education

Department of Education
FREE STATE PROVINCE

GRADE 11

LIFE SCIENCES P1

November 2024

MARKS: 150

TIME: 2½ HOURS

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers 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 for each question.
6. Make 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 must use a non-programmable calculator, protractor and compass, where necessary.
11. Write neatly and legibly.

SECTION A

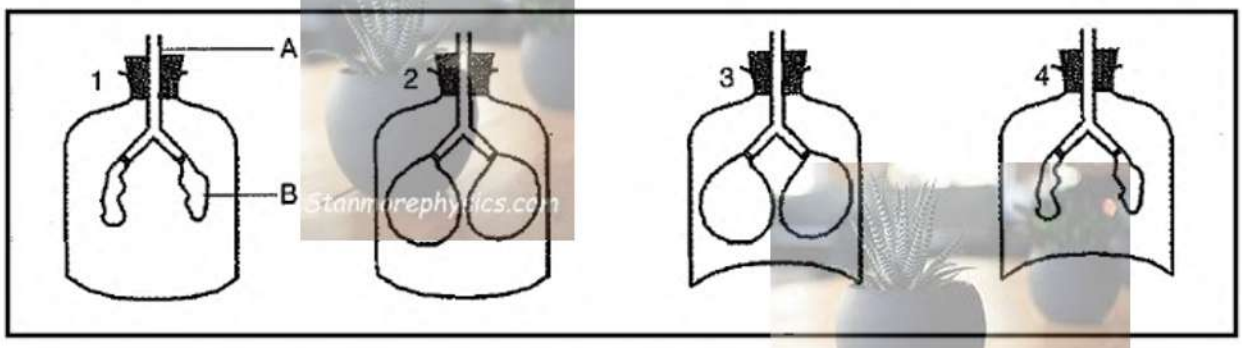
QUESTION 1

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 numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, for example, 1.1.11 D.

1.1.1 Carbon dioxide is carried in the blood mainly as…

A carbaminohaemoglobin.
B carbonic acid in the erythrocytes.
C bicarbonate ions.
D gas bubbles in the blood plasma.

QUESTIONS 1.1.2 AND 1.1.3 REFER TO THE APPARATUS USED FOR DEMONSTRATING THE PROCESS OF BREATHING IN HUMANS.



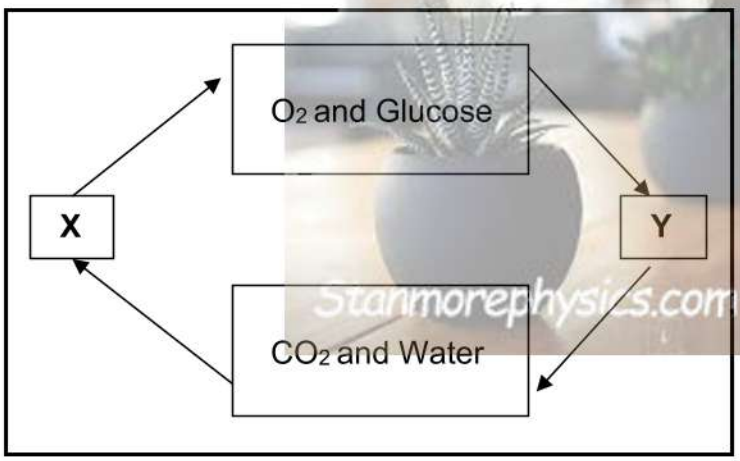
1.1.2 **A** and **B** respectively represent the … in the human respiratory system.

A bronchus and lungs
B larynx and lungs
C trachea and lungs
D bronchiole and lungs

1.1.3 The correct representation of inhaling and exhaling are diagrams …

A 1 and 2.
B 2 and 3.
C 1 and 3.
D 2 and 4.

QUESTIONS 1.1.4 AND 1.1.5 REFER TO THE FLOW CHART BELOW REPRESENTING METABOLIC PROCESSES IN PLANTS.



1.1.4 Which process is presented by **X** and **Y** respectively?

	X	Y
A	Respiration	Photosynthesis
B	Photosynthesis	Respiration
C	Transpiration	Photosynthesis
D	Photosynthesis	Transpiration

1.1.5 Radiant energy is …

A not involved in these processes.
B needed by both **X** and **Y**.
C needed by **Y** and released by **X**.
D needed by **X** only.

1.1.6 Bile is produced in the …

A gall bladder.
B kidneys.
C pancreas.
D liver.

1.1.7 If all plants with chlorophyll were removed from the Earth, which gas would disappear first?

A Carbon dioxide
B Oxygen
C Nitrogen
D Water vapour

1.1.8 Which products formed during photosynthesis in the light phase are needed in the dark phase?

A CO_2 and H ions
B H_2O and ATP
C ATP and H ions
D O_2 and ATP

1.1.9 The main function of the colon in the human body:

A Digestion of cellulose.
B Absorption of digested food.
C Absorption of water.
D Storage of faeces.

1.1.10 Substance formed during anaerobic respiration in yeast cells:

A Alcohol (ethanol)
B Oxygen
C Glucose
D Carbonic acid

(10 x 2) (**20**)

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.8) in the ANSWER BOOK.

