Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2020

LIFE SCIENCES P1

MARKS: **150**

TIME: **2½ hours**

ILFSCE1

This question paper consists of 14 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 of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, flow charts or tables 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 a compass where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 Energy is released during …

A photosynthesis.
B cellular respiration.
C transpiration.
D digestion.

1.1.2 Which ONE of the following pathways shows the correct sequence of air movement during exhalation?

A Bronchiole→bronchus→alveolus→trachea
B Alveolus→bronchiole→bronchus→trachea
C Trachea→bronchus→bronchiole→alveolus
D Alveolus→bronchus→bronchiole→trachea

1.1.3 The part of the brain that will be activated when a person begins to dehydrate is the …

A cerebrum.
B cerebellum.
C pons
D hypothalamus.

1.1.4 Which ONE of the following substances is formed during anaerobic respiration by yeast cells?

A Ethyl alcohol (ethanol)
B Oxygen
C Glucose
D Carbonic acid

1.1.5 The carbon dioxide is transported in the blood mainly in the form of …

A urea.
B carboxylic acid
C bicarbonate ions.
D lactic acid

1.1.6 Which of the following factors will determine the rate of breathing in humans?

A Carbon dioxide level in the blood
B Level of oxygen in the exhaled air
C Amount of water in the blood
D Concentration of insulin in the blood

1.1.7 If the pH of the blood becomes (drops) too low, which substance will the cells of the renal tubule excrete from the blood and pass into the filtrate to correct this imbalance?

A Potassium ions.
B Carbonate ions.
C Sodium ions.
D Hydrogen ions.

1.1.8 The blood tissue that transports oxygen is/are the …

A white blood cells
B red blood cells
C platelets
D haemoglobin

1.1.9 Which ONE of the following blood vessels carries oxygen from the lung to the heart?

A Pulmonary artery
B Renal artery
C Hepatic vein
D Pulmonary vein

1.1.10 Which region of the kidney contains renal pyramids?

A medulla
B cortex
C hilum
D pelvis (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 number (1.2.1–1.2.8) in the ANSWER BOOK.

1.2.1 The process by which the body eliminates metabolic waste products

1.2.2 The structure that prevents food from entering the trachea during swallowing

1.2.3 The part of the alimentary canal that serves as a passage for both food and air

1.2.4 The regulation of the water content in the body fluids by the kidneys

1.2.5 The region of the brain that controls the rate of breathing in humans

1.2.6 The general energy carrier in the cells of living organisms

1.2.7 The process by which food is moved along in the alimentary canal of humans

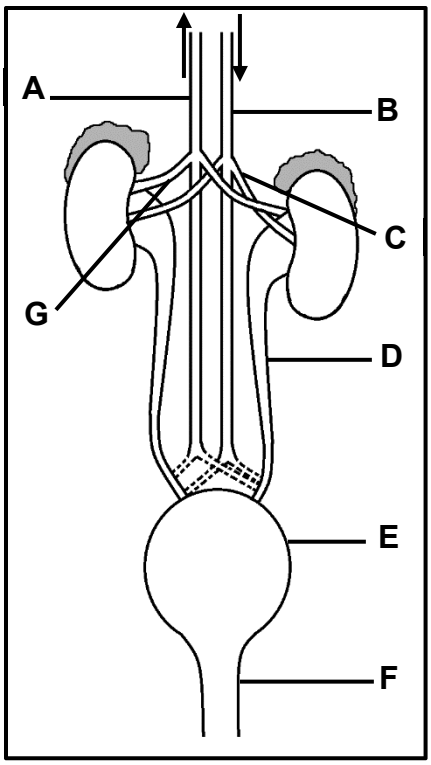
1.2.8 The stage of cellular respiration in which glucose is converted to pyruvic acid (8 x 1) (8)

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 (1.3.1–1.3.3) in the ANSWER BOOK.

	COLUMN I		COLUMN II
1.3.1	Site of cellular respiration	A: B:	Chloroplast Mitochondrion
1.3.2	Transport of digested nutrients from the small intestine to the liver	A: B:	Renal vein Hepatic vein
1.3.3	Hormone involved in the reabsorption of water	A: B:	ADH Glucagon

(3 x 2) (6)

1.4 The diagram below represents the human urinary system.



1.4.1 Label parts:

(a) **G** (1)

(b) **F** (1)

1.4.2 Name the main blood vessel that:

(a) Transports deoxygenated blood back to the heart (1)

(b) Is under highest blood pressure (1)

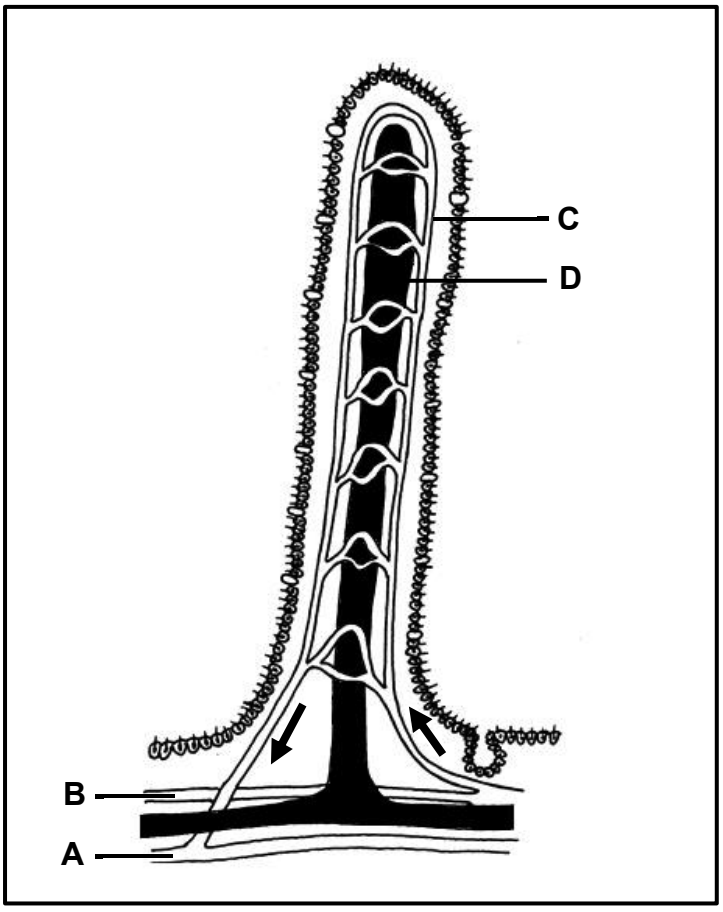
1.4.3 Give the LETTER and NAME of the:

