# Common Practical Endorsement Criteria (CPAC) pen portraits

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 Common Practical Assessment Criteria (CPAC) standard.

These exemplars have been developed in collaboration between the four Awarding Bodies: AQA, Eduqas, OCR and Pearson.

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** |
| **1.1N** **Context**  Chemistry (Year 12):  Make up a volumetric solution and carry out a simple acid-base titration  **Observed**  The learners took specific roles, one responsible for preparing the volumetric solution, the other for the titration. In the process they requested apparatus that was not needed to carry out the written method. There were several requests for reassurance in the initial stages, with the teacher intervening to demonstrate the drop-wise addition of burette solution towards endpoint. | **1.1A Context**  Chemistry (Year 12):  Make up a volumetric solution and carry out a simple acid-base titration  **Observed**  The learner methodically and confidently followed the method steps in the correct order; firstly to make the volumetric solution, then to carry out the titration work. The learner asked the teacher for clarification about the number of drops of indicator to add and decided to go with 3 drops to enable the end point to be seen more clearly. They generated a set of expected titre volumes. The learners proceeded to carry out a further three titration runs, sufficient to ensure that two results were in close agreement. | **1.1E Context**  Chemistry (Year 12):  Make up a volumetric solution and carry out a simple acid-base titration  **Observed**  The class was provided with a simple outline of the practical method steps. Learners could be seen reading the outline in full before selecting apparatus independently from a range of glassware provided. Both elements of the practical work – making up the standard solution and titration work – were carried out efficiently, methodically and independently with little reference to the written practical outline. It was clear that learners had developed clear routines e.g. use of balance, addition of washings, re-filling of burette, and end point addition that were fully embedded in their titration practical work. |

***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)

| **Not achieved** | **Achieved** | **Exceeding CPAC standard** |
| --- | --- | --- |
| **1.2N Context**  Chemistry (Year 12):  Preparation of a soluble salt using a titration  **Observed**  Following teacher demonstration of how to use titration apparatus, a learner attempts to follow detailed written instructions. The teacher intervenes on a number of occasions to correct the learner, thus demonstrating that the learner is not working independently. | **1.2A Context**  Biology (Year 12):  Extraction of DNA from living material  **Observed**  Following a discussion about the principles of extraction of DNA and a reminder about safety, learners worked individually to complete the task. A learner followed the written procedure carefully, confidently and without intervention from the teacher. | **1.2E Context**  Chemistry (Year 13):  Estimation of copper(II) salts  **Observed**  After reading instructions prior to starting the practical, a learner works efficiently and independently to accurately make up a standard solution with minimal further reference to the instruction sheet. |
| **1.3N Context**  Biology (Year 12):  Qualitative testing for biological molecules – glucose  **Observed**  The class is reminded about safety and the main points of the procedure. The learner does not follow the instruction in the correct order and misses a critical stage. This has to be corrected by the teacher. | **1.3A Context**  Biology (Year 12):  Qualitative testing for biological molecules – glucose  **Observed**  The class is reminded about safety and the main points of the procedure. The learner carries out the practical methodically and confidently and all parts are done in the correct order. The expected set of results is collected with no intervention from the teacher. | **1.3E Context**  Biology (Year 12):  Qualitative testing for biological molecules – glucose  **Observed**  The class is reminded about safety and the main points of the procedure. The leaner works methodically and confidently with no teacher intervention to collect the expected set of results and engages the teachers in a discussion about improvements to the procedure. |
| **1.4N Context**  Physics (Year 12):  Determine the electrical resistivity of a material  **Observed**  A student is working a 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 circuit, leaving this task to his partner. The worksheet tells students to collect a reading every 10cm along a 1-metre length of wire. The student collects three readings only. | **1.4A Context**  Physics (Year 12):  Determine the electrical resistivity of a material  **Observed**  A student is working a part of a pair. The student reads the instructions provided for the practical. She is able to use the circuit diagram from the apparatus provided. With her partner she asks her teacher to check the circuit, 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. | **1.4E Context**  Physics (Year 12):  Determine the electrical resistivity of a material  **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 circuit, 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).] |

