## Contents

GCE AS and A Level GEOLOGY Teachers' Guide

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1. **INTRODUCTION**

The WJEC AS and A2 Geology specification has been modified and updated for delivery from September 2008. The first AS awards will be made in Summer 2009 and the first A level awards in summer 2010. For the first availability of units, see page 2 of the specification. The specification can be delivered and assessed in centres throughout the UK.

The revised subject criteria for GCE Geology issued by the regulators have resulted in little change in the course structure from the current 3 plus 3 modules except in terms of internal assessment.

This Guide is one of a number of ways in which the 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 (CPD) 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
- Regular CPD delivered by Chief Examiners
- Easy access to both the Subject Officer and to administrative sections

Contact Points for GCE Geology are as follows:

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(Administrative Support Officer)  
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Subject page  
[www.wjec.co.uk](http://www.wjec.co.uk)

CPD Section  
[inset@wjec.co.uk](mailto:inset@wjec.co.uk)  
[www.wjec.co.uk/professionaldevelopment](http://www.wjec.co.uk/professionaldevelopment)
1.1 Rationale

The content at AS has been little changed as it fits in well with the new QCA geology criteria though more so at A2. Any changes are in order based on the following criteria:

- Adherence to the QCA geology criteria
- evolution NOT revolution
- as few changes as possible – but up-to-date.
- keep GL2a (at all costs)
- continue with GL3 – student uptake
- specify the need for fieldwork
- possible reduction in content at AS.
- maintain rigour

This has been achieved by;

- **minimal** changes from current specifications.
- option of no "coursework" at AS.
- option of assessed Practical paper OR fieldwork
- assessments based on;
  - data response questions
  - geological specimens (provided)
  - geological maps (problem solving/BGS)
- annual CPD/online support.

The content at A2 has been significantly reorganised in order to satisfy the following QCA criteria:

- Geological data: Collection and interpretation of geological data including maps and photos, logs and other data.
- Life on Earth: The nature, distribution, analysis and interpretation of fossils.
- Earth Materials and resources: Sustainability and environmental issues related to resources, including water and energy.
- Climate change - Evidence and impacts over varying timescales, past climates and their interpretation in the rock record.
# 1.2 Overview of the Specification

## ADVANCED SUBSIDIARY
(3 units GL1, GL2, GL3)

<table>
<thead>
<tr>
<th>UNIT AS GL1</th>
<th>FOUNDATION GEOLOGY</th>
<th>UNIT A2 GL4</th>
<th>INTERPRETING THE GEOLOGICAL RECORD</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(17.5%)</td>
<td></td>
<td>(17.5%)</td>
</tr>
<tr>
<td>Matter.</td>
<td>Written Paper 1 hour</td>
<td>Rock forming processes.</td>
<td>Written Paper 2 hours</td>
</tr>
<tr>
<td>Energy</td>
<td>Short answer data response questions.</td>
<td>Rock deformation.</td>
<td>Integrated short answer paper interpreting a variety of data including geological maps.</td>
</tr>
<tr>
<td>Time and change.</td>
<td></td>
<td>Past life &amp; past climate</td>
<td>Geographical map interpretation.</td>
</tr>
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</table>

## UNIT AS GL2(a) OR GL2(b)

### INVESTIGATIVE GEOLOGY
(Internal Assessment)
(15%)

<table>
<thead>
<tr>
<th>GL2(a) Internal Controlled Practical Assessment 1 hour 30 mins</th>
<th>2 of 4 Themes</th>
<th>GL2(b) Internal Field Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated problem solving paper based on a geographical map, photographs, specimens and other data.</td>
<td>1. Quaternary Geology.</td>
<td>one field-based geological investigation.</td>
</tr>
<tr>
<td>OR</td>
<td>2. Natural Resources.</td>
<td></td>
</tr>
<tr>
<td>GL2(b) Internal Field Assessment</td>
<td>3. Evolution of Britain.</td>
<td></td>
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<td></td>
<td>4. Lithosphere.</td>
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## UNIT AS GL3