(a) Part that collects and stores urine temporarily (2)

(b) Blood vessel that transports oxygenated blood directly into the kidney (2)

(c) Tube that transports urine from the kidney to part **E** (2)

1.5 The diagram below represents a structure found in the small intestine of a human.



1.5.1 Identify the structure shown in the diagram above. (1)

1.5.2 Name the labelled part which is responsible for the absorption of:

(a) Fatty acids and glycerol (1)

(b) Glucose and amino acids (1)

1.5.3 Which ONE of the blood vessels (**A** or **B**) transports the highest amount of digested nutrients? (1)

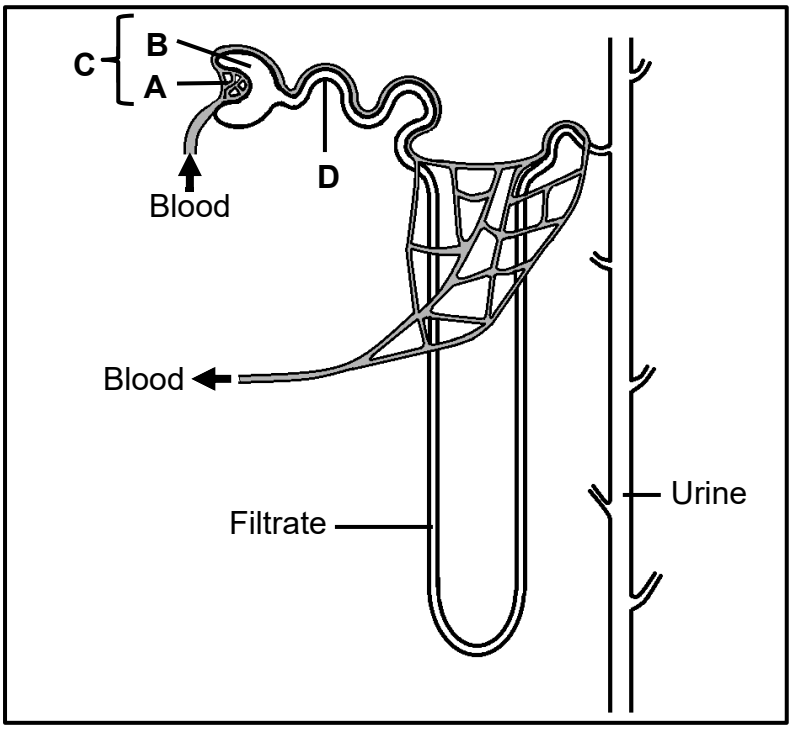
1.5.4 State TWO processes responsible for the absorption of digested nutrients. (2)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the structure of a nephron.



2.1.1 Identify the parts labelled:

(a) **A** (1)

(b) **B** (1)

2.1.2 Name the process that takes place at **C**. (1)

2.1.3 The concentration of various substances in the blood, filtrate and urine are given below.

Location	**Urea g/100 cm^3**	**Glucose g/100 cm^3**	**Proteins g/100 cm^3**	**Salts g/100 cm^3**
Blood at part **A**	0,03	0,10	8,00	0,72
Filtrate	003	0,10	0,00	0,72
Urine	2,00	0,00	0,00	1,50

Which of the substances shown in the table …

(a) did not move from the part labelled **A** to **B**? (1)

(b) is present in the filtrate, but is completely reabsorbed at the part **D**? (1)

(c) reaches the highest concentration in the urine? (1)

