

CPAC Pen portraits (GEOLOGY Proposal)

A series of pen portraits have been written to clarify what is meant by 'not achieved', 'achieved' and 'achieved' at a level of competence exceeding the CPAC standard.

These exemplars have been developed in collaboration between the two Awarding Bodies offering A level Geology: Eduqas and OCR. They are intended for guidance and training purposes, and to give an indication of the standard necessary for each CPAC statement.

Note that, although these pen portraits show (in the most part) CPAC skills in isolation, many practical exercises are likely to involve CPAC strands being assessed in combination.

CPAC 1: Follows written instructions

| Not achieved | Achieved | Exceeding CPAC standard |
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| <p>1.1N Context Geology (Year 12): Construction of a graphic log for an unfamiliar outcrop</p> <p>Observed As they approach the outcrop the teacher reminds the class about the main points of the procedure, including safety matters. At the outcrop the student does not manage to follow the instructions correctly and makes errors in recording grain size on their graphic log. This has to be pointed out by the teacher.</p> | <p>1.1A Context Geology (Year 12): Construction of a graphic log for an unfamiliar outcrop</p> <p>Observed As they approach the outcrop the teacher reminds the class about the main points of the procedure, including safety matters. The student then works independently to collect the expected set of results. All procedural points are carried out correctly and the student is methodical and confident in their approach to the task. The teacher does not have to have any involvement.</p> | <p>1.1E Context Geology (Year 12): Construction of a graphic log for an unfamiliar outcrop</p> <p>Observed As they approach the outcrop the teacher reminds the class about the main points of the procedure, including safety matters. Following this, the student works without intervention from the teacher and collects the expected set of results, having followed all of the method points. The student engages in a discussion with the teacher about the possible sources of error in the procedure at this particular field locality and it is agreed that the instructions could be modified slightly.</p> |

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| <p>1.2N Context Geology (Year 13): Modelling contact metamorphic processes</p> <p>Observed A student is working as part of a pair. The student asks the teacher for reassurance that the apparatus provided is correct for the experiment. He takes no part in the setting-up of the equipment, leaving this task to his partner. The worksheet tells students to collect a set of readings, at appropriate time intervals, over a period of twenty minutes. The student collects three readings only, and asks his teacher if this is enough data.</p> | <p>1.2A Context Geology (Year 13): Modelling contact metamorphic processes</p> <p>Observed A student is working as part of a pair. The student reads the instructions provided for the practical. She is able to use the diagram and equipment list to set up the apparatus provided. With her partner, she asks her teacher to check the setup, which is correct. At the end of the practical session, she has collected sufficient data, together with her partner, as outlined in the method on the worksheet.</p> | <p>1.2E Context Geology (Year 13): Modelling contact metamorphic processes</p> <p>Observed The student is provided with an outline of the experiment, where some steps are given in outline only. He reads through the instructions provided and is able to formulate a correct method for the task. He finds all the apparatus independently (CPAC 2d). He sets up the apparatus and checks that it is correct before turning on the power pack. He works methodically to collect the data required, ensuring that is tabulated and checked as he goes along (CPAC 4b).</p> |
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CPAC 2: Applies investigative approaches and methods when using instruments and equipment

