Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

MARKS: **150**

TIME: **2½ hours**

This question paper consists of 17 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

12 Round off all calculations to two TWO decimals after the comma.

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.9) in the ANSWER BOOK, for example 1.1.10 D.

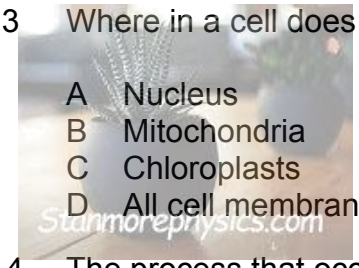
1.1.1 Which chemical is a product of photosynthesis that moves out of a green leaf through its stomata?

A Carbon dioxide
B Glucose
C Oxygen
D Water

1.1.2 The products of protein digestion are …

A amino acids.
B fatty acids.
C glycerol.
D simple sugars.

1.1.3 Where in a cell does cellular respiration take place?



A Nucleus
B Mitochondria
C Chloroplasts
D All cell membranes

1.1.4 The process that occurs in the capsules of some plants to form spores is:

A Mitosis
B Binary fission
C Meiosis
D Fertilisation

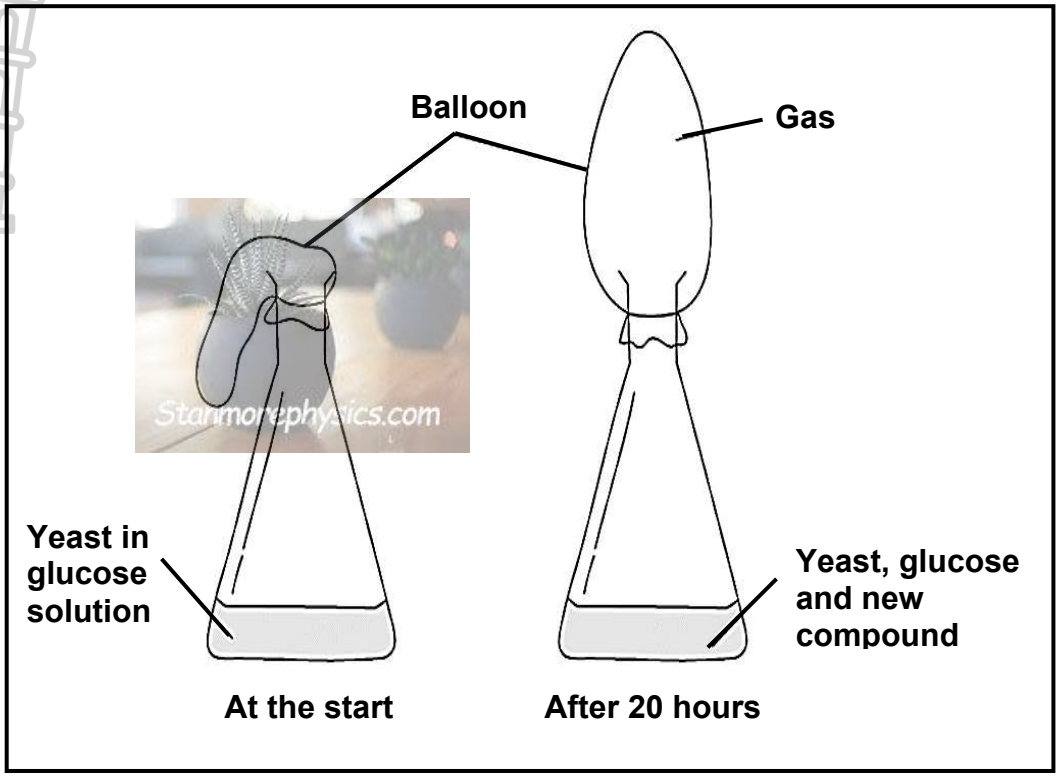
1.1.5 A closed blood system is found in:

A Annelida
B Insecta
C Cnidaria
D Porifera.

1.1.6 Which animal activity is NOT beneficial to farmers?

A Dogs herding sheep on a Karoo farm
B Soil organisms preying on crop pests and maintaining low numbers
C Swallows preying on insect larvae that destroy crop plants
D Mice feeding on wheat in storerooms

1.1.7 The diagram below shows an experiment set up by a group of students to investigate respiration in yeast.



Which row of the table below CORRECTLY describes the contents of the flask after 20 hours?

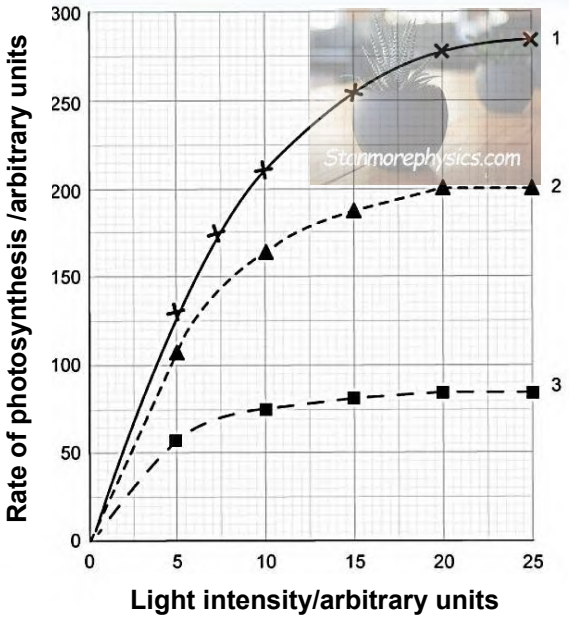
	New compound	Gas produced
A	alcohol	oxygen
B	alcohol	carbon dioxide
C	lactic acid	oxygen
D	lactic acid	carbon dioxide

1.1.8 The graph below shows the results of three experiments to measure the rate of photosynthesis under different conditions.

