WJEC
CBAC

GCSE TEACHERS' GUIDE

New Specifications:
for teaching from September 2009

Geology

Contents

GCSE in Geology
Teachers' Guide

1. INTRODUCTION

The WJEC GCSE Geology specification has been modified and updated for delivery from September 2009. The first awards will be made in Summer 2011. The specification can be delivered and assessed in centres throughout the UK.

There are major changes in the methods of assessment and the opportunity has also been taken to thoroughly revise the specification content.

This guide is one of a number of ways in which WJEC provides assistance to teachers delivering the new specification. Also essential to its introduction are the Specimen Assessment Materials (question papers and marking schemes) and professional development (INSET) conferences.

Other provision which you will find useful are:

- Examiners' reports on each examinations series
- Free access to past question papers via the WJEC secure website
- Easy access to specification and other key documents on main website
- INSET delivered by Chief Examiners
- Easy access to both the Subject Officer, Chief Examiner and to administrative sections

Contact points for GCSE Geology can be obtained from the website:

Subject page **www.wjec.co.uk**

INSET Section **inset@wjec.co.uk**
www.wjec.co.uk/professionaldevelopment

1.1 Rationale

The **content** at GCSE has been significantly updated to make the study of geology more relevant to prospective students and includes:

- analysis and interpretation of rock exposures
- interpretation of the landscape
- major geological concepts such as the rock cycle, uniformitarianism, plate tectonics, global temperatures and sea level change
- major geological events that have affected the Earth and the drift of Britain northwards through geological time
- current geological events such as Earth hazards, climate change, fossil finds and local planning issues
- present day roles of professional geoscientists such as the oil and mineral extraction industries.

The method of **assessment** is simplified, makes full use of technology and encourages fieldwork whilst still allowing some degree of choice for centers with different circumstances. The assessment is un-tiered with two elements:

- an onscreen test
- controlled internal assessment which is a directed investigation of either an actual or a virtual outcrop.

1.2 Overview of the Specification

Theory Paper - external assessment 75% 1½hr 100 marks
An on-screen non-tiered written paper consisting of compulsory structured data and stimulus response questions, marked by WJEC.
Controlled internal assessment 25% 50 marks
Option 1 Directed investigation of a virtual location presented as 'field' notes and a written report. Marked by centre. **Or** **Option 2** Directed investigation of an actual location presented as field notes and a written report. Marked by centre.

Assessment	Weighting	Mark
Theory paper (data response)	75%	100
Internal assessment Option 1	25%	50
or		
Internal assessment Option 2		

1.3 Changes for teaching from September 2009

SUMMARY

Assessment for GCSE Geology is un-tiered, i.e. both components cater for the full range of ability and allow access to grades A*-G for the subject award.

Examination Paper: 75%

This is a non-tiered paper provided as an on-screen test. It consists of compulsory structured data and stimulus response questions. The paper comprises 75% of the overall assessment, carries 100 raw marks and is 1½ hr in duration.

Controlled Internal Assessment: 25%

The controlled internal assessment complements the theory paper by assessing the geological practical skills of candidates. There are two options available:

Option 1
This is a directed investigation of a **virtual** location/outcrop. The aim of the investigation and materials (photographs, specimens, maps etc) will be supplied by WJEC. The task will vary annually.

OR

Option 2
This is a directed investigation of an **actual** location/outcrop. The aim of the investigation and the location are chosen by the centre and should be varied annually. **Approval for the appropriateness of the investigation must be sought from the WJEC Chief Moderator before it is carried out.**

For both options, the field notes and report produced by the candidate are assessed by the teacher using the assessment framework given in the specification. It is very important that the field notes of each candidate be retained. The field notes of each candidate must accompany the report in the moderation submission.

For **both** options, the assessment will consist of two parts:

Part 1 consists of carrying out relevant tests, making relevant observation and measurements and the recording of these by the construction of appropriate "field notes". This must be done under supervision and the notes collected in by the teacher at the end of the session.

Part 2 consists of writing a report of the investigation using the field notes which are re-issued to candidates at the start of the session. The report must include the processing and analysis of the collected data, evaluation of the methods of data collection and the planning of an extension to the investigation. The report should be no longer than 2000 words.

The construction of the report must be done under supervision. The field notes and report must be collected in at the end of the session/sessions.

CHANGES

- There is only one written paper which caters for the full range of ability. This will replace the tiered Foundation and Higher level papers. This paper will be machine marked in the main and the questions will therefore be similar in style to the questions in the current Foundation Paper. However, there will be questions which allow candidates to demonstrate their knowledge and understanding through extended writing and these questions will be human marked. The paper will test the whole of the content of the specification.
- There is no paper version of the written paper and all candidates will attempt an on-screen version.
- The written paper comprises 75% of the overall assessment.
- There is no Paper 2 or 'practical' paper.
- The **content** of the specification has been thoroughly updated and reorganised under 6 Key Ideas which will be assessed in the examination.