| Not achieved | Achieved | Exceeding CPAC standard |
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| <p>2.1N Context Geology (Year 12): Investigation of a fold</p> <p>Observed The student has a clear plan to collect data relevant to an investigation involving the measurement of dip and strike. However he is confused about how to use a compass-clinometer to collect data on both limbs. When asked by the teacher about his field notebook, which is disorganised, he is unsure where on the fold each of the measurements was taken and what the figures recorded mean.</p> | <p>2.1A Context Geology (Year 12): Investigation of a fold</p> <p>Observed The student follows a clear plan to collect data relevant to an investigation involving the measurement of dip and strike over the fold. The compass-clinometer is used correctly and slight modifications of the plan allow him to collect an expected set of data that is recorded on a sketch map of the fold in his field notebook using a consistent format (e.g. dd°/sss°/direction).</p> | <p>2.1E Context Geology (Year 12): Investigation of a fold</p> <p>Observed The student works independently to plan an investigation involving the measurement of dip and strike using correct apparatus. Data collection is done methodically every 010° azimuth along strike lines around the fold. She records data in a suitable table with transects shown on a clear field sketch in her notebook. Modifications of the plan are made as the need arises with no requirement for intervention from the teacher.</p> |
| <p>2.2N Context Geology (Year 13) Planning a sequence of tests to identify minerals</p> <p>Observed A group of three allowed one student to lead the task while the other two were less focused and unable to explain the rationale for their investigation. The leader of the group had a clearer understanding but it was still difficult to identify the contribution of each student.</p> | <p>2.2A Context Geology (Year 13) Planning a sequence of tests to identify minerals</p> <p>Observed Students working in a pair devised a suitable testing sequence that would allow for the identification of the minerals in relatively few steps, choosing appropriate equipment and chemicals with minimal assistance. They recognised that one of the steps in their sequence was not necessary in most instances, and modified their testing sequence accordingly.</p> | <p>2.2E Context Geology (Year 13) Planning a sequence of tests to identify minerals</p> <p>Observed Following choice of equipment and techniques, a student planned an investigation using previous knowledge and research. The student carried out preliminary work to inform this planning. When questioned during this work, the student displayed an excellent understanding of the procedure, could justify their actions and link them to the expected outcome. The acid test for calcite was inconclusive so the student used repeats to confirm the results for the mineral.</p> |

CPAC 3: Safely uses a range of practical equipment and materials

| Not achieved | Achieved | Exceeding CPAC standard |
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| <p>3.1N Context Geology (Year 12): Field based investigation of an outcrop</p> <p>Observed The student collects a hard hat for study of this coastal cliff exposure. For the majority of the time she does not wear the hard hat despite working at the foot of the cliff. She only wears it when prompted by her teacher. She climbs up the rock face in an attempt to take dip and strike readings at height.</p> | <p>3.1A Context Geology (Year 12): Field based investigation of an outcrop</p> <p>Observed The student follows safety instructions correctly. He collects all the required safety equipment and wears it appropriately throughout the investigation. He completes the fieldwork activity without incident.</p> | <p>3.1E Context Geology (Year 12): Field based investigation of an outcrop</p> <p>Observed The student collects and wears all the required safety equipment appropriately. She remembers all the key points for conducting fieldwork safely in this coastal exposure and warns a fellow student that he is standing too close to the edge of the wave cut-platform.</p> |
| <p>3.2N Context Geology (Year 13) Simple qualitative mineral test; teacher has chosen to do this in a laboratory</p> <p>Observed The student dropped a couple of test tubes, leaving broken glass on the floor. Rather than dealing with the incident, the student kicked the glass under their desk. Later on, the same student carried a stock bottle of concentrated HCl from the fume cupboard to use at their workspace. The student failed to consider and therefore minimise risk or harm to themselves or other students around them.</p> | <p>3.2A Context Geology (Year 13) Simple qualitative mineral test; teacher has chosen to do this in a laboratory</p> <p>Observed The student sets up an organised workspace, and handled equipment confidently and sensibly, disposing of reacted mixtures as directed by the teacher. They accidentally spilled a small amount of a chemical when testing for calcite purity in a limestone sample, but wiped it up without fuss. They were considerate of a classmate who has asthma when using certain chemicals.</p> | <p>3.2E Context Geology (Year 13) Simple qualitative mineral test; teacher has chosen to do this in a laboratory</p> <p>Observed The student had prepared a detailed risk assessment covering all aspects of the practical work. She completes the investigation safely in accordance with laboratory requirements and risk assessment. She works confidently, without need of intervention and her work space is well organised. She spills a small amount of HCl in the fume cupboard but warns those working near her and then reports this to the teacher (laboratory rules specify that spills are to be reported to teacher who deals with situation).</p> |

