Surname	Centre Number	Candidate Number
Other Names		2

GCE A LEVEL

1400U50-1A

S18-1400U50-1A

BIOLOGY – A2 unit 5

Practical Examination

Experimental Task

TEST 1

TUESDAY, 1 MAY 2018

2 hours

For Teacher's use only Award a mark of 0 or 1 for each of the following	
Correct measurement of volumes	
Accurate measurement of time	

For Examiner's use only	
Mark Awarded	
Total	

1400U501A
01

ADDITIONAL MATERIALS

In addition to this examination paper, you will require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Pencil may be used to draw tables and graphs.
Write your name, centre number and candidate number in the spaces at the top of this page.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The total number of marks available for this task is 20.
Your teacher will directly assess your practical skills.
The number of marks is given in brackets at the end of each question or part question.
You are reminded of the necessity for orderly presentation in your answers.

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1. Copper sulfate ($CuSO_4$) is used as a pesticide and is toxic if ingested. In humans, copper sulfate interacts with the iron-containing haem group in haemoglobin and reduces its ability to transport oxygen.

Catalase is an enzyme that also contains iron and is known to be inhibited by copper sulfate. This enzyme breaks down toxic hydrogen peroxide into water and oxygen.

$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

In this investigation you are going to determine the type of enzyme inhibition caused by copper sulfate.

Follow these instructions carefully

You are provided with:

1. yeast suspension (approximately 10 cm^3)
2. 0.1 mol dm^{-3} copper sulfate ($CuSO_4$) solution (approximately 5 cm^3)
3. 2, 4, 6, 8 and 10 vol hydrogen peroxide (H_2O_2) (approximately 50 cm^3) in labelled beakers
4. 250 cm^3 beaker of distilled water
5. 1 × 10 cm^3 measuring cylinder
6. 2 × 5 cm^3 syringes
7. 2 × 1 cm^3 syringes
8. 2 × 100 cm^3 beakers
9. 10 × test tubes
10. 2 × test tube racks
11. 20 × discs of filter paper cut with hole punch
12. 1 × forceps
13. 1 × stop clock
14. 2 × glass rods
15. 2 × pipettes
16. 1 × marker pen or labels
17. paper towels
18. eye protection

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YOUR TEACHER WILL BE OBSERVING YOUR EXPERIMENTAL TECHNIQUE. [2]

Method

1. Measure 5 cm^3 of yeast suspension using a 5 cm^3 syringe and transfer the yeast suspension to a 100 cm^3 beaker.

2. Add 1 cm^3 distilled water to the yeast suspension in the beaker using a 1 cm^3 syringe and mix well with a glass rod.

3. Use a measuring cylinder to measure 10 cm^3 of 10 vol H_2O_2 and place this in a test tube.

4. Using the forceps, dip a disc of filter paper in the yeast suspension and then drop the disc into the 10 cm^3 of H_2O_2. Make sure that you are only using a single disc of filter paper each time. Record the time taken for the disc to sink and rise to the top.

5. Remove the disc and wash the forceps in the beaker of distilled water and dry on a paper towel.

6. Using a **new paper disc** and **the same H_2O_2 solution**, repeat steps 4 and 5 to obtain one further reading for 10 vol H_2O_2.

