PHOENIX NORTH LIFE SCIENCES CLUSTER

NOVEMBER EXAMINATION – 2019

LIFE SCIENCES PAPER 1

GRADE 10

MARKS: 150 **TIME:2,5 HOURS**

EXAMINER: MR T.B. GOVENDER (HAVENPARK SECONDARY)

MODERATOR: MRS J. RAMSEWAK (STANMORE SECONDARY)

****

INSTRUCTIONS AND INFORMATION

1. Please ensure that this examination paper consists of 4 questions and 13 pages.
2. Answer All the questions in the ANSWER BOOK
3. Number the answers correctly according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. All drawings and graphs must be done in pencil and labelled in blue or black ink.
6. Draw diagrams, flow charts or tables only when asked to do so.
7. You must use a non-programmable calculator, protractor and compass where necessary.
8. Write neatly and legibly.

Please Turn Over

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 to D) next to the question number in the answer book e.g. 1.1.11 D

1.1.1. The phases of mitosis in correct order are....

A metaphase, anaphase, telophase and prophase
B anaphase, metaphase, interphase and prophase
C prophase, metaphase, anaphase and telophase
D telophase, prophase, metaphase and anaphase

1.1.2. Which ONE of the following combinations represent only organic compounds?

A carbohydrates, proteins, water and vitamins
B carbohydrates , proteins, lipids and vitamins
C proteins, carbon di oxide, lipids and starch
D lipids, vitamins, carbohydrates and sodium chloride

1.1.3. The phase during which DNA replication occurs is ...

A interphase
B prophase
C metaphase
D anaphase

1.1.4. The function of the white blood corpuscles of the human body is ....

A carry O_2 from the lungs to the cells
B carry CO_2 from the cells to the lungs
C bring about clotting of blood at the site of an open wound
D defend the body against invasion of microbes such as germs and bacteria

1.1.5. The number of phalanges present in each finger is....

A 5
B 7
C 14
D 3

1.1.6. Study the following characteristics related to plant tissue.

(i) Acts as a strengthening tissue
(ii) Made up of living cells
(iii) Cell walls are thickened with lignin
(iv) Transports dissolved food from the leaves to all parts of the plant

Which of the following combinations applies to Xylem tissue?

A (i), (ii) and (iv)
B (i) and (iii)
C (ii), (iii)) and (iv)
D (i), (iii) and (iv)

1.1.7. If the magnifying power of the eyepiece of a microscope is 7X and that of the objective is 10X, the total magnification of the specimen will be...

A 70X
B 700X
C 7X
D 20X

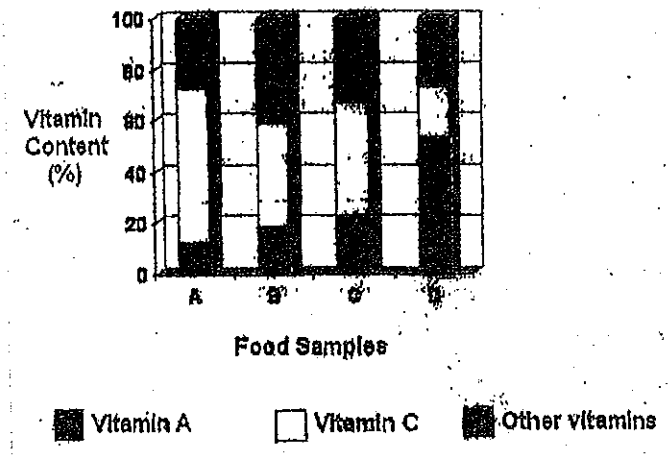
1.1.8. An alternate term for the kneecap is...

A suture
B clavicle
C patella
D fibula

1.1.9. The condition which results in bone becoming porous (having holes) due to loss of calcium is ...

A rickets
B gout
C arthritis
D osteoporosis

1.1.10. Five samples of food were analysed to determine the Vitamin A and Vitamin C content. The results were recorded in the graph below.



The food that is most likely to be recommended for a person suffering from scurvy is ...