### ****CPAC 2: Applies**** investigative approaches and methods when using instruments and equipment

| **Not achieved** | **Achieved** | **Exceeding CPAC standard** |
| --- | --- | --- |
| **2.1N Context**  Biology (Year 12):  Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction  **Observed**  When working in a group of three, one learner did not engage with the task. The group did not make the required progress with the planning stage so teacher intervention was required to provide a method. Even with this, lack of concentration meant that the group failed to obtain the expected trend and were unable to explain either the theory behind the task or the outcome. | **2.1A Context**  Biology (Year 12):  Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction  **Observed**  A learner used previous knowledge and research to plan an investigation including the choice of suitable apparatus and a method to collect sufficient data. The learner modified the plan slightly during the carrying out of the procedure and collected a data set showing the expected trend. | **2.1E Context**  Biology (Year 12):  Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction  **Observed**  Following choice of independent variable and apparatus, a learner planned an investigation using previous knowledge and research. The learner carried out preliminary work to inform this planning. When questioned during this work, the learner displayed an excellent understanding of the procedure, could justify their actions and link them to the expected outcome. Repeat data was collected in a well-designed table and it followed the expected trend. |
| **2.2N Context**  Biology (Year 13)  Investigation into the abundance and distribution of plants in a habitat  **Observed**  A group of three allowed one learner 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 learner. Evidence for CPAC 2 would need to be more definitive. | **2.2A Context**  Chemistry (Year 13)  Planning a sequence of tests to identify organic compounds  **Observed**  A learner devised a suitable testing sequence that would allow for the identification of the compounds in relatively few steps, choosing appropriate reagents with minimal assistance. He recognised that one of the steps in his sequence was not necessary in one instance, and he modified his testing sequence accordingly. | **2.2E Context**  Physics (Year 13)  Measurement of *g* with a pendulum  **Observed**  Learners are asked to devise a method to determine g selecting apparatus from a range of equipment. A learner illustrates a proposed method and carries out trial runs to determine a suitable range of values also considering the uncertainty in timings. The learner took multiple readings and demonstrated an understanding of the process and factors which influenced the accuracy of the outcome. |
| **2.3N Context**  Physics (Year 13):  Potential divider investigation  **Observed**  Students working in pair are unable to get their circuit to operate. The teacher leaves them for fifteen to twenty minutes to try and overcome their difficulties before stepping in to guide them to assembling a correctly functioning circuit. | **2.3A Context**  Physics (Year 13):  Potential divider investigation  **Observed**  Students working in pair are unable to get their circuit to operate. The students work though their circuit and after fifteen to twenty minutes overcome their difficulties and are able to collect data as required.  (Achieves the use of instruments and equipment although not investigative CPAC 2a, b). | **2.3E Context**  Physics (Year 13):  Potential divider investigation  **Observed**  Students working in pair set up their apparatus with no issues, each participating and communicating with each other. They collect data as required and have completed the task set within twenty minutes. The teacher then asks them to determine the best value for the fixed resistor in their circuit to optimise the range of potential difference output.  (Achieves the use of equipment and investigative nature CPAC 2a, b, c) |
| **2.4N Context**  Biology (Year 12)  Investigate a factor affecting the initial rate of an enzyme controlled reaction  **Observed**  The learner has a clear plan but is confused about variables so has two changing variables. The procedure is carried out in a disorganised way and data is not recorded to a consistent number of significant figures. | **2.4A Context**  Chemistry (Year 12)  Investigate a factor affecting the initial rate of an enzyme controlled reaction  **Observed**  The learner follows a clear plan to vary substrate concentration and is aware that other variables must be controlled. Slight modifications of the plan allow collection of an expected set of data that is recorded in a suitable table. | **2.4E Context**  Physics (Year 12)  Investigate a factor affecting the initial rate of an enzyme controlled reaction  **Observed**  The learner works independently to choose and independent variable and plan an investigation using correct apparatus. Data collection is done methodically controlling all other variables. Modifications of the plan are made as the need arises with no requirement for intervention from the teacher. |

