



# **Geology Handbook — Intermediate 2 and Higher**

**A guide for teachers and lecturers starting to deliver  
Geology and those considering delivering  
Intermediate 2 and Higher in bi-level classes**

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# Introduction

This document is intended to be a concise and user-friendly handbook for teachers just starting, or thinking of starting, to teach Geology. It provides a guide to resources, particularly for Intermediate 2 and Higher, and advice on delivering bi-level teaching across these levels.

Geology is a fascinating area of study for candidates. Science, Mathematics and Geography teachers will enjoy the content and the varied teaching approaches to which the subject lends itself.

## Basic information to download

This section lists basic information to download from SQA, Learning and Teaching Scotland, Scottish Earth Science Education Forum (SESEF), Earth Science Teachers' Association (ESTA), the Geologists' Association, and the British Geological Society. All website addresses are correct at the date of publication.

### 1 SQA

Arrangements documents for all levels of Geology, which include the Unit specifications:

[www.sqa.org.uk/sqa/3296.html](http://www.sqa.org.uk/sqa/3296.html)

Specimen question papers:

[www.sqa.org.uk/sqa/6086.html](http://www.sqa.org.uk/sqa/6086.html)

Past papers and marking instructions:

[www.sqa.org.uk/pastpapers/findpastpaper.htm?subject=Geology](http://www.sqa.org.uk/pastpapers/findpastpaper.htm?subject=Geology)

Fieldwork exemplars are also available on SQA's secure site. Your SQA Co-ordinator has access to this site.

### Geology Intermediate 2 (CO43 11) — Unit codes, titles and credits

D8XK 11	Minerals and Rocks	1 credit (40 hours)
D247 11	Earth Physics and Earth Movements	1 credit (40 hours)
D8XL 11	History of the Earth	1 credit (40 hours)

Earth Physics and Earth Movements (D247 11) includes compulsory fieldwork which contributes to the external assessment mark for the Course.

### Geology Higher (CO43 12) — Unit codes, titles and credits

D8XK 12	Minerals and Rocks	1 credit (40 hours)
D250 12	Earth Physics, Structural Geology and Plate Tectonics	1 credit (40 hours)
D251 12	Fossils and Stratigraphy	0.5 credit (20 hours)
D252 12	Economic Geology	0.5 credit (20 hours)

Earth Physics, Structural Geology and Plate Tectonics (D250 12) includes compulsory fieldwork which contributes to the external assessment mark for the Course.

## 2 Learning and Teaching Scotland

There are Geology teaching resources on LTScotland's website ([www.ltscotland.org.uk](http://www.ltscotland.org.uk)). Here are direct links to the most useful information for Intermediate 2 and Higher:

### Intermediate 2

#### Earth Materials: Rocks and Minerals

Staff notes and student materials. Adaptation of SCCC short course:  
[www.ltscotland.org.uk/resources/e/ngresource\\_tcm4229437.asp](http://www.ltscotland.org.uk/resources/e/ngresource_tcm4229437.asp)

#### Earth Physics and Earth Movements

Staff notes and student materials. Adaptation of SCCC short course:  
[www.ltscotland.org.uk/resources/e/ngresource\\_tcm4229438.asp](http://www.ltscotland.org.uk/resources/e/ngresource_tcm4229438.asp)

#### Geology: Earth Physics and Earth Movements — simulated fieldwork study

This resource is designed to meet the Geology Intermediate 2 Course requirements in cases where students are unable to carry out fieldwork in the usual way. It includes a teacher's guide with a map of the field study:

[www.ltscotland.org.uk/resources/g/ngresource\\_tcm4230252.asp](http://www.ltscotland.org.uk/resources/g/ngresource_tcm4230252.asp)

#### History of Earth

Staff notes and student materials. Adaptation of SCCC short course:  
[www.ltscotland.org.uk/resources/h/ngresource\\_tcm4229439.asp](http://www.ltscotland.org.uk/resources/h/ngresource_tcm4229439.asp)

#### Extension tests

Questions that can be used to prepare estimates and evidence for appeals:  
[www.ltscotland.org.uk/resources/e/ngresource\\_tcm4229436.asp](http://www.ltscotland.org.uk/resources/e/ngresource_tcm4229436.asp)

These tests are not available to download but can be obtained from LTS by contacting Customer Services on 08700 100 297 or by e-mailing: [enquiries@LTScotland.org.uk](mailto:enquiries@LTScotland.org.uk)

### Higher

#### Minerals and Rocks

Staff notes, student information and worksheets:  
[www.ltscotland.org.uk/resources/m/ngresource\\_tcm4229435.asp](http://www.ltscotland.org.uk/resources/m/ngresource_tcm4229435.asp)

#### Geology: Minerals, Rocks and Microscope

The package is designed as both a teaching pack and an assessment tool for Higher Geology. It includes outstanding images of minerals and rocks viewed through a petrological microscope:

[www.ltscotland.org.uk/resources/g/ngresource\\_tcm4285405.asp](http://www.ltscotland.org.uk/resources/g/ngresource_tcm4285405.asp)

