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LIFE SCIENCES: PAPER III
MEMO

13 November 2023

Time: 1,5 hour
Examiner: Ms T du Toit

Total: 50
Moderator: Mrs P du Toit

Invigilators are asked to please complete the following after the examination.

CRITERIA		
Following instructions	0	1
Test tube arrangement	0	1
Manipulation	0	1
Total		/3

For Markers USE ONLY

		Possible mark	Student mark
PART 1	Practical	3	
	Questions	32	
PART 2	Questions	15	
TOTAL		50	

Please read the Information Sheet carefully before you start. There are two parts to this question paper. Part 1 – a practical investigation and Part 2 – experiment design.

PART 1 PRACTICAL INVESTIGATION

You are going to investigate the Vitamin C content of each sample given using the simple method explained below.

Before you begin your investigation, make sure you have the following equipment at your workstation:

- Four test tubes
- One test tube rack
- One marking pen
- Two 10 ml syringes
- One 100 ml beaker with water (to clean syringes each time to prevent contamination)
- Four bottles with various samples:
 - Apple juice
 - Lemon juice
 - Orange juice
 - Ascorbic acid solution
- Four kebab sticks for stirring (to stir each sample to prevent contamination)
- One dropper / pipette
- Methylene blue

1. Mark each of the four test tubes A, B, C and D with the marking pen.
2. Using a syringe add 20ml of ascorbic acid solution to A.
3. Using a syringe add 20 ml of apple juice to B.
4. Using a syringe add 20 ml of lemon juice to C.
5. Using a syringe add 20 ml of orange juice to D.
6. Using a dropper or pipette add one drop of methylene blue to test tubes A,
7. Stir each test tube with the kebab stick provided.
8. Arrange test tubes A, B, C and D in the test tube rack from the greatest vitamin C content starting left to the least vitamin C content on the right.

CALL THE INVIGILATOR BEFORE PROCEEDING FURTHER

9. Complete the table below to indicate the sample, colour change and vitamin C content (high or low). (7)

Table showing the colour change of four samples: Ascorbic acid, apple juice, lemon juice and orange juice when tested for vitamin C.

Sample	Colour change	Vitamin C content
A	Light pink/colourless – pale green	High
B	Golden – dark green	Low
C	Milky light yellow – light milky green	High
D	Orange – bright greens	High

10. Write a conclusion for this investigation. (2)

Solution A (Ascorbic acid) has the highest concentration of Vitamin C, as the colour change in solution A resulted in the lightest colour. Solution B (Apple juice) has the least amount of Vitamin C, the colour change was the darkest.

11. What is the dependant variable in this investigation? (1)

Colour change of sample

12. Identify TWO controlled variables relevant to this investigation and explain how they were controlled.

The volume of each sampled added – 20ml using a syringe

The amount of methylene blue added – 1 drop using a dropper or pipette (4)

13. This type of an investigation is referred to as a qualitative and not quantitative investigation. Explain what the difference is between a qualitative and quantitative investigation. (2)

Qualitative investigations involve looking at colour changes etc.

Quantitative investigations will have results that are measurable (in numbers).

14. Aside from the colour change in the test tube, what other way could a scientist determine the vitamin C content in a sample? (2)

He/she could run a quantitative test on the sample to determine the accurate amount of vitamin C.

15. Is there a control present in this investigation? What is the importance of a control being present? (2)

No there is no control. The control would be a sample containing no vitamin C. A control is done to compare the results to ensure the correct variable is being tested, thus ensuring the investigation is accurate and a fair representation.