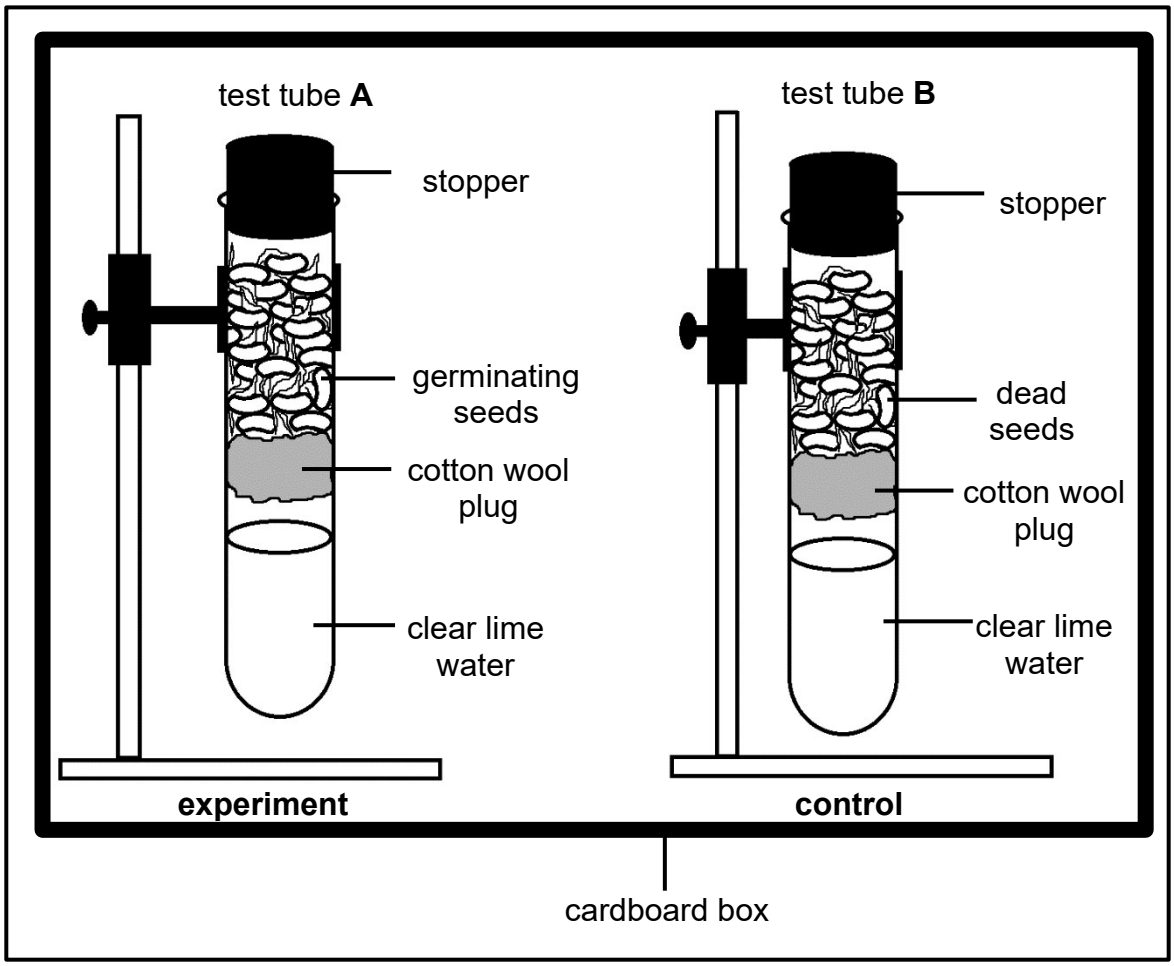
2.1.4 Explain TWO structural adaptations of part the labelled **D**. (4)

2.1.5 List ONE way in which the information in the table would differ if it were applicable to a patient suffering from diabetes mellitus before any treatment was given. (2)

2.2 An investigation was conducted to determine which gas was released during cellular respiration.

The procedure was as follows:

- 120 seeds of the same species were germinated
- 60 of them were separated and placed in boiling water for 30 minutes
- The other germinating seeds were placed in test tube **A**, while the seeds from the hot water were placed in test tube **B** after cooling
- Both sets of apparatus were rinsed with formalin to remove any micro-organisms which might have been present
- Both sets of apparatus were set up as shown in the diagram below



2.2.1 Write a hypothesis for the investigation. (2)

2.2.2 Name the gas released during cellular respiration. (1)

2.2.3 How was the test for the gas mentioned in QUESTION 2.2.2 carried out? (1)

2.2.4 Why were germinating seeds used in the experiment? (2)

2.2.5 Explain why the result was different in the control part as compared to the experiment (2)

2.2.6 Why was a cotton wool plug used as a barrier instead of using a rubber block? (2)

2.2.7 The size of the seeds and the rate of metabolism in the seeds vary and, therefore, the result obtained in this experiment may not be reliable.

How would you improve the reliability of this experiment? (1)

2.2.8 Give a reason for keeping both sets of apparatus in a cardboard box (1)

2.2.9 Which TWO environmental factors must be kept constant during this experiment? (2)

2.3 Read the following extract.

Insulin is a hormone that allows cells to absorb and use glucose. It regulates the amount of glucose that circulates in the blood stream. It also instructs the liver to store excess glucose.

In people with insulin resistance, the cells are unable to use insulin effectively. When the cells cannot absorb glucose, levels of glucose build up in the blood. Therefore, the pancreas makes extra insulin to overcome the low rate of glucose absorption and diabetes is less likely to develop. This means that the blood glucose levels will stay within the healthy range. Over time, the pancreas's ability to release insulin begins to decrease which leads to the development of type 2 diabetes.