## **Geology: Earth Physics, Structural Geology and Plate Tectonics**

Staff notes, student information and worksheets:

[www.ltscotland.org.uk/resources/g/nqresource\\_tcm4229431.asp](http://www.ltscotland.org.uk/resources/g/nqresource_tcm4229431.asp)

## **Fossils and Stratigraphy**

Support materials containing a student guide, a student information book and student activity sheets:

[www.ltscotland.org.uk/resources/f/nqresource\\_tcm4230092.asp](http://www.ltscotland.org.uk/resources/f/nqresource_tcm4230092.asp)

## **Economic Geology (Geology Higher)**

Staff notes, student information and worksheets:

[www.ltscotland.org.uk/resources/e/nqresource\\_tcm4229432.asp](http://www.ltscotland.org.uk/resources/e/nqresource_tcm4229432.asp)

## **Extension tests**

Questions that can be used to prepare estimates and evidence for appeals:

[www.ltscotland.org.uk/resources/e/nqresource\\_tcm4229434.asp](http://www.ltscotland.org.uk/resources/e/nqresource_tcm4229434.asp)

These tests are not available to download but can be obtained from LTS by contacting Customer Services on 08700 100 297 or by e-mailing: [enquiries@LTScotland.org.uk](mailto:enquiries@LTScotland.org.uk)

## **3 SESEF (Scottish Earth Science Education Forum)**

[www.sesef.org.uk](http://www.sesef.org.uk)

From the home page, under the heading 'Resources', follow the links to 'secondary' and then 'Earth Science Outdoors'. The page that appears contains links to resources for various fieldwork sites. They will be helpful even although you may not be within travelling distance.

## **4 ESTA (Earth Science Teachers' Association)**

[www.esta-uk.net](http://www.esta-uk.net)

Members have access to geological teaching resources.

## **5 The Geologists' Association**

Free copies of their code for geological fieldwork can be downloaded from the following link:

[www.geologists.org.uk/downloads/GAfieldworkcode.pdf](http://www.geologists.org.uk/downloads/GAfieldworkcode.pdf)

## **6 The British Geological Society**

[www.geolsoc.org.uk/index.html](http://www.geolsoc.org.uk/index.html)

Teaching resources including animations of the rock cycle.

## Print, equipment and other physical resources

### Textbooks

*OCR AS and A2 Geology* by Frances Stratton et al (May 2008) £18.80, Heinemann, ISBN 978-0-435-69211-7

*Geoscience: Understanding Geological Processes* by D. Edwards et al (1999) £34.59, Hodder and Stoughton

*Understanding Geology* by David Webster (1987) £18.99, Oliver and Boyd

*Geological Science* by Andrew McLeish (2001) Nelson Thornes

*A Coloured Atlas of Rocks and Minerals in Thin Section* by W.S. Mackenzie (1994) £21.85, Manson Publishing Limited

There are a number of new university textbooks that offer useful chapters on areas covered at Higher. The able student will find them interesting and useful. They have excellent web links to superb animations and questions.

*Understanding Earth* by John Grotzinger et al (2006) 5th edition, £38 approx, W.H. Freeman and Company Ltd, ISBN-10: 0716776960, ISBN-13: 978-0716776963

*Earth: Portrait of a Planet* by S. Marshak (2007) 3rd International student edition, £40 approx, W.W. Norton & Co, ISBN-10: 0393111377, ISBN-13: 978-0393111378

*Physical Geology Revealed* by Diane Carlson et al (Oct 2008) 8th edition with CDs, £80 approx, McGraw-Hill Higher Education, ISBN-10: 0073376671, ISBN-13: 978-0073376677

### Geological suppliers

The following companies are amongst those able to supply useful materials for Geology:

Geo Supplies Limited: [www.geosupplies.co.uk](http://www.geosupplies.co.uk)

UKGE Limited: [www.ukge.co.uk](http://www.ukge.co.uk)

Philip Harris Education: [www.philipharris.co.uk](http://www.philipharris.co.uk)

# **NABs, prelims, fieldwork and risk assessment**

## **Timing**

The Unit 'Minerals and Rocks' takes a long time to teach, at both Intermediate 2 and Higher. This can be seen from the sample teaching plan given later in this booklet. It is recommended that this Unit is the first to be delivered at each level. It could probably be assessed in early December, although schools may manage sooner if they have three weeks of teaching in June.

The Units 'Earth Physics and Earth Movements' and 'Earth Physics, Structural Geology and Plate Tectonics' with their fieldwork, cross sections, structure contours and theory, are also 'busy' Units. These Units could probably be assessed in February/early March.

The remaining Unit(s) should be lighter in content since some of the necessary ideas and skills will already have been embedded.

Centres may wish to set a main prelim which covers the first two Units, with the remainder of the Course content forming the basis of an additional 'top-up' prelim. This 'top-up' prelim should, however, also contain a few marks' worth of assessment of material from the first two Units.