1.2.1 A double membrane surrounding the lungs

1.2.2 The breakdown of large, insoluble food molecules into smaller, soluble molecules in the presence of enzymes

1.2.3 The part of a chloroplast where the dark phase occurs

1.2.4 The liquid that becomes milky in the presence of carbon dioxide

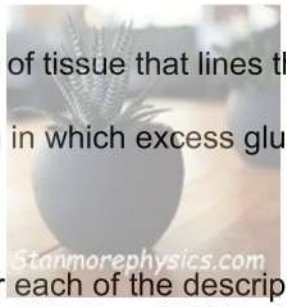
1.2.5 The organelle where cellular respiration occurs

1.2.6 The process in nutrition where absorbed nutrients become part of cells

1.2.7 The type of tissue that lines the nasal cavity

1.2.8 The form in which excess glucose is stored in a plant

(8 x 1) **(8)**

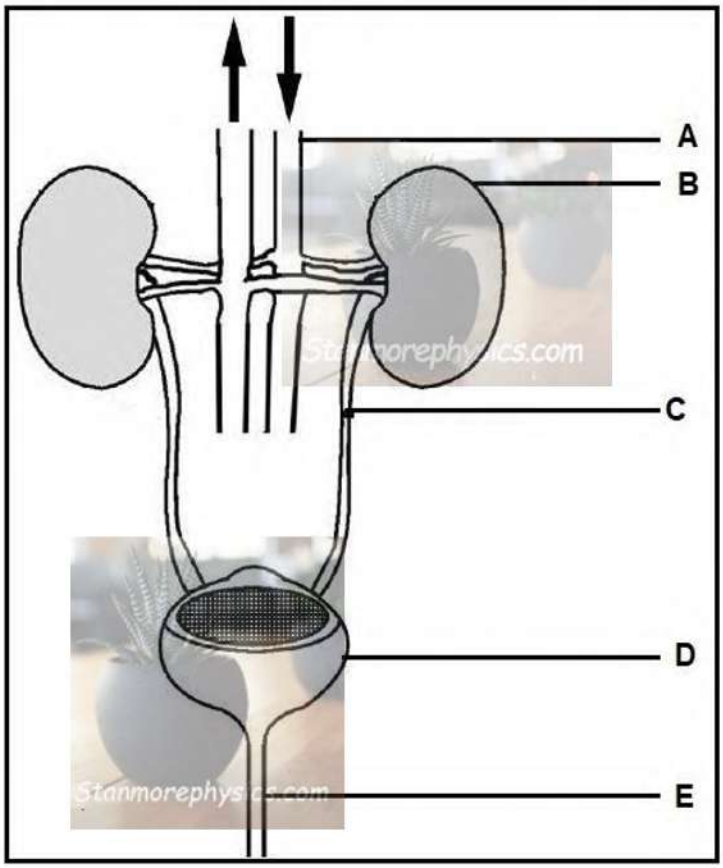


1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Active process of breathing	A: B:	Inhalation Sneeze
1.3.2	Lowers the rate of photosynthesis	A: B:	Very high temperatures Low temperatures
1.3.3	Type of teeth used by a predator to catch and tear prey	A: B:	Premolars Molars

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

1.4 The diagram below represents the urinary system in humans



1.4.1 Give the LETTER and the NAME of the part that …

(a) protects the kidney. (2)

(b) temporarily stores urine. (2)

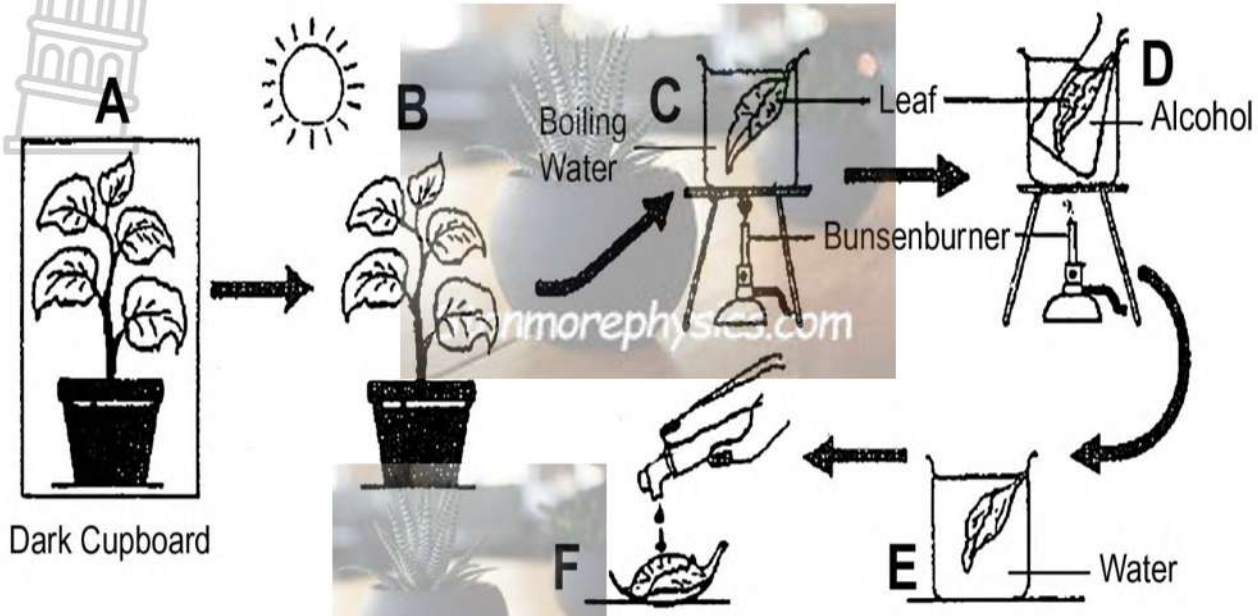
(c) transports urine to the exterior. (2)