<table>
<thead>
<tr>
<th>GEOLOGY AND THE HUMAN ENVIRONMENT</th>
<th>UNIT A2 GL6</th>
<th>GEOLOGICAL INVESTIGATIONS</th>
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</thead>
<tbody>
<tr>
<td>(17.5%)</td>
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<td>(15%)</td>
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<tr>
<td>Natural Hazards.</td>
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<tr>
<td>Human Hazards.</td>
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<tr>
<td>Engineering Geology.</td>
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</tbody>
</table>

### Written Paper 1 hour 15 mins
Compulsory data response, and one structured essay.

### Planning.
Implementing.
Analysing evidence and drawing conclusions.
Evaluating.

### Internal assessment
Two visits to each of the four criteria. Minimum 50% field evidence. Max 50% (optional) from the laboratory.
1.3 Changes to the specification for delivery in September 2008

**GL1 FOUNDATION GEOLOGY**

Summary

- Written Paper - 1 hour (17.5% of A level)
- Short answer data response questions.

Changes:

- Increase in weighting from 16.7% to 17.5%
- Reorganise and clarify geological knowledge
- Remove - the generic fieldwork question to GL2a
- Polar wandering

**GL2(a) Internal "Controlled Practical" Assessment**

Summary

- 1½ hours (15% of A level)
- Integrated problem solving paper based on a geological problem map, photographs, specimens and other data.
- Field, laboratory and simple geological map skills. Mineral Data Sheet available.

Changes to GL2(a)

- Reduction in weighting from 16.7% to 15%
- Set and moderated by WJEC (as before) but
- Administered and marked by centre
- Direct assessment of centre based fieldwork in exam including field notes (from GL2a)

**OR**

**GL2(b) Internal "Field" Assessment**

Summary

- 15% of A level
- one field-based geological investigation.
- marked by centre, moderated by WJEC

Changes to GL2(b)

- Reduction in weighting from 16.7% to 15%
- No other changes (one field-based geological investigation.
  marked by centre, moderated by WJEC
**GL3 GEOLOGY AND THE HUMAN ENVIRONMENT**

Summary

- Written Paper 1¾ hour (17.5% of A level)
- Compulsory data response, and one structured essay.
- Natural Hazards.
- Human Hazards.
- Engineering Geology.

Changes  
increase in weighting from 16.7% to 17.5%
remove "geological site investigation techniques"

**GL4: INTERPRETING THE GEOLOGICAL RECORD**

Summary

- Written Paper - 2 hours (17.5% of A Level )
- Integrated short answer paper interpreting a variety of data including geological maps.
- Rock forming processes, Rock deformation, Past Life and Past Climates
- Geological map interpretation.

Changes

Increase in weighting from 15% to 17.5%

**Past Life and Past Climates** – new sub-unit
(Renamed E3 formerly The Fossil Record) with four key ideas.
Minor clarification changes to original content of Key Idea 1

New Key Idea 2- "Fossils provide evidence of increasing diversity of life through geological time".
Knowledge has been clarified to highlight stages in the development of life and mass extinctions. e.g. Ediacaran fauna, Cambrian explosion, migration to life on land, causes of extinction events.

New Key Idea 3  
"A combination of global factors contributes to climate change through geological time."
Includes:
- Continent and mountain belt distribution
- Milankovitch cycles
- Greenhouse gas changes and natural processes
- Rates of past and present climate change.

New Key Idea 4  
"Evidence of climate change is obtained from the fossil record, sedimentary rocks and ocean sediments"
Includes:
- faunal evidence from land plants and corals
- a comparison of Carboniferous (icehouse) and Cretaceous (greenhouse).
- \(^{18}\text{O}/^{16}\text{O}\) isotopes
- "Snowball Earth" theory
Geological map interpretation.

Changes

Reorganisation and clarification of applications of geological maps related to:

1. Construction projects
2. Geological hazards
3. Resources including underground water and energy supplies
4. Environmental issues related to extraction
5. Sustainability of waste disposal sites

GL5: GEOLOGICAL THEMES

Summary

- Written Paper - 2 hours (17.5% of A level)
- 2 of 4 Themes
- Compulsory data response, and choice of one essay for each theme.
  1. Quaternary Geology
  2. Natural Resources.
  3. Evolution of Britain.
  4. Lithosphere.