A food sample A
B food sample B
C food sample C
D food sample D

(10x2=20)

1.2. Provide 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. The large opening at the base of the skull through which the spinal cord passes
1.2.2. Connective tissue which connects muscle to bone
1.2.3. Part of the microscope which regulates the amount of light entering the microscope
1.2.4. Movement of gas molecules from a region of high concentration to a region of low concentration
1.2.5. Pair of voluntary muscles found at joints which work in opposition to each other to bring about movement e.g. triceps and biceps
1.2.6. The green pigment found in the chloroplast which traps light energy for photosynthesis
1.2.7. Division of the cytoplasm during mitosis
1.2.8. A type of skeleton where muscles acts against fluid to bring about movement.
1.2.9. The cells in a leaf with large intercellular air spaces between them
1.2.10. The part of the skull that contains and protects the brain

(10)

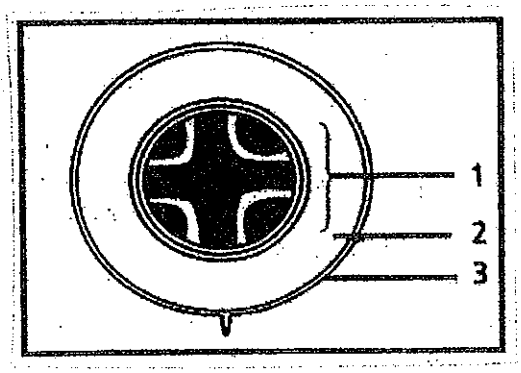
Please Turn Over

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 1.3.5) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1. Tumours which have stopped growing	A: Malignant B: Benign
1.3.2. Cancer causing agent	A: Smoking B: Radiation
1.3.3. Single stranded nucleic acid	A: RNA B: DNA

(3x2=6)

1.4. The diagram below represent a plan diagram showing the cross section through a dicotyledenous root.



1.4.1. Provide ONE OBSERVABLE reason as to why this is a plan diagram of a dicotyledenous root. (1)

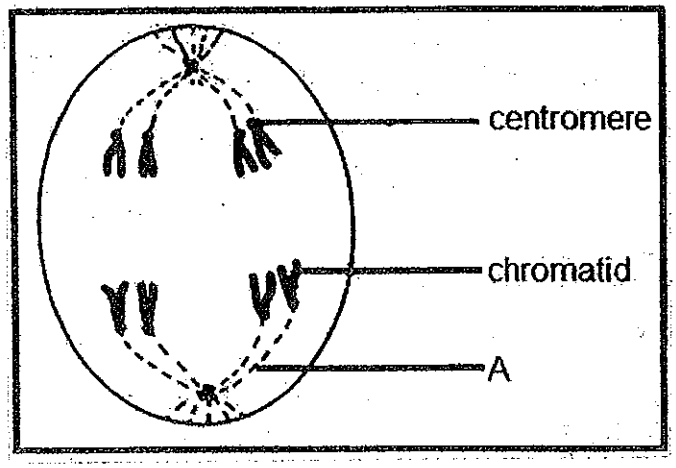
1.4.2. Provide labels 1, 2 and 3. (3)

1.4.3. State the function of phloem tissue in the root. (1)

[5]

Please Turn Over

1.5. Study the diagram below which shows a phase in mitosis.



1.5.1. Identify the phase of mitosis represented by the diagram. (1)

1.5.2.1. Identify part A. (1)

1.5.2.2. State the role of part A during the phase mentioned in QUESTION 1.5.1. (1)

1.5.3. How many chromosomes are shown in the diagram? (1)

1.5.4. How many chromosomes will be found in each of the two cells at the end of mitosis? (1)

1.5.5. Name the phase of mitosis which follow the phase shown in the diagram. (1)

1.5.6. State THREE ways in which mitosis is biologically important. (3)

[9]

TOTAL SECTION A: 50

Please Turn Over

SECTION B

QUESTION 2

2.1. The following table shows an analysis of nutrients found in 100g portion of breakfast. The breakfast was made up of eggs, butter and bread.

