observations and measurements
- apply scientific knowledge and understanding when explaining your results
- determine the most suitable conditions for the activity of an organism
- consider alternative methods to obtain the results you want. Justify your methods
- identify sources of error and describe how you would limit their effect
- compare what you did in the laboratory with the way in which comparable activities are carried out in industry

Learning Knowledge and Understanding Needed for Scientific Work

Biology

Syllabus range

You must carry out an extended investigation of the activities of an organism under controlled conditions.

You need to select an organism for a particular purpose, which you can monitor.

You need to produce a plan for your investigation. This must include information about:

- the type of organism
- the purpose of the activity you will be monitoring
- the conditions you will be providing and controlling
- how you intend to monitor the conditions you provide and the organism's activity
- a monitoring schedule for the duration of your investigation
- how you will evaluate the results of your investigation

Cross referenced to unit 1:

You need to identify standard hazards in science laboratories and the risks they present.

micro-organisms, such as bacteria and Fungi

You need to be able to:

identify and describe biological hazards

identify the risks from these hazards

You need to be able to:

carry out a risk assessment for the activity you are doing

For scientific observations and measurements you must know what is meant by:

- accuracy
- reliability
- precision
- You need to know how to:
 - set up a light microscope ready for use, choosing a suitable objective lens (yeast)
 - prepare samples for investigation, including a temporary slide using staining
 - use aseptic techniques to culture micro-organisms and know how to dispose of them safely

Biology

KEY SKILLS SIGNPOSTS	
<i>When students are:</i>	<i>There may be opportunities for them to develop the following key skills evidence</i>
monitoring the activities of an organism	N2.1 Interpret numerical information from written and first-hand sources N2.2 a carry out calculations to do amounts and sizes N2.3 interpret the results of their calculations and present their findings using graphs, charts or diagrams
obtaining information from secondary sources	C2.2 Read and summarise information about straightforward subjects from extended documents, including at least one image
preparing records of activities	C2.3 Write different types of document about straight forward subjects, using at least one image
obtaining information from secondary sources	IT 2.1 Search for and select information for different purposes
preparing reports and activities	IT 2.2 explore and develop information and derive new information for different purposes It 2.3 Present combined information for different purposes, including at least one example of text, images and numbers

Biology – Animals

Monitoring the Activity of the Human Body

Speed is the quickness of movement of limb, whether this be the legs of a runner or the arm of the shot putter. Speed is an integral part of every sport and can be expressed as any one of, or combination of, the following:

- maximum speed
- elastic strength (power)
- speed endurance

Speed is influenced by the athlete's mobility, special strength, strength endurance and technique. For the sprinter, these are essential, while for a number of sports acceleration and speed over a short distance (10-50 m) is also very important, e.g. American football, basketball, baseball, cricket, hockey, rugby, soccer, etc..

To develop these qualities, a training programme is essential. A suitable programme may be found on Brian Mackenzie's Sports Coach website:

<http://www.brianmac.demon.co.uk/speed.htm>

Biology – Animals

Monitoring the Performance of a Sprinter

A 100-metre sprinter, undergoing a training programme to increase fitness, monitored their performance over a number of weeks.

Planning the monitoring process is just like any other scientific investigation and requires a series of decisions about manipulating and controlling variables.

Results of sprint tests:

Time, weeks	Mean time for 100 m, s ⁻¹
0	14.76
1	14.38
2	13.84
3	13.40
4	12.87
5	12.52

A series of ECGs, grouped by week:

Time (Weeks)	Heart rate, beats min ⁻¹											
	Before exercise	After exercise	1	2	3	4	5	6	7	8	9	10
0	72	180	155	120	110	100	84	81	78	76	74	72
1	71	170	122	102	90	82	80	79	75	73	72	71
2	70	160	110	92	82	79	76	75	72	71	70	70
3	68	148	100	82	78	75	73	73	71	68	68	68
4	67	142	92	74	72	70	68	68	67	67	67	67
5	66	140	84	70	68	67	67	66	66	66	66	66

Describe and discuss the changes that have occurred during the training programme.

Biology – Animals

Detailed Notes

Controlling Variables

Which variables need to be controlled – i.e. kept constant - to make this a fair test?

- Distance of sprint
- Sociological factors, e.g. peer pressure
- Psychological factors, e.g. stress, anxiety, motivation
- Fatigue
- Illness
- Environmental factors, e.g. altitude, wind speed, etc.

Monitoring

How may performance be monitored?

With training, several changes take place in the cardiovascular system, respiratory system and body's musculature which may be monitored. It is convenient to measure:

- the simplest way to test speed is to time how quickly they could run the distance
- monitor heart rate
- monitor cardiac recovery rate.