CPAC 4: Makes and records observations

| Not achieved | Achieved | Exceeding CPAC standard |
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| <p>4.1N Context Geology (Year 12): Recording observations as field sketches</p> <p>Observed Some geological structures are drawn but these appeared out of proportion with those viewed by student. Very little observation of the field geology is made by the student who appears to draw what he thinks should be present. The student is clearly distracted from the task by chatting to his neighbour. The candidate forgets to add a scale to the field-sketch and the labels added to the sketch are vague.</p> | <p>4.1A Context Geology (Year 12): Recording observations as field sketches</p> <p>Observed The student accurately records what is observed in the field on a reasonably well-proportioned field sketch. The sketch includes a scale, title, orientation and annotations which highlight some details of the geological structures seen.</p> | <p>4.1E Context Geology (Year 12): Recording observations as field sketches</p> <p>Observed The student draws a well-proportioned field-sketch which has an appropriate scale, orientation and title. There are very detailed annotations which link the geological features to the processes which have formed them. It is not necessary to record processes - <i>only the observed features</i> - so this student has exceeded the standard.</p> |
| <p>4.2N Context Geology (Year 13) Finding the density of rock samples</p> <p>Observed A student carried out the practical satisfactorily but when the results table was drawn, he was short of time and rushed it. The table did not have units in the headers and in some places the student recorded the units in the body of the table. Also, the student did not use a consistent number of decimal places when recording the masses of the rock samples.</p> | <p>4.2A Context Geology (Year 13) Finding the density of rock samples</p> <p>Observed A student accurately records data from the experiment. She determines the volume by difference as all the displacement vessels (over-spill cans) were being used. She records all readings at the time of taking them. Her readings are recorded into suitable tables to an appropriate number of decimal places taking into account the resolution of the apparatus (e.g. measuring cylinder readings were to 1dp with a figure of '0' or '5'). On one volume reading she omitted to write down the initial</p> | <p>4.2E Context Geology (Year 13) Finding the density of rock samples</p> <p>Observed The student carried out a number of repeats for each rock sample to reduce uncertainty. He used a number of samples of each rock type and made and recorded multiple readings throughout the procedure. The data table had variable headings and units to the expected format and, in addition to his raw data, had columns for processed data. This included density, mean density and standard deviation so a graph with error bars could be drawn.</p> |

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| | reading. This appeared to be an oversight by the student who recognised her error when her attention was brought to it. | |
| <p>4.3N Context Geology (Year 13) Production of scientific drawings using photomicrographs</p> <p>Observed The student drew a generalised network of crystals inside a circle in their book from a photomicrograph. However, the shape and relative proportions of the crystals did not resemble those viewed by the student. No indication of scale was given and the magnification of the drawing was not recorded. The labels 'Quartz' and 'Mica' had been connected to their drawing by arrows which did not touch any specific feature. The student spent very little time observing the photomicrograph and she appeared to draw what she thought should be present. For most of the lesson the student was distracted from the task by chatting to her neighbour.</p> | <p>4.3A Context Geology (Year 13) Production of scientific drawings using photomicrographs</p> <p>Observed The student was working as one of a pair. Only three crystals were drawn but these were close to the shape and in relative proportion with crystals viewed by the student on the photomicrograph. The three primary minerals were identified and annotations added to the drawing using straight lines which ended at the relevant feature. The student spent some time discussing with his partner how to tell kyanite from quartz and borrowed a reference atlas of minerals. He had included a scale bar and recorded the correct magnification on the drawing.</p> | <p>4.3E Context Geology (Year 13) Production of scientific drawings using photomicrographs</p> <p>Observed The student had drawn several examples of each primary mineral to illustrate the variation on the photomicrograph, and had also drawn one of the accessory minerals. Using the tools on the virtual microscope she was able to measure dimensions and areas with high precision and make use of plain and cross-polarised light to help her identification. She located the individual crystals drawn using a screen dump of the photomicrograph, and included other images illustrating twinning and undulose extinctions. All drawings had clear scales and comprehensive relevant annotations.</p> |

