# Geology PAG 1: Investigating minerals and rocks

# Suggested Activity 3: Geology on the street

## Instructions for teachers and technicians

This practical activity is composed of two parts; a teacher/technician section and the student activity which can be found on [page 6](#_Suggested_Activity_1:). This practical activity supports OCR AS/A Level Geology.

**When distributing the activity section to the students either as a printed copy or as a Word file you will need to remove the teacher instructions section.**

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| This is a **suggested practical activity** that can be used as part of teaching the OCR AS and A Level Geology specifications helping to fulfil the requirements of the Practical Endorsement.  These are **not required activities**, nor are they coursework tasks.  You may modify these activities to suit your students and centre. Alternative activities are available from, for example, ESTA, Earth Learning Idea, CLEAPSS and publishing companies. Support for mapping activities to the requirements of the Practical Endorsement is available from OCR – see www.ocr.org.uk/positiveaboutpractical or email us at PASS@ocr.org.uk.  Students can collaborate during the activities but each student must individually demonstrate competence in each of the practical skills being assessed (see Practical Skills below).  It is possible for a student to achieve some but not all of the practical skills involved in an activity (and this can be recorded as individual skills in the OCR PAG Tracker).  Further details are available in the [specifications](http://www.ocr.org.uk/qualifications/as-a-level-gce-geology-h014-h414-from-2017/) (Practical Skills Topics). |

**OCR recommendations:**

**Before carrying out any fieldwork based on this guidance, it is the responsibility of teachers to ensure that they have undertaken a risk assessment in accordance with their employer’s requirements, making use of up-to-date information and taking account of their own particular circumstances. Any local rules or restrictions issued by the employer must always be followed.**

**CLEAPSS resources are useful for carrying out risk-assessments: (**<http://science.cleapss.org.uk>**).**

**Centres should trial fieldwork activities in advance of giving them to students. Centres may choose to make adaptations to this practical activity, but should be aware that this may affect the Apparatus and Techniques covered by the student.**

*This activity has been developed for OCR by* ***Ruth Siddall.***

***DISCLAIMER***

This resource was designed using the most up to date information from the specification at the time it was published. Specifications are updated over time, which means there may be contradictions between the resource and the specification, therefore please use the information on the latest specification at all times.If you do notice a discrepancy please contact us on the following email address: [resources.feedback@ocr.org.uk](mailto:resources.feedback@ocr.org.uk)

### Introduction

Students will use fieldwork skills to describe and identify a range of rocks and geological materials in the built environment. Any built-up area will be appropriate and can focus on building stones used over an urban area, or it can focus on a single stone-built building such as a church, or on a cemetery where typically a wide range of different stones will be used. A common misconception is that many lowland areas of Britain are geological deserts. However, even in a small market town or modern shopping centre there will be a range of building, paving and decorative primary stone and close examination of secondary products such as brick, mortar and concrete can reveal detail of the local geology. This may be the student’s first encounter with rocks outside the classroom so it is important that the challenge of the activity is appropriate but not overly ambitious.

### Aims

* to produce full rock descriptions of a range of igneous, sedimentary & metamorphic rocks and their constituent minerals, textures and fossils
* to build confidence in describing and identifying rocks outside the classroom
* to production annotated scientific drawings of small scale geological features
* to identify local vs non-local provenance of materials and construct a building stones trail around a town/building

### Intended fieldwork time

* 2 hour, to collect data

### Practical Skills – competence assessed by the teacher

1.2.1 (b) safely and correctly use a range of practical equipment and materials

1.2.1 (c) follow written instructions

1.2.1 (d) make and record observations/measurements

1.2.1 (f) present information and data in a scientific way

1.2.1 (h) use online and offline research skills including websites, textbooks and other printed scientific sources of information

1.2.1 (i) correctly cite sources of information

1.2.2 (a) location of geological features in the field using traditional navigation and basic field survey skills without the use of GPS

1.2.2 (b) identification of geological structures in the field recording observations as field sketches

1.2.2 (h) production of full rock descriptions of macro and micro features from conserved hand samples and unfamiliar field exposures

### CPAC

1. follows written procedures
2. applies investigative approaches and methods when using instruments and equipment
3. safely uses a range of practical equipment and materials
4. makes and records observations.

### Links to Specifications

1.3.1 (a) the measurement and description of the diagnostic properties of rocks in the field

1.3.1 (b) the collection of valid data in the field relating to the igneous, metamorphic or sedimentary processes that formed the rocks

2.1.2 (a)(ii) the diagnostic properties of rocks to identify igneous rocks in samples, photographs and thin section diagrams

2.1.3 (d)(iii) the diagnostic properties of rocks to identify siliciclastic and carbonate rocks in samples, photographs and thin section diagrams

5.4.1 (b)(ii) the diagnostic properties of metamorphic fabrics in samples, photographs and thin section diagrams

### Mathematical Skills – learning opportunity within activity

* Mathematical skills must be applied in the recording of the data and calculations, and in analysing the data. These steps require the appropriate application of the following mathematical skills:
  + - M1.1 Recognise and make use of appropriate units in calculations.
    - M1.3 Use an appropriate number of significant figures.
    - M1.4 Use ratios, fractions and percentages.