Biology – Animals

Physiological Changes During Exercise

When we exercise, oxygen must be supplied to the muscles, and carbon dioxide, produced during respiration, must be removed. It is the role of the lungs to take in oxygen and get rid of carbon dioxide; it is the job of the heart to deliver to, and remove wastes from the muscles. When exercising vigorously, a point will come where the muscles will run short of oxygen when the lungs and heart fail to deliver it sufficiently quickly. The muscle will begin to respire anaerobically, producing lactic acid rather than carbon dioxide and water. When normal oxygen supply is again resumed, it is needed to return the body to its pre-exercise state by burning off the lactic acid and replenishing muscle energy stores. This is known as the oxygen debt. The time for the body to return to normal is called the recovery rate.

Biology – Animals

Physiological Changes During Training

The major long-term effect of training is on the body's muscle fibres - these are better organised and can contract more forcibly and efficiently:

- the leg muscles will work more efficiently
- the respiratory muscles become more efficient and ventilation is therefore improved, increasing lung volume and reducing breathing rate
- the volume the heart muscle pushes out per beat (the stroke volume) increases, so the heart rate decreases
- fast twitch muscle fibres can tolerate higher levels of lactic acid and are much better at removing it

Biology – Animals

Evaluation

The data here show distinct trends, but when carrying out similar scientific investigations yourselves, the results may not be so clear-cut.

One major source of error will be in timing. Stop-watches are often used to time sprints but these rely on the actions of the operator. For more accurate timing, time gates are set up at the start and finish points.

Detailed Notes

Evaluating a Laboratory Experiment

Sources of error include:

Design Error:

- the use of stopwatches instead of light gates
- the use of manual pulse rate measurements instead of ECGs
- difficulties in detecting pulse rates, particularly in females
- sprinter at different physiological states/different sociological factors in different weeks
- differences in environmental factors
- the sprinter at different levels of fatigue

Human Error:

- poor timing
- incorrect measurement of distance
- incorrect counting from manual pulse rate measurements
- incorrect readings from ECGs

Equipment Error:

- sensitivity of stopwatches
- difficulty making contact with electrodes with ECG

Biology – Animals

Activity 5b: Monitoring the activity of a human during a speed training programme

Speed is an integral part of every sport and it is essential that the performance of an athlete is monitored.

You are to monitor the performance of a sprinter over 100 m and determine the effect of a training programme, over a specific period of time, on the ability of the sprinter to perform this task.

To do this effectively you will first need to produce a plan:

- state the organism and the purpose of monitoring performance during the training programme
- the conditions you will be **providing**, i.e. specifics of the training programme and the sprint distance you have chosen, and those conditions must **control** to make your results meaningful
- how you intend to monitor the **conditions you provide** and the **sprinter's performance**. You must show here that you consider alternative methods, and justify why you have chosen your method for monitoring conditions and/or the sprinter's performance
- a monitoring schedule, showing when you will take readings, for the duration of the investigation
- how you will evaluate your results

Present a full report of the investigation, to include:

- your plan
- your materials and methods
- results, along with the relevant graphs
- a conclusion, explaining changes to the sprinter's body during exercise and the effects of the training programme
- an evaluation of the techniques used, identifying sources of error and how these limit the validity of the conclusions you can draw
- the implications of your findings to sporting activities and professional training programmes

Biology – Animals

Portfolio Evidence

Activity 5b: Monitoring the activity of a human during a speed training programme	
Introduction Type of organism whose activity is to be monitored. Vocational aspects of measuring performance.	<i>A human.</i> <i>You should include a discussion on why you have chosen this organism – in other words, why it is important to monitor performance during a speed training programme.</i>
Planning Factors affecting the performance of a sprinter.	<i>This should include a list of factors- the independent variables - that might affect the sprinter's performance.</i>
Monitoring and controlling variables.	<i>You will then select one variable, i.e. the performance of the sprinter (resulting from an increase in fitness) during a training programme, then test the effects of this variable over a period of time.</i> <i>All other variables will need to be controlled, i.e. not allowed to vary. State what these are. It would be useful to monitor these for the duration of the investigation and describe how this can be carried out.</i>
Monitoring the effects of training.	<i>You must decide the length of time over which the effects of the training should be monitored.</i> <i>Describe how the performance of the sprinter can be monitored. You should consider different methods of monitoring performance and it may be desirable to use more than one method of measurement.</i>
Safety points	<i>List any safety considerations that you have to make, e.g. on the health of the sprinter.</i>
Materials and methods	<i>A report, in the past tense, on what you did.</i>
Results	<i>This should include measurements of the performance of the task:</i> <ul style="list-style-type: none"> ● <i>direct measurements of performance</i> ● <i>heart rate</i> ● <i>cardiac recovery rate</i> <i>You will draw graphs of these for the duration of the training programme.</i>
Conclusion	<i>This will describe:</i> <ul style="list-style-type: none"> ● <i>the relationship between performance over the length of time of the training programme</i> ● <i>the effects of exercise</i> ● <i>the physiological effects of training.</i>
Evaluation	<i>This should discuss:</i> <ul style="list-style-type: none"> ● <i>how random error affects results</i> ● <i>other sources of error which are within your control</i> ● <i>suggested modifications to improve the scientific validity of your results.</i>
Discussion of vocational implications	<i>This should discuss the implications of what you found out in terms of suitable training schedules for athletes.</i>