2.3.1 Name the gland that secretes insulin. (1)

2.3.2 Why is glucose required in the cells? (1)

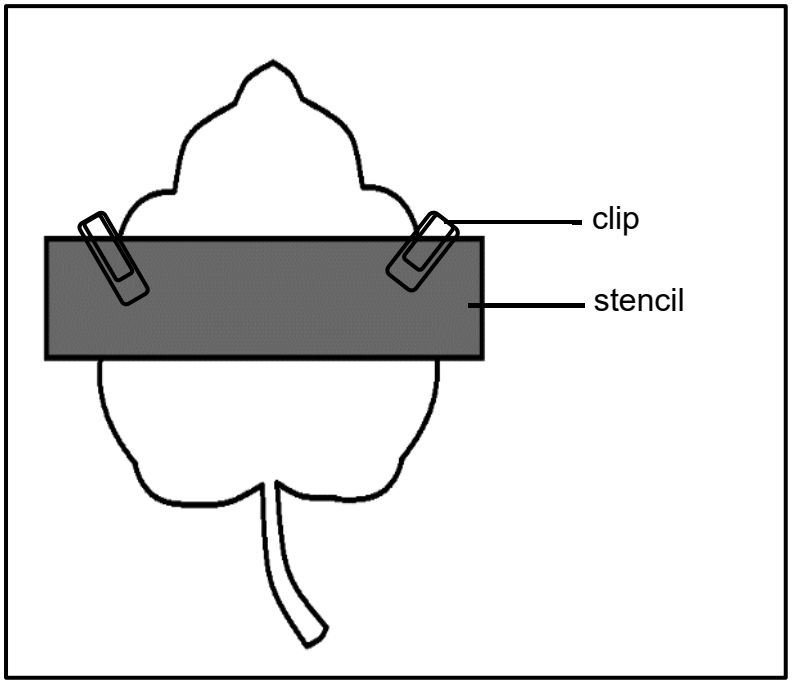
2.3.3 Describe how insulin resistance leads to type 2 diabetes. (4)

2.3.4 Explain how normal glucose levels are maintained when a healthy non-diabetic person consumes food containing a high percentage of glucose. (4)

2.4 An investigation was conducted to determine whether light is necessary for photosynthesis.

The investigation was conducted as follows:

- A potted geranium plant was kept in a dark room for 2–3 days
- One of the leaves was tested for starch
- The potted geranium plant was placed in the sun for about 4–5 hours
- One of the leaves was partially covered with a cardboard strip as shown in the diagram below
- A starch test was conducted on the same leaf at the end of the investigation



2.4.1 Why was the plant placed in a dark room? (1)

2.4.2 Why was the starch test conducted after 3 days? (1)

2.4.3 Name the chemical (reagent) used in testing for the presence of starch. (1)

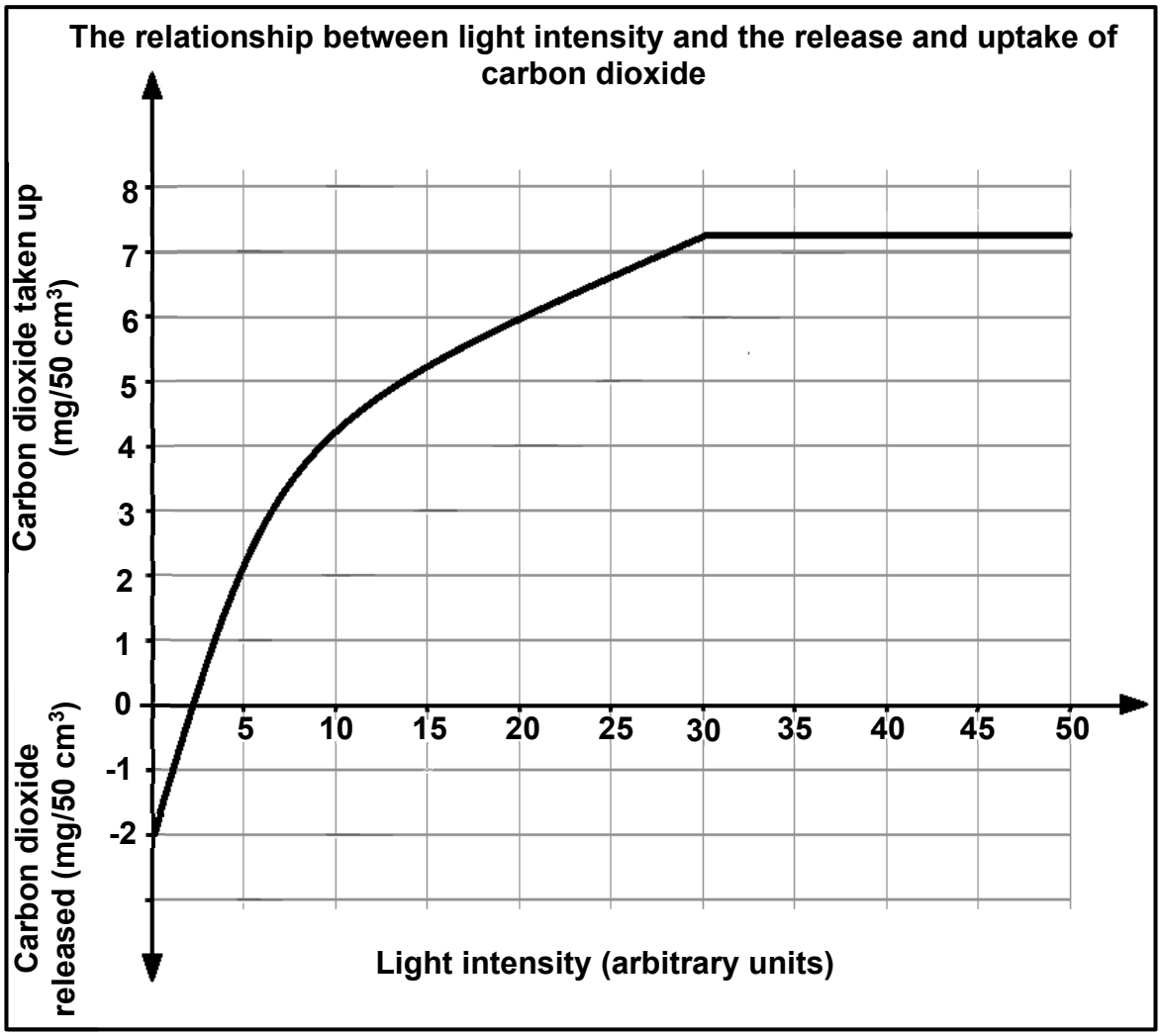
2.4.4 Why is only part of the leaf covered with stencil? (2)

2.4.5 Draw a labelled diagram of the leaf to show the results after the starch test at the end of the investigation. (3)

2.5 Explain any THREE structural requirements of an efficient gaseous exchange system. (6)
[50]

QUESTION 3

3.1 The graph below shows the relationship between light intensity and the release and uptake of carbon dioxide by the leaves of a plant.