NUTRIENTS IN A 100 g PORTION	FOOD TYPES		
	Eggs	Bread	Butter
Carbohydrates (g)	0	20,2	0,1
Fats (g)	12,5	0,2	85,2
Protein (g)	11,8	2,5	0
Calcium (mg)	56	3,3	13,8
Iron (mg)	2,8	0,6	0,15
Vitamin A (mg)	675	12	2344
Vitamin C (mg)	0	57	0,2

2.1.1. Name the monomers (building blocks) of fats. (2)

2.1.2. List ONE function of iron in the human body. (1)

2.1.3. Identify the food type that would be best for a person suffering from anaemia. Provide a reason for your answer. (3)

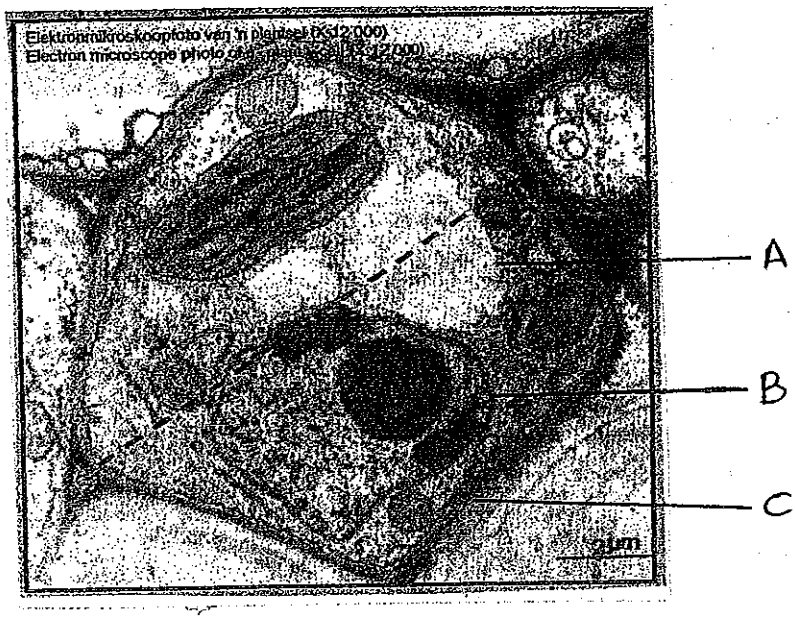
2.1.4. Differentiate between saturated fats and unsaturated fats. (2)

2.1.5. List ONE function of calcium in the human body. (1)

2.1.6. A recommended balanced diet should consists of 55% carbohydrates, 30% fats and 15% proteins. Using the above information, draw a pie chart for a recommended balanced diet. (6)

[15]

2.2. Study the micrograph below.



2.2.1. Does the micrograph represent a plant cell or an animal cell? Provide TWO observable reasons for your answer. (3)

2.2.2. Write down the LETTER and the NAME of the following parts:

(a) Structure consisting of cellulose (2)
(b) Structure which controls all the activities within the cell (2)
(c) Structure which is filled with cell sap (2)

2.2.3. Using the scale line shown on the micrograph, calculate the width of the cell along the plane indicated by the dotted lines. (show all calculations) (3)

2.2.4. Discuss THREE structural adaptations of the chloroplast for its function. (6)

[18]

2.3. Read the following article and answer the questions

Stem cell cure?

A paralysed patient in the USA has been injected with human embryonic stem cells in a world –first attempt to help him walk again. Doctors hope the stem cells will help nerves in the newly damaged spinal cord regenerate before the disablity becomes permanent.

The patient has had millions of the stem cells injected into the site of the injury in an effort to find a revolutionary cure, according to th US firm carrying out the hugely controversial experiment.

The study uses stem cells obtained from three – to –five- day old fertilised embryos discarded by IVF doctors. The treatment offers hope to patients suffering from serious spinal injuries and also blindnes. Researchers are looking to unlock the potential of stem cells for new ways to treat cancer, Parkinson's disease and a host of other illnesses.