Biology – Animals

Portfolio Evidence

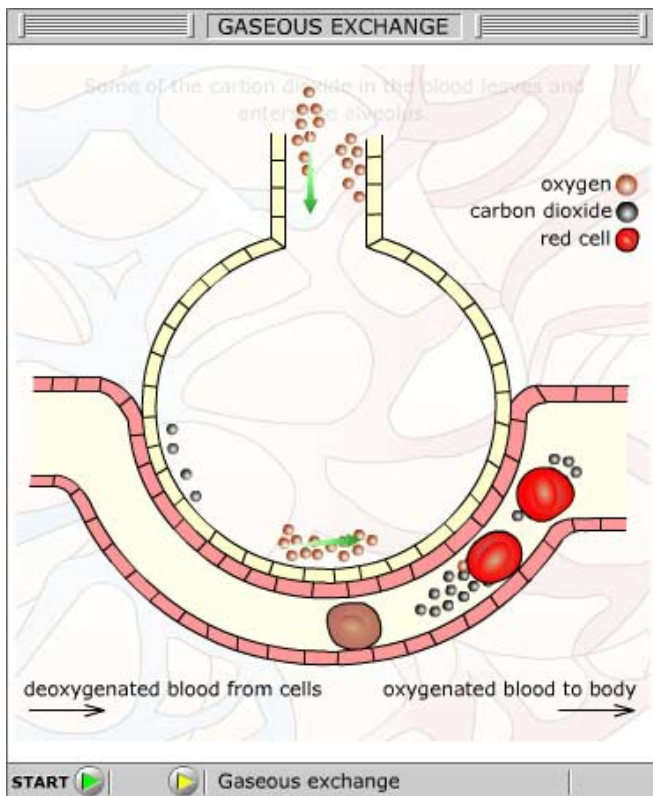
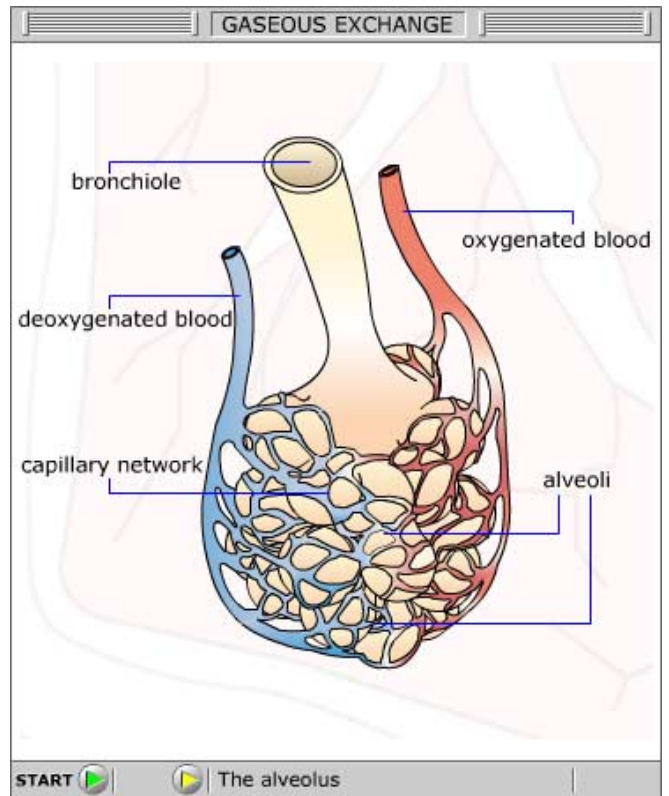
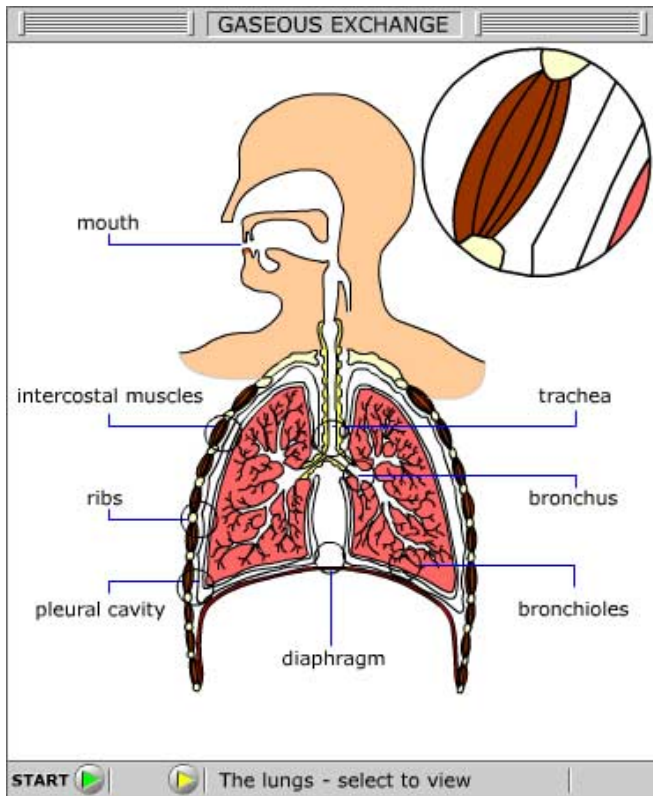
Activity 5b: Monitoring the activity of a human during a speed training programme	
Introduction Type of organism whose activity is to be monitored. Vocational aspects of measuring performance.	
Planning Factors affecting the performance of a sprinter.	
Monitoring and controlling variables.	
Monitoring the effects of training.	
Safety points	
Materials and methods	
Results	
Conclusion	
Evaluation	
Discussion of vocational implications	

