Centre Number	Candidate Number	Candidate Name

NAMIBIA SENIOR SECONDARY CERTIFICATE

BIOLOGY HIGHER LEVEL

8321/2

PAPER 2

2 hours 15 minutes

Marks 100

2019

Additional Materials: Ruler

INSTRUCTIONS AND INFORMATION TO CANDIDATES

- Candidates answer on the Question Paper in the spaces provided.
- Write your Centre Number, Candidate Number and Name in the spaces at the top of this page.
- Write in dark blue or black pen.
- You may use a soft pencil for any rough work, diagrams or graphs.
- You may use a non-programmable calculator.
- Do not use correction fluid.
- Do not write in the margin *For Examiner's Use*.

Section A

- Answer **all** questions.
- You are advised to spend no longer than 1 hour on Section A.

Section B

- Answer **two** questions.
- Write your answers on the answer sheets provided at the back of the booklet.
- The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	
Section B	
Question	
Question	
Total	

Marker	
Checker	

This document consists of **20** printed pages.

Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

SECTION A

1 (a) Five geranium plants produced by asexual reproduction were chosen for a transpiration experiment. Each plant had equal root growth and the same number of leaves and leaves of the same size. The transpiration rate was calculated for each plant in a range of relative humidities.

Table 1.1

relative humidity in %	transpiration rate in g per dm^3 per hour					
	plant 1	plant 2	plant 3	plant 4	plant 5	average
25	7.0	7.3	6.9	6.9	6.6	
46	5.1	5.3	5.6	5.7	5.7	
58	2.8	3.0	3.1	3.2	2.7	
70	1.6	1.2	1.4	1.3	1.9	

(i) Calculate the average transpiration rate for the five plants at each humidity level. Write your answers into Table 1.1. [1]

(ii) Name **two** environmental factors, not mentioned in the description of the experiment, which should have been kept the same to make the results comparable.

1 .....

2 ..... [2]

(iii) Explain why it was important to choose plants with the same root growth, size and number of leaves for the experiment.

same root growth

.....

..... [1]

size and number of leaves

.....

.....

.....

..... [2]

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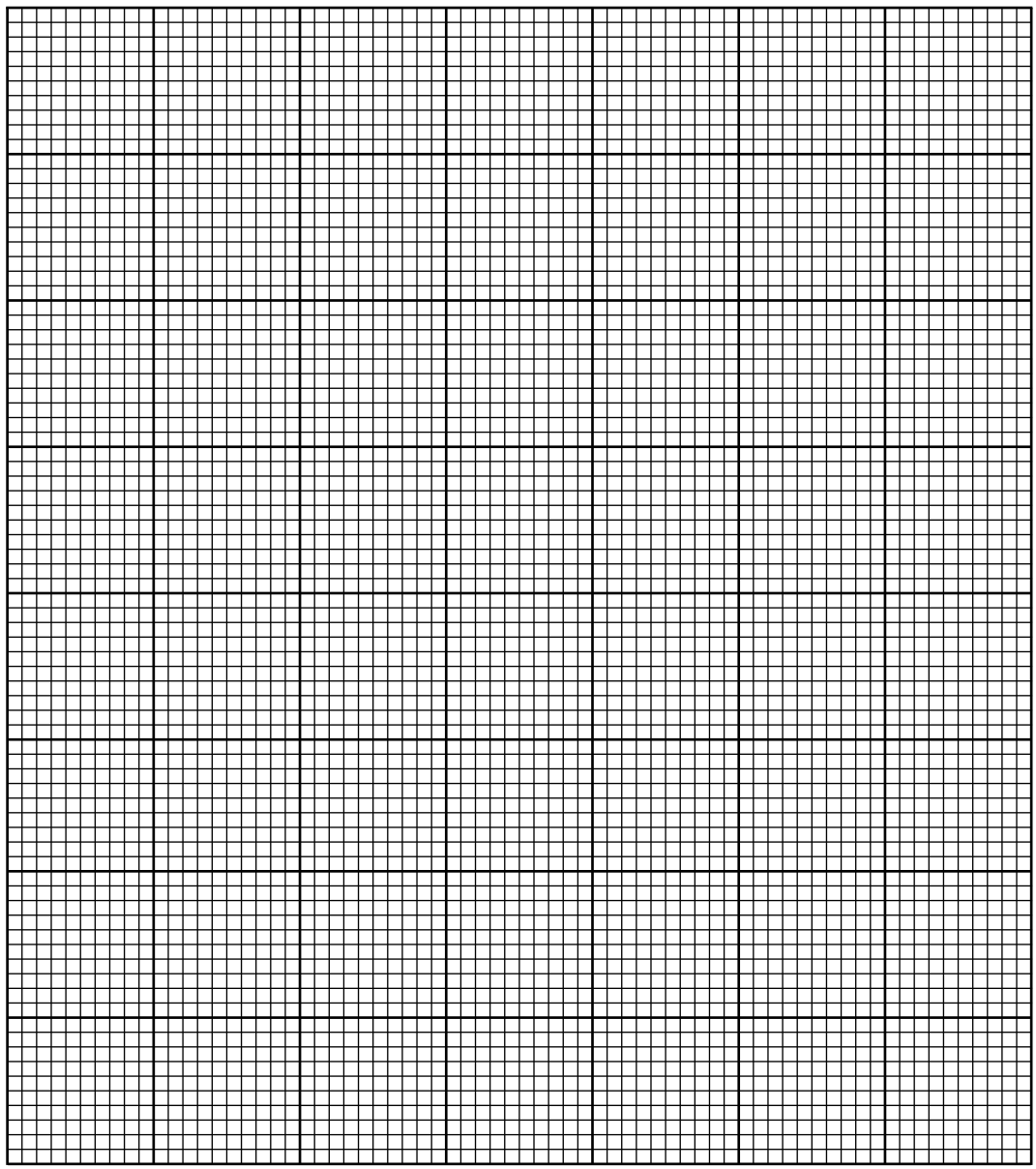
(iv) Use the average transpiration rate to draw a graph of the effect of relative humidity on the rate of transpiration.