3.1.1 At what range of light intensities is carbon dioxide released? (2)

3.1.2 Name the process, taking place in the leaves, which uses carbon dioxide. (1)

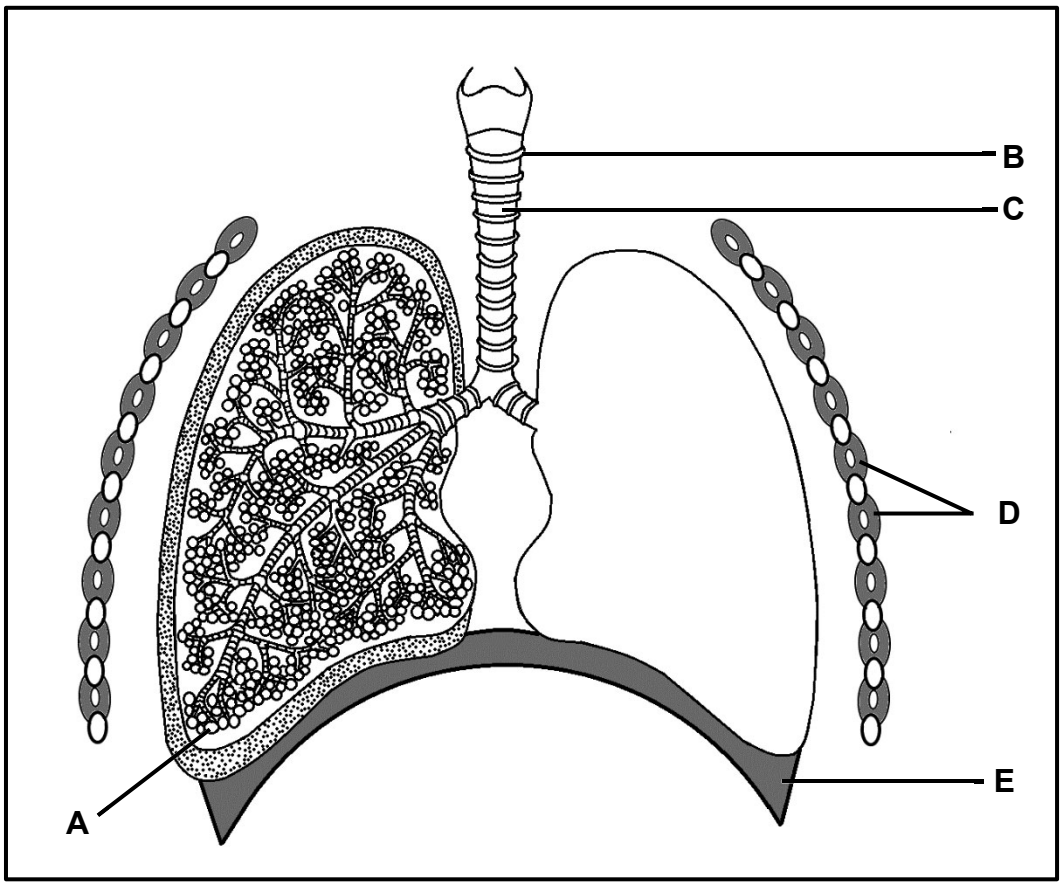
3.1.3 Why is most carbon dioxide released when the light intensity is zero units? (2)

3.1.4 How much carbon dioxide is taken up by the leaves at a light intensity of 20 units? (2)

3.1.5 When the light intensity is approximately 2 units, there is no net change in the concentration of carbon dioxide surrounding the plant. Give an explanation for this. (2)

3.1.6 At light intensities above 30 units, the amount of carbon dioxide taken up remains the same. Suggest an explanation for this observation. (4)

3.2 The diagram below represents the human lungs.



3.2.1 Identify parts:

(a) **D** (1)

(b) **E** (1)