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

| **Not achieved** | **Achieved** | **Exceeding CPAC standard** |
| --- | --- | --- |
| **3.1N Context**  Chemistry (Year 12):  Carry out simple test-tube reactions to identify cations and anions in aqueous solution  **Observed**  A learner dropped a couple of test tubes, leaving broken glass on the floor. Rather than dealing with the incident, the learner kicked the glass under their desk. Later on, the same learner carried a stock bottle of concentrated H2SO4 from the fume cupboard to use at their workspace. The learner failed to consider and therefore minimise risk or harm to themselves or other learners around them. | **3.1A Context**  Chemistry (Year 12):  Carry out simple test-tube reactions to identify cations and anions in aqueous solution  **Observed**  The learner set 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 limewater, but wiped it up without fuss. They were considerate of a classmate who has asthma when using certain chemicals. | **3.1E Context**  Chemistry (Year 12):  Carry out simple test-tube reactions to identify cations and anions in aqueous solution  **Observed**  A learner wrote a full, detailed risk assessment to cover all aspects of the practical work. They completed the procedure efficiently and with no teacher intervention. When noticing a classmate had brought a fume cupboard reagent over to their bench and left the stopper off, they went over and spoke to the classmate and alerted the teacher. |
| **3.2N Context**  Chemistry (Year 12)  Indirect determination of an enthalpy change of reaction  **Observed**  A learner breaks a mercury thermometer in the course of an experiment and is seen putting the broken thermometer in a draw. No attempt is made to deal with any spilt mercury. The learner continues with his work and does not report the incident to class teacher. The incident is mentioned to the teacher who intervenes. | **3.2A Context**  Physics (Year 13)  Measurement of the specific heat capacity for a solid by the method of heat transfer  **Observed**  A learner identifies hazards and risks associated with their procedure. His work space is well organised. He works safely and handles equipment confidently and competently. The practical period is completed without incident. | **3.2E Context**  Chemistry (Year 13)  Planning a sequence of tests to identify organic compounds  **Observed**  A learner prepares a detailed (suitable and sufficient) risk assessment covering all aspects of the practical work. At all times she works confidently and without need of intervention. She spills a small amount of ethanamide 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 the teacher) who deals with situation. |
| **3.3N Context**  Biology (Year 12):  Investigation into the effect of exercise on pulse rate  **Observed**  The learner starts the investigation without consideration of the impact of the exercise on those participating. One participant has an asthma attack and has to stop and take medication and it is determined in hindsight that this individual should not have been asked to exercise. | **3.3A Context**  Biology (Year 12):  Investigation into the effect of exercise on pulse rate  **Observed**  The learner asks the individuals participating in the exercise if they have any relevant health concerns. He then proceeds with the investigation without incident once it has been established that no one suffers from a heart or lung condition. | **3.3E Context**  Biology (Year 12):  Investigation into the effect of exercise on pulse rate  **Observed**  The learner considers detailed risks and hazards relevant health concerns of the participants and the safety of the exercise. One participant is excluded as she has a heart condition. The method of exercise is changed when it is decided that the first idea is too dangerous. A detailed risk assessment is provided as part of the investigation. |
| **3.4N Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  The learner collects safety glasses, but they spend the majority of the time pushed up on her head – she only pushes them down over her eyes when prompted by her teacher. She knocks over a conical flask during the practical and does not notice the spillage. | **3.4A Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  The learner follows safety instructions correctly. He checks with the teacher that his method for attaching the pipette filler to the pipette is safe. He completes the practical without incident. When he is washing up after the experiment, he accidentally spills some acid on his skin. He washes it off with plenty of water, and then tells his teacher what has happened: no further action is necessary. | **3.4E Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  The student is working in a pair, and she reminds her lab partner of the safe method of attaching the pipette filler to the pipette. She remembers all the key points for safely filling a burette, including bringing the burette down to a safe working level before filling. When her teacher asks what she would do in the event of a spillage, she is able to describe a safe method of clearing it away. |