The Key Ideas are:

Key Idea 1: Rock exposures contain evidence of how the rocks were formed and subsequently deformed

This Key Idea enables candidates to analyse and interpret a rock exposure from primary and secondary evidence. The idea includes the traditional 'rocks, minerals and fossils' of older specifications with an emphasis on their interpretation in rock exposures rather than pure description. The amount of pure identification has been reduced. The deformation and relative dating of rocks in exposures is also included in this Key Idea.

Key Idea 2: The character of the landscape contains evidence of the relationship between past and present processes and the underlying geology

This Key Idea enables candidates to 'read' the landscape for evidence of landscape-formation processes. This Key Idea includes weathering and erosion processes and landforms which reflect the underlying geology and geological processes. The effect of human activity on the landscape is included and conservation of important geological sites.

Key Idea 3: Some major concepts underpin our current understanding of the Earth

This Key Idea enables candidates to demonstrate an understanding of some of the 'big ideas' of geology such as the rock cycle, principle of uniformitarianism, plate tectonics, global warming and sea level change.

Key Idea 4: Major geological events fit into a timeline, beginning with the formation of the Earth

This Key Idea enables candidates to fit the major geological events that have affected the Earth and the UK into a timeline. This includes the major steps in the evolution and extinction of life on Earth and the evidence for the drift of Britain northward through time by looking at snapshots between the Lower Palaeozoic and the Cenozoic.

Key Idea 5: Earth events occur frequently and are commonly reported in the media

This Key Idea enables candidates to appreciate the importance of current geological events. Geological events can be hazardous and are commonly reported in the media. The human impact on climate change, the reporting of major fossil finds both past and present and local planning issues are commonly reported in national and local media.

Key Idea 6: Professional geoscientists use a variety of investigational skills in their work

This Key Idea aims to enable candidates to describe the present day roles of key professional geoscientists. This includes their role in the extraction industries but also their role in hydrology, environmental assessment, major civil engineering projects and research.

- **The controlled internal assessment** comprises 25% of the overall assessment. This assesses the geological practical skills of candidates identified in Key Ideas 1-3 and is assessed by the centre and moderated by WJEC. Candidates must attempt one of the two options below.

Option 1 An investigation of a virtual outcrop/series of outcrops. The aim of the investigation and materials (photographs, specimens, maps etc) will be supplied by WJEC. The task will vary annually. The field notes and report produced by the candidate are assessed by the teacher using the assessment framework given in the specification.

- There is no assessment of laboratory work.
- Evaluation is restricted to the evaluation of the methods used for the collection of the data.
- Planning is restricted to planning an extension of the directed investigation or planning of a subsequent investigation using experience gained from the data.

OR

Option 2 An investigation of an actual outcrop/series of outcrops. The investigation is directed by the centre after approval of the aims and location by the Chief Moderator. The field notes and report produced by the candidate are assessed by the teacher using the assessment framework given in the specification.

2. SUPPORT FOR TEACHERS

We pride ourselves on our support for teachers whom we realise are often working in isolation. This is achieved by

- Access to examiners for specification clarification via the Subject Officer
- An INSET programme to explain changes and provide exemplars
- Coursework clarification and feedback
- Attendance at conferences – ESTA, GA, ASE.

For other enquiries or information, visit www.wjec.co.uk

In addition, membership of the EARTH SCIENCE TEACHERS' ASSOCIATION (ESTA) is encouraged. Members receive the following benefits and support:

- A magazine, *Teaching Earth Sciences,* published four times a year containing articles on classroom, laboratory and field teaching, news and resources, curriculum updates, book and website reviews - often written by examiners.
- An Annual Course and Conference offering a range of in-service training, academic updating, ideas for teaching and fieldwork, plus exhibits of resources.
- ESTA teaching materials, including rock and fossil kits.
- A network of fellow members and a dedicated website to support your Earth science teaching.

For other enquiries or information, visit www.esta-uk.org

2.1 Suggested textbooks

Course textbooks

Understanding Geology – David Webster (Oliver & Boyd)

Geoscience – Understanding Geological Processes – Dee Edwards and Chris King (Hodder)

Teach Yourself Geology – David Rothery (Hodder)

Geological Science - Andrew McLeish (Nelson Thornes)

Background reading

Sedimentary Petrology – M. E. Tucker (Blackwell Science)

Basic Palaeontology – Benton, Harper – (Prentice Hall)

British Palaeozoic Fossils (also Mesozoic and Cainozoic) – British Museum (Natural History)

Hamlyn Guide to Minerals Rocks and Fossils

The Hidden Landscape - A Journey into the Geological Past – Richard Forty (1996) – (Pimlico) 0-7126-6040-2

Apocalypse: A natural history of global disasters – Bill McGuire (1999) – (Cassell) 0-304-35209-8

Evolutionary Catastrophes – The science of mass extinction – Vincent Courtillot (1999) - (Cambridge) 0-521-58392-6

The End of the Dinosaurs – Chicxulub Crater and Mass Extinction – Charles Frankel (1999) (Cambridge University Press) 0-521-47447-7

Ice Age – John and Mary Gribbin (2001) – (Allen Lane /The Penguin Press) 0-71399612-9

Trilobite! Eyewitness to Evolution – Richard Forty (2001) – (HarperCollins) 00-257012-2