1.4.2 Identify the type of blood that is transported from **A** to **B**. (1)

1.4.3 Apart from excretion of nitrogenous waste, name ONE other function of the kidney. (1)

(8)

1.5 The diagrams below represent steps followed to test for the presence of starch in a leaf.



1.5.1 Name the process during which starch is formed in a leaf? (1)

1.5.2 What is the purpose of step **A**? (1)

1.5.3 Give ONE reason why step **E** is included in the experiment. (1)

1.5.4 What is the purpose of the alcohol during step D? (2)

1.5.5 Name the reagent used at **F**. (1)

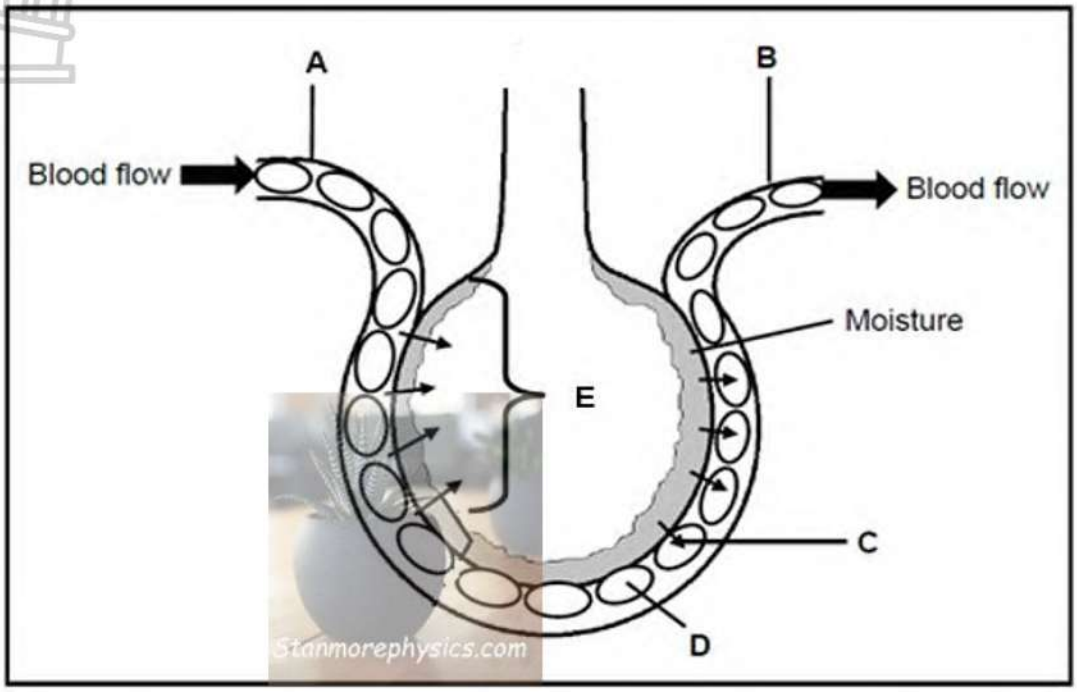
1.5.6 What positive colour change is expected at **F**? (2)
(8)

TOTAL SECTION A: (50)

SECTION B

QUESTION 2

2.1 The diagram below represents an alveolus in a human lung.



2.1.1 Identify:

(a) Type of blood that enters capillary **A.** (1)

(b) Process that exchanges gases at **E.** (1)

(c) Structure **D**. (1)