## **Intermediate 2 NABs**

Each candidate must pass the three Unit NABs in order to achieve Course certification. Candidates are normally allowed one initial attempt and one reassessment if necessary, with time for remediation in between. A different NAB must be used for reassessment. A third attempt should be allowed only in exceptional circumstances.

A holistic approach is taken to the marking of Intermediate 2 Unit assessments. Candidates must achieve a total of at least 26/40 in each NAB in order to pass.

Candidates must pass the fieldwork report and reach the NAB cut-off score indicated above in order to pass the 'Earth Physics and Earth Movements' Unit. This is done by scoring at least 15/30 in total for the report, with no less than 4 marks in each of the three assessable aspects. A specimen marking grid can be found in the appendix to this handbook.

## **Higher NABs**

Each candidate must pass the four Unit NABs in order to achieve Course certification. Candidates are normally allowed one initial attempt and one reassessment if necessary, with time for remediation in between. A different NAB must be used for reassessment. A third attempt should be allowed only in exceptional circumstances.

The Unit assessments at Higher are divided into knowledge and understanding (KU) and problem solving (PS). KU and PS are marked separately, and where reassessment is necessary it may be that only one of these needs to be reassessed.

The cut-off scores to achieve a pass in each Unit are as follows:

Minerals and Rocks	16/25 for KU and 10/15 for PS
Earth Physics, Structural Geology and Plate Tectonics	16/24 for KU and 10/15 for PS
Fossils and Stratigraphy	8/12 for KU and 5/8 for PS
Economic Geology	8/12 for KU and 5/8 for PS

Candidates must pass the fieldwork report and reach the NAB cut-off score indicated above to pass the 'Earth Physics, Structural Geology and Plate Tectonics' Unit. This is done by scoring at least 15/30 in total for the report, with no less than 4 marks in each of the three assessable aspects. A specimen marking grid can be found in the appendix to this handbook.

## Fieldwork

This is a compulsory part of both the Intermediate 2 and Higher Courses and is worth 15 marks towards the total of 110 marks in the external assessment. The examination makes up the remaining 95 marks.

Fieldwork is commonly undertaken in February or early March. Expert assistance may be available to you and will make this an enjoyable and informative event in the curriculum. Even if you know an area very well, having a person along who is knowledgeable about the standard required is invaluable. If you would like to arrange assistance from such a person, please contact SQA's Qualifications Manager for Geology.

For field trips, as well as completing a risk assessment form it is essential to:

- ◆ make a preparatory trip to help draw up the risk assessment
- ◆ carry emergency contact details of all participants
- ◆ leave a copy of the above contact details and travel itinerary with the centre's office
- ◆ brief the candidates beforehand of any potential hazards, ensuring that they bring suitable clothing and footwear
- ◆ carry a first aid kit, spare warm clothing and a mobile telephone
- ◆ ensure that candidates bring any medication that they require
- ◆ download the code for geological fieldwork from the Geologists' Association [www.geologists.org.uk/downloads/GAfieldworkcode.pdf](http://www.geologists.org.uk/downloads/GAfieldworkcode.pdf)

More information on fieldwork will be available from your centre's office.

## **Risk assessment forms**

Prior to any field trip or experimental work, a risk assessment should be constructed. It should be incorporated into your teaching notes and updated regularly — ideally every year. A specimen risk assessment form is provided in the appendix to this handbook.

## **Possible timetable**

The following plan is based on 36 weeks of teaching and should be condensed if you have less time available to you.

## Unit 1 Minerals and Rocks (Higher and Intermediate 2)

Week	Topic	Classroom based	Independent study	Visual aids	Practical activities	Work for Intermediate 2 if Higher work not relevant
1	<p>Outline of Course</p> <p>Origin of the Universe (as background information)</p> <p>Deep time and the geological time frame</p> <p>Introduction to rocks and minerals</p> <p>The economic value of rocks and minerals mentioned</p>	Teacher-directed lessons	Read Marshak Chapter 1	<p>Course outline PPT</p> <p>Origin of Universe PPT</p> <p>Deep time and geological time PPT</p> <p>Video on rocks and minerals</p> <p>Elements minerals and rocks PPT — how to identify them</p>	<p>Toilet roll exercise for time</p> <p>Newspaper articles to show relevance of the subject</p> <p>Handle rocks and minerals</p> <p>See the difference between igneous, metamorphic and sedimentary</p> <p>Look at the minerals they will have to learn</p>	<p>Many teachers may wish to give all students Higher work for Unit 1 then decide on their level of presentation after the Unit 1 NAB.</p> <p>All students are given the Higher and Intermediate 2 LTS information and activity booklets. Not all exercises need to be done.</p> <p>Even if your class starts as bi-level from the start, for most of this Unit all students will work at Higher level nearly all the time since the theory is similar.</p>