Biology – Animals

Teacher Guidance

Activity 5b: Monitoring the activity of a human during a speed training programme

There are several methods of monitoring improvement of performance. It is suggested that a direct measurement is taken, i.e. how long it takes to run 100 m or alternative distance, over a period of several weeks. Other measurements could include heart rate and cardiac recovery rate.



MONITORING A TRAINING PROGRAMME

week 3 heart rate for 100 m

rhr - 68 bpm

post exercise time 100m 148 bpm 06:94

Input the cardiac recovery rate : Week 3 - press return [view graph](#)


time - weeks	time -100m	rhr	crr
0	14.76	72	10 mins
1	14.38	71	10 mins
2	13.84	69	9 mins
3	13.40	68	8 mins
4			
5			

rhr - resting heart rate crr - cardiac recovery rate

weeks	heart rate - beats min		recovery									
	pre exercise	post exercise	1	2	3	4	5	6	7	8	9	10
0	72	180	155	120	110	100	84	81	78	76	74	72
1	71	170	122	102	90	82	80	10	75	73	72	71
2	69	160	110	92	82	79	76	75	71	70	69	69
3	68	148	100	82	78	75	73	73	71	68	68	68
4												
5												



START Week 3 - select post exercise

PHYSIOLOGICAL CHANGES DURING TRAINING




The major long-term effect of training is on the body's muscle fibres - these are better organised and can contract more forcibly and efficiently:

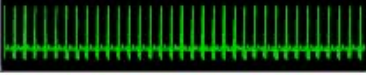
body muscle mass


START  

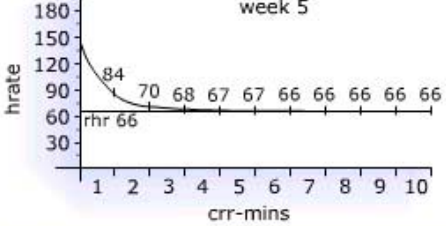
MONITORING A TRAINING PROGRAMME

week 5 heart rate for 100 m



rhr - 66 bpm 

post exercise 140 bpm  time 100m 12:52


view chart 



weeks	heart rate - beats min		recovery									
	pre exercise	post exercise	1	2	3	4	5	6	7	8	9	10
0	72	180	155	120	110	100	84	81	78	76	74	72
1	71	170	122	102	90	82	80	10	75	73	72	71
2	69	160	110	92	82	79	76	75	71	70	69	69
3	68	148	100	82	78	75	73	73	71	68	68	68
4	67	142	92	74	72	70	68	68	67	67	67	67
5	66	140	84	70	68	67	67	66	66	66	66	66

START   Restart



PHYSIOLOGICAL CHANGES DURING TRAINING



Characteristics of fast-twitch muscle fibres

- relatively fast contractile speed
- fast myosin ATPase
- high glycolytic activity
- low oxidative activity
- fatiguable

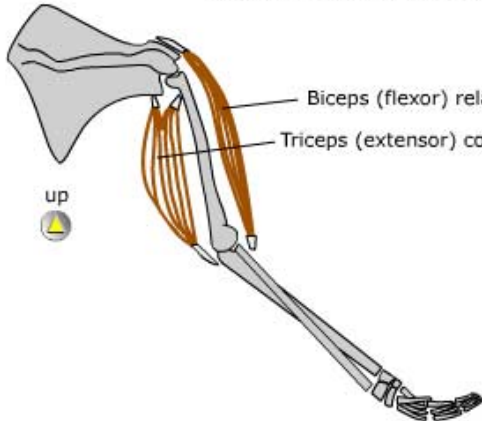
Fast twitch muscle fibres can tolerate higher levels of lactic acid and are much better at removing it.


START  


PHYSIOLOGICAL CHANGES DURING TRAINING

Antagonistic muscle activity.

The biceps and triceps in the forearm.



up 

START 

Frequently Asked Questions - Curriculum

As a school that has traditionally taught GCSE double/single award science, why should I opt to do the Intermediate GNVQ in Science course?

- the Intermediate GNVQ in Science Course is a QCA approved course equivalent to 4 GCSEs - twice as many as the GCSE double award.
- take up of this qualification will therefore improve student and league table results.
- at Kingshurst, the “pass rate” (A*-C grades at GCSE) has increased from 54% to 90+% since its implementation.

