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| A picture containing drawing  Description automatically generated | **Year 11 General Biology**  **Task 5 – Factors affecting respiration rate** |

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| **Name:**  **Date:** | **Teacher:** |  |

## Task 5 Factors affecting respiration rate

**Assessment type:** Practical

**Conditions**

Time for the task:

* ***Part A: One lesson to carry out investigation and data collection***

* Part B: One lesson for in-class validation test

Part A is to be completed and submitted on the day of part B validation. You will be allowed your results for completion of part B

**Task Weighting 8%­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Part A : Conducting and Planning of Investigation**

**Introduction**

Long before yeasts were identified with the aid of a microscope, their effects were well known. A yeast is a single-celled fungus that is capable of multiplying rapidly in the right conditions. For centuries, they have been used for making alcohol (wine & beer) and bread. The enzymes produced by the yeast cells break sugars down into ethanol and carbon dioxide. This process is known as cellular respiration. In wines and beers, the carbon dioxide escapes and the ethanol remains in solution. In bread, the carbon dioxide causes the dough to rise and the alcohol is evaporated during baking.

**Purpose**

The process of respiration is influenced by a number of external and internal factors. The main external factors are temperature, light, oxygen supply, water supply and carbon dioxide concentrations. In this experiment, you will be investigating the effect of temperature on yeast growth.

who will collect and record the data to ensure you have enough to make valid conclusions.

A picture containing table

Description automatically generated**Materials required (per group)**

* 4 Test tubes
* 4 Stoppers with glass tube
* Metal washers
* 2L beaker
* Water bath
* Thermometer
* 20% sugar solution ( 20 mls per test tube)
* 4 Timers
* Balance scale
* 2 Weight boat
* Yeast ( 2 grams per test tube)
* 25mL measuring cylinder
* Test tube rack
* Test tube holder
* 2 Spoons

**Method**

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Description automatically generatedYou will need to conduct this investigation in four parts. Each part of the experiment will have a different water bath.

Part A – Ice Bath low temperature

Part B – Room Temperature Bath medium temperature

Part C – Water bath temperature (35-40 0C)

Part D – Water bath very high temperature (greater than 60 0C)

**Part A- ICE BATH**

1. Label your test tube with ‘1’, ‘2’ and ‘3’. To each test tube add 20 mL of 20% glucose solution and 2 grams of yeast. Shake slightly to mix the yeast and glucose.
2. Into each test tube insert a stopper with glass tubes attached. Make sure it is a firm fit. The glass tube must not have any liquid in it and the bottom must be above the yeast/glucose suspension.
3. Fill the 2L beaker with water and place in ice bath and record the temperature. Try to maintain the water bath at this temperature throughout the activity by replacing some of the water, if necessary, with ice water or hot water.
4. Submerge the three stoppered test tubes in the 2L beaker. The tubes must be totally under water. If they tend to float, use metal washers to ‘weight’ each tube. Leave the tubes in the water bath for 3 minutes, then commence counting the number of bubbles released per minute from each tube for 10 minutes.
5. Record your data into the table below.

Yeast respiration rate at \_\_\_\_\_\_\_\_\_\_\_\_\_ 0C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Number of bubbles per minute | | | |
| Tube 1 | Tube 2 | Tube 3 | Average |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**Part B- ROOM TEMPERATURE**

1. Repeat steps 1-4 in Part A and change the water bath temperature to ROOM TEMPARTURE. Also ensure that you use clean test tubes and stoppers.
2. Record your data in the table below.

Yeast respiration rate at \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 0C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Number of bubbles per minute | | | |
| Tube 1 | Tube 2 | Tube 3 | Average |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**Part C- WATER BATH 30-40 0C**

1. Repeat steps 1-4 in Part A and change the water bath temperature to 30-40 0C. Also ensure that you use clean test tubes and stoppers.
2. Record your data in the table below.

Yeast respiration rate at 35 0C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Number of bubbles per minute | | | |
| Tube 1 | Tube 2 | Tube 3 | Average |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**Part D- WATER BATH 70 0C**

1. Repeat steps 1-4 in Part A and change the water bath temperature to greater than 70 0C. Also ensure that you use clean test tubes and stoppers.
2. Record your data in the table below.

Yeast respiration rate at 70 0C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Number of bubbles per minute | | | |
| Tube 1 | Tube 2 | Tube 3 | Average |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

# **Questions**

1. Write a likely aim for this investigation.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. State the variables that affect this investigation.

Independent (change) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent (measure) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Control (same): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write a likely hypothesis for this investigation

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Calculate the average in each of the above result tables.
2. Enter the average form Parts A-D in the table below to allow easier interpretation of results.

Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Average gas bubbling rate at different temperatures | | | |
| Low | Medium | High | Very high |
| (temp. 4 0C) | (temp. 18 0C) | (temp. 35 0C) | (temp. 70 0C) |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**END OF PART A**

|  |  |  |  |
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| A picture containing clipart  Description automatically generated | **Year 11 General Biology**  **Task 5 – Factors affecting respiration rate** | | |
| **Name:**  **Date:** | | **Teacher:** | **Score: /24** | |

## Task 5 Factors affecting respiration rate

**Assessment type:** Practical

**Conditions**

Time for the task:

* Part A: One lesson to carry out investigation and data collection

* ***Part B: One lesson for in-class validation test***

**Task Weighting 8%­­­­­­­­­­­**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Task**

*A student from Byford College carried out an investigation to see the effects of temperature on the rate of respiration in yeast, similar to the we did in class. The table of results are extracts from a student’s report on his investigation.*

*Your task is to study the table, graph the data and answer the questions that follow to validate the results you have received and verify you have learnt the concept.*

**Results table** - Yeast respiration rate at different temperatures.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (min) | Average gas bubbling rate at different temperatures | | | |
| Low | Medium | High | Very high |
| (temp. 5 0C) | (temp. 20 0C) | (temp. 35 0C) | (temp. 72 0C) |
| 1 | 0 | 5.66 | 2.66 | 0 |
| 2 | 0 | 6.66 | 2.66 | 0 |
| 3 | 0.66 | 8.33 | 3 | 0.33 |
| 4 | 0.33 | 9.33 | 3 | 1 |
| 5 | 1.33 | 10 | 4 | 0.5 |
| 6 | 1.33 | 9.66 | 4 | 0.33 |
| 7 | 0.66 | 11.3 | 4 | 0 |
| 8 | 2 | 10 | 3 | 0.33 |
| 9 | 1.66 | 9.3 | 3 | 0.33 |
| 10 | 1 | 10 | 4 | 0.25 |

**Questions:**

Answer all questions in the space provided.

On the graph paper provided draw a graph of the data from the table above.

( 5 marks )

1. Identify the **variables** that affect this investigation.

Independent variable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark )

Dependent Variable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 1 mark )

Control variable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 2 mark )

1. Write a likely hypothesis for the investigation. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How would the student ensure that his investigation is reliable? (1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Looking at the results for ‘high temperature’, describe what occurred between 1 to 10 minutes (use data to support your statements). (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Using your scientific knowledge of cellular respiration, suggest a reason for your answer to question 4. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Describe using data, the effect of temperature on the rate of yeast respiration in a glucose solution.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 3 marks )

1. What is the optimum (best) temperature for the rate of yeast respiration?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_( 1 mark )

1. What can you conclude from his overall results on the yeast respiration rate at different temperatures? (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain how this experiment could be improved in two specific ways. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Give the word equation for cellular respiration.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 1 mark )

**End of Assessment**