2	Elements, Compounds	Teacher-directed lessons	Read textbook	<i>The Study of Minerals</i> CD Interactive	Lab work — scratch, density, effect of acid etc	
	Minerals	Pages 1–5 of LTS activity sheets completed	<i>OCR AS and A2 Geology</i> pages 66–9/ <i>Geological Science</i> McLeish	Educational Computer Software TASA Graphic Arts Inc can be bought via Geo Supplies		
	Classification					
	Properties	Old Intermediate 2 exam questions (usually pages 1 and 2)		Mineral classification PPT		
	Atomic structure					
	Bonding					
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2009 Question 1a 2008 Question 1 2007 Question 1				<b>Higher</b> 2009 Question 1		

3	<p>Atomic structure</p> <p>Bonding overlap</p> <p>Polarising microscope and thin sections — minerals identified</p>	<p>Teacher-directed lessons</p> <p>Pages 6–7 LTS activity sheets</p> <p>Pages 13–15 LTS activity sheets</p> <p>LTS mineral and rocks package used</p> <p>It includes PowerPoints which are ideal for teaching about the polarising microscope and minerals. The tests are used to aid learning of mineral properties. The tests (non-compulsory) are visual and an excellent reinforcement of learning.</p>	<p>Textbooks and information sheets with activities</p> <p>McLeish pages 23–28</p>	<p>Ionic and covalent bonding PPT</p> <p>LTS — Geology: Minerals Rocks and Microscope</p> <p>Using the OU University Digital Microscope CD</p>	<p>3D models of NaCl crystal, diamond and graphite</p> <p>Petrological microscope used and thin sections examined by the students</p>	<p>Although thin sections are not in the Intermediate 2 Course, doing this work reinforces the differences between the minerals and all students like using the microscopes and recognising the different patterns in the thin sections.</p>
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4	Isomorphs, polymorphs  Substitution  Solid solution series  Olivine  Feldspars  Ternary diagrams  Silicate structure	Teacher-directed lessons  Pages 8–12 LTS activity sheets pages16–17 LTS activity sheet (quick quiz on thin sections) Higher 2000 past paper — relevant questions	McLeish textbook and LTS information sheets  Complete unfinished LTS activities	Polymorph, isomorph and solid solutions PPT  Reading a ternary diagram PPT  Silicate structure PPT	Examining olivine and the feldspars	Students with no Chemistry background initially find this section difficult. Be prepared to go over it a few times and assure the students that they will soon understand as well as the rest.
SUITABLE PAST PAPER QUESTIONS						
				<b>Higher</b> 2006 Question 2 2005 Question 1		

5	<p>Magma types, plate boundaries and hot spots</p> <p>Igneous rock classification</p> <p>Viscosity linked to framework structure of quartz</p>	<p>Teacher-directed lessons</p> <p>Pages 20, 23, 21, LTS activity sheets</p> <p>Intermediate 2 2005 viscosity question</p>	<p><i>OCR AS and A2 Geology</i> textbook pages 72–80</p> <p>Complete unfinished LTS activity sheets</p>	<p>Magma PPT</p> <p>Igneous rock classification PPT</p> <p>Video</p>	<p>Lab work — minerals which usually bond to make igneous rocks are displayed</p> <p>Igneous rock identification game</p> <p>Identification of igneous rocks using thin sections</p>	
SUITABLE PAST PAPER QUESTIONS						
				<p><b>Higher</b> 2008 Question 4</p>		

6	<p>Melting temperatures for wet and dry magma</p> <p>Volcanic activity and surface features</p> <p>Pillow lava</p>	<p>Teacher-directed lessons</p> <p>Extra notes in addition to the LTS information sheets are required to make melting temperatures understandable</p> <p>Pages 31–33 of LTS activity sheets</p> <p>Intermediate 2 2005 Question on plates and pillow lava and viscosity questions</p>	<p><i>OCR AS and A2 Geology</i> textbook — pages 82–3 (good coverage)</p>	<p>Geothermal gradient and melting temperatures PPT</p> <p>Volcanic PPT</p>		<p>The Higher graph question in the LTS activity booklet is difficult and would be best led by the teacher in order to aid full understanding. Poorer students can become disheartened if left to try this on their own.</p> <p>Past Higher questions are also tricky. Students may need to work through them in class.</p> <p>Intermediate 2 students could be directed to the LTS Intermediate 2 activity booklet whilst this is going on.</p>
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**

2005 Question 7 (problem solving)  
2005 Question 8

**Higher**

2009 Question 14 (photograph question)  
2008 Question 13  
2006 Question 10 (essay)  
2006 Question 12  
2005 Question 6 (problem solving)

7	<p>Intrusive features including columnar jointing</p> <p>More on magma evolution</p> <p>Fractional crystallisation, pegmatites, filter pressing, magma mixing, assimilation</p>	<p>Teacher-directed lessons</p> <p>Intermediate 2 2003 classification question</p> <p>Pages 22, 24–27 of LTS activity sheets</p> <p>Intermediate 2 2008 hexagonal column question</p>	<p><i>OCR AS and A2 Geology</i> textbook — good coverage pages 84–7</p>	<p>Intrusive igneous PPT</p> <p>Magma evolution PPT</p>		<p>Magmatic segregation is important and is revisited again in Economic Geology (Unit 3).</p>
<b>SUITABLE PAST PAPER QUESTIONS</b>						
<p><b>Intermediate 2</b></p> <p>2007 Question 10</p> <p>2006 Question 10 (problem solving)</p>				<p><b>Higher</b></p> <p>2009 Question 7 (f requires knowledge of metaquartzite)</p>		