Stem cell therapy is opposed by pro-life activitist led by the Roman Catholic Church, which is against the use of human embryos to harvest stem cells.

2.3.1. What are stem cells? (1)

2.3.2. How do doctors hope that the stem cell therapy will help the paralysed patient? (1)

2.3.3. From where are the stem cell harvested? (1)

2.3.4. List TWO illnesses listed above which stem cells have the potential of treating. (2)

2.3.5. Why are some people against the use of embryonic stem cells for treating illnesses? (2)

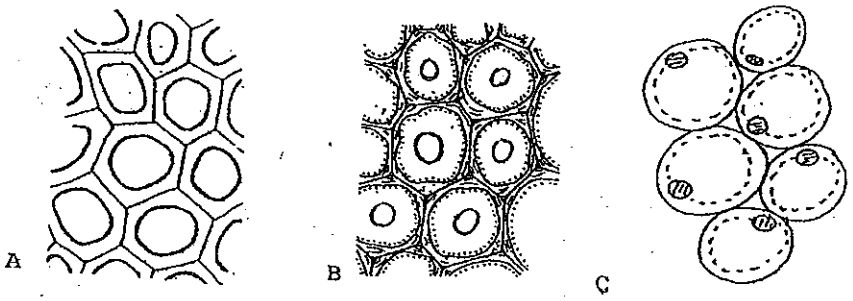
[7]

[40]

Please Turn Over

QUESTION 3

3.1. The following diagrams represent 3 plant tissues.



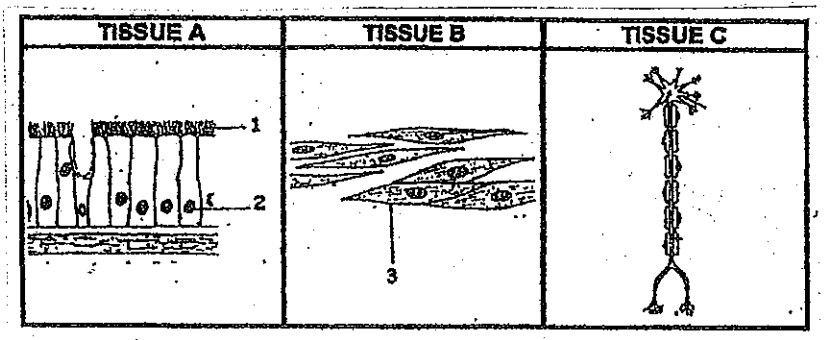
3.1.1. Identify tissue A, B and C. (3)

3.1.2. Tabulate TWO structural differences between tissue A and B. (5)

3.1.3. State ONE function common to both tissue A and B. (2)

[10]

3.2. The following diagrams represent 3 mammalian tissues.



3.2.1. Identify tissue A, B and C. (3)

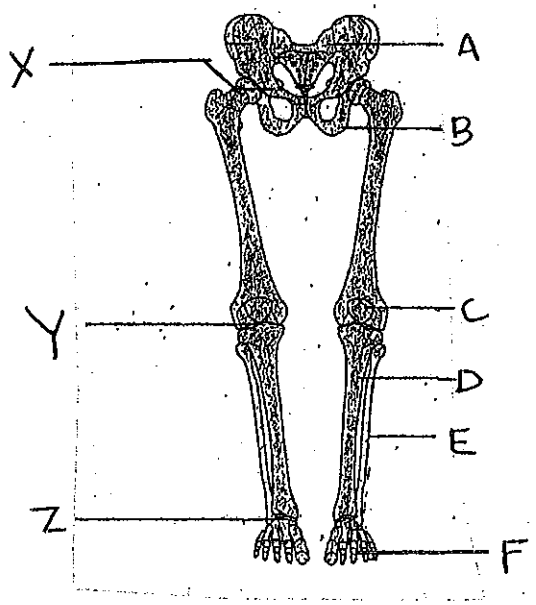
3.2.2. label parts numbered 1, 2 and 3. (3)

3.2.3. Draw a fully labelled diagram of tissue C. (4)

[10]