How does the content of the Intermediate GNVQ in Science course compare with GCSE?

- it is scientifically rigorous – there is no prescribed threshold to learning and some students will undoubtedly produce work of Advanced level standard or higher.
- it provides real life topical scientific research questions and emulates “what scientists do.”
- the content of the on-line course lends itself to accreditation of Key Skills.

Is the GNVQ course a soft option or more suited to less able students?

- neither - it provides **all students** with vocational science relevant to life in the twenty-first century.
- it can be used with students of all abilities and in particular raise performance levels of underachieving students.
- it is differentiated both by assignment and by outcome.

How will the course fulfil the requirements of the National Curricula for England and Wales?

- the Examination Boards (AQA, OCR and EdExcel) provide detailed mapping against the National Curricula.
- a number of our students pick up a single science GCSE in Year 11 as a voluntary option in their own time, based on the GNVQ course.

Frequently Asked Questions - Curriculum

As an 11-18 school we are interested in progression to AS, A-level and University. How can I be assured that this will allow satisfactory progression?

All of our Year 10 and 11 students have undertaken the Intermediate GNVQ in Science course in the past. Approximately 93% of these stay on into Post 16, embarking on either Advanced GNVQ courses or the International Baccalaureate (equivalent to 4 - 5 A levels). 63% of these went on to university last year, and we have Oxbridge candidates every year.

Do you have any examples of students who have progressed from the Intermediate GNVQ in Science course to science related employment?

Students progressing into science-based employment are too numerous to mention! Some have established their own £multimillion companies!

How much time should I allocate to the course?

The time is comparable with a typical GCSE science course, e.g. four hours per week over two years (in practice, we believe that it can be delivered well within this limit).

Which exam board validates the course you offer?

The course we offer is specifically aligned to OCR's and AQA's optional units. Staff at Kingshurst have worked with OCR on the development of these units and are unit test writers for this board. We think these units are better than the others on offer, but this does not preclude working with EdExcel in the future.

Where can I get more information on registration for the GNVQ course?

You can obtain more details, such as registration and testing fees, and full support for assessing, grading and moderation, from www.qca.org.uk, www.ocr.org.uk, www.aqa.org.uk and www.EdExcel.org.uk

Frequently Asked Questions - Curriculum

How much timetable time is devoted to the GNVQ science in year 10 and year 11, compared with a typical GCSE subject?

GNVQ time is 5 x 50 minute lessons per week.

Why opt to do the course on-line?

- the on-line course consists of animated teaching materials covering detailed scientific information and concepts, laboratory tasks and simulations, proformas for students to write up activities for assessment, and detailed teacher guidance.
- with its depth of information and up-to-date and topical material, it minimises teacher preparation.

Is the on-line course simply of use to GNVQ students – could it be used for GCSE Sciences?

All of the material in the package is applicable to GCSE. Examples featured would also be invaluable to GCSE investigations.

How are requirements for practical – genuine or simulated - addressed?

- Simulations are intended to support learning/laboratory/field work. All of the practical activities in the on-line course can all be replicated in the environments above.

What class sizes are involved? Is there any requirement for timetabling in rooms with one computer per student?

- Class sizes are around 28 at Kingshurst.
- There are no timetabling requirements in terms of suites of computers. Digitalbrain is so designed so students can work on PCs at home. CD-ROMs and printable materials support the on-line course.

Frequently Asked Questions - Technical

How can I access the course materials?

In a number of ways:

- You can log onto the course via digitalbrain.com. This will give you access to all the course resources including the printable materials. You can also benefit from digitalbrain's functionality in terms of students' notes.
- You will get a CD-ROM duplicating the on-line student materials.
- You can make a copy of the CD-ROM to a hard-disk and run it directly from the machine. Note: teacher materials are only available on-line

Is there any specialised software I need to deliver the course?

Yes. You need a version 4+ browser with Macromedia Flash 5 installed. Internet Explorer 5.5, Netscape Navigator 4.7 and Macromedia Flash 5 Player are supplied with the CD-ROM and accessible from the website. Note: Flash Player must be version 5 or later – the course will not work with older versions.

The printable material is available in both Microsoft Word format (*.doc) and Adobe Acrobat format (*.pdf). The Adobe Acrobat reader is supplied with the CD-ROM and accessible from the website.

Do I need to install the Macromedia Flash Player?

Yes. When you first go onto the on-line course, or initially start the CD-ROM, a detection program will determine whether or not you need to download the Flash Player. Follow the on-screen instructions to install. You only need to do this once for each machine.

Do I need a fast Internet connection?

No. The materials have been tested on lower specification machines, using a 28.8 K modem and the download times average around 10 seconds. With newer machines and a slightly faster Internet connection, the download time is just a few seconds. The materials are developed with the help of Macromedia Flash resulting in very small files sizes.

Frequently Asked Questions - Technical

What is the minimum specification machine I need to run the course materials?

