

Section A

Question 1

1. The table below shows the results of an investigation in which the effect of temperature and light on the yield of tomatoes in two greenhouses on a farm was investigated.

TEMPERATURE (°C)	AVERAGE YIELD OF TOMATOES PER PLANT (kg)	
	LOW LIGHT LEVELS	HIGH LIGHT LEVELS
5	0,5	0,5
10	1,5	2,5
15	3,0	5,0
20	3,6	8,5
25	3,5	7,8
30	2,5	6,2

- 1.1 State TWO steps the investigator may have taken into consideration during the planning stage of the investigation. (2)
- 1.2 Identify the:
- (a) Independent variables (2)
 - (b) Dependent variable (1)
- 1.3 Plot bar graphs on the same system of axes showing the results of the average yield of the tomatoes from 20°C to 30°C for both light levels. (6)
- 1.4 State ONE way in which the scientists could have improved the reliability of the investigation. (1)
- (12)**

Question 2

The root of an onion is a rapidly growing part of an onion. Many cells will be in different stages of mitosis. A sample of an onion tip was stained and studied under a microscope. Various phases of mitosis were identified in the table below.

	Number of cells counted in 3 different slides			
	Slide 1	Slide 2	Slide 3	Total
Interphase	47	49	58	154
Prophase	5	7	18	30
Metaphase	2	4	1	7
Anaphase	10	10	2	22
Telophase	4	4	4	12

2.1 Which phase produces the:

(a) Highest number of cells (1)

(b) Lowest number of cells (1)

2.2 Calculate the percentage of cells produced during prophase. Show ALL calculations (3)

(5)

Question 3

3.1 The table illustrates the rate of water absorption by roots and the rate of transpiration by leaves.

Time	Rate of water absorption (ml/hour)	Rate of transpiration (ml/hour)
06h00	1.5	0.5
08h00	1.5	2.0
10h00	3.2	4.5
12h00	4.5	6.0
14h00	5.7	7.4
16h00	7.6	9.3
18h00	8.0	5.5

3.1.1 Draw line graphs on the same set of axes to illustrate the results. (6)

3.1.2 By using the information in the table, indicate the time the sun rises. Motivate your answer. (2)

(8)

3.2 Diabetes insipidus (dilute urine) is a disease caused by a lack of ADH

secretion into plasma. Scientists wanted to determine the effect of this disease on the volume of urine that a person produces per day. The investigation was carried out on 5 male participants over a period of 30 days. The males were of

similar age and weight. Their average daily urine production was calculated and recorded in the table below.

NOTE: Normal daily urine production is between 600 ml – 1800 ml.

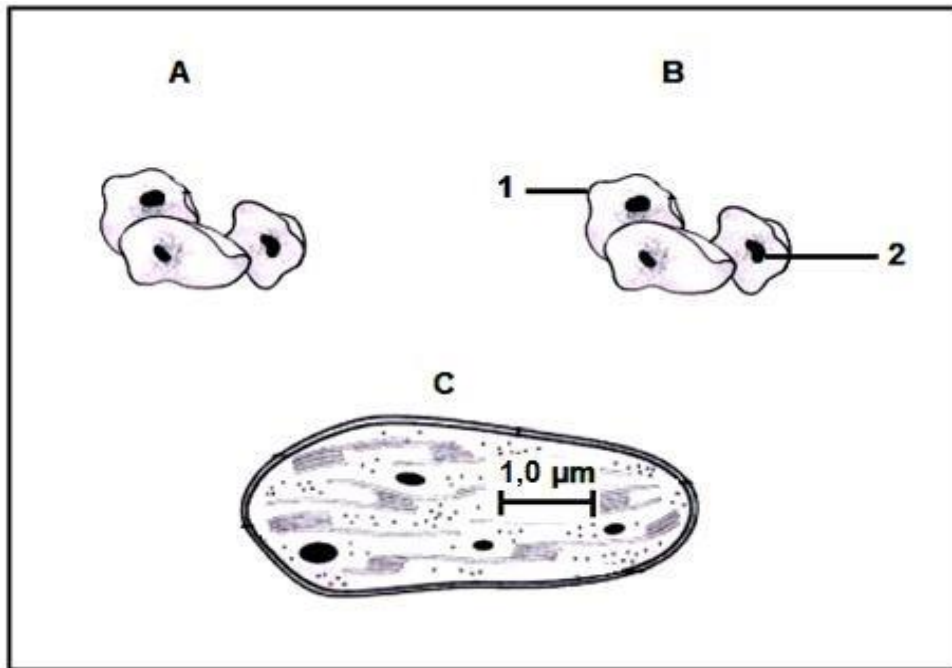
Individual	Average volume of urine produced in ℓ/day
1	2,9
2	1,5
3	1,3
4	1,0
5	1,2

- 3.2.1 Which individual would the scientists suspect of having Diabetes insipidus? (1)
- 3.2.2 Give a reason for your answer to QUESTION 3.2.1. (1)
- 3.2.3 Identify the dependent variable for this investigation. (1)
- 3.2.4 Identify TWO factors that should be kept constant during the investigation. (2)
- 3.2.5 Provide ONE precaution (safety measure) that the scientists needed to take when they conducted this investigation. (1)
- 3.2.6 State TWO ways in which the scientists improved the reliability of the investigation. (2)
- 3.2.7 Draw a pie chart of the information in the table. Show ALL calculations. (6)

(14)

Question 4

Diagram C is a chloroplast as seen on a micrograph.



Remember: 1000 μm (micron) = 1 mm

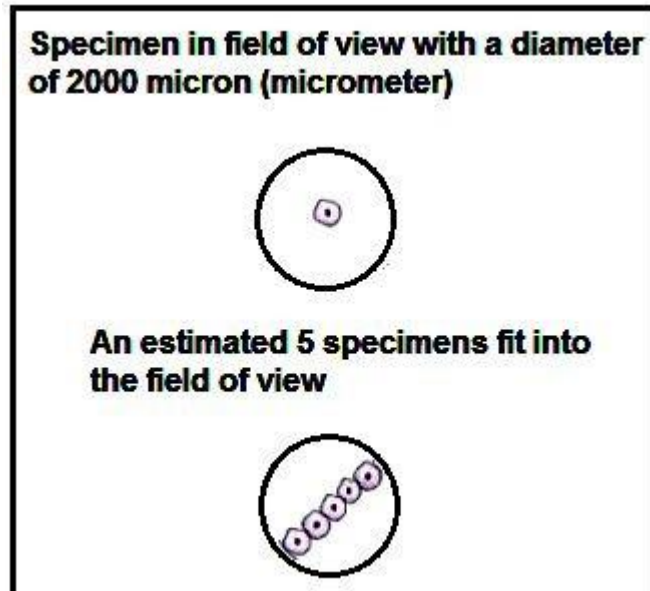
4.1 Use a ruler to measure the actual length of the scale and the length of the full specimen of **(diagram C)**. Use your answers to calculate the actual length of the chloroplast.

$$\text{Actual length of chloroplast} = \frac{\text{measured length of specimen} \times \text{length on scale}}{\text{measured length on scale}}$$

Show all working and give the answer in microns (μm).

(3)

4.2 The following diagram shows the actual field of view (FOV) of only one cell in **Question 4.1 (diagram A)**.



4.2.1 Calculate the estimated size of the specimen of one epithelium cell. Show your working and give the answer in microns (μm).

(3)

(6)

Total = 45