

Teacher Resource Bank

GCE Human Biology 2405

Other Guidance:

- Investigative Skills Assessment: HBI6T
Teachers' Notes (Specimen ISA)



CONFIDENTIAL

The effect of substances on the growth of bacteria

Candidates will be required to investigate the effect of disinfectant concentration on the growth of a suitable bacterium.

Materials

Candidates should be provided with:

- a stock solution of a disinfectant (100%)
- appropriate apparatus to make 3 further concentrations (10%, 1% and 0.1%) by serial dilution.
- sufficient nutrient agar and Petri dishes available for a candidate to produce up to 4 per concentration.
- filter paper
- instrument for cutting discs from the filter paper
- instrument for measuring the size of the clear zone around each disc of filter paper
- incubator or means of keeping the agar plates at the same temperature

The use of 4 different concentrations of disinfectant should allow candidates the opportunity for a later meaningful comparison of the effect of two specific concentrations.

In this investigation, help may be given on:

- how to carry out a serial dilution
- how to inoculate an agar plate. [Suitable methods include the use of a lawn culture by use of a (glass) spreader, or the bacterium can be added to the nutrient agar when molten and before pouring into the Petri dish.]

The time for incubation allows for local circumstances and a visual check that

- bacterial growth has taken place before attempting measurements
- the plates do not dry out.

Candidates should be told to compare the effect of one concentration of disinfectant with another concentration of disinfectant where data has been obtained and some difference is apparent. [For example, the 10% solution might be compared with the 0.1% solution.]

In this investigation, you must not provide candidates with the following information:

- the number of repeats or when additional readings are required
- what variables to monitor or control
- the choice of statistical test to use
- How to interpret the results of the statistical test

Candidates should work individually to collect their own data in this investigation.

One week before sitting Stage 1 of the ISA you can inform your candidates:

You will be investigating the effect of substances on the growth of bacteria

Assessment of presentation of raw data (3 marks)

Candidates should be assessed on their ability to present raw data according to the following criteria.

- 1 mark -** Title given which relates the independent and dependent variables.
- 2 marks -** Column headings correctly identify both the independent and dependent variables with independent variable in first column.
- 3 marks -** Institute of Biology unit conventions followed.[Teachers are referred to the Institute of Biology publication, *Biological Nomenclature*, 3rd edition, 2000.]

Assessment of use of statistical test (3 marks)

Candidates should be assessed on their ability to use a statistical test according to the following mark scheme (**one mark** for each).

1. Null hypothesis clearly stated.
2. Choice of statistical test appropriate.
3. Valid reason for stated choice of statistical test.

General Guidance on carrying out ISAs

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Practical work should be carried out after candidates have practiced the necessary skills and after teaching the appropriate of sections of the specification. They should also be familiar with the apparatus they will be using.

It is the responsibility of the centre to ensure that practical activity works with the materials provided to the candidates.

Risk Assessment

It is the responsibility of the centre to ensure that a risk assessment is carried out before candidates carry out the practical work.

Stage 1: The Practical Work

This work should be carried out under controlled conditions in one or more practical sessions. Teachers will be in the best position to judge which is more appropriate for candidates in their own centre.

At the start of Stage 1, you should give each candidate a copy of the Task Sheet together with the appropriate apparatus and materials to carry out the investigation.

Candidates should present their results on the *Candidate Results Sheet*, which is the last page of the Task Sheet. Centres must not present candidates with a blank table for the candidate to complete.

At the end of each practical session the Teacher must collect the Task Sheet with the *Candidate Results Sheet* attached and keep them securely until the next stage.

The teacher assesses the candidates' work following the AQA marking guidelines.

Stage 2: Processing raw data

During this stage, candidates will process their raw data and carry out a suitable statistical test. They must do this in a single session, under controlled conditions with no communication with other candidates.

At the start of the session, the Teacher should return to the candidate

- their own Task Sheet
- their *Candidate Results Sheet*

It is the Teacher's responsibility to ensure that candidates are aware that they are not permitted to add to or amend their material from Stage 1.

Using these, the candidates should be instructed to:

- state the null hypothesis to be tested
- state the statistical test to be used
- state the reason for the choice of this test

- make appropriate calculations so that the null hypothesis can be supported or rejected

Stages 1 and 2 may be done in the same session.

At the end of this session, the Teacher must collect and keep secure:

- the Task Sheet
- the *Candidate Results Sheet*
- the null hypothesis and statistical test

The teacher assesses the null hypothesis and statistical test following the AQA marking guidelines.

Stage 3: The ISA written test 1 hour 15 minutes

Stage 3 should be undertaken as soon as possible after the Stage 2. This stage consists of an ISA written test provided by AQA which candidates must complete under controlled conditions.

At the start of the written test, you should provide each candidate with the following items.

- their own material from Stages 1 and 2
- a copy of the appropriate ISA written test.

It is the Teacher's responsibility to ensure that candidates are aware that they are not permitted to add to or amend their material from Stages 1 and 2.

Candidates should be instructed when they can begin the written test and should complete it without assistance.

At the end of the 1 hour 15 minutes, you should collect the work of all candidates. The teacher assesses the ISA written test following the AQA marking guidelines.

Administration

Candidates must not bring any paper-based materials into any of the session(s) or remove anything from them. Anything they require must be provided during the session. Mobile phones are not allowed.

Redrafting

Redrafting of the ISA is not allowed at any stage.

Modification

The Task Sheet gives candidates an outline of the investigation. The teacher may modify the Task Sheet to take account of the conditions and equipment available in the centre. Any modification must be discussed and agreed, in writing, with the Assessment Adviser, and must be notified to the moderator.

Guidance on discussion about the task

Any discussion must be of a general nature so that candidates are left to make their own decisions about key questions in the task sheet.

PSA skills

PSA should be assessed over the whole course of study. If, however, you have external candidates in your centre this investigation might be the only time that you will be able to assess their practical skills. Under these circumstances you may assess candidates' practical skills as they carry out the investigation.

Working in groups

Candidates may work in groups provided that any skills being assessed are the work of individual candidates. For A2, the processing of raw data and decisions about the statistical test must be the candidate's own work.

Information provided to candidates

A Supervisor must not give any advice to candidates about the way they are conducting experiments unless it is to prevent personal injury to the candidates or damage to apparatus. Unless specific mention to the contrary is made in the instructions, Supervisors must not give any advice or information to candidates, whether it is asked for or not.

Candidates absent for the practical work

A candidate absent for the practical work (Stage 1) should be given an opportunity to carry out the practical work before they sit Stage 2. This may be with another group or at a different time. Only when this is not possible, can the teacher supply a candidate with real data to be processed at Stage 2. In this instance no marks can be awarded for Stage 1. The use of class data should be notified to the moderator on the *Candidate Record Form*.

Can I discuss a completed 'live' ISA with a candidate?

Completed 'live' ISAs should be treated like examination papers and kept under secure conditions until the publication of results. Teachers may give candidates their unmoderated marks. Candidates must not be given access to their completed 'live' ISA.

Teachers may discuss issues relating to completed 'live' ISAs with candidates provided that

- the feedback is of a general nature
- no other candidates from the centre will be attempting the ISA and
- the discussion is with whole teaching groups.

Discussion, with individual candidates, of specific details of questions is not allowed.

Following publication of results ISAs which are no longer 'live' may be used for practice.