The course can be delivered through both Windows PC and Macintosh computers.

	Windows PC	Macintosh
<i>Processor</i>	Pentium class	PowerPC
<i>Supported OS</i>	95, 98, ME, NT4, 2000	Mac OS 8.5 and above
<i>Memory</i>	16MB RAM	16MB RAM
<i>At least one of the following:</i>	A CD-ROM drive, Internet connection or network connection	

Frequently Asked Questions - Digitalbrain

1 Accessibility

A student's digitalbrain can be accessed at school, home or anywhere in the world. Students can start work in the classroom, save it to their digitalbrain, then continue the work at home or in the next lesson. Students can mail work directly to teacher for assessment and get feedback without seeing the teacher. Students that are off long term sick can work from home with ease and receive support from teachers.

2 Reliability

Once work is saved on digitalbrain, it cannot be mislaid, unlike pieces of paper, especially at the beginning when a portfolio is just in its early stages of being developed. No more saving work to disk!

3 Cut costs

Because all portfolio work can be saved on the student's own digitalbrain, there is no need for lots of printing to be done.

4 Key Skills

These can be easily cross referenced in digitalbrain, without having to duplicate evidence.

5 "My Notes"

Students can save work which is linked to the specific section they are studying, ensuring it is easily accessed and easily referred back to.

6 Security

Different "permission levels" can be set by the teacher to stop copying, and reading of individual work.

Frequently Asked Questions - Digitalbrain

7 Flexibility

“Anytime, anywhere learning,” with the possibility of making the timetable more adaptable to match students’/school needs.

8 Groups

Groups of people can be pre-set to allow easy viewing ... this can be dictated by teacher.

9 Adaptable

The ability to add your own materials and notes and change them easily with little, if any training, to suit circumstances, using the digitalbrain wizard.

10 Chat line

A chat line is available so students can discuss problems with each other and teacher if necessary. The teacher has permission to “throw out” students if necessary.

Specification Summary

UNIT TITLES

Mandatory Units at Intermediate Level

Unit	Title	Type of Assessment	Entry Code
1	Applying practical skills	Portfolio	6461
2	Learning knowledge and understanding needed for scientific work	External	6462
3	Applying knowledge, understanding and skills	Portfolio	6463
4	Forensic science	External	6464

Optional Units at Intermediate Level

Unit	Title	Type of Assessment	Entry Code
5	The science of sports equipment	Portfolio	6465
6	Biotechnology and genetics	Portfolio	6466
7	The chemistry of renewable resources	Portfolio	6467
8	Ecology and conservation	Portfolio	6468
9	Using electronics	Portfolio	6469
10	Optical communication systems	Portfolio	6470

ROUTES THROUGH THE COURSE

Candidates may choose from the units listed in the table above.

Candidates will study **six** units, four of which are mandatory and two further units. Two of the mandatory units are externally assessed. All optional units are assessed through a portfolio

EXTERNAL ASSESSMENT

There are two assessment sessions each year, in January and June. Each unit will be available for assessment in both sessions.

Unit	Title	Type of Assessment	Length
2	Learning knowledge and understanding needed for scientific work	Written test	1½ hours
4	Forensic science	Written test	1½ hours

1 Introduction

1.1 RATIONALE

This specification leads to a GNVQ qualification in Science at Intermediate level in the National Qualifications Framework. Candidates study six units for an Intermediate qualification.

The specification builds upon the broad educational framework set out in the GNVQ Criteria of the Qualifications and Curriculum Authority. GNVQs are broad based vocational qualifications designed to allow candidates flexible progression routes moving on to Vocational Certificates of Education (VCEs), further education or further training for employment.

The Intermediate GNVQ in Science has been designed to form a qualification which provides a range of knowledge and understanding of this vocational area. It is an ideal qualification for those candidates who want a background which will allow them to progress to further or higher education or employment. The course is intended to support the development of Key Skills at level 2. It is designed to be delivered in full-time or part-time education.

The course of study prescribed by this specification can reasonably be undertaken by students with knowledge of Science equivalent to Key Stage 3 at level 5 of the National Curriculum. Progression through Intermediate level will provide a suitable basis for further study in this subject, either at Advanced level or for related courses in further or higher education. Units such as Unit 1: *Applying practical skills*, Unit 2: *Learning knowledge and understanding needed for scientific work* and Unit 3: *Applying scientific knowledge, understanding and skills*, provide broad introductions to many vocational aspects of science. Other units focus on aspects of individual science disciplines.

A variety of approaches including work experience, links with local employers, case studies and laboratory work is recommended. This will enhance the candidates' appreciation of the role of science in society.

The specification is flexible, with a unit structure designed to allow for a variety of pathways.

Assessment is designed to give credit for what candidates can do as well as what they know. It is based both on portfolio evidence from assignments, set and assessed by the Centre and moderated by OCR, and external assessments, which are set and marked by OCR.

This specification has been developed in consultation with a range of professional institutes and Further and Higher Education Institutions.