### Equipment

Each student will require:

* hand lens – ×10 or ×20, check screws on cover are tightened before issuing
* street map or OS 1:2,500/1:1,250 [MasterMap®](https://www.ordnancesurvey.co.uk/education/teachers/digimap-for-schools.html) map extract
* ruler or data card (‘grain size card’) and *Blu Tack*® to fix these to a vertical surface
* small water bottle
* field notebook or equivalent

### Health and Safety

* Health and safety should always be considered by a centre before undertaking any practical work. A full risk assessment of any activity should be undertaken including checking the CLEAPSS website (<http://www.cleapss.org.uk>).
* Continuously assess the safety of your working environment. The main risks are posed by traffic and you should take care crossing roads and stepping back to take photographs.
* Be respectful and courteous to members of the public. If appropriate, ask permission to take photographs, especially in indoor locations. Please comply with any instructions from building security officers.

### Notes

Centres are advised to trial this activity before using it with students. In particular:

* This activity was developed for OCR by Ruth Siddall, a champion for [Urban Geology](http://www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm).
* Ruth Siddall has written the [Barkingside: A Suburban Geological Town Trail](http://www.ucl.ac.uk/~ucfbrxs/Homepage/walks/Barkingside.pdf) as a model answer for those who want to make their own town trail from their own observations. It is particularly aimed at A-level Geology students.

Siddall, R, 2017, Barkingside: A Suburban Geological Town Trail., Urban Geology in London No. 38, 10 pp. http://www.ucl.ac.uk/~ucfbrxs/Homepage/walks/Barkingside.pdf

* This is intended as an activity suitable for students who have completed 2.1.2 and 2.1.3, detailed knowledge of metamorphic textures is not expected.
* For most English counties local stone is detailed in the [Strategic Stone Survey Database](https://www.bgs.ac.uk/mineralsuk/buildingStones/StrategicStoneStudy/EH_project.html) run jointly by English Heritage and BGS, for Wales the [Welsh Stone Forum](https://amgueddfa.cymru/curadurol/daeareg/fforwm-cerrig-cymru/) offers similar support. Members of [ESTA](http://www.esta-uk.net/) can access digital postcards of common British building stones and within the M25 [London Pavement Geology](http://londonpavementgeology.co.uk/) contains details of hundreds of sites and building stones. Local county museums will have a reference collection of local building material (you may have to arrange prior access) and both [BGS](http://geoscenic.bgs.ac.uk/asset-bank/action/browseItems?categoryId=1547&categoryTypeId=1) and [UCL](http://www.ucl.ac.uk/~ucfbrxs/Homepage/UCLDecorativeStone/UCLBuildingStones.htm) have online catalogues of building stones.
* A previsit should be made to any site prior to using it with students. In particular you will need to identify where there are sufficient localities and stone structures of geological interest in the local area to produce a viable urban geology trail.
* The instructions will need to be modified and adapted for your urban field site.

### Answers and Guidance to Extension Activities

1. It is useful to define the difference between a ‘rock’ and a ‘stone’. We can use the word ‘rock’ to describe lithologies that are in their geological context, i.e. as an outcrop. A ‘stone’ has been removed from its geological context and put in a human context, for example, a ‘dry-stone wall’. Inevitably materials used in the built environment will be stones, but they give us opportunities to examine minerals, fossils and textures close up, and commonly without any weathering. It is often much easier to identify minerals on a polished granite surface rather than in hand specimen. Many of the stones used for buildings will be familiar from fieldwork and classroom practical sessions. You will typically encounter varieties of granites and other intrusive igneous rocks, sandstones, limestones, slates, serpentinites, marbles and if you are lucky, gneiss. Your local region may also produce building stone which may give your area a unique character, for example granite in Aberdeen, sandstone in Edinburgh or limestone in Lincolnshire.
2. The ability to communicate geological ideas and concepts “for the use of non-specialists” is a Learning Outcome for A level geologists – 6.1.1(d) and 6.1.2(c). This activity provides an opportunity for students to develop this skill depending on the audience chosen.
3. The final compiled geology trail can be used as display material for reference and to interest other students in studying geology.
4. Stone supplied by quarries and stone contractors to the building industry are often given ‘trade names’. Some of these are very similar to geological names, i.e. Shap Granite, Lincolnshire Limestone, Craigleith Sandstone. However others may give misleading geological names. For example, Collyweston Slate from Lincolnshire is actually a limestone and not a true, metamorphic slate. Similarly the word marble is often used to describe any limestone, marble or even serpentinite that can take a good polish. For this reason, good rock identification skills are needed to avoid confusion. Even if you can identify a stone as, for example Portland Stone, you should always describe it from first principles too.