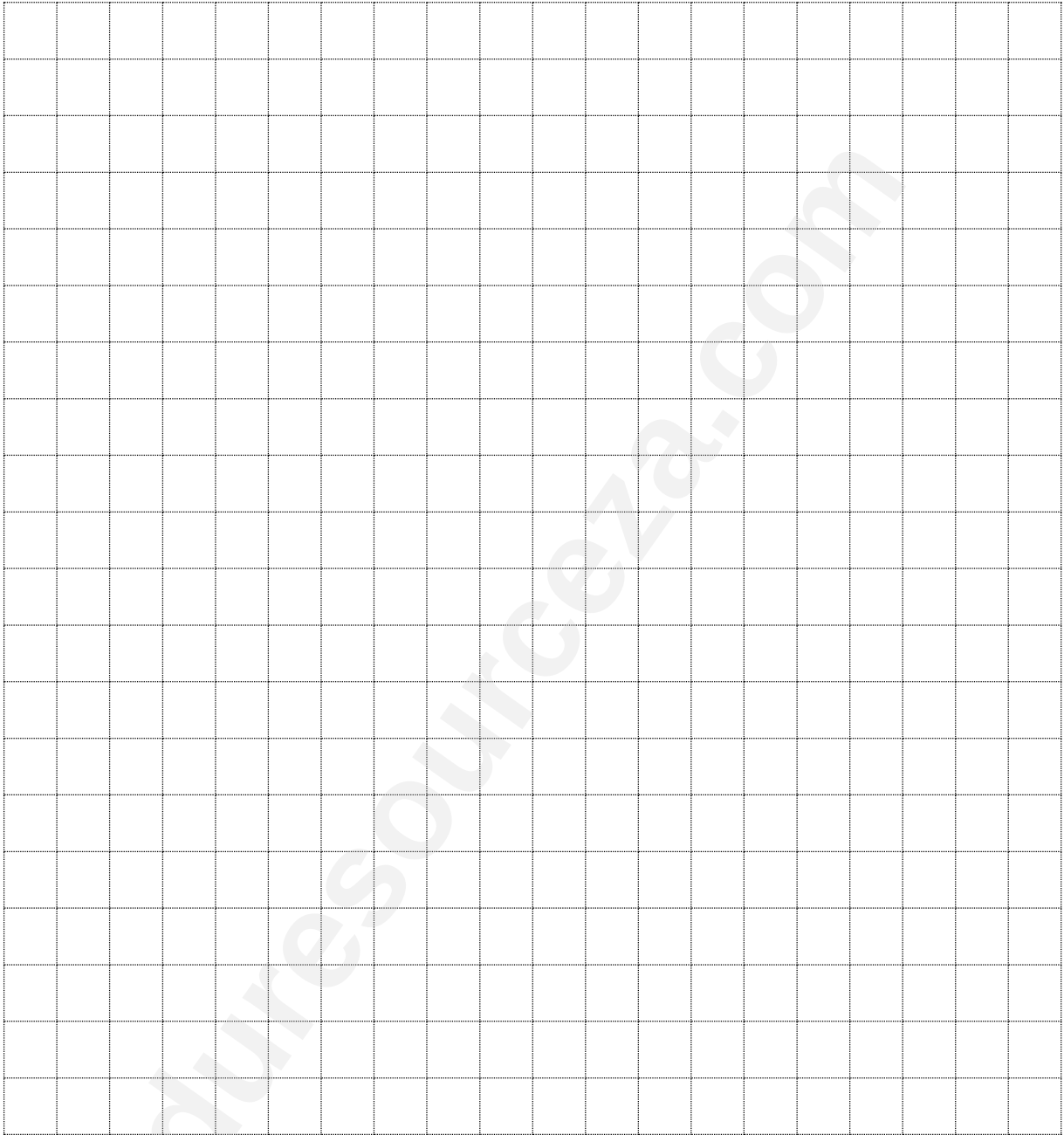
16. How could you increase the reliability of the results for this investigation? (2)

Increase the number of each sample being tested.
Repeat the experiment several times.

17. It may not be the cure for the common cold; however, it is thought to help prevent more serious complications. Benefits of Vitamin C include protection against immune system deficiencies, cardiovascular disease, prenatal health problems, eye disease and skin wrinkling. Doctors recommend taking 500 milligrams of Vitamin C per day in order to maintain a healthy body.

Draw a bar graph in the space on the next page to represent the following food types and the amount of vitamin C (mg) in each type of food. (10)

Table showing the vitamin C content of various foods per serving.		
Food	Serving	Vitamin C content (mg)
Spinach (cooked)	1 Cup	17.6
Tomato (raw)	1 (medium)	15.6
Banana	1 (medium)	10.3
Apple	1 (medium)	8.4
Peach	1 (medium)	9.9



[32]

PART 2 EXPERIMENTAL DESIGN

You have been provided with three samples of carrot juice. One sample was made from raw carrots, one sample was made from carrots cooked for a few minutes at 30°C and the last sample was made from carrots cooked at 60°C for 10 minutes. Research has shown that Vitamin C is destroyed at high temperatures. You have been asked to design a simple investigation to determine the Vitamin C content in the samples.

1. Provide a hypothesis for your investigation. (3)
If carrots are cooked high temperatures then they will contain less Vitamin C.
2. State the independent variable. (1)
Treatment of the carrots
3. State the dependent variable. (1)
Colour change of solution/Vitamin C content
4. What do you expect the conclusion for your investigation to be? (2)
The carrot juice containing carrots that were cooked at 60°C will contain less Vitamin C, whereas the carrot juice made from raw carrots will contain the most Vitamin C.

QUESTION 5 ON THE NEXT PAGE

5. Outline your method in the simplest way, using numbered points. (8)

1.	Mark each of the three test tubes A, B, and C with the marking pen.
2.	Using a syringe add 20ml of carrot juice made from raw carrots to A.
3.	Using a syringe add 20 ml of carrot juice made from carrots cooked at 30°C to B. to B.
4.	Using a syringe add 20 ml of carrot juice made from carrots cooked at 60°C to C.
5.	Using a dropper or pipette add one drop of methylene blue to test tubes A, B, and C. respectively.
6.	Stir each test tube with the kebab stick provided.
7.	Arrange test tubes A, B, and C in the test tube rack from the greatest vitamin C content starting left to the least vitamin C content on the right.
8.	Record the results of the colour changes in a table

MARK ALLOCATION:

- **Layout (L):** neat and numbered ✓
- **Aim (A):** needs to make use of different treated carrot juices ✓ and involve colour change ✓
- **Original (O):** must make use of carrot juices only. No marks if any other juices are mentioned ✓
- **Equipment (E):** must make use of test tubes, pipette and methylene blue ✓
- **Control (C):** same amounts of each juice and methylene blue added ✓
- **Valid (V):** order of instructions makes sense and each test tube stirred ✓
- **Results (R):** recording of colour change. No marks if just "record the results" ✓

[15]