3.2.2 Name the epithelial tissue that lines the inside of part **C**. (1)

3.2.3 State the function of the part labelled **B** (1)

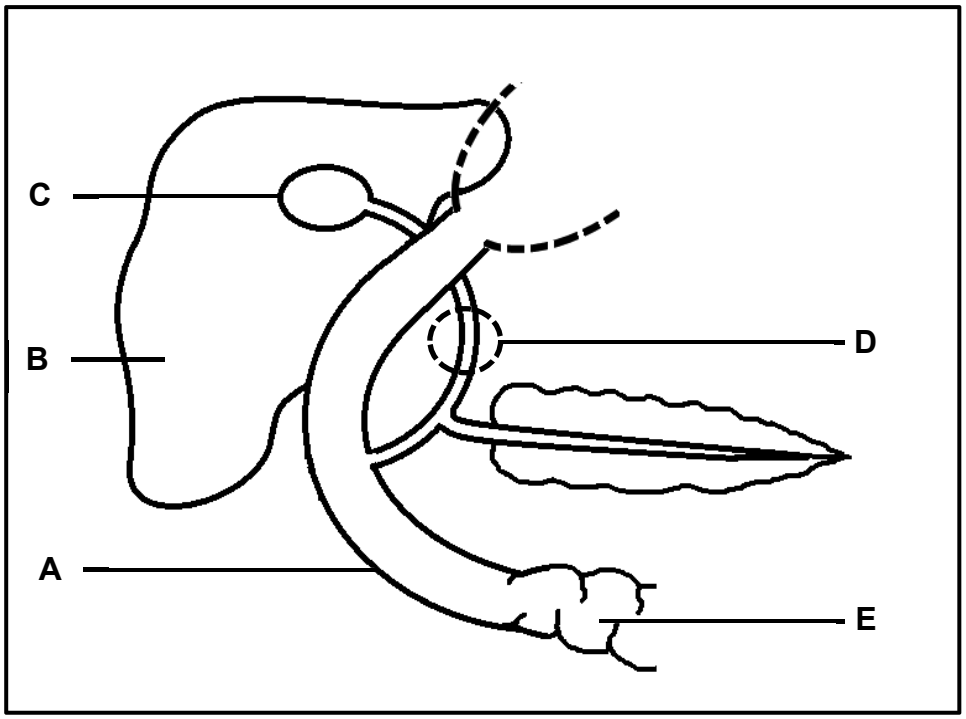
3.2.4 Describe the process of inhalation. (5)

3.2.5 The corona virus, responsible for Covid-19, infects the lower respiratory passages. This causes the accumulation of fluids in the pulmonary tubes and in the parts labelled **A**. Furthermore, the tissues that line part **A** become scarred and thickened. This may lead to the death of a patient.

(a) Name the part labelled **A** (1)

(b) Explain why the infection of lower respiratory pathways leads to possible death. (4)

3.3 The diagram below represents a certain section of the human alimentary canal (digestive canal).



3.3.1 Identify parts:

(a) **A** (1)

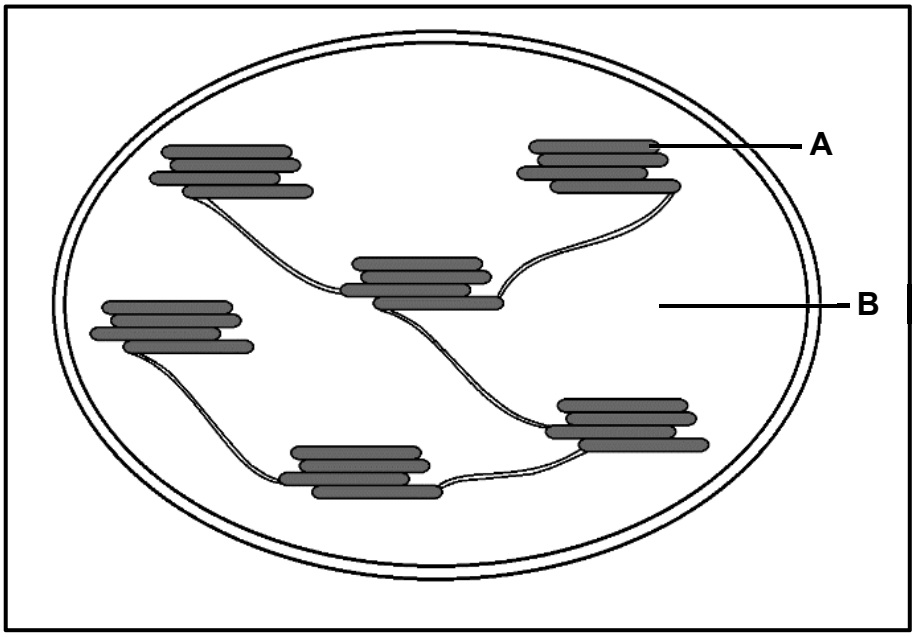
(b) **C** (1)

3.3.2 State THREE functions of the part labelled **B**. (3)

3.3.3 Explain how fat digestion would be affected if the duct labelled **D** were blocked. (3)

3.3.4 Explain TWO ways in which the part labelled **E** is structurally suited for the efficient absorption of digested nutrients. (4)

3.4 The diagram below represents an organelle found in a plant cell.



3.4.1 Identify the organelle. (1)

3.4.2 Name the part labelled **B**. (1)

3.4.3 Name the TWO stages of an important biological process which takes place within this organelle. (2)

3.4.4 Describe the process that takes place in the part labelled **A** during daylight. (5)

3.4.5 Explain whether environmental temperatures could either slow down or stop the process that takes place in the organelle represented in the diagram. (2)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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GRADE 11