### Records

As evidence for the Practical Endorsement, students:

* should not need to re-draft their work, but rather keep all of their notes as a continuing record of their practical work, **dating their work clearly**,
* should record any observations and measurements taken to the number of significant figures (resolution) appropriate. This should be recorded clearly in an appropriate field notebook or similar,
* should produce correctly annotated drawings of any features they observe – this means the drawings need to be drawn with a sharp pencil with no sketching, be labelled with a ruled line, include a scale bar and be correctly titled,
* the presentation slide of one of their Urban Geology trail stops, including any sources used with references

Extension questions help students develop their understanding of the underlying geological theory and are a preparation for the written examinations. They also help students to develop the practical science skills assessed indirectly in the written examinations and they should be encouraged to record their data appropriately, for example showing full workings in calculations, and stating final answers to the appropriate number of significant figures.

### Document updates

v1.0 September 2017 Original version.

v1.1 January 2019 Minor edits for clarity.

**OCR Resources**: *the small print*This formative assessment resource has been produced as part of our free A Level teaching and learning support package. All the A Level teaching and learning resources, including delivery guides, topic exploration packs, lesson elements and more are available on the qualification webpages.

If you are looking for examination practice materials, you can find Sample Assessment Materials (SAMs) on the qualification webpages: <http://www.ocr.org.uk/qualifications/as-a-level-gce-geology-h014-h414-from-2017/>

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# Geology PAG 1: Investigating minerals and rocks

# Suggested Activity 3: Geology on the street

## Student activity

### Introduction

In this practical activity you will be describing and identifying a range of rocks and geological materials in the built environment. Any built-up area will be appropriate and can focus on building stones used in a town centre, or it can focus on a single stone-built building such as a church, or on a cemetery where a wide range of different stones will be used.

You will be collecting data on four rocks of interest within the urban area, which you will then research and develop into a mini urban geology trail. You will be producing rock descriptions and field sketches of what you see. You will be expected to use standard scientific practice including adding annotations and a scale bar to your drawing(s).

### Aims

To produce full rock descriptions of a range of igneous, sedimentary & metamorphic rocks and their constituent minerals, textures and fossils.

To build confidence in describing and identifying rocks outside the classroom.

To identify local vs non-local provenance of materials and construct a building stones trail around a town/building.

### Intended fieldwork time

2 hours, to collect data

### Equipment

hand lens

street map extract

ruler or data card (‘grain size card’), and Blu Tack® to fix these to a vertical surface

small water bottle

field notebook or equivalent

### Health and Safety

* The safety of yourself and others comes first in all geological fieldwork, including urban fieldwork. Take heed of all safety instructions given to you and do nothing which might put the safety of yourself or others at risk while in the field;
* Continuously assess the safety of your working environment. The main risks are posed by traffic and you should take care crossing roads and stepping back to take photographs.
* Be respectful and courteous to members of the public. If appropriate, ask permission to take photographs, especially in indoor locations. Please comply with any instructions from building security officers.

### Procedure

Before starting your practical work, read the information below.

1. Visit the location and decide which structures, made of specific building stone of interest to, you wish to include in your trail guide. You need to find at least one sedimentary, one igneous and one metamorphic rock. The rocks you choose may be building material, decorative cladding, paving or public art.
2. Locate the four chosen sites on your street map.
3. At each of the four sites take a photograph of the whole structure, and a close up (field of view 20–30cm) to show the features in the rock; your photograph needs to include a scale.
4. Fully describe the rock, including any macro features such as fossils and draw an annotated *field sketch* (scientific drawing) of any features of interest. Give a name to the rock.
5. Using the reference resources your teacher will give you try to identify if the building stone has come from a local source or has been brought from elsewhere in the UK or overseas.
6. Using the Barkingside Geological Town Trail as an example, use your rock descriptions, photographs and *field sketches* to write up each of the stops on your mini urban geology trail as a single presentation slide. [www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm](http://www.ucl.ac.uk/~ucfbrxs/Homepage/UrbanGeology.htm)
7. You need to include what you have called the rock, what the building stone is called and where it comes from (based on your research) and why the rock is of interest. You should give the bibliographic reference of the source you used to identify the building stone type (see any Wikipedia entry *biography* for the style to use.

### Extension opportunities

1. Ask a non-geologist to use your mini urban geology trail and give you feedback on how they found it to use. Consider how you could improve the way you communicate geological ideas to non-specialists. This is an important communication skill for most working geologists.
2. Review with the class all the trail stops that the whole class has found, and use them to create a single urban geology trail of your local town. This could be done by linking printout outs of the slides to a map of the urban area, or by combining the best slides into one presentation and printing it as a two slides per page view.
3. Using the whole classes data construct a geochronological column of the town centre and show the age of each of the main building stones. If you have the data on the provenance of the building stones you could add this information to show where they were quarried.

### Records

As evidence for the Practical Endorsement, you need records in your field notebook of:

* full rock descriptions for your four chosen trail stops,
* field sketches of geological features you observed at the trail stops,
* a hardcopy of one of your Urban Geology trail stops presentation slides, this should include a bibliographic reference that you used.

All work should be clearly dated.

In addition you should have considered the above questions as the answers to these questions will aid you in preparation for your written examinations.