General Certificate of Education
Advanced Level Examination
June 2011

Human Biology HBI6T/P11/TN

Unit 6T A2 Investigative Skills Assignment

Teachers' Notes Confidential

A copy should be given immediately to the teacher(s) responsible for GCE Human Biology

Teachers' Notes

CONFIDENTIAL

These notes must be read in conjunction with *Instructions for the Administration of the Investigative Skills Assignment*: GCE Human Biology published on the AQA Website.

The effect of temperature on the rate of respiration of microorganisms such as those found in probiotic foods

Candidates are required to compare the time taken by yeast to remove the colour from methylene blue at two different temperatures.

Materials

In addition to access to general laboratory equipment, each candidate needs

- 25 cm^3 yeast culture, 200 g dm^{-3}
- 25 cm^3 methylene blue, 0.005%
- 200 cm^3 glucose solution, 10 g dm^{-3}
- distilled water
- at least 7 test tubes with a diameter in excess of 12 mm. To avoid rinsing between trials at the other temperature, 14 tubes would be needed
- test tube rack or large beaker to stand larger / boiling tubes in
- at least 7 test tubes with any diameter, could be standard size of approx 10 mm. To avoid rinsing between trials at the other temperature, 14 tubes would be needed
- test tube rack or beaker to stand test tubes in
- droppers, pipettes, syringes or measuring cylinders, suitable for measuring 10 cm^3 and 1 cm^3
- stop watch, clock or timer
- permanent marker or chinagraph pencil
- glass rod
- bungs or stoppers to seal boiling tubes
- thermostatically controlled waterbaths or large beakers of water to act as waterbaths. These should be available at about 25 °C, 40 °C and near to 100 °C. If waterbaths are not available, candidates must be given the means to set them up using beakers, Bunsen burner, heat-resistant mats, gauze, tripods, matches or spills
- thermometers to stand in the waterbaths, capable of reading between 20 °C and 100 °C. If possible, three should be available per candidate, or one in each waterbath

A copy of the AQA Students' Statistics Sheet is provided at the back of the Task Sheet. Candidates may refer to this during any Stage.

Managing the Investigation

Waterbaths should be set up in the laboratory at about 25 °C, 40 °C and near to 100 °C. If thermostatically controlled waterbaths are not available, large beakers of water may be used. Candidates should be supplied with kettles of hot water to top up the beakers as the water cools.

Each candidate is likely to need a minimum of 140 cm^3 glucose solution. This assumes they run 5 repeats of tube **X** at each temperature, and only one of **Y** and **Z**. Supplying 200 cm^3 per person will allow for wastage.

Each candidate will need 3 boiling tubes and 3 test tubes to start with. They are asked only to repeat tube **X**, but will need to keep one version of tubes **Y** and **Z**. The number of extra tubes they will need at each temperature will depend upon the number of repeats they run of tube **X**. A minimum would be 5 repeats. This would bring the total to 7 boiling tubes and 7 test tubes per candidate per temperature. Repeating at a different temperature could bring the total to 14 of each.

Technical Information

The yeast used was dried bakers' yeast bought in a local supermarket.

The dried yeast should be activated just before use. The 200 g dm^{-3} yeast culture should be made up in the following way, and multiplied up to give sufficient quantities.

Measure out 20 g dried yeast, and 100 cm^3 distilled water. The dried yeast should be poured into the water in a clean flask or beaker, stirred frequently, and left to start to respire.

The investigation was also found to be successful with 100 g dm^{-3} yeast culture. This could be trialled if time is not a problem. The reaction will take longer.

Some of our trials found that soaking the yeast in water for 10 minutes at room temperature meant the colour change in the subsequent experiment took about half an hour. Other trials took an hour to activate the yeast in warm water. There appear to be significant differences in yeast from manufacturer to manufacturer. The duration of soaking is not critical as long as the yeast is active, i.e., respiring, when it is used.

The task will need to be trialled before use. This is very important as the activity of different yeast products may vary.

Candidates **must not** be given information about an ISA assessment until one week before Stage 1.

One week before Stage 1 candidates should be given the following information:

You will investigate the effect of temperature on the rate of respiration of a microorganism found in a probiotic food.

There **must** be no further discussion and candidates **must not** be given any further resources to prepare for the assessment.

In this investigation, teachers must not give candidates the following information

- how long to leave the tubes in the waterbath before adding the yeast culture
- how many repeats to carry out of tube **X**
- which statistical test to carry out.