Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6421459044

CO-ORDINATED SCIENCES **0654/63**

Paper 6 Alternative to Practical **May/June 2023**

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 60.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

DC (PQ/CT) 314768/2

1 Fig. 1.1 shows a photograph of a flower.

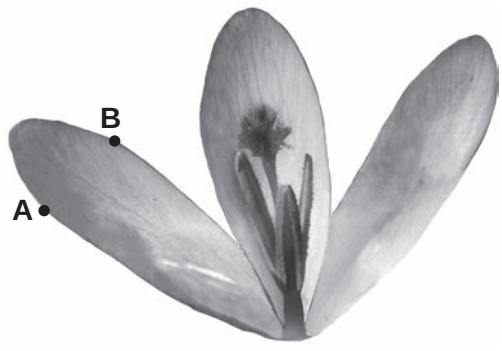

Fig. 1.1

(a) In the box, make a large and detailed pencil drawing of the flower.

Include the internal parts of the flower.

[3]

(b) (i) Draw a line to join points **A** and **B** on Fig. 1.1.

Measure the length of this line **AB** in millimetres to the nearest millimetre.

length of line **AB** on Fig. 1.1 = ... mm [1]

(ii) Draw a line on your drawing in **(a)** in the same place as **AB** on Fig. 1.1.

Measure the length of this line in millimetres to the nearest millimetre.

length of line **AB** on your drawing = ... mm [1]

(iii) Use your measurements in **(b)(i)** and **(b)(ii)** to calculate the magnification *m* of your drawing.

Use the equation shown.

$$m = \frac{\text{length of line } \mathbf{AB} \text{ on your drawing}}{\text{length of line } \mathbf{AB} \text{ on Fig. 1.1}}$$

Record your value to **two** significant figures.

magnification *m* = ... [2]

(c) Fig. 1.2 shows a flower at the same magnification as the flower in Fig. 1.1.

Fig. 1.2

(i) Describe three **visible** differences between the flower in Fig. 1.1 and the flower in Fig. 1.2.

difference 1 .....

difference 2 .....

difference 3 .....

[3]

(ii) Add a line labelled anther to identify an anther on Fig. 1.2. [1]

[Total: 11]

2 A student investigates the action of three different concentrations of an enzyme on milk protein.

Milk contains a protein that makes it look white (opaque).

When the protein is broken down, the milk becomes clear.

(a) Procedure

The student:

- labels four test-tubes **A**, **B**, **C** and **D**
- adds 5 cm^3 of enzyme solution of four different concentrations as shown in Table 2.1
- adds 2 cm^3 of milk to each test-tube
- uses a glass stirring rod to mix the contents of each test-tube and then starts a stop-watch
- measures the time it takes for the milk in each test-tube to become clear
- records in Table 2.1 these times to the nearest second; if the milk does not clear after 5 minutes, the result is recorded as >300.

(i) State the name of a piece of apparatus suitable for measuring 2 cm^3 of milk.

..... [1]

(ii) Fig. 2.1 shows the reading on the stop-watch for test-tube **A**.

Record this time in Table 2.1.

Fig. 2.1

Table 2.1

test-tube	percentage concentration of enzyme	time / s
A	4	
B	2	133
C	1	196
D	0	>300

[1]

(b) Use Table 2.1 to state the relationship between the concentration of the enzyme and the time it takes for the milk to clear.

.....

..... [1]

(c) (i) Explain why it is important to mix the contents of the test-tubes.

.....

..... [1]

(ii) Suggest how a student alters the procedure to investigate the action of this enzyme on a protein solution which is already clear.

.....

..... [1]

(d) (i) The thermometer in Fig. 2.2 shows the temperature of the room.

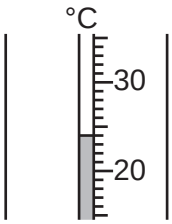

Fig. 2.2

Record the temperature of the room.

temperature of the room = ... °C [1]

(ii) Increasing the temperature increases the rate that an enzyme breaks down a protein.

The student repeats the procedure in **(a)** at 35 °C.

Suggest the effect of increasing temperature on the times taken for the milk to become clear in test-tubes **A**, **B** and **C**.

.....

..... [1]

(iii) Suggest why there is no effect on the time taken for the milk to become clear in test-tube **D**.

.....

..... [1]

(iv) The enzyme in this investigation denatures (stops working) at temperatures above 55 °C.

The student repeats the procedure in **(a)** at 75 °C.