Experiment **1** measured the effect of light intensity on photosynthesis
Experiment **2** measured the effect of temperature on photosynthesis
Experiment **3** measured the effect of carbon dioxide on photosynthesis

Key:

	Temp (°C)	CO_2 (%)
1	30	0.13
2	20	0.13
3	30	0.13



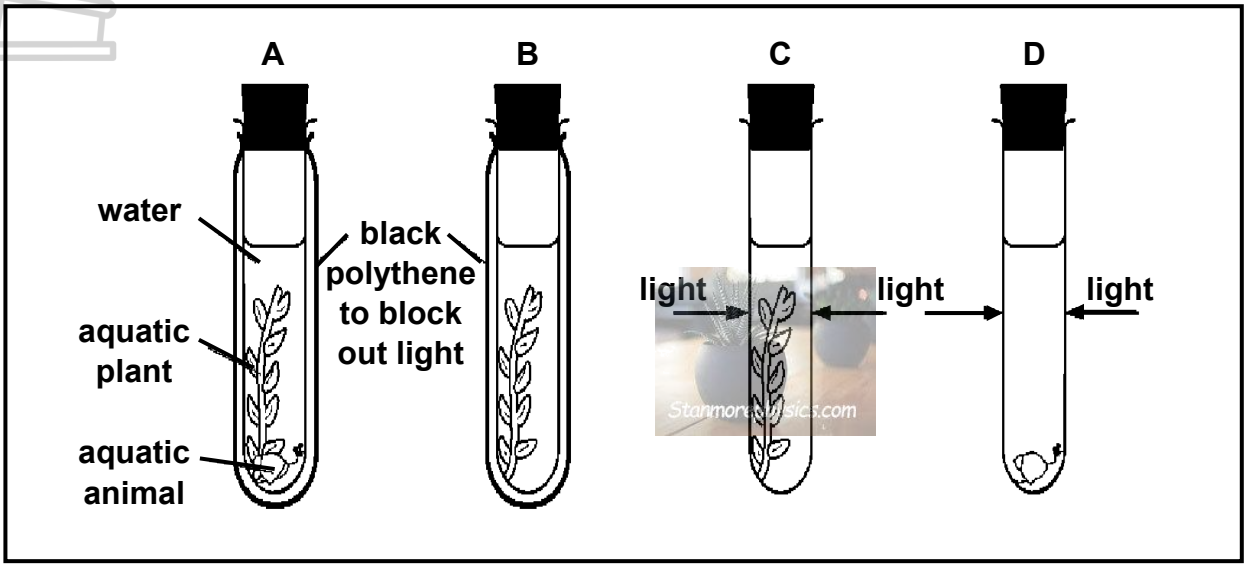
Which row in the following table CORRECTLY identifies the limiting factor for photosynthesis in each experiment?

	1	2	3
A	light intensity	light intensity	carbon dioxide concentration
B	temperature	temperature	light intensity
C	light intensity	temperature	carbon dioxide concentration
D	light intensity	carbon dioxide concentration	temperature

1.1.9 The apparatus shown was used in an experiment.

The carbon dioxide content of the water in each test-tube was measured at the start of the experiment and again three hours later.

In which test-tube will the carbon dioxide concentration decrease?



(9 x 2) **(18)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 A plant body with no true roots ,stem and leaves

1.2.2 A symbiotic relationship where both organisms benefit

1.2.3 Reproduction which uses non-reproductive parts of a plant to produce new plants

1.2.4 The collective name for a filament and an anther

1.2.5 Organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms

1.2.6 The type of animal that does not have a backbone.

1.2.7 Tissue that transports water in plants

1.2.8 An underground stem in ferns

1.2.9 The incorporation of absorbed nutrients into the cells of the body

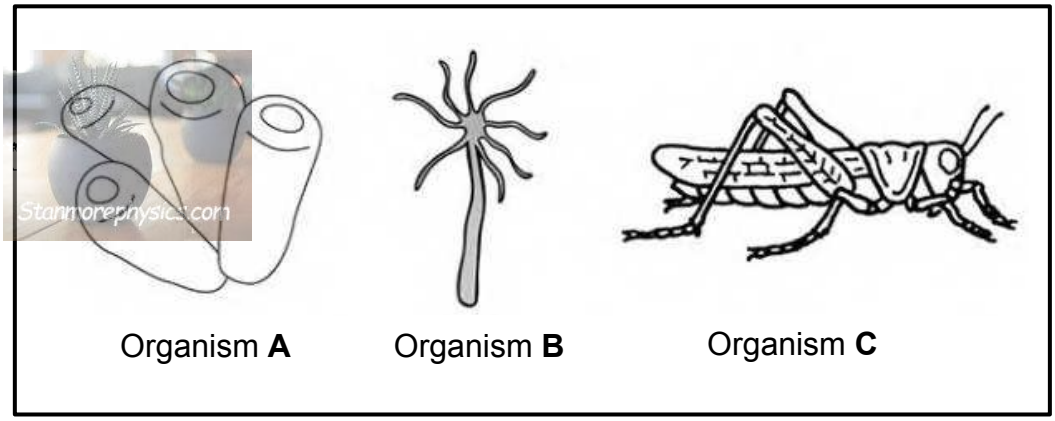
1.2.10 The process of producing ATP without oxygen (10 x 1) **(10)**

1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	They are diploblastic	A: Porifera B: Cnidaria
1.3.2	The fuel required for cellular respiration	A: Glycogen B: Glucagon
1.3.3	Gametophyte is dominant	A: Ferns B: Mosses

(3 x 2) **(6)**

1.4 These diagrams show various organisms from the animal kingdom.



1.4.1 Give the letter of an organism that …

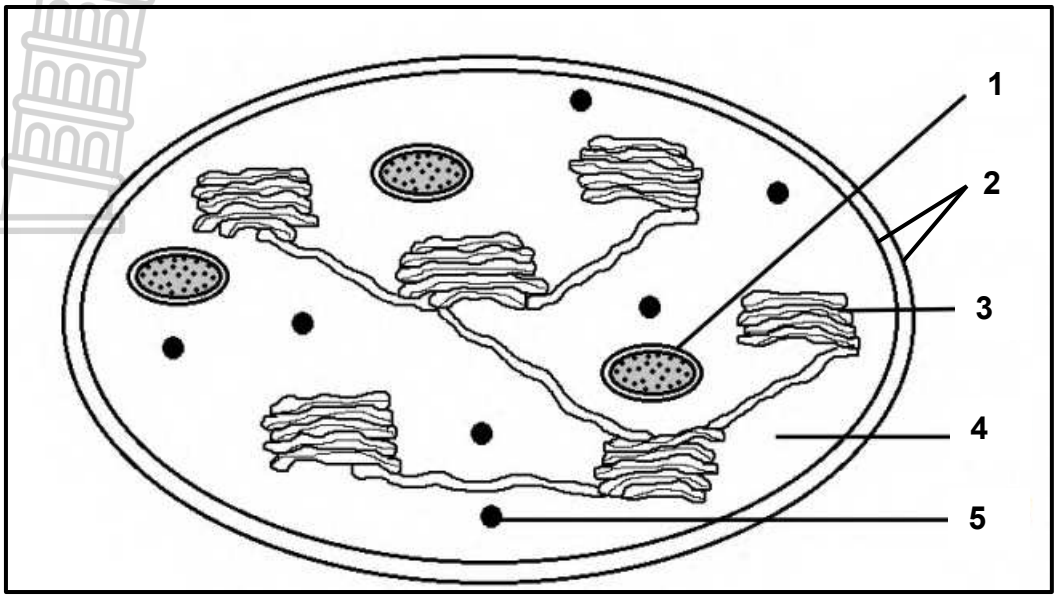
(a) has a haemocoel. (1)