Please Turn Over

3.3. Study the diagram below of the pelvic girdle and lower limb.



3.3.1. Provide labels for D, E and F. (3)

3.3.2. Identify the type of synovial joints X, Y and Z. (3)

3.3.3. Discuss the advantage of the pelvic girdle being wide. (2)

3.3.4. Identify each of the following disease that affect the skeleton..

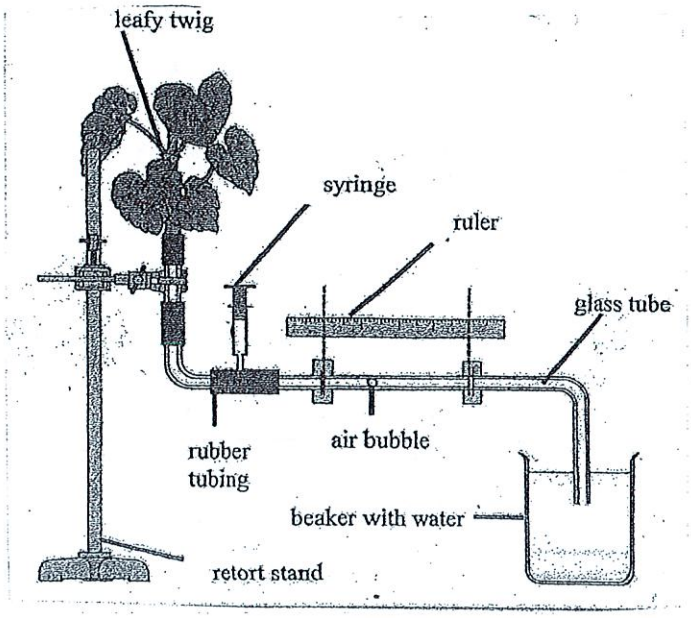
a) softening of bones in children potentially leading to fractures. (1)

b) condition which affects the joints resulting in severe pain and stiffness. (1)

[10]

Please Turn Over

3.4 Xian used a potometer to investigate how temperature affect transpiration rate.



The results of the investigation are reflected in the table below.

Temperature (O^c)	22	25	27	28
Transpiration rate (m mol/m^2sec)	1.5	3.5	5	6

3.4.1. State an hypothesis for this experiment. (2)

3.4.2. Explain ONE precaution to be taken when setting up this investigation. (2)

3.4.3. Identify the...

a) dependent variable (1)

b) independent variable (1)

3.4.4. Predict what would happen to the speed of the movement of the bubble if vaseline was applied to the ventral (lower) surfaces of all the leaves. Explain your answer. (3)

3.4.5. Why should this apparatus be allowed to stand before starting the experiment? (1)

[10]

TOTAL SECTION B: 80

Please Turn Over

SECTION C

QUESTION 4

Water, is which is absorbed by the roots of the plants, is transported by the xylem to the leaves where it is lost either through transpiration or guttation.

Write an essay in which you discuss...

a) the absorption of water by the root hair.

b) The lateral transport of water across the root to the xylem of the root.

c) The difference between transpiration and guttation.

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

Content: (17)
Synthesis: (3)

TOTAL SECTION C: 20

GRAND TOTAL: 150

PHOENIX NORTH LIFE SCIENCES CLUSTER

NOVEMBER EXAMINATION – 2019

LIFE SCIENCES PAPER 1

GRADE 10

MARKING MEMORANDUM

SECTION A

QUESTION 1

1.1.1. C ✓✓
1.1.2. B ✓✓
1.1.3. A ✓✓
1.1.4. D ✓✓
1.1.5. D ✓✓
1.1.6. B ✓✓
1.1.7. A ✓✓
1.1.8. C ✓✓
1.1.9. D ✓✓
1.1.10. A ✓✓

1.2.1. Foramen magnum ✓
1.2.2. Tendons ✓
1.2.3. Diaphragm ✓
1.2.4. Diffusion ✓
1.2.5. Antagonistic ✓
1.2.6. Chlorophyll ✓
1.2.7. Cytokinesis ✓
1.2.8. Hydrostatic ✓
1.2.9. Spongy Mesophyll ✓
1.2.10. Cranium ✓