[4]

(b) Fig. 1.1 shows a graph of average cloud cover and humidity levels in the Kunene region in 2016.

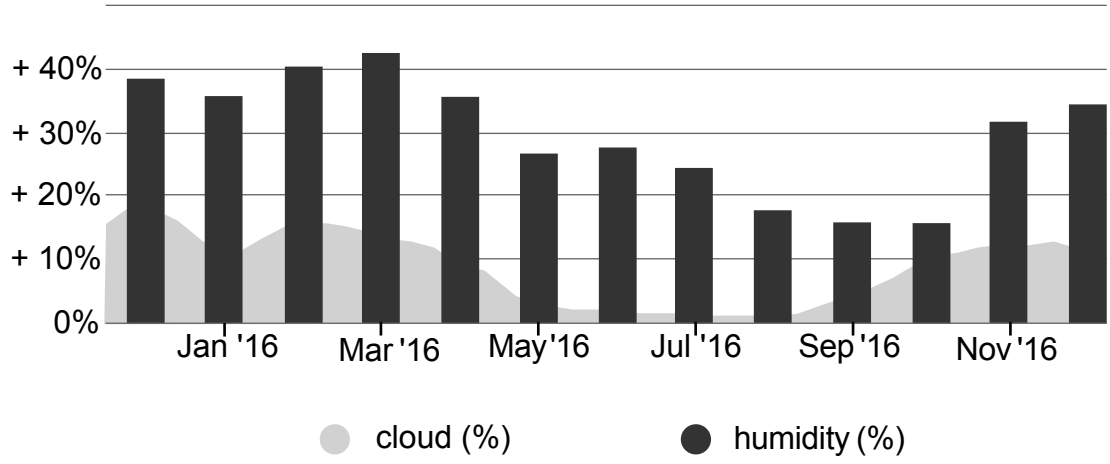


Fig. 1.1

Use your graph in **(a) (iv)** and Fig. 1.1 to predict the transpiration rate of the geranium plant if it was placed in the Kunene region in March 2016.

..... [1]

(c) Fig. 1.2 A and B show plants, growing in the Kunene region of Namibia, which has a desert climate.

Fig. 1.2 A

Fig. 1.2 B

(i) Plants need to adapt their transpiration rates to the climate they live in. Describe and explain the visible adaptations of the plants in Fig. 1.2 A and Fig. 1.2 B, which allow them to survive in desert conditions.

Fig. 1.2 A.....

.....

.....

.....

Fig. 1.2 B.....

.....

.....

..... [4]

(ii) Fig. 1.3 A and Fig. 1.3 B show the leaves of the same plant growing in the Kunene region of Namibia. Fig. 1.3 A shows the appearance of the leaves early in the morning and Fig. 1.3 shows the appearance at midday/noon.

Fig. 1.3 A

Fig. 1.3 B

Describe the difference in the appearance of the leaves in Fig. 1.3 A and Fig. 1.3 B and explain how this could ensure the survival of the plant.

Difference: .....

.....

Explanation: .....

.....

.....

..... [3]

[18]

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2 After a long drought in the early 1980s and heavy poaching, the Kunene Region's desert wildlife numbers were critically damaged, especially the black rhino subspecies *Diceros bicornis*. Very little was known about this animal's habitat and anti-poaching efforts did not exist. In 1982 the Save the Rhino Trust (SRT) was formed.

(a) Define the term *conservation*.

.....

.....

.....

..... [2]

(b) Discuss why conservation is important.

.....

.....

.....