1.2 CERTIFICATION TITLE

This specification will be shown on a certificate as OCR Intermediate GNVQ in Science.

1.3 LEVEL OF QUALIFICATION

This qualification is approved by QCA as a National Intermediate level qualification. It is of a standard that is broadly equivalent to GCSE grades A* to C or NVQ Level 2.

An Intermediate GNVQ may also be considered as equivalent to four GCSEs grade A* to C.

1.4 SPECIFICATION AIMS

The aims of this specification are to encourage candidates to:

- develop an understanding of practical techniques involving chemicals, organisms and physical devices;
- apply knowledge and skills to solving scientific problems;
- develop an understanding of properties and uses of materials;
- develop an understanding of the characteristics of organisms and how to monitor their activities;
- develop an understanding of specifically vocationally-relevant aspects of science.

1.5 SPECIFICATION OBJECTIVES

Candidates for this qualification will be expected to:

- follow standard procedures for handling scientific materials and equipment;
- report scientific information obtained from primary and secondary sources;
- solve scientific problems;
- show an understanding of investigative methods and techniques;
- demonstrate their ability to apply their knowledge in a vocational context;
- show appreciation of ethical, moral and environmental issues relevant to aspects of science;
- appreciate the importance of obtaining accurate and reliable information and, when appropriate,
 - plan and organise their work;
 - explain, analyse and evaluate their work;
 - make comparisons and recommendations.

Depending on the choice of optional units, candidates will also be expected to show an understanding of:

- the properties of materials which are required for different purposes;
- the application of biotechnology to produce useful substances;
- the feasibility of making more use of renewable resources;
- ecosystems and how they are affected by human activity;
- the design and construction of electronic circuits;
- the design and construction of optical communication systems.

1.6 RECOMMENDED PRIOR LEARNING

Students entering this course should have achieved a general educational level, including Science, equivalent to Foundation Level in the National Qualifications Framework or level 4/5 of the National Curriculum. Students should have standards of literacy and numeracy comparable to Key Skills level 1.

Prior study of a Foundation GNVQ in Science may be of benefit to some students but it is not mandatory.

1.7 PROGRESSION

1.7.1 Progression into Employment

This specification is designed to develop candidates' confidence and allow them to gain a range of skills which will be useful within future employment.

The scientific sector is an important area of modern employment and the well developed personal skills (e.g. initiative, teamwork, problem-solving) combined with work-related knowledge gained within the Intermediate GNVQ means that candidates are particularly suitable for recruitment in a range of employment categories e.g. laboratories, communications, environmental agencies, sports centres.

1.7.2 Progression to Further Qualifications

Candidates who achieve this qualification will be fully prepared to enter a course leading to a VCE in Science.

An Intermediate GNVQ may also be considered as equivalent to four GCSEs grade A* to C for the purposes of admission to other Intermediate level courses within the National Qualifications Framework, including VCEs in other vocational areas.

This qualification would support progression into related NVQs at levels 1 and 2 and work related training programmes.

1.8 RELATED QUALIFICATIONS

1.8.1 GCSE/GNVQ

GNVQ Reference	National Curriculum reference	GCSE Coursework reference e.g. only (Science: Double Award Syllabus A, Co-ordinated)
Intermediate Unit 1:Applying practical skills		Skill area O, A, E
Intermediate Unit 2: Learning knowledge and understanding needed for scientific work		
Natural and manufactured materials	3.2r, 3.2s, 3.1a, 3.1g, 3.3a, 3.3c, 3.1b, 3.1c, 3.1d, 3.1e, 3.3b 3.1h, 3.1i, 3.1f, 3.1j, 3.1k 4.2j 4.1a, 4.1e, 4.1f	Sc3 Teaching block 1 Sc3 Teaching block 3 Sc3 Teaching block 6 Sc4 Teaching block 3 Sc4 Teaching block 1
Living organisms	2.1a, 2.1c, 2.1d 2.2f 2.3a, 2.3c, 2.3b 2.3f, 2.3g, 2.3h 2.2n 2.5d 2.4b, 2.4j, 2.1e, 2.4g	Sc2 Teaching block 1 Sc2 Teaching block 3 Sc2 Teaching block 5 Sc2 Teaching block 6 Sc2 Teaching block 7 Sc2 Teaching block 8 Sc2 Teaching block 9
For materials science there may be links with GCSE Design and Technology.		
Intermediate Unit 3: Applying scientific knowledge, understanding and skills		
Changing materials	3.2r, 3.2s, 3.2t, 3.1g, 3.3u, 3.3v	Sc3 Teaching block 1
Tools, machines and devices	4.3a, 4.3b, 4.3d, 4.5f, 4.5g	Sc3 Teaching block 1
Monitoring the activities of organisms		Skill area P, O, A, E
For electronics there may be links with GCSE Design and Technology.		