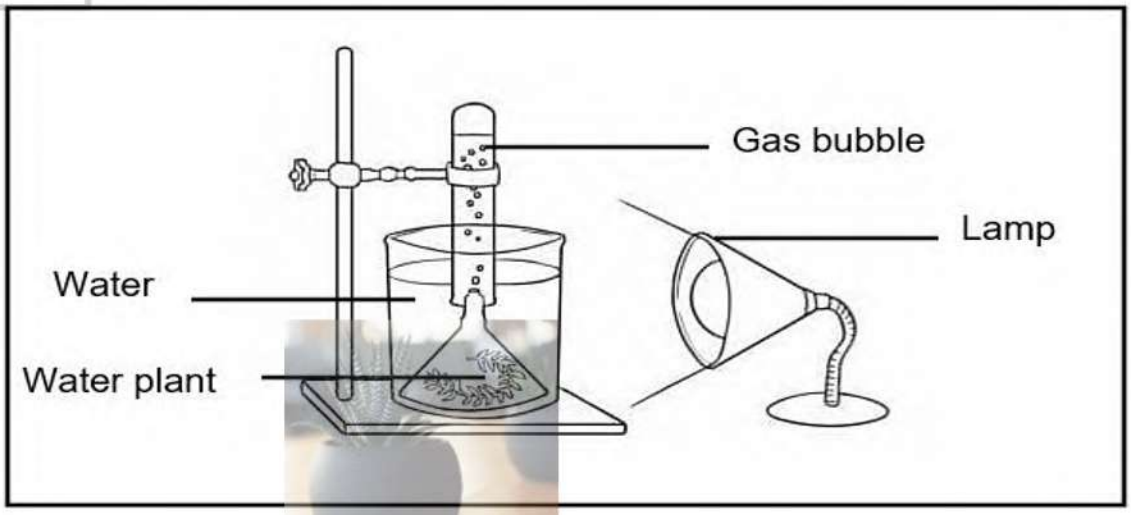
2.1.2 Explain THREE adaptations of the alveolus for carrying out gaseous exchange successfully. (6)

2.1.3 Name TWO ways in which oxygen is transported by blood. (2)

2.1.4 During exercise, the rate of cellular respiration increases and more CO_2 is released by the muscle cells. Describe the homeostatic control that will take place to restore the CO_2 balance in blood. (7)
(18)

2.2 An investigation was conducted to determine the effect of light intensity on the rate of photosynthesis in water plants.

The apparatus was setup as illustrated in the diagram below.
The lamp is placed at different distances from the water plant.
Gas bubbles released during the process were counted every minute for four minutes.



The table shows the results:

Distance in cm	Number of bubbles released per minute intervals				
	1 min	2 min	3 min	4 min	Average
10	52	52	54	54	53
20	49	51	48	52	50
30	32	30	27	31	30
40	30	10	9	11	**X**

2.2.1 Give an investigative question for this experiment. (2)

2.2.2 Name the gas that is released in the water. (1)

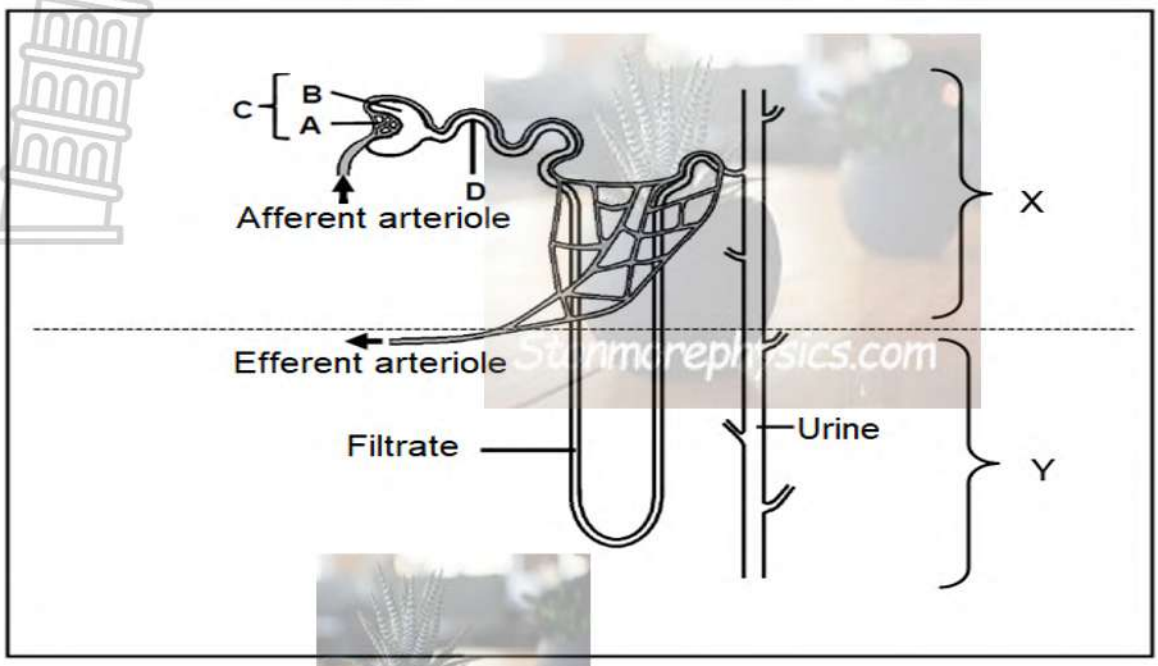
2.2.3 Calculate the value of **X**. Show all your calculations. (3)

2.2.4 On the same set of axes, draw a bar graph to represent the data for the number of bubbles release at 1- and 4-minutes intervals. (6)

2.2.5 Draw a conclusion for this investigation. (2)

2.2.6 Name TWO ways in which the validity of this investigation can be improved. (2)
(16)

2.3 The diagram below represents a nephron.



2.3.1 Identify:

(a) Capillary network **A**. (1)