### CPAC 4: Makes and records observations

| **Not achieved** | **Achieved** | **Exceeding CPAC standard** |
| --- | --- | --- |
| **4.1N Context**  Biology (Year 12):  Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue  **Observed**  A learner 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 learner recorded the units in the body of the table. Also, the learner did not use a consistent number of decimal places when recording the masses of the chips. | **4.1A Context**  Biology (Year 12):  Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue  **Observed**  A learner designed a results table for their raw data that was complete with variable headings and units to the format expected outlined in their practical handbook. After blotting dry the chips the learner weighed each one, recording the initial masses to 2 decimal places as it was being collected. This number of significant figures appropriate for the weighing balance was used. | **4.1E Context**  Biology (Year 12):  Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue  **Observed**  The learner carried out a number of repeats for each sucrose concentration to reduce uncertainty. They used a number of sets of sucrose tubes and chips 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 their raw data, had columns for processed data. This included gain in mass and % gain in mass so a graph could be drawn as directed. |
| **4.2N Context**  Biology (Year 12)  Preparation and scientific drawing of onion cells including calibration of actual size and magnification of drawing.  **Observed**  Three cells are drawn but these were out of proportion with cells viewed by candidate. Little observation of the image was made by the learner who drew what she thought should be present. The learner was distracted from the task by chatting to her neighbour. No indication of length in eye piece units was given and the magnification of the drawing was not recorded. | **4.2A Context**  Chemistry (Year 12)  Back titration - determination of calcium carbonate in limestone.  **Observed**  A learner records data from the titration. He determines the mass weighed by difference.  He records all readings at the time of taking them. His readings are recorded into suitable tables to an appropriate number of decimal places (e.g. burette readings were to 2dp with second figure as '0' or '5'). On one titre reading he omitted to write down '0', but recognised his error when his attention was brought to it. | **4.2E Context**  Physics (Year 13)  Measurement of *g* with a pendulum  **Observed**  Learners are asked to devise a method to determine *g* selecting apparatus from a range of equipment. A learner illustrates a proposed method and carries out trial runs to determine a suitable range of values also considering the uncertainty in timings. The learner took multiple readings and demonstrated an understanding of the process and factors which influenced the accuracy of the outcome. She recorded all information immediately into suitable table to an appropriate precision with units correctly recorded. Her tables also facilitated the recording of processed data. |
| **4.3N Context**  Biology (Year 12)  An investigation into the water potential of potato  **Observed**  When drawing the table, the learner confuses the dependent and independent variables and draws a table where the units are repeated in each line of data. Teacher intervention allows the learner to draw a more suitable table and know the format for the next time this skill is required. | **4.3A Context**  Biology (Year 12)  An investigation into the water potential of potato  **Observed**  The learner uses a balance to 2dp to weigh and record the mass of her potato chips. The table used has the variables and headings correctly labelled. The learner is reminded of the importance of recording all readings at the time of taking them and so does this for all readings after the first one. | **4.3E Context**  Biology (Year 12)  An investigation into the water potential of potato  **Observed**  The learner records the mass of potato chips accurately using a balance to 2dp and writes them down in a suitable table as they are weighed. The table is rough and sketched and has all headings and variables correctly labelled. A further table is drawn for processed data to include the percentage gain or loss of water of each chip and the mean, all recorded correctly. |
| **4.4N Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  A learner performs the titration three times. The learner does not use a table to record initial and final burette readings, writing down only the final titre value. There is no evidence of concordance in the titre values. The teacher observes that the learner’s use of the apparatus is haphazard. | **4.4A Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  A learner records titre values in a rough table in his lab book, recording to an appropriate number of decimal places. The learner collects three titre values, showing an initial and final burette reading. Two of the values are within 0.2 cm3 of each other. The mean titre is within 0.5 cm3 of that obtained / expected by the teacher. | **4.4E Context**  Chemistry (Year 12)  Finding the concentration of a solution of hydrochloric acid by titration  **Observed**  The learner carries out the process with fluency. She uses a results table which includes units in the table headings and which clearly identifies the initial titration as “Rough”. The learner collects two accurate titre values. The two values obtained are concordant to within 0.1 cm3 of each other. The mean titre is within 0.2 cm3 of that obtained / expected by the teacher. |