NOVEMBER 2020

LIFE SCIENCES P1 MARKING GUIDELINE

MARKS: **150**

This marking guideline consists of 10 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are 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 national 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	B ✓✓		
	1.1.2	B ✓✓		
	1.1.3	D ✓✓		
	1.1.4	A ✓✓		
	1.1.5	C ✓✓		
	1.1.6	A ✓✓		
	1.1.7	D ✓✓		
	1.1.8	B ✓✓		
	1.1.9	D ✓✓		
	1.1.10	A ✓✓	(10 x 2)	(20)
1.2	1.2.1	Excretion ✓		
	1.2.2	Epiglottis ✓		
	1.2.3	Pharynx ✓		
	1.2.4	Osmoregulation ✓		
	1.2.5	Medulla oblongata ✓		
	1.2.6	ATP ✓/Adenosine triphosphate		
	1.2.7	Peristalsis ✓		
	1.2.8	Glycolysis ✓	(8 x 1)	(8)
1.3	1.3.1	B only ✓✓		
	1.3.2	None ✓✓		
	1.3.3	A only ✓✓	(3 x 2)	(6)
1.4	1.4.1	(a) Renal vein ✓		(1)
		(b) Urethra ✓		(1)
	1.4.2	(a) Inferior vena cava ✓		(1)
		(b) Aorta ✓		(1)
	1.4.3	(a) E ✓ – (Urinary) bladder ✓		(2)
		(b) C ✓ – Renal artery ✓		(2)
		(c) D ✓ – Ureter ✓		(2)
1.5	1.5.1	Villus ✓		(1)
	1.5.2	(a) Lacteal ✓		(1)
		(b) (Network of) blood capillaries ✓		(1)
	1.5.3	A ✓		(1)
	1.5.4	Diffusion ✓ and active transport ✓		(2)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) A – Glomerulus ✓ (1)

(b) B – Bowman's capsule ✓ (1)

2.1.2 (Ultra) filtration ✓ (1)

2.1.3 (a) Proteins ✓ (1)

(b) Glucose ✓ (1)

(c) Urea ✓ (1)

2.1.4
- The tubule is convoluted, ✓ to allow sufficient time for re-absorption of useful nutrients ✓/ increases surface area for maximum absorption
- The capillary network is in close contact with the tubule ✓ to facilitate faster re-absorption of nutrients ✓
- The cells of the inner wall of the tubule are richly supplied with many mitochondria ✓ to generate energy for active absorption ✓ (active transport) of nutrients back to the surrounding capillaries
- The cells of the tubule have microvilli ✓ to increase the surface area for maximum absorption ✓ (Any 2 x 2) (4)

2.1.5 Patient with untreated diabetes mellitus will have glucose in the urine ✓✓ (2)

2.2 2.2.1 Carbon dioxide/ oxygen is released during cellular respiration ✓✓ (2)

2.2.2 Carbon dioxide ✓ (1)

2.2.3 The clear lime water turns milky white in the presence of carbon dioxide ✓ (1)

2.2.4
- Germinating seeds are actively growing plant parts ✓
- therefore, the rate of respiration is higher ✓ than in any other parts of the plant
- since more energy ✓ is required for the active growth process (Any 2) (2)

2.2.5
- No cellular respiration takes place in the dead seeds ✓
- as a result, no carbon dioxide is released ✓ therefore, clear lime water remains clear ✓ (Any 2) (2)

2.2.6 - There are spaces between the fibres of the cotton plug ✓/ gases can diffuse through cotton wool
- allows the downward movement of carbon dioxide ✓

OR

- The rubber block does not allow the downward movement of carbon dioxide ✓
- hence no result would be obtained ✓ (2)

2.2.7 - Repeat the experiment several times ✓
- use more seeds ✓/ increase sample size (Any 1) (1)

2.2.8 - Some of the cells in the seeds may contain chloroplasts ✓ and therefore
- they perform photosynthesis ✓
- and disrupt the end result ✓ (Any 1) (1)

2.2.9 - Temperature ✓
- Light ✓ (2)

2.3 2.3.1 Pancreas ✓/ Islets of Langerhans (1)

2.3.2 The glucose is a source of energy ✓ as it is oxidised (broken down) during cellular respiration (1)

2.3.3 - When a person develops insulin resistance,
- the body cells become incapable of using insulin effectively ✓/ unable to absorb sufficient amounts of glucose
- This leads to an increase in the level of glucose in the blood ✓
- which stimulates the pancreas to secrete extra insulin ✓
- to enable the cells to absorb sufficient amounts of glucose ✓
- Over a period of time, the pancreas's ability to secrete extra insulin begins to decrease ✓
- which leads to the development of type 2 diabetes (Any 4) (4)

2.3.4 - Glucose level in the blood increases above the normal levels ✓
- The pancreas is stimulated ✓
- to secrete insulin into the blood ✓
- Insulin travels in the blood to the liver ✓
- where it stimulates the conversion of excess glucose to glycogen ✓ which is then stored
- The glucose level in the blood now decreases ✓and returns to normal (Any 4) (4)

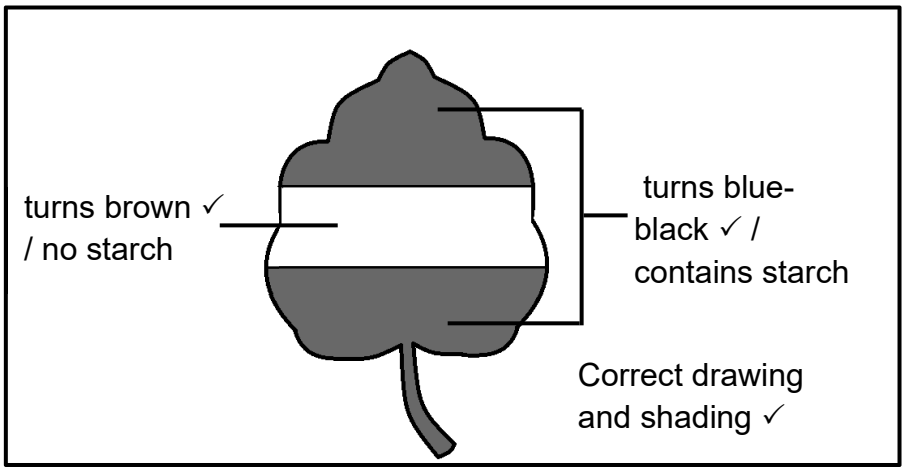
2.4 2.4.1 To destarch ✓ the plant / to allow plant to use up its starch reserves (1)