(b) Specialised cells of the inner wall of **B**. (1)

(c) Region **Y** in the kidney. (1)

2.3.2 Name the process that takes place between parts **A** and **B**. (1)

2.3.3 Give:

(a) TWO substances that are reabsorbed at **D**. (2)

(b) TWO ways in which **D** is adapted for reabsorption. (2)

2.3.4 Explain the significance of the difference in diameter between the afferent and efferent arterioles. (3)

2.3.5 Urea, a nitrogenous waste product, form part of the urine. Explain the metabolic process that results in the production of urea in humans. (3)

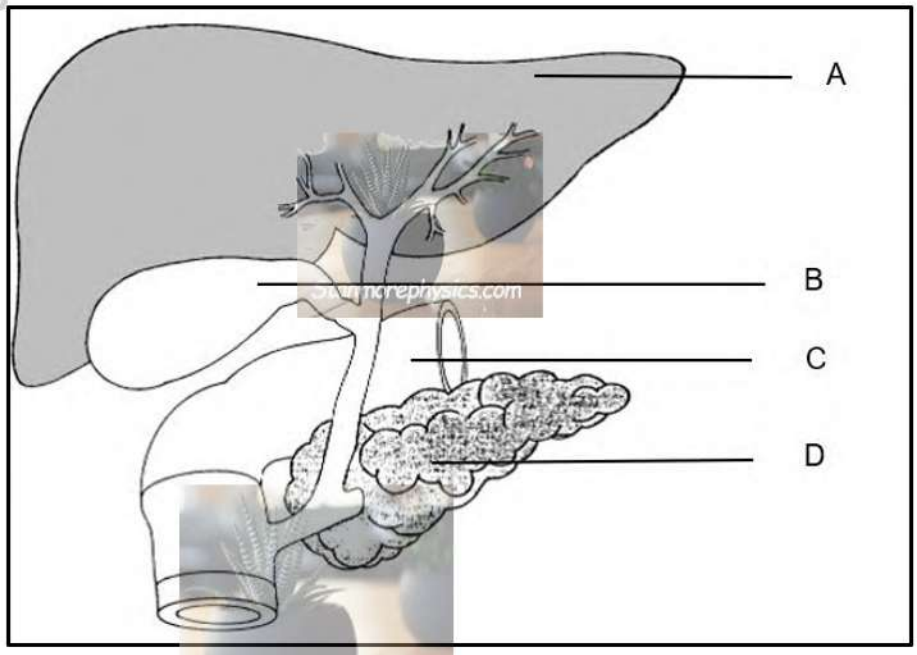
2.3.6 Except for the kidneys, name any TWO other excretory organs in the human body. (2)

(16)

TOTAL QUSTION 2: (50)

QUESTION 3

3.1 The diagram below represents part of the human digestive system.



3.1.1 Identify:

(a) Organ **A**. (1)

(b) Fluid found in **B**. (1)

(c) Part **C**. (1)

3.1.2 Give THREE functions of part **A**. (3)

3.1.3 Name the process responsible for movement of food particles in part **C**. (1)

3.1.4 Digestion and absorption mainly take place in part **C**.

Identify the following:

(a) The process by which glycerol and fatty acids are absorbed. (1)

(b) The form in which digested proteins are absorbed. (1)

(c) The enzyme involved in chemical digestion of fats. (1)

3.1.5 Make a labelled diagram of the structure responsible for the increased absorption surface area in part **C.** (5)
(15)

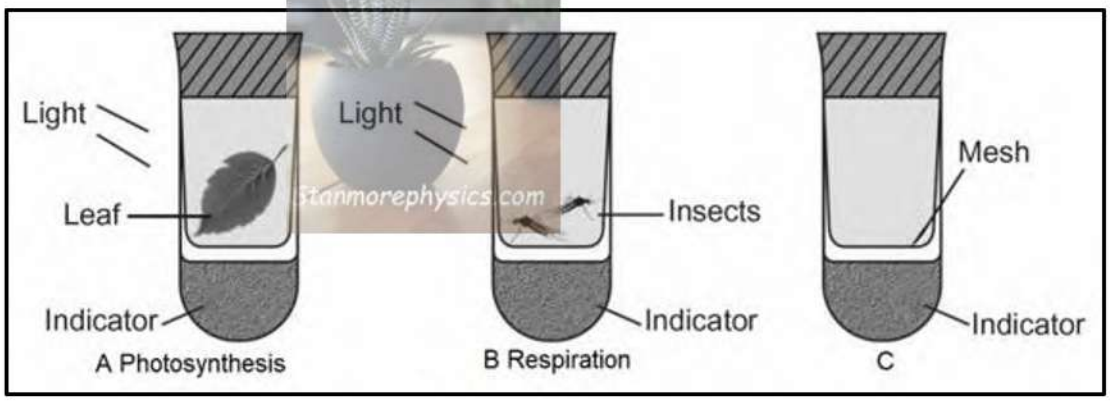
3.2 An investigation was conducted to determine the amount of CO_2 present in the test tubes below.

- All the test tubes were exposed to the same light.
- An indicator was added to each test tube to test for the amount of carbon dioxide.