Predict the results the student obtains.

.....

..... [1]

[Total: 9]

3 A student investigates the rate of reaction between solution **H** and solution **K**.

When solutions **H**, **K** and starch are mixed together, a blue-black colour is seen after a period of time.

When the concentration of solution **H** is changed, the time taken for the blue-black colour to appear changes.

(a) Procedure

The student:

- adds 2 cm^3 of solution **H** into a conical flask
- adds 8 cm^3 of distilled water into the conical flask
- adds 5 drops of starch solution into the conical flask
- adds 10 cm^3 of solution **K** into the conical flask, swirls the flask and immediately starts a stop-watch
- stops the stop-watch when the solution turns blue-black
- records in Table 3.1 the time taken *t* in seconds to the nearest second.

The student repeats the procedure using the other volumes shown in Table 3.1.

Table 3.1

volume of solution **H** / cm^3	volume of distilled water / cm^3	drops of starch solution	volume of solution **K** / cm^3	time taken *t* / s
2	8	5	10	118
4	6	5	10	
6	4	5	10	34
8	2	5	10	17
10	0	5	10	8

(i) The student uses different measuring cylinders to measure the volumes of solution **H** and solution **K**.

Explain why the student uses different measuring cylinders.

.....

..... [1]

(ii) The substance made when solution **H** and solution **K** react together turns the starch solution blue-black.

Identify the substance made.

..... [1]

(iii) Fig. 3.1 shows the reading on the stop-watch for 4 cm^3 of solution **H**.

Fig. 3.1

Record in Table 3.1 this time in seconds to the nearest second. [1]

(b) (i) On the grid, plot a graph of time taken *t* (vertical axis) against the volume of solution **H**.

[3]

(ii) Draw the line of best fit. [1]

(iii) Use your graph to estimate the time taken for the mixture to turn blue-black when 5.5 cm^3 of solution **H** and 4.5 cm^3 of distilled water are used.

Show on your graph how you arrived at your answer.

time taken *t* = ... s [2]

(c) When distilled water is added to solution **H**, the solution becomes less concentrated.

(i) State the relationship between the concentration of solution **H** and the time taken for the reaction.

.....

..... [1]

(ii) State the relationship between the concentration of solution **H** and the rate of reaction.

.....

..... [1]

(d) Suggest what the student does to have more confidence in their results.

.....

..... [1]

(e) Suggest why the experiment is **not** done using 10 cm^3 of distilled water and 0 cm^3 of solution **H**.

.....

..... [1]

[Total: 13]

4 A student does a series of tests to identify solution **L**.

Solution **L** gives:

- a white precipitate when tested with both a few drops of aqueous sodium hydroxide and with excess aqueous sodium hydroxide
- a colourless solution when tested with both a few drops of aqueous ammonia and with excess aqueous ammonia
- a white precipitate when carbon dioxide is bubbled into it.

The student also adds a liquid that shows that solution **L** is weakly alkaline.

(a) Complete a results table to show all the tests and all the observations made by the student.

[6]

(b) State the identity of solution **L**.

..... [1]

[Total: 7]

5 A student measures the density of plasticine (modelling clay) by two different methods.

Method 1

(a) Procedure

The student:

- places a piece of plasticine onto a top-pan balance
- records the mass *m* of the plasticine.

Fig. 5.1 shows the reading on the balance.

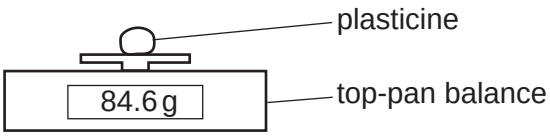

Fig. 5.1

Record the mass of the plasticine to the nearest gram.

m = ... g [1]

(b) (i) Procedure

The student:

- pours water into a measuring cylinder
- records in Table 5.1 the volume V_1 of water in the measuring cylinder
- uses a thread to lower the plasticine into the measuring cylinder until it is completely immersed
- records in Table 5.1 the new volume V_2.

Fig. 5.2 shows the reading V_2 on the measuring cylinder.

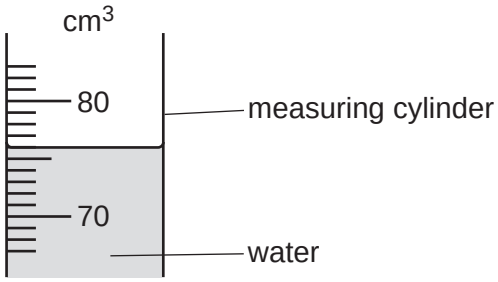

Fig. 5.2

Record in Table 5.1 the reading on the measuring cylinder.