### CPAC 5: Researches, references and reports

| **Not achieved** | **Achieved** | **Exceeding CPAC standard** |
| --- | --- | --- |
| **5.1N Context**  Physics (Year 12):  Determination of *g* by free-fall method  **Observed**  The learner was asked by his teacher to report his findings. They were had difficulty processing their raw data using the calculator and there was some lack of understanding. The teacher intervened with support. The report produced was very brief and still contained some original errors. There was no evidence of any research conducted by the learner to support the practical work or analysis. | **5.1A Context**  Physics (Year 12):  Determination of *g* by free-fall method  **Observed**  Independent processing of raw data collected through the practical lesson was followed by a short, concise report being produced by the learner in their own words. They commented on the value of *g* obtained through calculation, and the significance of uncertainty. Several relevant research resources were included in the report, with the full url address and the time and date accessed. The learner had accessed more information than identified by the teacher. | **5.1E Context**  Physics (Year 12):  Determination of *g* by free-fall method  **Observed**  A full, detailed report had been completed in the learner’s own words, supported by extensive, relevant research resources that they had used to support the practical work. The learner used the Harvard system to reference. The learner had been keen to minimise uncertainty in the data collection and so had considered several ways of adapting the procedure. Scientific terminology had been used correctly throughout and a calculator used without error to process raw data to calculate *g*. |
|  | **5.2A Context**  Biology (Year 12):  Investigation into the effect of temperature on enzyme activity  **Observed**  The learner processed results to obtain an appropriate graph of rate (*1/t*) against temperature.  His report commented on the significance of the findings and contained two relevant websites whose URLs and date accessed were recorded. The report was written using his wording and was not simply 'cut and pasted' from websites. |  |
| **5.3N Context**  Any subject or Year: Physics Y12  Materials Report  **Observed**  Student presents information, which may be correct, but without any references or evidence of additional knowledge found from researching. | **5.3A Context**  Any subject or Year: Physics Y12  Materials Report  **Observed**  Student has identified a minimum amount of new information relevant to the material 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. | **5.3E Context**  Any subject or Year: Physics Y12  Materials Report  **Observed**  Student has taken the project seriously and researched a wide range of additional data to support how the internal structure of a material lends that material to a particular use. The references follow an accepted pattern and are complete. |
| **5.3N Context**  Biology (Year 12)  Investigation of plant mineral deficiencies  **Observed**  The learner’s preparatory research into relevant factors is poor, using only the textbook and, although he has read up on some of the theory, he has not considered how this would affect the practical work to be undertaken. No written record is made by the learner to say which source was used in his research. | **5.3A Context**  Biology (Year 12)  Investigation of plant mineral deficiencies  **Observed**  For the preparatory research into relevant factors, the learner uses Wikipedia and the textbook. She makes some notes in her lab book. Her written report has the URL for Wikipedia, along with the data and time accessed; and the title of the textbook used, the author, and the pages from which she obtained the information. She is aware that Wikipedia may not be a reliable source, but says that the information on the website agreed with her textbook. | **5.3E Context**  Biology (Year 12)  Investigation of plant mineral deficiencies  **Observed**  The learner’s preparatory research into relevant factors is poor, using only the textbook and, although he has read up on some of the theory, he has not considered how this would affect the practical work to be undertaken. No written record is made by the learner to say which source was used in his research. |

We’d like to know your view on the resources we produce. By clicking on [‘Like’](mailto:resources.feedback@ocr.org.uk?subject=I%20liked%20the%20A%20Level%20Biology,%20Chemistry,%20Physics%20CPAC%20Pen%20Portraits) or [‘Dislike’](mailto:resources.feedback@ocr.org.uk?subject=I%20disliked%20the%20A%20Level%20Biology,%20Chemistry,%20Physics%20CPAC%20Pen%20Portraits) you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click ‘Send’. Thank you.

If you do not currently offer this OCR qualification but would like to do so, please complete the Expression of Interest Form which can be found here: [www.ocr.org.uk/expression-of-interest](http://www.ocr.org.uk/expression-of-interest)

Looking for a resource? There is now a quick and easy search tool to help find free resources for your qualification: [[www.ocr.org.uk/i-want-to/find-resources/](http://www.ocr.org.uk/i-want-to/find-resources/)](http://www.ocr.org.uk/i-want-to/find-resources/)

**OCR Resources**: *the small print*OCR’s resources are provided to support the delivery of OCR qualifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.   
© OCR 2019 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content: n/a

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: [resources.feedback@ocr.org.uk](mailto:resources.feedback@ocr.org.uk)