(b) is sessile. (1)

(c) has a mesoderm (1)

1.4.2 State the phylum to which organism **A**, **B** and **C** belong. (3)
(6)

1.5 The diagram below represents a cell organelle.



1.5.1 Identify the organelle represented in the diagram. (1)

1.5.2 Give labels for:

(a) **2** (1)

(b) **3** (1)

1.5.3 Give the LETTER and NAME of the part that:

(a) Stores glucose (2)

(b) Forms enzymes for photosynthesis (2)

(c) Is the site of light independent reactions (2)

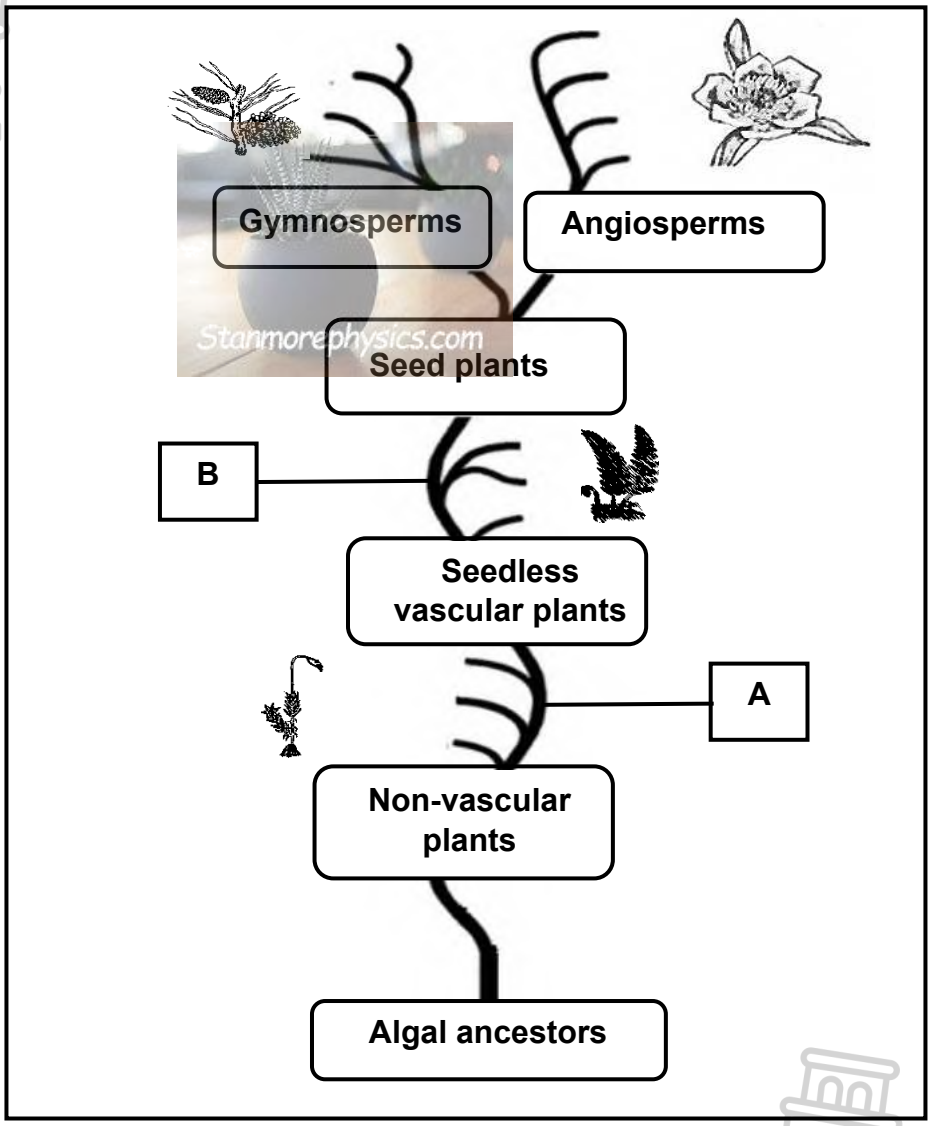
1.5.4 What is the name of the energy carrier molecule that is formed in light dependent phase? (1)
(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below is a phylogenetic tree of plants and their algal ancestors.



2.1.1 State the most important adaptations that evolved at each of the positions labelled **A** and **B**. (2)

2.1.2 Name the division of plants is represented as nonvascular plants in the diagram. (1)

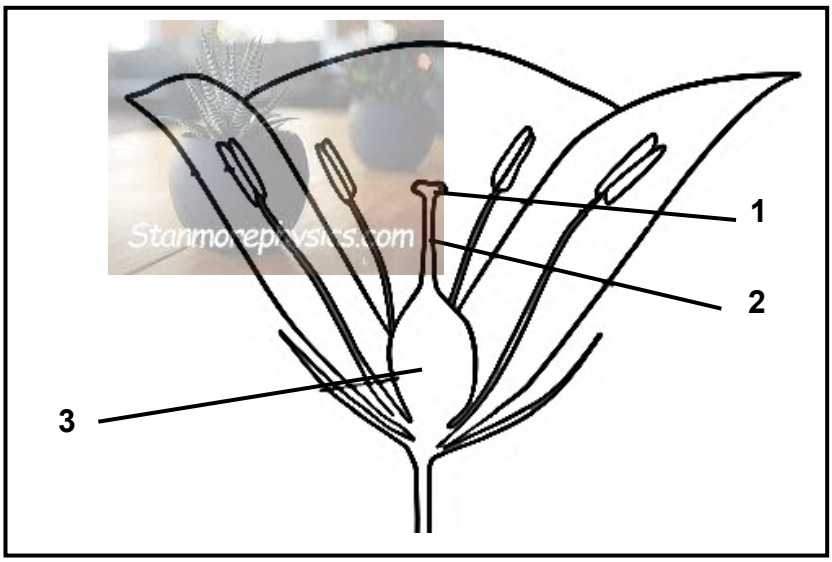
2.1.3 Explain why the seedless vascular plants can grow taller than the nonvascular plants. (2)