The colour changes of the indicator showed the amount of carbon dioxide present.

The results are shown in the table below:

Amount of carbon dioxide	Colour change
Normal	Orange
Low	Purple
High	Yellow



3.2.1 Explain ONE reason why the test tubes were sealed tightly with a rubber stopper. (2)

3.2.2 Explain the expected difference in colour between test tube **A** and **B**. (4)

3.2.3 Tabulate THREE differences between photosynthesis and respiration. (7)
(13)

3.3 The table below shows water intake and water loss of a person on a cold and hot day.

		COLD DAY	HOT DAY
Water intake cm^3/day	Cold drink intake	500	1500
	Soup intake	800	400
	Through Coffee	100	300
Water loss cm^3/day	Urine	1500	500
	Sweat	600	4000

3.3.1 Under which circumstance indicated in the table is water loss through sweat the highest? (1)

3.3.2 Identify the fluid that results in the lowest water intake during a hot day. (1)

3.3.3 On a cold day the water levels in the blood will rise above normal. Explain the homeostatic control of the water levels in the human body on a cold day. (6)

3.3.4 Which hormone is responsible for regulating salt levels in the blood? (1)
(9)

3.4 The blood glucose levels in a healthy person, when he/she is not eating, are between 3.9 and 7.1 mmol/L of blood.

The table below shows the blood glucose levels in a healthy person who ate only one meal.

TIME (hours)	BLOOD GLUCOSE LEVELS (mmol/L
07:00	4,2
0800	4,2
0900	8,4
10:00	7,6
1100	7,1
1200	5,1
13:00	4,8
14:00	3,1
15:00	4,1
16:00	4,3
17:00	4,6

3.4.1 Name the:

(a) TWO hormones involved in the normal homeostatic control of blood glucose levels. (2)

(b) Organ in the human body that secretes the hormones named in QUESTION 3.4.1 (a). (1)

3.4.2 Between which hours of the day did the person eat? (1)

3.4.3 Using evidence from the table, give ONE reason for your answer to QUESTION 3.4.2. (2)

3.4.4 Explain the change in blood glucose levels between 14:00 and 15:00. (5)

3.4.5 Describe how blood glucose levels would have been different after 10:00 a.m. if the person suffered from diabetes mellitus. (2)

(13)

TOTAL QUESTION 3: (50)

TOTAL SECTION B: 100
GRAND TOTAL: 150

education

Department of
Education
FREE STATE PROVINCE

GRADE 11

LIFE SCIENCES

NOVEMBER 2024

MARKS: 150

MARKING GUIDELINES

This marking guidelines consists of 10 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and '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 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 learner's 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.

SECTION A
QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	C✓✓		
	1.1.3	D✓✓		
	1.1.4	B✓✓		
	1.1.5	D✓✓		
	1.1.6	D✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	C✓✓		
	1.1.10	A✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Pleura✓		
	1.2.2	Chemical digestion✓		
	1.2.3	Stroma✓		
	1.2.4	(Clear) Lime water✓		
	1.2.5	Mitochondria✓		
	1.2.6	Assimilation✓		
	1.2.7	Ciliated columnar✓		
	1.2.8	Starch✓	(8 x 1)	**(8)**
1.3	1.3.1	Only A✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	None✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) B✓ Renal Capsule✓		(2)
		(b) D✓ Bladder✓		(2)
		(c) E✓ Urethra✓		(2)
	1.4.2	Oxygenated blood✓/rich in metabolic waste products		(1)
	1.4.3	- Regulation of the water content✓/osmoregulation - Regulation of salt content - Regulation of pH		(1)
		(Mark first ONE only)		**(8)**
1.5	1.5.1	Photosynthesis✓		(1)
	1.5.2	To de-starch the plant✓		(1)
	1.5.3	To soften the leaf✓		(1)
	1.5.4	To extract✓ chlorophyll from a leaf✓		(2)
	1.5.5	Iodine solution✓		(1)
	1.5.6	The iodine will change from yellow✓/brown to blue-black✓		(2)
				(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Deoxygenated blood✓ (1)

(b) Diffusion ✓ (1)

(c) Red blood cell✓/erythrocyte (1)

2.1.2
- The surface is moist✓ which is important for diffusion✓
- Surface is thin✓ there are only one cell layer for easy diffusion✓
- Many alveoli ✓ that enlarge surface for optimum diffusion✓
- Have a lot of blood vessels✓ that makes transport efficient✓

(ANY 3 x 2) (6)

2.1.3 -As oxyhaemoglobin✓
-Dissolved in blood plasma✓ (2)

2.1.4
- CO_2 levels in the blood increase above normal levels.✓
- Receptor cells in the carotid artery in the neck✓ are stimulated.
- To send impulses to the medulla oblongata ✓ in the brain.
- Medulla oblongata stimulates respiratory muscles OR (intercostal muscles and diaphragm) and heart✓
- Respiratory muscles contract more actively✓-this accelerates
- The rate and depth(both) of breathing.✓
- Increasing the heartrate.✓
- More CO_2 is taken to the lungs✓
- More carbon dioxide is taken to the lungs and more carbon dioxide is exhaled✓/more oxygen is inhaled.
- The imbalance in the blood is restored✓ **(Any 7)**