..... [2]

(c) Describe **two** advantages and **two** disadvantages of the effect of tourism on conservation within the Kunene region.

Advantages

1 .....

.....

2 .....

..... [2]

Disadvantages

1 .....

.....

2 .....

..... [2]

(d) Explain how the binomial naming system is used in the naming of organisms with reference to the black rhino.

.....

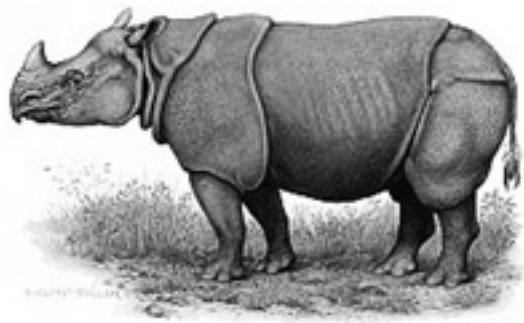
.....

.....

..... [2]

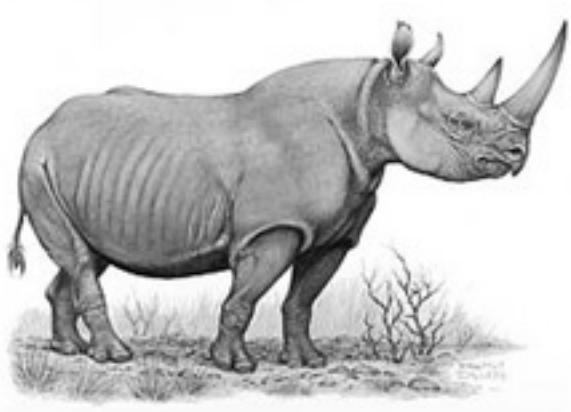
(e) Use the space provided on the next page to construct a key for the classification of the five rhinoceros species.

Indian rhinoceros

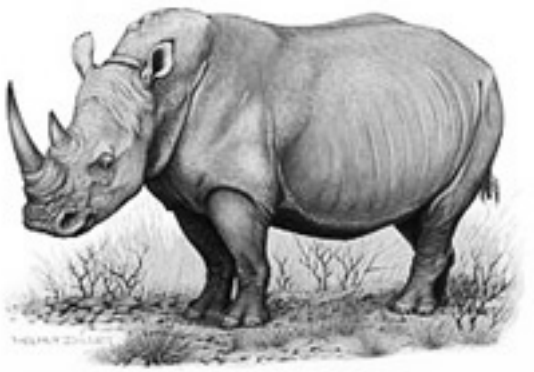


Javan rhinoceros

Sumatran rhinoceros



Black rhinoceros



White rhinoceros

[5]

[15]

3 Fig. 3.1 shows the internal structure of the human kidney.

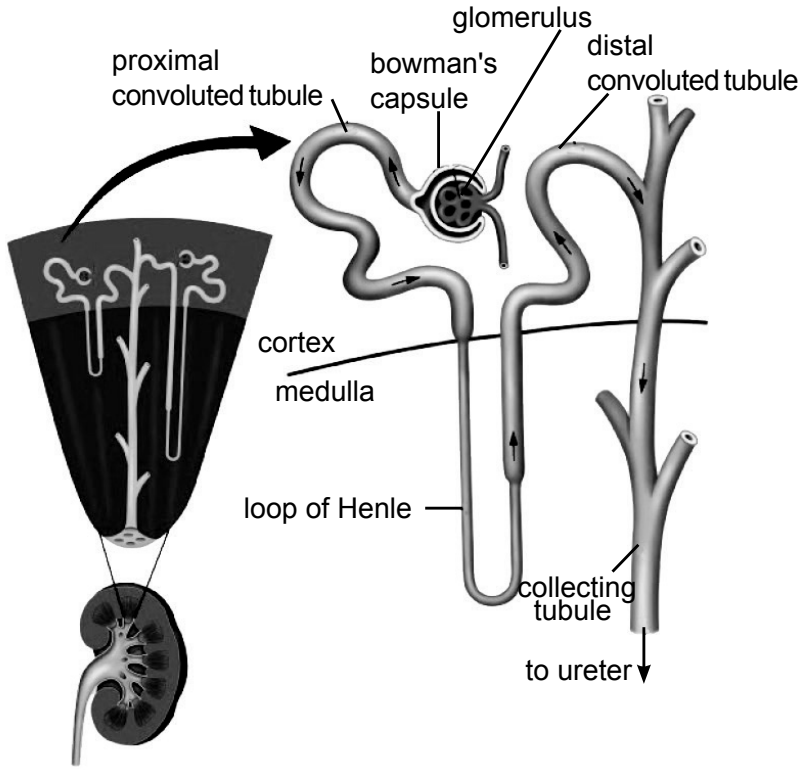


Fig. 3.1

(a) State the functions of a healthy human kidney.