1.3.1. B only
1.3.2. Both A and B
1.3.3. A only

1.4.1. Xylem is star/stellate shape / Phloem alternates with Xylem/ Phloem found within the arms of Xylem ANY 1 unicellular root hairs present

1.4.2. 1- Stele or vascular cylinder ANY 1
2- Cortex/ parenchyma of cortex ANY 1
3 - Epidermis

1.4.3. Transport manufactured food from the leaves to the root.

1.5.1. Anaphase

1.5.2.1. Spindle fibre

1.5.2.2. Contracts and pulls the chromatids apart towards the opposite ends of the cell.

1.5.3. 4

1.5.4. 4

1.5.5. Telophase

1.5.6. a) It promotes/brings about growth in size of organism
b) It repairs worn out or damaged cells
c) It replaces dead cells
d) It brings about asexual reproduction in certain plants and animals 3 4 9

SECTION B

QUESTION 2

2.1.1. Fatty acids and glycerol / 3 Fatty acids and 1 glycerol ANY 1

2.1.2. Required for haemoglobin formation to transport oxygen

2.1.3. Eggs – has the highest amount of Iron

2.1.4. Saturated fats are solid at room temperature while unsaturated fats are liquid at room temperature / Saturated fats are formed from animal sources while unsaturated fats are formed from plant sources

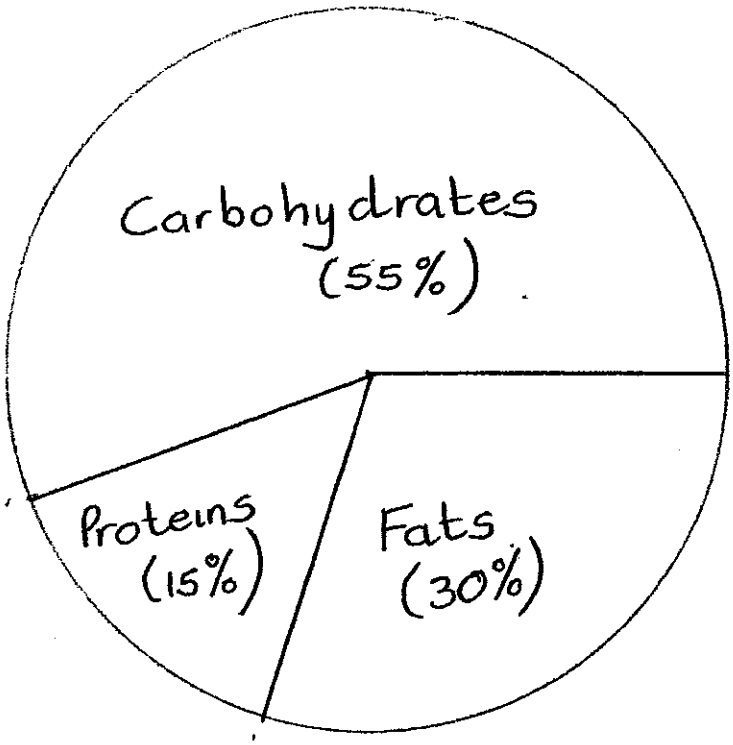
2.1.5. Required for bone and teeth formation

2.1.6. Calculation:

Carbohydrates: $55/100 \times 360^0 = 198^0$ Fats: $30/100 \times 360^0 = 108^0$

Proteins: $15/100 \times 360^0 = 54^0$

Pie chart showing a recommended balanced diet consisting of 55 % carbohydrate, 30 % proteins and 15% fats



Marking grid for pie chart

Criteria	Mark allocation
Correct type of graph (pie chart) (T)	1
Title of graph (including both variables)	1
Calculations (C)	1: 1 to 2 calculations correct 2: All 3 calculations correct
Proportions accurate for each sector/ slice labelled (P)	1: 1 to 2 sectors drawn correctly 2: All 3 sectors drawn correctly

(6)