2.1.4 Give the collective name for all seed-bearing plants. (1)

2.1.5 In what way are the seeds of gymnosperms different to seeds of angiosperms? (2)

2.1.6 Explain why gymnosperms do not depend on water for fertilisation. (2)
(10)

2.2 The diagram below shows the structure of a flower.



2.2.1 Identify parts labelled :

(a) **1** (1)

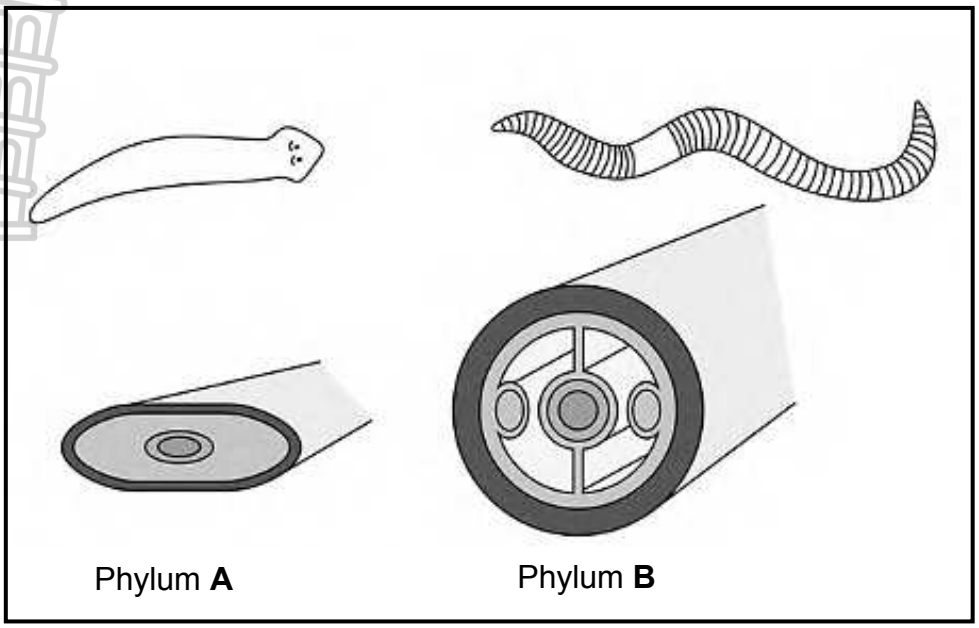
(b) **3** (1)

2.2.2 Give the function for the part labelled **2**. (1)

2.2.3 Explain how the part labelled **1** is structurally suited for insect pollination. (2)

2.2.4 Tabulate TWO differences between wind and insect pollinated flowers (5)
(10)

2.3 Study the diagrams below and answer the questions that follow.



2.3.1 Identify phylum:

(a) **A** (1)

(b) **B** (1)

2.3.2 Name the type of digestive system that occurs in each of the organisms **A** and **B**. (2)

2.3.3 Name type of symmetry that occurs in each of the organisms. (1)

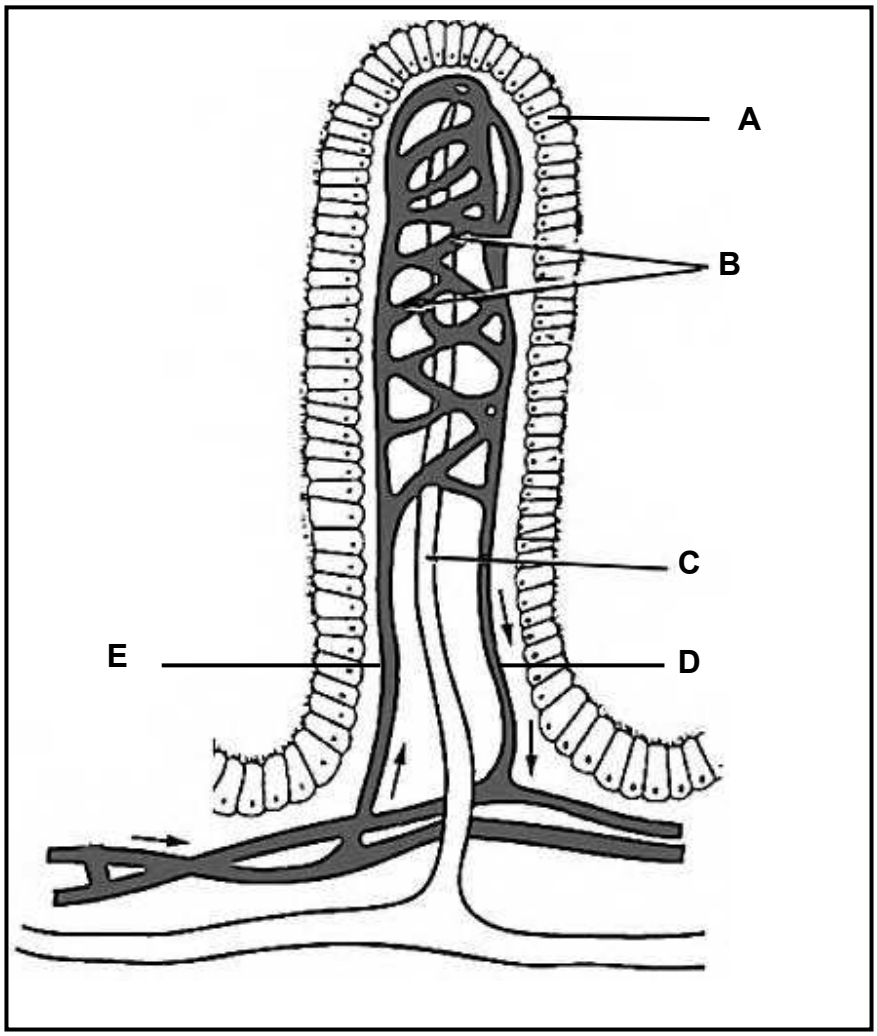
2.3.4 Explain the advantage of this type of symmetry to these organisms. (5)