(7)
(18)

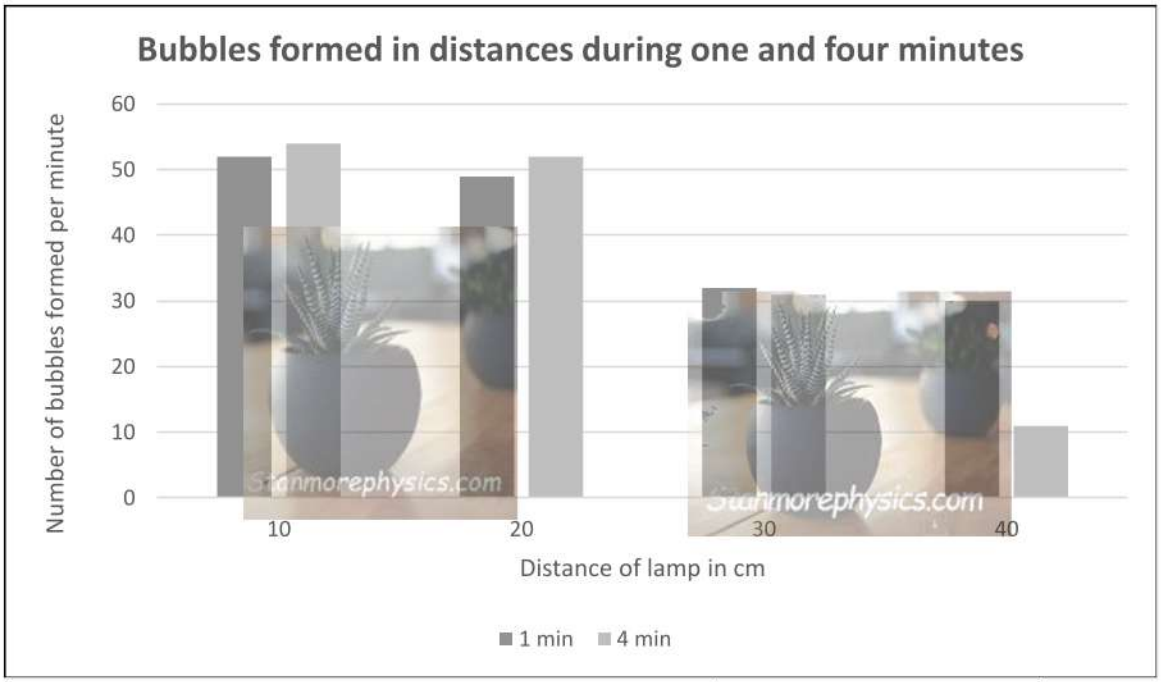
2.2 2.2.1 What is the effect of light intensity on the rate of photosynthesis in a water plant? ✓✓ (2)

2.2.2 Oxygen✓ (1)

2.2.3 30+10+9+11= 60✓

$\frac{60}{4}$ ✓ = 15✓ (3)

2.2.4



Criteria	Mark allocation
Caption of the graph includes both variables **(C)**	1
Bar graph is drawn **(T)**	1
Correct labels of x-axis and y- axis with correct units on the y-axis **(L)**	1
Correct scale of y-axis and bars of equal width and spaces between bars for x-axis**(S)**	1
Plotting**(P)** correctly done for: Only bars of min 1 and 4 was drawn 1-7 bars plotted correctly All bars plotted correctly	 1 1 1

(6)

2.2.5 The nearer the lamp to the water plant the higher the rate of photosynthesis✓✓

OR

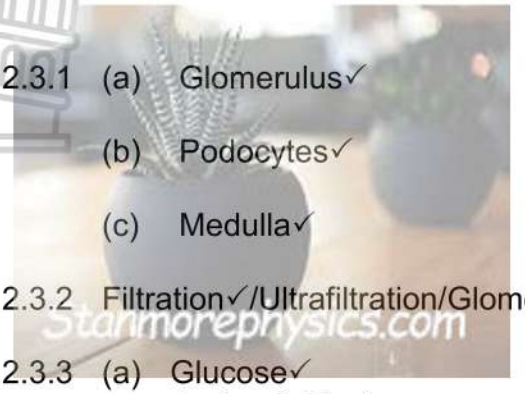
The further away the lamp is from the water plant the lower the rate of photosynthesis✓✓ (2)

2.2.6 - Use the same type of lamp✓
- Use the same strength of lamp✓

- Use the same type of water plant✓
- Use the same length/size of water plant✓
- Same apparatus✓ (2)

(Mark first TWO only) **(ANY 2)**

(16)



2.3.1 (a) Glomerulus✓ (1)

(b) Podocytes✓ (1)

(c) Medulla✓ (1)

2.3.2 Filtration✓/Ultrafiltration/Glomerular filtration (1)

2.3.3 (a) Glucose✓
Amino Acids✓
Vitamins✓
(Mark first TWO only) (2)