8	<p>The factors that affect the size of aureoles</p> <p>Geothermal gradient to determine temperature of country rock</p> <p>Predicting volcanic activity</p>	<p>Teacher-directed lessons</p> <p>Old Intermediate 2 and Higher questions on batholiths (2007 and 2008)</p> <p>Quick quiz pages 28–30 of activity sheets</p> <p>Quick quiz pages 36–37</p>	<p>OCR AS and A2 <i>Geology</i> textbook — good coverage pages 90–1</p> <p>Students make own notes on predicting volcanic activity using above textbook</p>	<p>Predicting volcanic activity PPT</p>		<p>Thermal metamorphism seems appropriate at this stage and is revisited in more detail when metamorphic rocks are examined later in this Unit.</p>
SUITABLE PAST PAPER QUESTIONS						
<p><b>Intermediate 2</b></p> <p>2008 Question 9 (problem solving)</p>				<p><b>Higher</b></p> <p>2007 Question 12</p> <p>2006 Question 3 (problem solving)</p>		

9	<p>Weathering. Landscapes of erosion</p> <p>Huljstrom</p> <p>Diagenesis</p> <p>Sedimentary rocks</p> <p>Classification of sedimentary rocks</p> <p>Sedimentary structures</p>	<p>Teacher-directed lessons</p> <p>Quick quiz LTS activity sheet p 53</p> <p>LTS activity sheets 55–58</p> <p>Intermediate 2 2006 sedimentary question</p>	<p>For landscapes of erosion students read the information sheets and complete activity sheets on their own</p> <p><i>OCR AS and A2 Geology</i> pages 104–21</p> <p>Students answer old exam paper questions from Intermediate 2 and Higher</p>	<p>Weathering PPT</p> <p>Sedimentary rock classification PPT</p> <p>Sedimentary structure PPT</p> <p>Animations of cross bedding and unconformities</p>	<p>Lab work — sedimentary rock identification</p> <p>Students study rock samples of structures such as cross bedding, wormholes</p>	<p>As time is short, if you have a class of students who have, or are taking, Higher Geography, it might be possible to get them to cover landscapes of erosion on their own.</p> <p>There is a lot to be covered quickly and students have to do some on their own.</p>
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**

2009 Question 3 (problem solving)  
2006 Question 9

**Higher**

2009 Question 12 (photograph question)

10	<p>Porosity permeability</p> <p>Environments of deposition</p> <p>Sand sieve analysis</p> <p>Thin sections of sedimentary rocks</p>	<p>Teacher-directed lessons</p> <p>LTS activity sheets 59–64</p> <p>Intermediate 2 2003 deposition question</p>	Old exam questions	<p>Sieving sand samples PPT</p> <p>Textural analysis of sediments PPT</p> <p>Thin sections of sedimentary rocks PPT</p>	Lab work — sieve analysis	
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**

2005 Question 6 (problem solving)  
2005 Question 10

**Higher**

2008 Question 3  
2008 Question 5  
2008 Question 10 (essay)  
2007 Question 3  
2007 Question 13  
2005 Question 10 (essay)  
2005 Question 11

11	<p>Metamorphism:</p> <p>Contact</p> <p>Regional/Grades</p> <p>Dynamic</p> <p>Thin sections</p>	<p>Teacher-directed lessons</p> <p>LTS activity sheets pages 66–68, 70–71, 72–75, 76–81</p> <p>Intermediate 2 (2008) and Higher past metamorphic exam questions</p>	<p>OCR AS and A2 <i>Geology</i> textbook pages 138–53 and complete LTS information sheets with activities</p> <p>Past exam papers</p>	<p>Large metamorphic PPT on the three types of metamorphism</p> <p>Thin sections metamorphic PPT</p>	<p>Students handle metamorphic rocks of different type and grade. Examine thin sections.</p> <p>Field trip (out of class time) to show different rocks and structures in the field. This always helps motivation. (The field trip could probably be done before the October holidays to help motivate the students.)</p>	
SUITABLE PAST PAPER QUESTIONS						
<p><b>Intermediate 2</b></p> <p>2009 Questions 1b and 1c</p> <p>2008 Question 7</p> <p>2007 Question 2</p>				<p><b>Higher</b></p> <p>2009 Question 11 (essay question)</p> <p>2008 Question 1</p> <p>2007 Question 1</p>		

12	Metamorphic facies	Teacher-directed lessons	Textbooks and information sheets with activities	Large PPT mentioned above on metamorphic rocks covers all this area		
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2006 Question 1 2005 Question 1				<b>Higher</b> 2007 Question 9 (essay)		
13	Revision and NAB					