2.3.5 State TWO differences between the embryonic body plans of these organisms. (4)
(14)

2.4 A person eats a baked potato.

Briefly describe how this baked potato is digested **(6)**

2.5 The accompanying diagram represents a structure associated with the human digestive system.



2.5.1 Identify the structure shown. (1)

2.5.2 In which organ is this structure found? (1)

2.5.3 State the main function of the structure shown above. (1)

2.5.4 Identify:

(a) **A** (1)

(b) **C** (1)

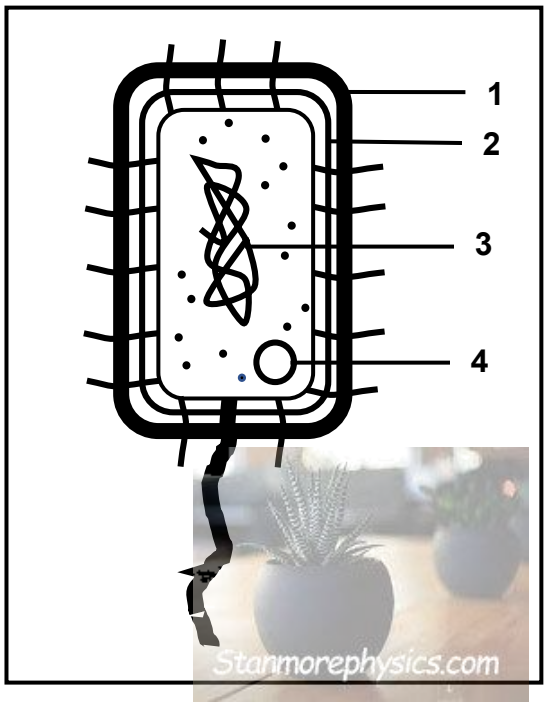
2.5.5 Name ONE substance which is found in higher concentration in **D** than in **E.** (1)

2.5.6 Explain TWO structural features of this structure shown that enable it to perform its function effectively. (4)

(10)
[50]

QUESTION 3

3.1 Bacteria are prokaryotes. The diagram below shows a bacterial cell.



3.1.1 State what is meant by the term *prokaryote*. (1)

3.1.2 Give labels for:

(a) **2** (1)

(b) **3** (1)

3.1.3 Give the function of the part labelled **1**. (1)

3.1.4 The structure labelled **4** is a circular DNA called a *plasmid*. Describe how it can be used in the manufacture of insulin for diabetics? (5)

3.1.5 Briefly explain how bacteria develop resistance to antibiotics and how humans can contribute to the phenomenon. (3)
(12)

3.2 Scientists conducted an investigation to determine which toothbrush sterilising method is the most effective in reducing bacterial growth.

The investigation was conducted as follows:

- 24 adult volunteers who were neither under dental treatment nor using antibiotics or antiseptic mouthwashes were selected
- The volunteers were divided into four groups
- The **first group** had to put their toothbrushes in Dettol once a day for five minutes then it must be washed thoroughly with water and kept as usual
- **Group 2** had to put their toothbrushes in a cup containing two teaspoons of table salt in 240ml water once a day for five minutes. The volunteers of this group were given a special cup and spoon in order to control the weight
- **Group 3** had to put their toothbrushes in hot tap water once a day for five minutes.
- **Group 4** used their toothbrushes in a normal way without the use of any kind of sterilization
- After 21 days toothbrushes were collected and transported to the laboratory in sterile bags.
- The identification of the bacteria isolated from toothbrushes was performed and the percentage of bacterial contamination was calculated and recorded.

The table below shows the results of the investigation.

Group	**Sterilizing Agent**	**Bacterial contamination (%)**
1	Dettol	12,5
2	Salt	37,5
3	Hot water	50
4	None	100

3.2.1 Identify the Independent variable (1)

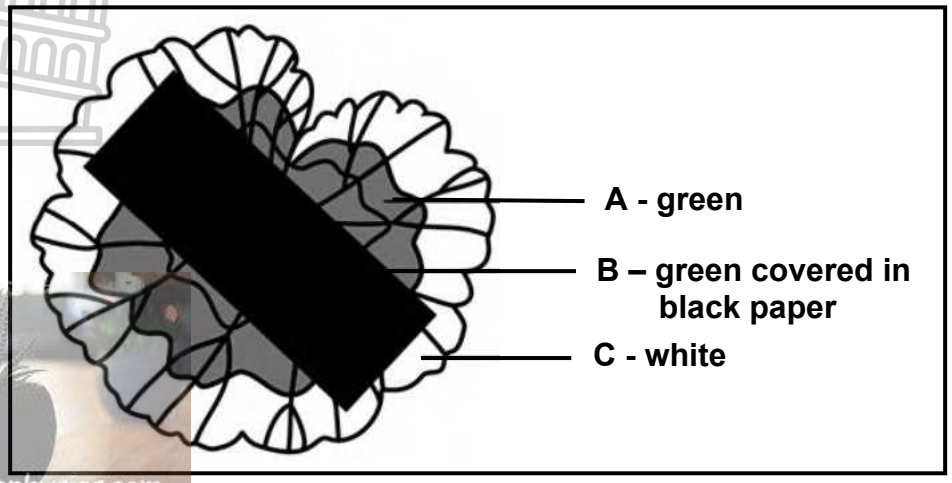
3.2.2 State THREE factors which were kept constant during the investigation (3)

3.2.3 Explain why was group 4 included in the investigation. (2)

3.2.4 State the conclusion for this investigation. (2)

3.2.5 Draw a bar graph to show the data presented in the table of results. (6)
(14)

3.3 The diagram below shows a variegated leaf being tested for photosynthesis. (A variegated leaf is a leaf that has a different colour on part of the leaf than on another).



Before the experiment, the leaf was destarched.