2.2.1. Plant cell. Presence of cell wall/ fixed or rigid shape/ presence of chloroplast
Large vacuole present ANY 2 REASONS

2.2.2. (a) C - cell wall
(b) B - nucleus
(c) A - vacuole

2.2.3. Width of cell = $\frac{\text{Measured width of cell (mm) x length of scale line (µm)}}{\text{Measure length of scale line (mm)}}$

$= \frac{67 \text{ mm} \times 2 \text{ µm}}{12 \text{ mm}}$

$= 11,17 \text{ µm}$

2.2.4. - The double membrane is translucent which allows for light to pass through
- The double membrane is permeable to carbon – di- oxide and water which enters the chloroplast and oxygen which leaves the chloroplast
- The granum increases the surface area for the absorption of light
- Ribosomes in the stroma manufactures enzymes which controls the process of photosynthesis ANY 3

2.3.1. Stem cells are undifferentited or unspecialised cells which have the potential to differentiate to form any tissue or organ in the body

2.3.2. Doctors hope the stem cells will help nerves in the newly damaged spinal cord regenerate before the disability becomes permanent.

2.3.3. Three to five day old fertilised embryos/ cord blood (blood from the umbilical cord and placenta) /bone marrow ANY 1

2.3.4. Serious spinal injuries/ blindness/ cancer/ Parkinson's disease ANY 2

2.3.5. Some people believe that a human embryo is a life and should be protected.

3.4.1. As the temperature increases, the transpiration rate will increase

OR

As the temperature increases, the transpiration rate will decrease

OR

Change in temperature will have NO effect on the rate of transpiration

3.4.2. Cut the stem underwater to prevent air bubbles from blocking the xylem
Cut the stem at an angle to ensure no damage to the xylem
Ensure the twig fits securely into the rubber stopper and seal with vaseline
Make sure apparatus is air tight. / Place the apparatus on a level surface.

3.4.3. a) Transpiration rate

b) Temperature

3.4.4. The speed of movement of the air bubble will be greatly reduced. Vaseline prevents transpiration at the ventral surfaces from taking place by blocking the stomata

3.4.5. To allow to acclimatise to the environment

QUESTION 4 (ESSAY)

a) Absorption of water by the roots (A)

Soil water/ capillary water has a high water potential while the cell sap has a low water potential due to its high concentration of solutes. Water moves along a water potential gradient, entering the cytosol/cytoplasm of the root hair through the cell membrane by osmosis. The water then enters the vacuole of the root hair.

Max: 5

b) Lateral transport of water across the root to the Xylem of the root (LT)

Water having entered the root hair may now follow two path ways on its journey to the stele before entering the xylem tissue:

Major pathway

Most water passes by diffusion, from the root hair, along the cell walls of the cortical cells, through the intercellular spaces along a water potential gradient, until it reaches the endodermis with the Casparian strip, which is impermeable to water. Water is then allowed to enter the stele by passing through the thin walled passage cells by osmosis. Water thens enters the xylem of the root.

ANY 4

Minor pathway

Water moves along a water potential gradient, through the cortical cells by osmosis until it reaches the endodermis with the Casparian strip. Water passes through the thin walled passage cells and enter the stele by osmosis and then it enters the xylem of the root.

ANY 4

Max: 8

c) The difference between Transpiration (T) and Guttation (G)

Transpiration is the loss of water in the form of water vapour through the stomata while guttation is the loss of water in droplet form through the hydathodes.

Max. 4

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the topic	Ideas arranged in a logical sequence/ cause and effect	Answered all aspects required by the essay
Only information about: - Absorption of water by the root hair - Lateral transport of water across the root to the Xylem of the root - The difference between guttation and transpiration	Information about: - Absorption of water by the root hair - Lateral transport of water across the root to the Xylem of the root - The difference between guttation and transpiration is given in a logical sequence	At least - Absorption of water by the root hair =3/5 - Lateral transport of water across the root to the Xylem of the root = 6/8 - The difference between guttation and transpiration =2/4 are obtained
1 Mark	1 Mark	1 Mark