Changes

Reduction in weighting from 20% to 17.5%
Reduction in content – to GL4.
ONE compulsory data response question (not two)
Some new content e.g.
  - Quaternary - Ice Core evidence
  - Natural Resources - CO₂ repositories
  - Evolution – Clarification of Key Idea 3
  - Lithosphere – already ahead of its time!

GL6: GEOLOGICAL INVESTIGATIONS

Summary

- 15% of A level
- marked by centre, moderated by WJEC
- Two visits to each of the four criteria
- Plan, Implement, Analyse, Evaluate
- Minimum 50% field evidence.
- Max 50% (optional) from the laboratory.

Changes:
- compulsory Laboratory element removed
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 John Pritchard (Subject Officer)
- Annual CPD (Cardiff, Manchester and London)
- Free CPD materials (see 2.1)
- 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 Generic Resources for the Specification as a whole

The following resources are available from the WJEC and represent the free CPD materials produced for the old WJEC Geology specification, much of which is still relevant to the new specification. New materials will be available at future annual CPD meetings to cover the newer aspects of the course.

<table>
<thead>
<tr>
<th>CPD 2002</th>
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<tbody>
<tr>
<td>AS Revision Handbook (doc)</td>
<td>Barytes (ppt)</td>
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<tr>
<td>Carn Brea – Virtual Fieldtrip (ppt)</td>
<td>Cligga Head – Virtual Fieldtrip (ppt)</td>
</tr>
<tr>
<td>Fluorite (ppt)</td>
<td>Geological powerpoint instructions (ppt)</td>
</tr>
<tr>
<td>Godrevy – Virtual Fieldtrip (ppt)</td>
<td>Godrevy - Virtual Labwork (ppt)</td>
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<tr>
<td>Granite (ppt)</td>
<td>Images from the Net (doc)</td>
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<tr>
<td>Metamorphism (ppt)</td>
<td>GL6 feedback 2002(ppt)</td>
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<td>Sediment analysis (Excel worksheet)</td>
<td>Geological websites (doc)</td>
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<th>CPD 2003</th>
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<tr>
<td>AS Mapwork (ppt)</td>
<td>A2 Mapwork 1 (ppt)</td>
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<td>A2 Mapwork 2 (ppt)</td>
<td>GL4 feedback 2003 (ppt)</td>
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<td>GL6 feedback 2003 (ppt)</td>
<td>Mineral Classification (ppt)</td>
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<tr>
<td>Mineral Guide (ppt)</td>
<td>Physical Property of Minerals (ppt)</td>
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<td>Seisvole (application)</td>
<td>Weathering (ppt)</td>
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<tr>
<td>Absolute Dating (ppt)</td>
<td>As Guide to Igneous Rocks (ppt)</td>
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<tr>
<td>Clastic Sedimentary Rocks (ppt)</td>
<td>GL4 feedback 2004 (ppt)</td>
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<tr>
<td>GL6 feedback 2004 (ppt)</td>
<td>Improve your Grade (ppt)</td>
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<tr>
<td>Large Igneous Provinces (ppt)</td>
<td>LIPs (pdf) &amp; LIPs references (doc)</td>
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<tr>
<td>Mantle Plume (movie clip)</td>
<td>Organic and Chemical rocks (ppt)</td>
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<tr>
<td>Paper Mapwork Models (ppt)</td>
<td>Phase Diagrams (ppt)</td>
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<td>Sedimentary Structures (ppt)</td>
<td>Sedimentary Practical (ppt)</td>
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<td>Volcanic Hazards (ppt)</td>
<td>Volcanic Monitoring (ppt)</td>
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<td>Volcanic Case Studies (ppt)</td>
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**CPD ESTA CONFERENCE – EDINBURGH 2004**

As above plus

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<tr>
<td>Edible Geology (ppt)</td>
<td>Exam Techniques (ppt)</td>
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<tr>
<td>VARK (ppt plus doc)</td>
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**CPD 2005**

*(there was no CPD this year in order to prepare for the new A level specification)*