3.3.1 (a) Give ONE reason for destarching the leaf. (1)

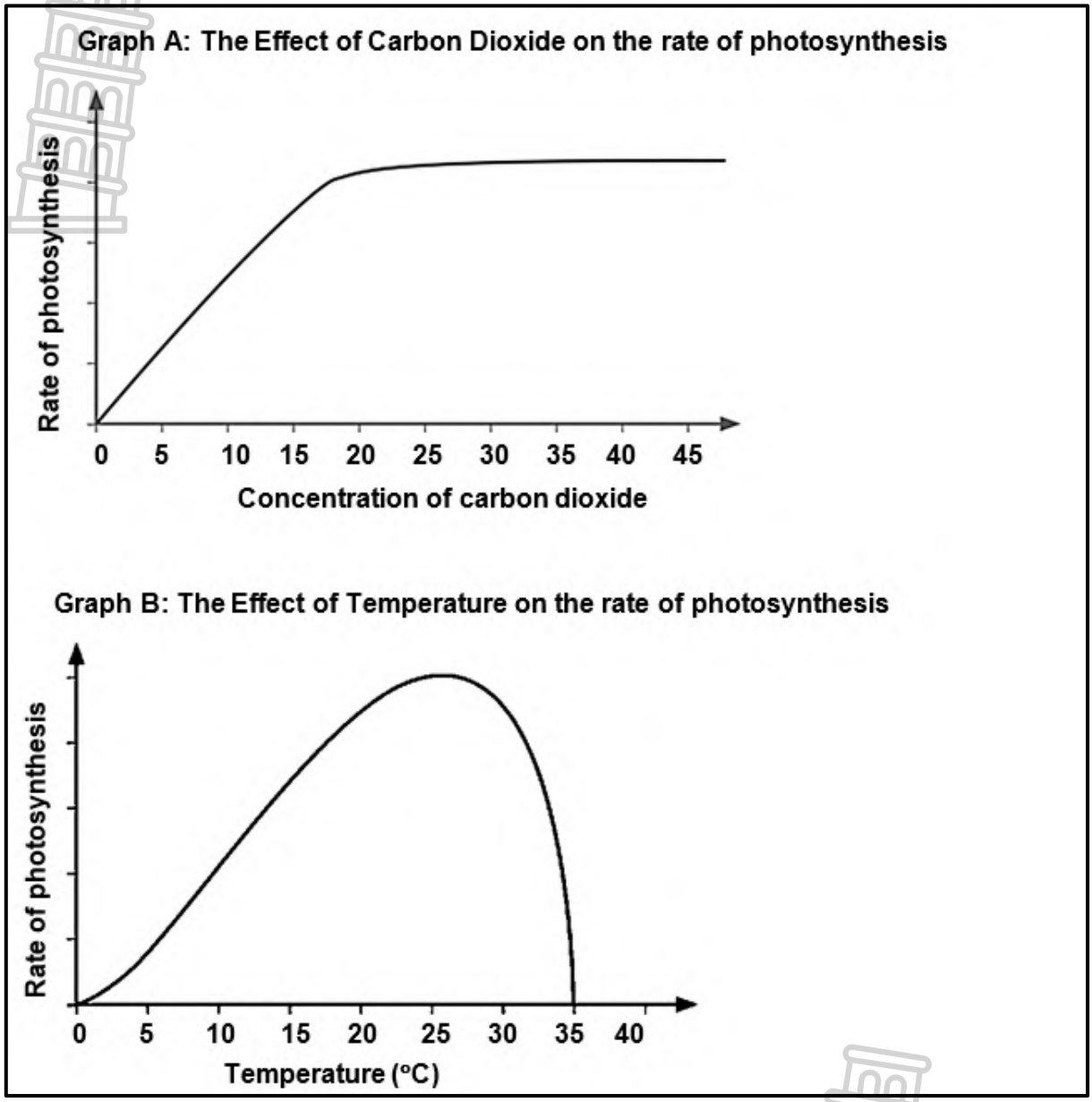
(b) Describe how the destarching is done. (1)

3.3.2 State the factor being investigated with reference to the region of the leaf marked **B.** (1)

3.3.3 Describe ONE precaution when covering the leaf with black paper. (1)

3.3.4 Suggest the possible result of the experiment in regions **B**. (2)
(6)

3.4 Graph **A** and graph **B** below show the effect of carbon dioxide and temperature on the rate of photosynthesis.



3.4.1 Explain why the shape of Graph **A** levels off after a while. (4)

3.4.2 In what way does the increase in temperature affect the process of photosynthesis? (2)

3.4.3 From the information in graph **B,** explain why the plant species being tested is NOT adapted to desert conditions. (2)
(8)

3.5 Read the passage below.

> Both aerobic and anaerobic respiration are used to supply energy during exercise. During some types of exercise, such as in sprinting the body is unable to supply enough oxygen to the muscles and lactic acid builds up in the cells. This is because the body cannot inhale enough oxygen to meet the muscles' requirements and the muscles go into 'oxygen debt'. This debt can 'repaid' breathing when the sprint ends.
>
> In a 100m sprint, the total oxygen required by the muscles may be as much as 8 litres per minute. It is impossible for the body to deliver this amount of oxygen during the few seconds it takes to run the race. The maximum oxygen that can be taken into the body is about 4 litres per minute.

3.5.1 Write down a word equation for aerobic respiration. (2)

3.5.2 Describe how lactic acid is formed in the muscle cells. (3)

3.5.3 Explain how the 'oxygen debt' referred to in the passage is repaid. (3)

3.5.4 The runner took 12 seconds to complete the 100-m sprint.

Calculate the amount of oxygen in litres that he would need to inhale per second to prevent going into oxygen debt. (2)
(10)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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NATIONAL SENIOR CERTIFICATE

GRADE 11

AMENDED LIFE SCIENCES MARKING GUIDELINES

MARKS: 150

This marking guideline consists of 11 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information is given than marks allocated**
   Stop marking when maximum marks are reached and put a wavy line and write 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the provincial memo discussion meeting.

14. **If only the letter is asked for but only the name is given (and vice versa)**
    Do not credit.

15. **If units are not given in measurements**
    Candidates will lose marks. Memorandum will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
    All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
    A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the marking guideline**
    No changes may be made to the marking guideline without consulting the provincial internal moderator.

SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	A✓✓		
	1.1.3	B✓✓		
	1.1.4	C✓✓		
	1.1.5	A✓✓		
	1.1.6	D✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓No answer – award 2 marks : Error in the question EXP 3 CO_2 should've been 0.03		
	1.1.9	C✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Thallus✓		
	1.2.2	Mutualism✓		
	1.2.3	Asexual✓/vegetative reproduction		
	1.2.4	Stamen✓/ Androecium		
	1.2.5	Humus✓		
	1.2.6	Invertebrate✓		
	1.2.7	Xylem✓		
	1.2.8	Rhizome✓		
	1.2.9	Assimilation✓		
	1.2.10	Anaerobic respiration✓	(10 x 1)	**(10)**
1.3	1.3.1	Both A and B✓✓/ B only		
	1.3.2	None✓✓/A only		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) C✓		(1)
		(b) B✓/ A		(1)
		(c) C✓		(1)
	1.5.2	A: Porifera✓ B: Cnidaria✓ C: Arthropoda✓		(3) **(6)**

1.5.1		Chloroplast✓ NOT chlorophyll	(1)
1.5.2	(a)	(Double) membrane✓	(1)
	(b)	Lamellla✓/Thylakoid/granum	(1)
1.5.3	(a)	1✓ - Starch grain✓	(2)
	(b)	5✓ - Ribosome✓	(2)
		4✓ - Stroma✓	(2)
1.5.4		ATP✓/ Adenosine tri-phosphate	(1) **(10)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 A - Vascular tissue✓ /Conducting tissue/Xylem and Phloem
B - Seeds✓ (2)

2.1.2 Bryophytes✓ (1)

2.1.3
- Possess vascular/conducting tissue✓ / xylem and phloem
- to push water up to tips of tall plants✓ /for strengthening/for support (2)

2.1.4 Spermatophytes✓/Spermatophyta (1)

2.1.5
- Gymnosperm seeds are naked✓/exposed on a cone
- Angiosperm seeds are enclosed✓ in an ovary/ fruit (2)

2.1.6
- Produce pollen✓
- which is carried by wind✓ to the female cones (2)

(10)

2.2 2.2.1 (a) Stigma✓ (1)

(b) Ovary✓/Ovule (1)

2.2.2
- Serves as a passage for the pollen tube✓
- Connects the stigma and the ovary✓ Any (1)

(Mark first ONE only)

2.2.3
- Stigma (**1**) is usually small and sticky✓
- so that pollen grains can attach✓ from the insect body

OR

- Stigma is situated deep inside the flower✓ which forces the insect to touch the stigma when trying to get to the nectar. ✓ (2)

2.2.4

WIND	INSECT
Flowers are small✓	Flowers are usually large✓
Flowers are green/dull✓	Brightly coloured flowers✓
Reduced scent✓	Highly scented✓
Pollen grains are smooth✓	Pollen grains are rough✓
No nectar produced✓	Nectar is produced ✓
Pollen light and dry✓	Sticky pollen✓
Stigma protrudes outside flower/filaments are longer✓	Stigma within the flower/filament shorter✓
Large amount of pollen is produced✓	Less amount of pollen is produced✓
No petals ✓	Petals are present ✓
The filament is long and thin✓	Filaments are not as long ✓
Anthers are easily moveable✓	Anthers are not as moveable ✓
The stigma is large ✓	The stigma is smaller ✓
No nectar is produced✓	Nectar is produced ✓

(Mark first TWO only) 1 table + (Any 2 x 2) (5)

(10)

2.3 2.3.1 (a) Platyhelminthes✓ (1)

(b) Annelida✓ (1)

2.3.2 A – blind gut✓
B – through gut✓ (2)

2.3.3 Bilateral✓ symmetry (1)

2.3.4
- Organisms with bilateral symmetry develop an anterior and posterior end✓
- with the development of cephalisation✓
- The organisms become more motile✓
- They have their sense organs concentrated on their head✓ and
- develop a brain✓
- This means that the animal moves head first into the environment✓
- The organisms become more motile✓
- and is able to detect food✓/danger quick
- and is able to detect food✓/danger quickly and
- can respond quickly Any (5)

2.3.5
- Phylum A is triploblastIc✓ and (award 2 marks – not a difference)
  Phylum B is triploblastic✓
- Phylum A is acoelomate✓/ has no coelom and
  Phylum B is coelamate✓/ has a coelom (4)
  (14)

2.4
- Potatoes are full of starch✓
- In the mouth✓
- teeth are used to chew the potato✓
- making smaller pieces on which enzymes can act✓
- Carbohydrase✓/salivary amylase
- breaks large polysaccharides into shorter polysaccharide (disaccharides) chains✓
- The stomach churns✓ and further breaks down the food increasing surface area for enzymes to work
- In the duodenum, carbohyhdrase✓/pancreatic amylase
- breaks the starch into monosaccharides✓ which can be absorbed

Any **(6)**

2.5 2.5.1 Structure of a villus✓/villi (1)

2.5.2 Small intestine✓ (1)

2.5.3 Absorption of digested nutrients✓ (1)

2.5.4 (a) Columnar epithelial cell✓ (1)

(b) Lacteal✓/ lymph vessel (1)

2.5.5
- Glucose✓
- Amino acids✓
- vitamins✓
- minerals✓
- water

Any (1)

(Mark first ONE only)

2.5.6
- The thin columnar epithelium✓ of the villus facilitates easy absorption of nutrients✓
- The columnar epithelial cells have a brush border or microvilli✓ to enlarge the surface area for absorption✓
- The columnar epithelial cells produce carrier molecules✓
- which facilitate active absorption of nutrients✓ against diffusion gradients
- The goblet cells between the columnar epithelial cells secrete watery mucus✓ that prevents friction and keeps the cells moist✓
- The villi contain many capillary blood vessels and lacteals in close contact✓ with the absorption surface
- to take the absorbed food away fast and therefore, maintain steep concentration gradients for fast diffusion✓
- Epithelial cells have many mitochondria✓ to provide energy for active absorption ✓

Any (2 x2) (4)

(Mark first TWO only) **(10)**

[50]

QUESTION 3

3.1.1 An organism where the nuclear material is not enclosed in a membrane✓/ cell with no definite nucleus (1)

3.1.2 (a) Cell wall✓ (1)

(b) Nucleoid✓/chromosome/DNA (1)

3.1.3 Protects from drying out✓/desiccation/protects from antibiotics (1)

3.1.4
- Plasmid (4)/DNA from the bacterial cell/E.coli is removed✓ and
- cut with (restriction) enzymes✓
- Human DNA with insulin gene is also cut and inserted into cut plasmid✓
- The plasmid / recombinant DNA is re-inserted to the bacterial cell to produce human insulin✓
- Human insulin is isolated and used to treat diabetics✓ (5)

3.1.5
- Mutations occur spontaneously in bacteria✓
- Some mutations cause bacteria to be resistant to antibiotics✓
- By stopping to take antibiotics early in the course✓
- the bacteria that have acquired resistance multiply and increase their population size✓ (3) **(12)**

OR

- The first dose of antibiotics usually kills all the weak bacteria ✓
- If the course is not completed✓
- the stronger bacteria that are left behind multiply and become drug resistant ✓