Table 5.1

V_1 / cm^3	V_2 / cm^3
31	

[1]

(ii) Use the values of V_1 and V_2 to calculate the volume V of the piece of plasticine.

V = ... cm^3 [1]

(iii) State **one** precaution that the student takes when reading the volume of water in a measuring cylinder to obtain an accurate reading.

.....

..... [1]

(c) Suggest why the mass of the plasticine is measured before its volume is measured.

.....

..... [1]

(d) Use your answers to **(a)** and **(b)(ii)** to calculate the density ρ_1 of the plasticine.

Use the equation shown.

$$\rho_1 = \frac{m}{V}$$

Give the unit for your answer.

ρ_1 = ... unit ..... [2]

Method 2

(e) Procedure

The student:

- removes the plasticine from the measuring cylinder
- dries the plasticine with a paper towel
- moulds the plasticine into a shape that approximates to a sphere
- places the plasticine between two wooden blocks
- uses a ruler to measure the diameter d_1 of the sphere of plasticine in centimetres to the nearest 0.1 cm.

Fig. 5.3 is a full-size diagram that shows how the student arranges the wooden blocks and the sphere.

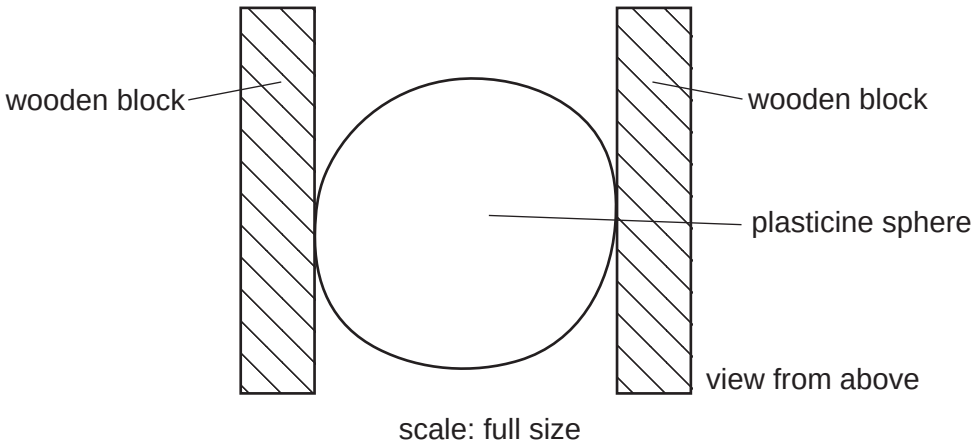

Fig. 5.3

(i) Suggest why the wooden blocks must be parallel to one another.

.....

..... [1]

(ii) Use a ruler to measure the horizontal diameter d_1 of the sphere of plasticine in centimetres to the nearest 0.1 cm.

d_1 = ... cm [1]

(iii) The student rotates the sphere and measures the diameter d_2 of the sphere across a different part of the sphere.

d_2 = 4.4 cm

Use the values of d_1 and d_2 to calculate the average diameter D of the sphere.

D = ... cm [1]

(f) Calculate the volume V_S of the plasticine sphere.

Use the equation shown.

$$V_S = 0.52D^3$$

V_S = ... cm^3 [1]

(g) Use your answers to **(a)** and **(f)** to calculate the density ρ_2 of the plasticine.

Use the equation shown.

$$\rho_2 = \frac{m}{V_S}$$

ρ_2 = ... [1]

(h) Compare your answers for the density of plasticine from **(d)** and **(g)**.

Suggest **one practical** reason why the values are different.

.....

..... [1]

[Total: 13]

6 Plan an investigation to find out if the material from which a spring is made affects the extension of the spring when it is stretched by a load.

You are provided with:

- springs made from aluminium, steel, iron and nickel
- a set of 100 g masses, together with a hanger
- boss, stand and clamp.

You may use any other common laboratory apparatus.

In your plan include:

- any other apparatus needed
- a brief description of the method, including what you will measure and how you will make sure your measurements are accurate
- the variables you will control
- a results table to record your measurements (you are **not** required to enter any readings in the table)
- how you will process your results to draw a conclusion.

You may include a labelled diagram if you wish.

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..... [7]

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