## Unit 2 Earth Physics, Structural Geology and Plate Tectonics (H) & Earth Physics and Earth Movements (Int 2)

Week	Topic	Classroom based	Independent study	Visual aids	Practical activities	Work for Intermediate 2 if Higher work not relevant
14	Folds, faults, dykes batholiths etc  Block diagrams  Stratigraphy  Dip and strike	Teacher-directed lessons  Intermediate 2 2007 Question 8 dip and strike	Textbook and LTS information sheets with activities used	Folds and Faults PPT	Use Plasticine, or Swiss rolls, to show folding, faulting and erosion  Set up boards at different angles to allow students to measure dip and strike	Start with the simple folds and faults material in the Intermediate 2 booklet (LTS).  The block diagrams are important.  Higher candidates read Higher information book and do page 4 in the activity book.
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2006 Question 3 2005 Question 4				<b>Higher</b> 2009 Question 8 2009 Question 13 (photograph question) 2008 Questions 14 and 15 2007 Question 14 2005 Question 7		

15	<p>Numerous exercises on block diagrams and maps at Intermediate 2 level to begin with (use past papers)</p> <p>Stress, strain, elastic, plastic, brittle etc reinforced</p>	<p>Teacher-directed lessons</p> <p>LTS information sheets with activities used</p>	<p><i>OCR AS and A2 Geology</i> textbook pages 46–59</p>	<p>Deformation PPT</p>	<p>Quizzes, practice assessments and homework</p>	<p>The terms stress, strain, elastic, plastic, brittle etc are required for Higher.</p> <p>Higher students should read their information booklet and do LTS activities pages 2 and 3.</p>
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**  
 2009 Question 4  
 2008 Question 2  
 2007 Question 4

16	Earthquakes  Waves  Finding the epicentre	Teacher-directed lessons  LTS information sheets and activities used	<i>OCR AS and A2 Geology</i> textbook pages 14–21 and 32 onwards  Summary notes with past exam questions and answers issued to emphasise the main points	Earthquakes PPT  China earthquake 2008 PPT	Note taking  Quizzes  Use slinky to show waves	Start with Intermediate 2 materials and do all the activities. Do past Intermediate 2 exam paper questions on earthquakes whilst Higher candidates continue with the more technical aspects in their information and activities books.
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2007 Question 9 (problem solving) 2006 Question 8				<b>Higher</b> 2008 Question 6		

17	Refraction and reflection  Earth's interior	Teacher-directed lessons  LTS information sheets with activities  Old Intermediate 2 (2003) and Higher exam questions	<i>OCR AS and A2 Geology</i> textbook pages 6–9	Earth Interior PPT  Web research into Earth's interior	Field trip  St Monan's	
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**

2009 Question 8  
2008 Question 8  
2005 Question 12

**Higher**

2009 Question 2 (problem solving)  
2009 Question 5

18	Geological cross sections — drawing them	Teacher-directed lessons  LTS information and activity sheets	<i>Understanding Geology</i> by David Webster has a chapter on drawing cross sections — good for Intermediate 2 and Higher	Geological Maps PPT	Students start write up of investigation and receive ongoing guidance	Some easy geological maps that Intermediate 2 can draw cross sections from may be available from experienced geology teachers such as George Strachan. Contact Elaine Riley or Greg Storey at SQA for further details. Higher start with them.  Intermediate 2 do old exam questions whilst Higher
SUITABLE PAST PAPER QUESTIONS						
				<p><b>Higher</b></p> <p>2009 Question 15  2008 Question 16  2007 Question 15  2006 Question 13  2005 Question 13</p>		

19	Interpreting geological maps and cross sections	Teacher-directed lessons  LTS information sheets with activities used  Samples answers available	<i>OCR AS and A2 Geology</i> textbook p 278		Investigation work continues  Students write up geological histories from cross sections and maps	
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SUITABLE PAST PAPER QUESTIONS

<p><b>Intermediate 2</b></p> <p>2009 Question 2 2008 Question 3 2008 Question 6 2007 Question 3 2006 Question 2 2005 Question 5</p>	<p><b>Higher</b></p> <p>2007 Question 2 2006 Question 1</p>
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20	Structure contours	<p>Teacher-directed lessons involving teaching tan if students do not know it already</p> <p>Scientific calculators helpful</p> <p>LTS information sheets with activities used</p> <p>Samples answers available</p>	<p>Textbook — McLeish <i>Geological Science</i> and Bennison and Mosely <i>An Introduction to Geological Structures and Maps</i> (Arnold) ISBN 0340692405</p>	<p>Drawing Structure Contours PPT (G Strachan)</p>	Investigation continues	<p>Intermediate 2 do not do structure contour work. They could do their investigation write-up or catch up with previous work, or work ahead on continental drift and plate tectonics.</p>
SUITABLE PAST PAPER QUESTIONS						
				<p><b>Higher</b></p> <p>2008 Question 17</p> <p>2007 Question 16</p> <p>2005 Question 14</p>		