(b) -The tube is long and convoluted✓
-The peritubular capillary network surrounds the renal tubule✓
-The cuboidal epithelial cells, have many mitochondria✓
-The cuboidal epithelial cells have finger-like projections✓ (2)
(Mark first TWO only) **(ANY)**

2.3.4 - The afferent arteriole is wider than the efferent arteriole, ✓
- Which causes a high blood pressure in the glomerulus, ✓
- Promoting filtration. ✓ (3)

2.3.5 - During deamination✓
- In the liver✓
- Amino acids ✓are broken down to urea (3)

2.3.6 - Liver✓ and
- Small intestines✓
- Skin✓ (2)
- Lungs✓
(Mark first TWO only) **(ANY)**

(16)

TOTAL QUESTION 2: (50)

QUESTION 3

3.1.1 (a) Liver✓ (1)

(b) Bile✓ (1)

(c) Small intestines✓/duodenum ✓ (1)

3.1.2
- Produces bile✓
- Conversion of glucose into glycogen✓
- Excess glucose converted to fat✓
- Excess amino acids broken down to form urea and glucose✓
- Liver is a detoxifying organ✓
- Stores Vitamins A, D, E, K and B_{12}✓
- Synthesises heparin which prevent blood clotting✓ (3)

(Mark first THREE only) **(ANY)**

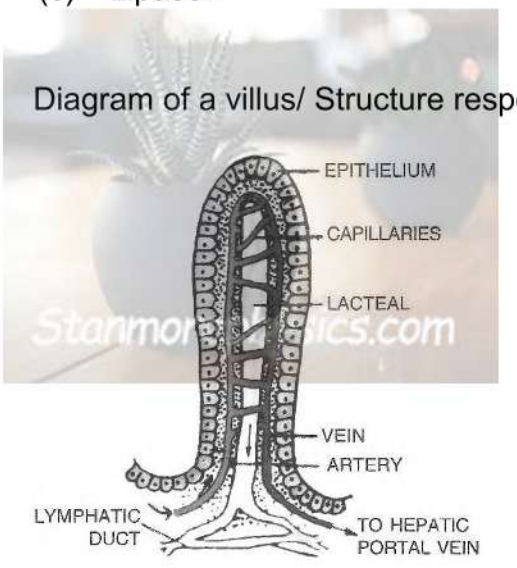
3.1.3 Peristalsis✓ (1)

3.1.3. (a) Diffusion✓ (1)

(b) Amino Acids✓ (1)

(c) Lipase✓ (1)

3.1.5 Diagram of a villus/ Structure responible for increse absorption area



	Mark allocation
Heading **(H)**	1
Correct drawing **(D)**	1
Any THREE correct labels **(L)**	3

(5)
(15)

3.2 3.2.1 To prevent any CO_2 form entering or leaving the test tube✓ so that the results cannot be influenced.✓ (2)

3.2.2 **A** will be Purple✓ The leaf photosynthesises and the CO_2 are absorbed which leads to low CO_2 concentration✓
B will be yellow✓ due to the insects that respire and release CO2 thus more CO_2 will be present in the test tube✓ (4)

3.2.3 ✓Table

Photosynthesis	Respiration
Occurs in the plant cells✓	Occurs in all living cells✓
Occurs only in the presence of light✓	Occurs day and night✓
Uses carbon dioxide and water✓	Uses oxygen and glucose✓
Oxygen is released as a product ✓	Carbo dioxide is released as product✓
Food/Glucose is manufactured✓	Food/ Glucose is broken down✓
Occurs in a chloroplast✓	Occurs in the Mitochondria✓

(ANY 3 + TABLE) (7)
(13)

3.3.1 Hot day✓ (1)

3.3.2 Coffee✓ (1)

3.3.3. - Blood contains more water than normal✓
- The hypothalamus is stimulated✓ and
- Sends impulses to the pituitary gland✓
- To secrete less ADH✓.
- And the walls of the renal tubules✓/convoluted tubule and collecting ducts
- Becomes less permeable✓ to water.
- Less water is re-absorbed ✓
- More water is lost✓.(diluted urine)
- The water balance decrease and the water level in the blood returns to normal.✓ (6)

(ANY 6)

3.3.4 Aldosterone✓ (1)
(9)

3.4.1	(a) Insulin✓ and Glucagon✓	(2)
	(b) Pancreas✓	(1)
3.4.2	8:00 – 9:00✓	(1)
3.4.3	The glucose levels in the blood increased above✓ 7,1 mmol/L✓ to 8,4 mmol/L	(2)
3.4.4.	-Glucose levels in the blood decreased under 3,9mmol/L✓ at 14:00 - It stimulated the islands of Langerhans/pancreas✓ - to secrete glucagon✓ - That converted glycogen into glucose✓ -glucose levels in the blood increased✓ at 15:00 - and glucose levels in the blood returned to normal✓ **(ANY 5)**	(5)
3.4.5	Glucose levels in the blood would have stayed high✓ for a longer period✓	(2)
		(13)
	TOTAL QUESTION 3:	**[50]**
	TOTAL SECTION B:	**100**
	GRAND TOTAL:	**150**