<table>
<thead>
<tr>
<th>CPD 2006</th>
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<tr>
<td>A level GCSE Criteria 1(pdf)</td>
<td>A level GCSE Criteria 2 (pdf)</td>
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<tr>
<td>Blockbusters (ppt)</td>
<td>Brainstorming Faults&amp; Folds (doc)</td>
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<td>Call my Geological Bluff (ppt)</td>
<td>Geological Catchphrase (ppt)</td>
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<tr>
<td>GL4 feedback 2006 ppt</td>
<td>GL5 Quaternary feedback 2006 (pdf)</td>
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<td>GL5 Nat Res feedback 2006 (pdf)</td>
<td>GL5 Evolution feedback 2006 (pdf)</td>
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<td>GL5 Lithosphere feedback 2006 (pdf)</td>
<td>Jurassic Challenge (ppt)</td>
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<td>La Palma Tsunamis Threat (ppt)</td>
<td>Marked GL1 2 and 3 scripts (pdf)</td>
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<td>Play your Earthquakes Right (ppt)</td>
<td>Question of Fossils (ppt)</td>
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<td>Question of Geology (ppt)</td>
<td>Question of Minerals (ppt)</td>
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<td>Question of Volcanoes (ppt)</td>
<td>Rocky Scrambles – Teachers (doc)</td>
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<td>Rocky Scrambles – students (doc)</td>
<td>Shotcrete at Holt Castle (ppt)</td>
</tr>
<tr>
<td>St Aidan’s case Study (ppt)</td>
<td>Water in Tenerife (ppt)</td>
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<tr>
<td>Mining Hazards (ppt)</td>
<td>WJEC OLD Specification (doc)</td>
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</table>
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CPD 2007
All AS and A2 Summer Papers and resources (maps, data sheet etc) (pdf)
Exploration Techniques (ppt) New WJEC Geology GCE Specification (pdf)
WJEC Geology Specimen papers (pdf) New WJEC GCSE Geology update (doc)
GL1 Past Papers (ppt) GL3 Past Papers (ppt)
GL5 Quaternary feedback 2007 (pdf) GL5 Nat Res feedback 2007 (pdf)
GL6 Evolution feedback 2007 (pdf) GL5 Lithosphere feedback 2007 (pdf)
Groundwater (ppt) Symmetrical folds (ppt)
What is a Fossil? (ppt) Changes to WJEC A level Geology (ppt)

## 2.2 Suggested textbooks

### Course textbooks

Understanding Geology – David Webster (Oliver & Boyd)

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

Fossils At A Glance – Clare Milsom and Sue Rigby (Blackwell)

Environmental Geology – Geology of the Human Environment – Matthew Bennett and Peter Doyle (Wiley)

Foundations of Engineering Geology – Tony Waltham (Spon Press)

### Background reading

In addition, the following books (in no particular order) are recommended background reading for AS and A2 geology students and their teachers.


The Floating Egg - Episodes in the Making of Geology - Roger Osborne (1999) - (Pimlico) 0-7126-6686-9

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

Noah's Flood - The new scientific discoveries about the event that changed history - Ryan & Pitman (1999) - (Simon & Schuster UK Ltd) 0-684-86137-2

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


The Dinosaur Hunters - A True Story of Scientific Rivalry & the Discovery of the Prehistoric World - Deborah Cadbury (2000) - (Fourth Estate) 1-85702-963-1

The Dating Game - One Man’s search for the Age of the Earth - Cherry Lewis (2000) - (Cambridge Uni Press) 0-521-79051-4

Surviving Galeras - One man’s battle to tame the power of the volcano - Stanley Williams (2001) - (Little, Brown and Company) 0-316-85570-7

Architects of Eternity : The new science of fossils - Richard Corfield (2001) – (Headline Book Pub) 0 7472 7179 8

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


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

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

A Short History of Nearly Everything - Bill Bryson (2003) - (Doubleday) 0-385-40818-8

Pompeii: A novel - Robert Harris (2003) - (Hutchinson) 0-09-180120-6


The Man who found Time - Jack Repcheck (2003) - (Simon and Schuster) 0-7432-3189-9

The Seashell on the Mountain - Alan Cutler (2003) - (Heinemann) 0-434-00857-5


2.3 General DVDs/video

Of those that are readily available

Earth Story- The shaping of our World by Aubrey Mannng, (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)

2.4 General Websites

www.geolsoc.org.uk
www.estaa-uk.org
www.wjec.co.uk

Also See CPD 2002 Geological websites (doc)
Contributors to the Teachers’ Guide

Pete Loader (Chief Examiner – AS/A2 Geology)