A Guide to the End of the World: Everything you never wanted to know – Bill McGuire (2002) (Oxford University Press) 0-19-280297-6

The Last Days of St. Pierre: The Volcanic Disaster that claimed 30,0000 lives – Ernest Zebrowski, Jr. (2002) – (Rutger University Press) 0-8135-3041-5

When Life Nearly Died: The Greatest Mass Extinction of All Time – Michael J. Benton (2003) (Thames and Hudson) 0-50005116X

Krakatoa: The Day the World Exploded – Simon Winchester (2003) – (Viking) 0-670911267

Snowball Earth – Gabrielle Walker (2003) – (Bloomsbury) 0-74756051X

The Earth: An Intimate History – Richard Fortey (2004) – (HarperCollins) 0002570114

Open University Course Materials
S260 *Geology*
S278 *Earth Resources and the Environment*
S193 *Fossil*
S186 *Volcanoes, Earthquakes and Tsunami* – www.ouw.co.uk

Foundations of Engineering Geology – Waltham E and FN Spon

2.2 Specimens, equipment and maps

A list of 'essential specimens'. Various items in **bold** are considered desirable although not essential.

Minerals

Specimens

Use this table in conjunction with the Data Sheet used in the examinations.

rock-forming minerals	quartz, **feldspar, mica**
metal ores	hematite, galena
evaporites	halite, calcite

Equipment for observations and tests; hand lens, streak plate, dilute hydrochloric acid, nail, coin, **density measurements**.

Photograph of mineral vein.

Rocks

Specimens

Igneous

	coarse	medium	fine/glassy
acid	granite		
intermediate			**andesite**
basic	gabbro		basalt, **porphyritic basalt vesicular basalt**

Sedimentary - clastic

coarse	medium	fine
conglomerate, breccia	sandstone	shale

Various types of sand to demonstrate grain size, sorting, grain shape through sieving

Sedimentary - biochemical; limestone, **chalk,** halite (salt), **bituminous coal, desert sandstone, black shale, peat, lignite, anthracite**

Metamorphic

contact	*regional*
marble	slate, schist

Photographs; dyke, sill, pluton, xenolith, columnar jointing, bedding, graded bedding/flute marks, cross-bedding, ripple marks, desiccation cracks, **glacial till, photomicrographs to show textures.** Use of photographs from WJEC past papers.

Fossils

Specimens

Group	***Specimens***	***Possible examples***
Corals	One solitary demonstrating tabulae. One colonial, cross-section demonstrating septa/symmetry.	*Dibunophyllum* *Lithostrotion*
Trilobites	A variety to show symmetry and variation in morphology related to mode of life such as presence/absence of eyes, spines, swimmer, crawler. Photograph of Burgess Shale specimen to show legs and gills. Can be demonstrated using plaster casts.	*Calymene, Dalmanites, Trinucleus, Encrinurus*
Dinosaurs	Museum visit or video/photographs to illustrate relationship between shape of teeth and diet and presence of armour for defence. Type of preservation of bone/teeth.	
Plants	A variety of Coal Measure plants to illustrate leaf, stem and root. Preservation by carbonisation.	
Graptolites	Evolutionary series to illustrate evolution of stipes and position of thecae. Can use diagrams/photographs such as from British Palaeozoic Fossils (BMNH). Preservation by replacement (pyritisation) and carbonisation.	*Dictyonema, Tetragraptus, Didymograptus, Diplograptus, Monograptus*
Ammonoids	Evolutionary sequence of – goniatite, ceratite and ammonite suture lines. Plaster casts are available.	plaster casts
Trace fossils	Photographs of - dinosaur footprints, burrows, tracks.	

Geological Maps

Simple maps demonstrating basic principles and examples from WJEC past examination papers.

Photographs of geological structures – anticline, syncline, normal fault, thrust fault, reverse fault, unconformity, joints.

Geology of the United Kingdom and Ireland and the adjacent continental shelf.

Local Field Investigations

Field Equipment – Hard hats, hand lens, field notebooks, grain size/grain shape/sorting scale, clinometer, compass, metre rule/tape, identification leys for rocks/minerals/fossils, maps of various scales, **Geological Survey maps of local area.**

British Regional Geology (various areas) – The Stationery Office

Suppliers

Geo Supplies Ltd, Chapeltown, Sheffield Tel 01142455746

2.3 General DVDs/videos /General Websites

www.geolsoc.org.uk	Geological Society
www.esta-uk.org.	Earth Science Teachers Association
www.wjec.co.uk	WJEC
www.bgs.ac.uk	British Geological Survey
www.nhm.ac.uk	British Museum Natural History
www.geologist.demon.co.uk	Geologists Association

DVDs/ videos that are readily available;

Earth Story- The shaping of our World by Aubrey Manning, (BBC DVD) (2006)
Earth: The Power of the Planet by Iain Stewart, (BBC DVD) (2008
The Truth about Killer Dinosaurs by Bill Oddie**, (**BBC DVD) (2005)
British Isles: A Natural History by Alan Titchmarsh, (BBC DVD) (2004)
Open University courses S278, S260, Y193, and Y186

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