2.4.2 To check whether the leaf has been completely destarched ✓/ to confirm no starch (1)

2.4.3 (Diluted) iodine solution ✓ (1)

2.4.4 - To prevent light from falling on covered part ✓/ shade the part from light
- to serve as a control ✓/ so as to compare part in light and dark (2)

2.4.5



(3)

2.5 - Surface area of the gas exchange organ must be large ✓ in order to allow sufficient oxygen to diffuse ✓
- Surface must be moist ✓ gases diffuse through only in solution ✓
- Surface must be thin ✓ to allow for rapid diffusion of gases across it ✓
- A transport system/ blood system must be available ✓ to transport the
- gases to and from the gas exchange surfaces ✓
- An adequate ventilating mechanism must be present ✓ to ensure that oxygen-laden air is brought in and carbon dioxide-laden air is driven out ✓
- The gas exchange surface must be protected ✓ because the gas exchange system is thin and delicate ✓/ so that it does not dry out

(Mark first THREE only) (Any 3 x 2) (6)

[50]

QUESTION 3

3.1 3.1.1 Between 0 – 2 ✓ arbitrary units ✓ (2)

3.1.2 Photosynthesis ✓ (1)

3.1.3 - No photosynthesis is taking place ✓
- only respiration is taking place ✓ (2)

3.1.4 6 mg ✓/50 cm^3 ✓ (2)

3.1.5 - The rate of photosynthesis equals ✓
- the rate of respiration✓

OR

- Amount of CO_2 being produced during respiration is equal ✓to the amount of CO_2
- taken up ✓ during photosynthesis (2)

3.1.6 - The rate of photosynthesis remains constant ✓
- because the optimum ✓ concentration of CO_2 ✓ for photosynthesis
- has been taken up /
- because chlorophyll molecules were saturated ✓
- Enzymes are the limiting factor ✓ (4)

3.2 3.2.1 (a) D – intercostal muscles ✓ (1)

(b) E – diaphragm ✓ (1)

3.2.2 Ciliated ✓ epithelial tissue (1)

3.2.3 The C- shaped cartilage rings keep the trachea open at all times ✓ (1)

3.2.4 - Diaphragm contracts and becomes flattened ✓
- The length of the thoracic cavity (i.e. top to bottom distance) is increased ✓
- The external intercostal muscles contract and the rib cage is lifted ✓
- This causes the thoracic cavity to be enlarged ✓
- The total volume of the thoracic cavity increases ✓ and
- the pressure on the lungs decreases ✓
- since the atmospheric pressure is greater than the pressure on the lungs ✓
- Air rich in oxygen is drawn in through the air passages into the lungs ✓ (Any 5) (5)

3.2.5 (a) Alveolus (1)

(b)
- The corona virus infection causes
- the squamous epithelium ✓ to become scarred and thickened
- This prevents gaseous exchange ✓
- between the alveolus and surrounding blood capillaries ✓
- The accumulation of fluids in the pulmonary tube (bronchiole) prevents air flow to the alveolus ✓
- Therefore, less oxygen is made available ✓
- for cellular respiration ✓
- resulting in organ failure due to lack of energy ✓ (Any 4) (4)

3.3 3.3.1 (a) A – Duodenum ✓ (1)

(b) C – Gall bladder ✓ (1)

3.3.2
- Secretes bile ✓
- Is able to convert excess glucose to glycogen ✓/ stores glycogen
- Stores minerals such as iron ✓
- Stores vitamins such as A, D and B_{12} ✓
- Deamination of excess amino acids takes place in the liver ✓
- Able to detoxify certain harmful substances and make them harmless ✓ **(Mark first THREE only)** (Any 3) (3)

3.3.3
- The bile will not be released into the duodenum, ✓
- therefore, no emulsification of fat is possible ✓/not broken down into tiny droplets
- This means that the enzyme lipase cannot digest fats into fatty acids and glycerol ✓/ lipase action is less effective (3)

3.3.4
- Very long ✓ intestine/Part **E** ensures that the food remains in the alimentary canal for a long period for maximum absorption. ✓
- The millions of villi ✓ in the small intestine/Part **E** increase the surface area ✓ for absorption
- The walls of the villi are made up of a single row of columnar epithelial cells ✓(thin walls) for easy absorption of digested nutrients ✓
- The lacteal and capillaries ✓ transport the absorbed food away quickly ✓
- The columnar epithelial cells of the villi have microvilli ✓ to increase the surface area for absorption ✓
- The columnar epithelial cells have a high concentration of mitochondria ✓ to provide energy ✓ for active absorption of food (Any 4) (4)

3.4 3.4.1 Chloroplast ✓ (1)

3.4.2 Stroma ✓ (1)

3.4.3 - Light phase ✓/ Light dependent phase
- Dark phase ✓/ Light independent phase (2)

3.4.4 - The light phase takes place in the grana of the chloroplast ✓
- which contain chlorophyll ✓
- the chlorophyll absorbs light energy ✓
- Part of the light energy is used to form ATP ✓
- Part of the light energy is used for splitting water ✓(photolysis)
- into high energy hydrogen atoms ✓ and
- oxygen gas ✓ which is released into the atmosphere as a by-product (Any 5) (5)

3.4.5 - At high temperatures, the protein molecules of the enzymes become denatured ✓
- Therefore, the enzymes become functionless ✓
- causing the metabolic process (photosynthesis) to stop ✓
- Very low temperatures ✓ slow down the rate at which photosynthesis takes place ✓ (Any 2) (2)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150