CPAC 5: Researches, references and reports

| Not achieved | Achieved | Exceeding CPAC standard |
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| <p>5.1N Context Geology (Year 12): Investigation of the layered structure of the Earth.</p> <p>Observed The student completed his experiment, measuring rock densities, and was asked by his teacher to report his findings. It was evident after a while that he was having difficulty processing his raw data using the calculator and there was some lack of understanding and so the teacher needed to intervene. Despite a lot of support, the report produced was very brief and still contained some of the processed errors that the teacher had supported the student managing. There was no evidence of any research conducted by the learner to support the practical work or analysis.</p> | <p>5.1A Context Geology (Year 12): Investigation of the layered structure of the Earth.</p> <p>Observed Independent processing of raw data collected through the practical lesson was followed by a short, concise report being produced by the student in her own words. She commented on the value of densities obtained through calculation, the report commenting on the significance of uncertainty. Several, relevant research resources were included in the report, detailed to include the full URL address and the time and date accessed so they could be accessed again if necessary. It was evident that the student had accessed more information than the teacher had initially shared with the students.</p> | <p>5.1E Context Geology (Year 12): Investigation of the layered structure of the Earth.</p> <p>Observed A full, detailed report had been completed in the students own words, heavily supported by the extensive, relevant research resources that they had used to support them in practical work. The student had been keen to minimise uncertainty in the data collection and so had considered several ways of adapting the procedure. Full, scientific terminology had been used correctly and a calculator used without error to process raw data to calculate density. The report was supported with extensive and relevant research and referenced using the Harvard system.</p> |
| <p>5.2N Context Geology (Year 13): Investigation of a geological process using a simulation experiment</p> <p>Observed As part of the preparatory work in advance of the practical, the class are asked to undertake some research concerning the factors that could be investigated in the simulation experiment. The student's research is poor: his only source of information is the textbook and, although he has</p> | <p>5.2A Context Geology (Year 13): Investigation of a geological process using a simulation experiment</p> <p>Observed As part of the preparatory work in advance of the practical, students are asked to undertake some research concerning the factors that could be investigated in the simulation experiment. The student uses Wikipedia as a source, along with her textbook, and she writes some notes that show</p> | <p>5.2E Context Geology (Year 13): Investigation of a geological process using a simulation experiment</p> <p>Observed As part of the preparatory work in advance of the practical, students are asked to undertake some research concerning the factors that could be investigated in the simulation experiment. The student writes some notes, based on the use of two different websites, and backed up by two different</p> |

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| <p>read up on some of the theory, he has not considered how this would affect practical work investigating the geological process. No written record is made by the student to say which sources were used in his research.</p> | <p>some factors that could be investigated. Her written report includes the URL for Wikipedia, along with the date and time accessed, the title of the textbook used, the author, and the pages from which she obtained the information. When questioned, she acknowledges that Wikipedia is not always a reliable source, but says that the information on the website agreed with her textbook.</p> | <p>textbooks. All sources used are accurately referenced using the Harvard system. He uses these sources to state the main factors, and then goes on to outline a possible plan for the experiment, including some excellent experimental detail on apparatus and quantities.</p> |
| <p>5.3N Context Geology (Year 13) Research</p> <p>Observed Student presents information, which may be correct, but without any references or evidence of additional knowledge found from researching.</p> | <p>5.3A Context Geology (Year 13) Research</p> <p>Observed Student has identified a minimum amount of new information relevant to the geological issue being studied and linked it to understanding from teaching. The references do not follow a standard format, but would allow the reader to locate the information.</p> | <p>5.3E Context Geology (Year 13) Research</p> <p>Observed Student has taken this component of the practical seriously and researched a wide range of additional data. The student has chosen to extend the scope of the activity to include how their local geology would be affected by the geological issue and has included information from the BGS GeoSure datasets to support their research. The references follow an accepted pattern and are complete.</p> |