21	<p>Structure contours</p> <p>With faults and other complexities</p>	<p>Teacher-directed lessons</p> <p>Past papers contain many useful class exercises</p> <p>LTS information sheets with activities used</p> <p>Sample answers</p>	Textbook			
SUITABLE PAST PAPER QUESTIONS						
				<p><b>Higher</b></p> <p>2009 Question 16</p> <p>2006 Questions 14 and 15</p> <p>2005 Question 15</p>		

22	<p>Earth's magnetic field</p> <p>Earth's internal heat</p> <p>Continental drift and plate tectonics</p>	<p>Teacher-directed lessons</p> <p>LTS information sheets with activities used</p> <p>Newspaper article on the Earth's magnetic field</p>	<p>OCR AS and A2 <i>Geology</i> textbook pages 24–9</p>	<p>Magnetism PPT</p> <p>Continental drift PPT</p>		<p>Continental drift at Intermediate 2 is much the same as at Higher. Give Intermediate 2 (2006) magnetic stripe question when Higher are doing polar wandering.</p>
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SUITABLE PAST PAPER QUESTIONS

**Intermediate 2**

2009 Question 9  
 2008 Question 11  
 2007 Question 8 (problem solving)  
 2006 Question 11  
 2005 Question 11

**Higher**

2009 Question 6 (problem solving)  
 2008 Question 7 (problem solving)  
 2008 Question 11 (plate tectonics essay)  
 2007 Question 6 (problem solving)  
 2007 Question 7  
 2007 Question 10 (essay)  
 2006 Question 5 (problem solving)  
 2006 Question 6  
 2005 Question 3  
 2005 Question 8

23	Isostasy/gravity  Raised beaches  Atolls	Teacher-directed lessons  LTS information sheets with activities used	OCR AS and A2 Geology textbook pages 234–235 for atolls	Isostasy PPT	Note taking  Quizzes  Practice assessments and homework	Intermediate 2 can do more isostasy questions when Higher are considering gravity anomalies.
<b>SUITABLE PAST PAPER QUESTIONS</b>						
<b>Intermediate 2</b> 2008 Question 10 2007 Question 5 2006 Question 7 2005 Question 13				<b>Higher</b> 2007 Question 5		

24	Revision and assessment					
25	Prelim exam  Protractors and scientific calculators are useful					The prelim covers Units 1 and 2.  Fieldwork report to be handed in by end of March for marking and possible moderation.

### Unit 3 Fossils and Stratigraphy (Higher — 0.5 Units) or History of the Earth (Intermediate 2 — whole Unit)

Week	Topic	Classroom based	Independent study	Visual aids	Practical activities	Work for Intermediate 2 if Higher work not relevant
26	<p>Classification broad outline of groups</p> <p>Evolution basic idea</p> <p>Food chains and adaptations to survive in different habitats</p>	<p>Teacher-directed lessons</p> <p>Do not spend too much time on the biology as the ideas will be highlighted in specific examples covered at the end of this week or next.</p> <p>LTS information sheets with activities used</p>	<p>OCR AS and A2 Geology textbook 220–25 used</p>	<p>Palaeontology PPT</p> <p>BBC DVD <i>Lost Words Vanished Lives — the complete series</i> David Attenborough</p>	<p>Note taking</p> <p>Quizzes</p> <p>Practice assessments and homework for every topic</p>	<p>Both groups benefit from seeing fossils laid out at the start and a discussion on how fossils can form, types of fossils and the ancient environment they lived and were formed in</p> <p>Intermediate 2 will work solidly through LTS History of the Earth support notes. Higher do not need Intermediate 2 material.</p>
SUITABLE PAST PAPER QUESTIONS						

27	Study of brachiopods, bivalves , other molluscs	Teacher-directed lessons  LTS information sheets with activities used	OCR AS and A2 <i>Geology</i> textbook pages 236–249	Palaeontology PPT	Seashore shells and fossils compared  Size, shape and thickness of shells discussed  Consideration of high and low energy environments	Emphasis on fossil morphology for Intermediate 2 students.  Habitat and animal behaviour very important.  There are questions on morphology in all Intermediate 2 past exam papers. Use them to reinforce lessons.
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2009 Question 6 2007 Question 6 2006 Question 4 2005 Question 2						

28	Detail of ammonoids, echinoids/micraster and graptolite  Evolutionary changes	Teacher-directed lessons  LTS information sheets with activities used	<i>OCR AS and A2 Geology</i> textbook pages 260–3, 240–245, 258–9	Ammonites PPT  Sea Urchin PPT  Graptolite PPT	Fossils examined	Intermediate 2 benefit from the more detailed lessons required for Higher.
SUITABLE PAST PAPER QUESTIONS						
				<b>Higher</b> 2009 Question 4 2008 Question 9 2005 Question 2		

29	Geological column  Relative and radiometric dating	Teacher-directed lessons  LTS information sheets with activities used	<i>OCR AS and A2 Geology</i> pages 274–7	Dating rocks PPT		Intermediate 2 can continue with Intermediate 2 activities and relevant old exam questions when radiometric dating is being taught.
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SUITABLE PAST PAPER QUESTIONS