7. Repeat steps **3** to **6** for 8, 6, 4 and 2 vol H_2O_2.

8. Measure another 5 cm^3 of yeast suspension using another 5 cm^3 syringe and place in a separate 100 cm^3 beaker.

9. Use a 1 cm^3 syringe to add 1 cm^3 of $CuSO_4$ to the yeast suspension and mix well.

10. Repeat steps **3** to **7** using the yeast suspension and $CuSO_4$ mixture.

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Examiner only

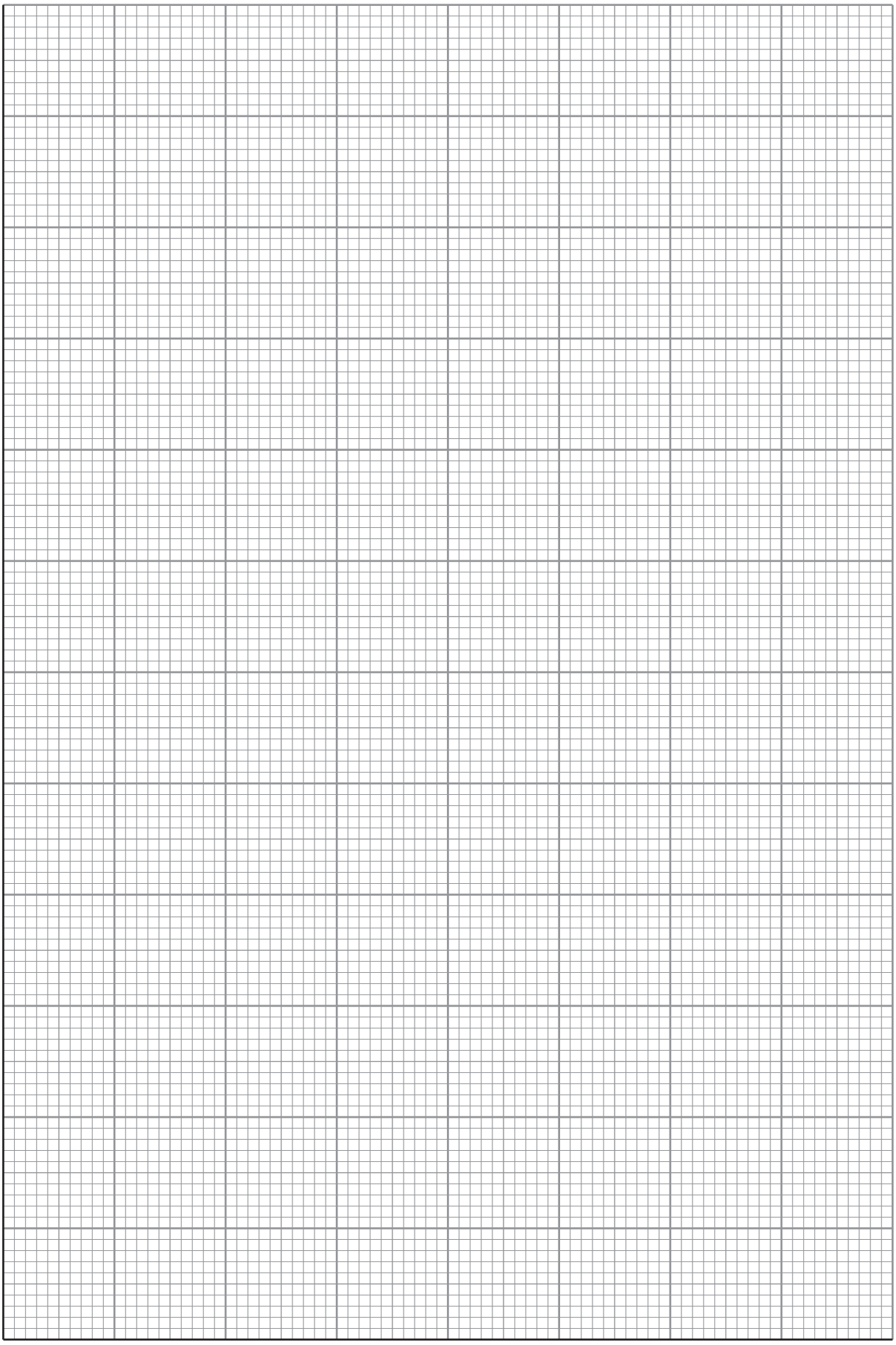
Record your rough results in the space below and use this space to calculate the mean time for the paper disc to sink and rise to the top for each concentration of H_2O_2 using yeast with water and yeast with $CuSO_4$.

(a) Construct a suitable table to show all of your data, including the mean time taken for the disc to sink and rise to the top at each concentration of H_2O_2, for yeast with water and for yeast with $CuSO_4$. [4]

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(b) Plot the **mean time taken for the disc to fall and rise to the top** for both yeast with water and yeast with $CuSO_4$ on the grid below. You should use the **same** axes for both sets of results. (No range bars are required.) [7]

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(c) (i) A student concluded that the $CuSO_4$ was acting as a non-competitive inhibitor. To what extent do your results agree with this conclusion? Explain your answer. [2]

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(ii) Suggest **three** sources of inaccuracy in this method and an improvement for each. [3]

Inaccuracy 1: .....

Improvement .....

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Inaccuracy 2: .....

Improvement .....

.....

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Inaccuracy 3: .....

Improvement .....

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(iii) Comment on the reliability of your means and suggest how it could be improved. [2]

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END OF PAPER

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