Intermediate Unit 4: Forensic science		Skill area O, A, E
Intermediate Unit 5: The science of sports equipment		Skill area P, O, A, E
Strength, elasticity and stiffness	4.2j	Sc4 Teaching block 3
Making collisions safer	4.2a, 4.2c, 4.2d	Sc4 Teaching block 4
There may be links with GCSE Design and Technology.		
Intermediate Unit 6: Biotechnology and genetics		
Improving production by genetic means	2.1e, 2.4g, 2.4h, 2.4b, 2.4h, 2.4c, 2.4a, 2.4h	Sc2 Teaching block 9
Intermediate Unit 7: The chemistry of renewable resources		
Biofuels	3.2d	Sc3 Teaching block 1
Foodstuffs	2.2b	Sc2 Teaching block 2
There may be links with GCSE Design and Technology.		
Intermediate Unit 8: Ecology and conservation		Skill area O, A, E
The relationships of organisms with their physical and biological environment	2.5a, 2.5b 2.5c, 2.5d, 2.5f 3.2q	Sc2 Teaching block 10 Sc2 Teaching block 8 Sc3 Teaching block 9
Intermediate Unit 9: Using electronics		Skill area O, A, E
General	4.1a, 4.1b, 4.1d, 4.1e, 4.1g	Sc4 Teaching block 1
Electronic processing	4.5e(part)	Sc4 Teaching block 2
There may be links with GCSE Design and Technology.		
Intermediate Unit 10: Optical communication systems		
General	4.3g, 4.3c, 4.3e, 4.3f, 4.3d, 4.3a 4.3b, 4.3h, 4.3j	Sc4 Teaching block 4 Sc4 Teaching block 5
There may be links with GCSE Design and Technology and GCSE Physics.		

Other Intermediate GNVQs contain units which may be related. Of particular relevance are Units within ICT, Health and Social Care, Leisure and Tourism, Engineering and Manufacturing.

1.8.2 Relationship to NVQs

This specification broadly introduces the candidate to skills which may be useful for NVQs at levels 1 and 2, though the assessment methods are not designed to guarantee occupational competence. In particular:

Unit 4: *Forensic science* and Unit 7: *The chemistry of renewable resources* broadly contribute knowledge, understanding and skills for NVQ Chemical levels 1 and 2.

All units broadly contribute knowledge, understanding and skills for NVQs in Science at levels 1 and 2.

1.8.3 Exclusions

Candidates who enter for this GNVQ Intermediate **may not** also enter for any other GNVQ Intermediate with the same certification title in the same examination series.

Candidates who enter for this GNVQ Intermediate **may** however also enter for any GCSE, GCE or VCE with the same or related certification titles in the same examination series. They may also enter for any NVQ.

1.9 SPIRITUAL, MORAL, ETHICAL, SOCIAL AND CULTURAL ISSUES

It is expected that this specification will be presented in such a way that appropriate opportunities are taken to address spiritual, moral, ethical, social and cultural issues.

Unit 4: *Forensic science* gives candidates the opportunity for discussion on ethical issues.

Unit 6: *Biotechnology and genetics* and Unit 8: *Ecology and conservation* give candidates the opportunity for discussion on ethical and moral issues.

1.10 ENVIRONMENTAL ISSUES

OCR has taken account of the 1988 Resolution of the Council of the European Community and the Report *Environmental Responsibility: An Agenda for Further and Higher Education*, 1993 in preparing this specification and associated specimen assessments.

Unit 7: *The chemistry of renewable resources* and Unit 8: *Ecology and conservation* are concerned with environmental and conservation issues.

1.11 THE EUROPEAN DIMENSION

OCR has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen assessments. European examples should be used where appropriate in the delivery of the subject content. Relevant European legislation is identified within the specification where applicable.

This specification brings candidates into contact with the use of international conventions for nomenclature and SI units.

1.12 HEALTH AND SAFETY

Candidates are introduced to health and safety issues addressed in the context of this sector and should be made aware of the importance of safe working practices in laboratory contexts.

Health and safety issues should pervade the teaching of all units.

1.13 STATUS IN WALES AND NORTHERN IRELAND

This specification has been approved by ACCAC for use by Centres in Wales and by CCEA for use by Centres in Northern Ireland.

Candidates in Wales or Northern Ireland should not be disadvantaged by terms, legislation or aspects of government that are different from those in England. Where such situations might occur, including in the external assessment, the terms used have been selected as neutral, so that candidates may apply whatever is appropriate to their own situation.

OCR will provide specifications, assessments and supporting documentation in English.

Further information concerning the provision of assessment materials in Welsh and Irish may be obtained from the Product Development Team at OCR (telephone 01223 553103).



Interest Form

Complete Online Intermediate GNVQ Science Course

On behalf of _____

I confirm that we are interested in becoming a Participating School in the above course.

Name _____

Position _____

School/Address _____

_____ **Post Code** _____

Telephone _____

e-mail _____

Signature Headteacher / Principal

Date

- **Please retain a copy of this form for your records**

- **Please return as soon as possible to:**

3E's Enterprises, PO Box 1017, Kingshurst, Birmingham B37 6NZ

Telephone 0121 788 1001 Fax 0121 788 1101