<p><b>Intermediate 2</b></p> <p>2009 Question 10 2005 Question 3</p>	<p><b>Higher</b></p> <p>2008 Question 2 2006 Question 4 2006 Question 8 2005 Question 4</p>
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30	Life and death assemblages  Sedimentary facies  Cyclothems  Correlation and index fossils	Teacher-directed lessons  LTS information sheets with activities used	<i>OCR AS and A2 Geology</i> pages 226–7, 282–5, 128–9, 184–5	Correlation PPT  Animation transgression and regression  Diachronism	Fieldwork completed	Intermediate 2 correlation exercises (2006) useful for Higher when they later match up varves and borehole data.
<b>SUITABLE PAST PAPER QUESTIONS</b>						
<b>Intermediate 2</b> 2009 Question 7 2008 Question 4 2007 Question 6 2006 Question 5				<b>Higher</b> 2009 Question 10 (essay question) 2007 Question 4		
31	Revision and assessment					

### Unit 3 Economic Geology (Higher — 0.5 Units)

Week	Topic	Classroom based	Independent study	Visual aids	Practical activities	Work for Intermediate 2 if Higher work not relevant
32	Resources and reserves physical and biological; renewable and non-renewable resource lifetimes and place value  Salt deposits  Sequences  (evaporates)	Teacher-directed lessons  LTS information sheets with activities used	Textbooks used and info and activity sheets	Economic Geology PPT	Note taking  Quizzes  Practice assessments	This Unit is not relevant to Intermediate 2.  Intermediate 2 complete the activities associated with their Intermediate 2 information book then attempt the specimen past exam paper. They can check their own answers.
SUITABLE PAST PAPER QUESTIONS						
				Higher 2009 Question 3		

33	<p>Ore deposits</p> <p>Definition of ore material; gangue materials; grade; cut-off grade</p> <p>Internal and surface formation of ores</p>	<p>Teacher-directed lessons</p> <p>LTS information sheets with activities used</p> <p>Use old papers to become familiar with the diagrams used to show different formations, eg contact metasomatism and hydrothermal veins</p>	<p>OCR AS and A2 <i>Geology</i> textbook pages 188–95</p>	<p>Metals PPT</p>	<p>Note taking</p> <p>Quizzes</p>	<p>Intermediate 2 do old exam papers</p>
SUITABLE PAST PAPER QUESTIONS						
				<p><b>Higher</b></p> <p>2008 Question 8</p> <p>2007 Question 8</p>		

34	Fossil fuels  Uranium  Mining methods  Surveying techniques	Teacher-directed lessons  LTS information sheets with activities used	OCR AS and A2 Geology textbook pages 168–75, 180–185, 197 and info and activity sheets	Fossil fuels PPT  Uranium PPT	Note taking  Quizzes  Practice assessments	Intermediate 2 do old exam papers.
SUITABLE PAST PAPER QUESTIONS						
<b>Intermediate 2</b> 2009 Question 5 2006 Question 6 (problem solving)				<b>Higher</b> 2009 (essay question) 2006 (problem solving) 2006		
35/36	Revision/NAB  Mini-prelims	Teacher-directed lessons			Quizzes  Practice assessments	Intermediate 2 revise along with Higher after economic NAB.

# Appendix

## Fieldwork reports table

	Student A	Student B	Student C	Student D	Student E	Student F	Student G	Student H	Student I	Student J	Student K
Organisation /2											
Observation /5											
Recording /3											
Total /10											
Identification /4											
Overall content /4											
Presentation /2											
Total /10											
Interpretation Total /10											
Overall Total /30											
Pass/fail (not less than 4/10 in any aspect)											

# Risk assessment

Activity assessed:	
Date of assessment:	Date of review:

Step 1	Step 2	Step 3
List significant hazards here:	List groups of people who are at risk from the significant hazards identified, eg pupils, teachers, technicians and cleaners:	List existing controls or where the information may be found. List risks not adequately controlled and action needed:

Description of activity:
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Additional comments:
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## Risk assessment (example)

Activity assessed: mineral testing	
Date of assessment: June 2009	Date of review: June 2010

Step 1	Step 2	Step 3
List significant hazards here:	List groups of people who are at risk from the significant hazards identified, eg pupils, teachers, technicians and cleaners:	List existing controls or where the information may be found. List risks not adequately controlled and action needed:
Using the following chemicals whilst mineral testing:  2 mol l <sup>-1</sup> HCl steel blades to scratch solid lumps of PbS	Pupils/students  Teachers	When using HCl: wear goggles, have equipment available to wipe up spills after neutralising them with NaHCO <sub>3</sub> solution (1 mol l <sup>-1</sup> ), and have dry rubber tubing available already prepared to attach to cold tap in the room to allow for eye irrigation (≥ 5 minutes). Use small volumes.  Plasters in first aid kit Students told to wash hands after contact and told not to lick their fingers during testing.

Description of activity: Students handle minerals, minerals are rubbed along a streak plate, minerals scratched with steel blade, HCl added to check for effervescence of CO <sub>2</sub> .
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Additional comments:
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