3.2.1 Type of sterilizing methodt✓ (1)

3.2.2
- All volunteers were not:
  - Under dental treatment✓
  - Using antibiotics✓
  - Using antiseptic mouthwashes✓
- Treatment of toothbrushes with sterilizer was done once daily✓
- Toothbrushes were kept in each sterilizer for five minutes✓
- Method of isolating and counting bacteria from toothbrushes✓
- Same type /size of toothbrush✓
- Toothbrushes were all transported after 21 days/ duration was the same✓
- Toothbrushes were all transported in sterile bags✓
- Same number/ Six toothbrushes/volunteers in all groups✓
- All volunteers were adults✓

(Mark first THREE only) Any (3)

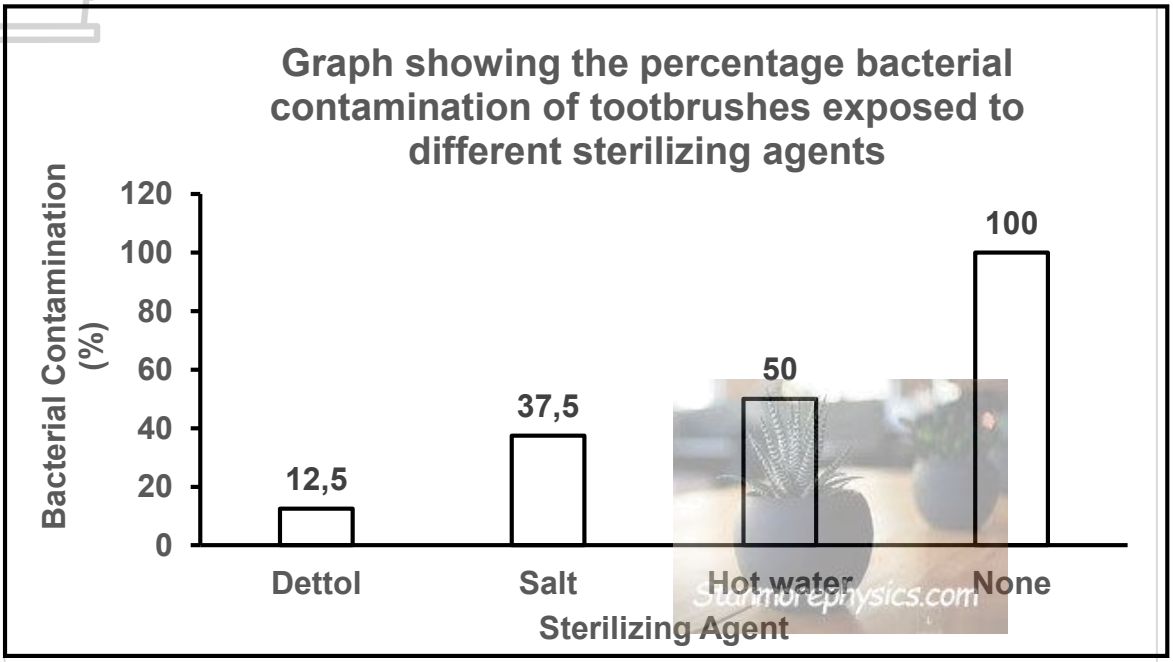
3.2.3 - To serve as a control✓
- to show that reduced bacterial contamination is due to the presence of a sterilizing agent✓ (2)

3.2.4 Dettol is the most effective sterilizing agent✓✓

OR

Hot water is the least effective sterilizing agent✓✓ (2)

3.2.5



Criteria for marking the graph:

Criteria	Mark allocation
Bar graph is drawn (**T**)	1
Caption of the graph includes both variable (**C**)	1
Correct labels on the X-axis and Y-axis with correct unit on the Y-axis (**L**)	1
Correct scale for Y-axis and equal width and space between the bars(**S**)	1
Plotting of bars correctly done for: **(P)** 1-3 Bars All 4 bars	 1 2

(6)
(14)

3.3.1 (a)
- The leaf must be free of starch at the start of the experiment so that evidence of the need for the factor being investigated can be provided during the experiment✓
- to remove starch so that the starch present afterwards shows that photosynthesis has occurred✓
- To make sure the starch tested at the end of the investigation is the only one that was produced during the investigation✓
- To ensure that the starch present is due to the investigation not from before✓ (1)

(b) The variegated plant is placed in a dark cupboard for 48 hours✓ (1)

3.3.2 The need for light✓ during photosynthesis// light (1)

3.3.3
- The black paper must be placed on both sides of the leaves – top and bottom✓
- To make sure that the black paper is securely attached/ does not fall off/ does not come off✓
- To make sure that the black paper does not let any light through✓
- Black paper must be carefully placed around the leaf to not squash the cells underneath✓ (1)

3.3.4
- The parts covered in black paper will turn reddish-brown/ brown after iodine is added
- proving that photosynthesis requires light✓ (2)

(6)

3.4 3.4.1
- As carbon dioxide levels rise, so too does the rate of photosynthesis✓
- When the optimum level of carbon dioxide is reached✓, the rate of photosynthesis levels off
- Very high levels of carbon dioxide increases acidity/forms carbonic acid✓ (4)

However, there is a limited number of chloroplasts available✓ and
- once they are all working to full capacity✓
- no further increase in photosynthesis is possible✓

3.4.2
- As the temperature increases so does the rate of photosynthesis up to a certain point ✓
- If the temperature increases beyond the optimum level that causes the enzymes to denature ✓ therefore decreasing the rate of photosynthesis. ✓ /Causing the photosynthesis to stop

OR

- photosynthetic reactions are enzyme controlled✓
- High temperatures cause the enzymes to denature✓ (2)

3.4.3 - At temperatures above 35° all photosynthesis stops✓
- The temperatures in deserts often get far higher than 40°✓ (2)
(8)

3.5 3.5.1 Glucose + oxygen✓ ➔ carbon dioxide + water + energy✓ (ATP) (2)

3.5.2 - Glucose is broken down✓/ glycolysis occurs
- In the absence of (sufficient) oxygen✓
- into two pyruvic acid molecules✓
- which are converted into lactic acid✓ Any (3)

3.5.3 - After exercise rate and depth of breathing increases✓.
- More oxygen is transported to muscles✓/ Enough oxygen is supplied to the cell✓ (3)
- The lactic acid is converted back into pyruvic acid ✓
- for aerobic respiration to occur✓

3.5.4 12s ÷ 60s × 8 litres✓ = 1,6✓ litres (2)
(10)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