1 .....

.....

2 .....

..... [2]

(b) Some patients suffer from kidney failure. A national research project is underway to create a small, surgically implanted, bioartificial kidney to treat end stage renal disease.

This bioartificial kidney needs to have two important components: a hemofilter and a cell bioreactor.

The hemofilter uses silicon nanotechnology to produce a highly efficient and compact membrane, to perform filtration.

The bioreactor must be capable of high-volume salt and water reabsorption from the ultrafiltrate while maintaining a barrier for reabsorption of toxins.

(i) Name the parts of the human nephron which are comparable to the hemofilter.

..... [1]

(ii) Explain how the nephron is adapted to maximise ultrafiltration.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(iii) Name **two** parts of the healthy human nephron which are comparable to the bioreactor.

1 .....

2 ..... [2]

(iv) Describe **two** advantages this technology would have, compared to kidney transplants and dialysis.

kidney transplants

1 .....

.....

2 .....

..... [2]

dialysis

1 .....

.....

2 .....

..... [2]

[13]

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4 FH (familial hypercholesterolaemia) is a genetic disorder where the liver fails to remove excess cholesterol. This leads to very high levels of cholesterol in the blood which can cause premature cardiovascular diseases.

FH is inherited as a result of a dominant allele (**D**) which leads to high cholesterol levels. A recessive allele (**d**) results in the liver processing cholesterol adequately.

(a) (i) Define the term *recessive*.

.....

..... [1]

(ii) State the **two** different genotypes which would result in a person suffering from FH.

1 .....

2 ..... [1]

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(b) Fig. 4.1. shows a family tree of a family with members suffering from FH. (Shaded individuals suffer from FH).

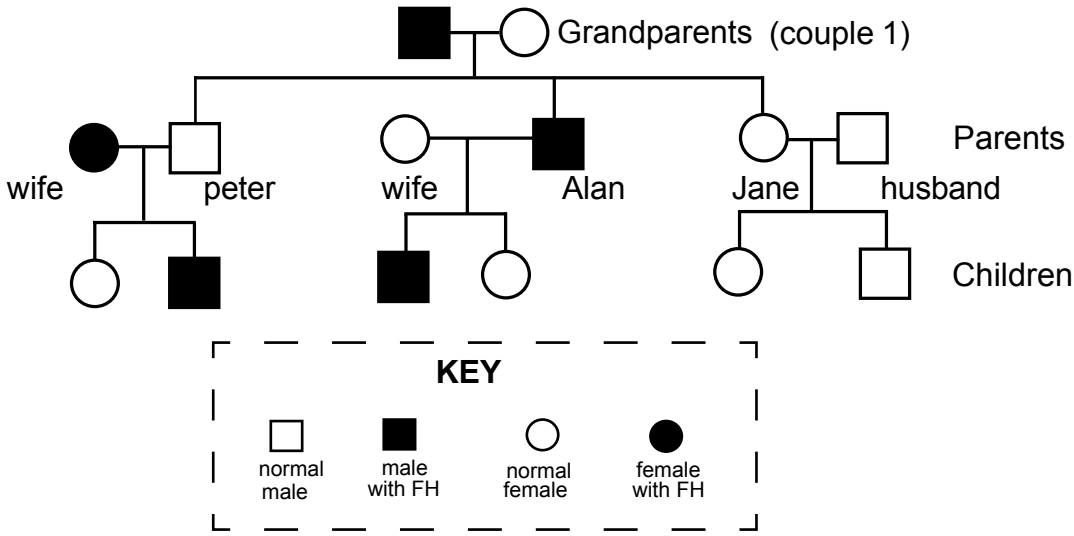

Fig. 4.1

(i) Draw a genetic diagram to show the phenotypes and genotypes of Alan, his wife their children.

[4]

(ii) State which possible genotype did not occur in any of the children of couple 1.

Give a reason for your answer.

genotype .....

Reason.....

.....

.....

..... [3]

(c) High levels of blood cholesterol can lead to a lifestyle disease called atherosclerosis. This causes a narrowing of the inner diameter of the arteries.

Suggest how this narrowing could affect the ability of the heart to function.

.....

.....

.....

.....

.....

..... [3]

(d) FH is treatable. If FH is found early, serious problems of the heart and blood vessels may be prevented or dramatically delayed by taking steps to reduce the risk of cardiovascular diseases.

State **two** factors which could reduce the risk of a person suffering from cardiovascular disease.

1.....

.....

2.....

..... [2]

[14]

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SECTION B

Answer any **two** questions from this section.

Write your answers on the answer sheets provided at the back of the booklet.

5 Compare respiration and photosynthesis in terms of

(a) energy source, [2]

(b) the major stages of each process and exactly where the stages occur, [8]

(c) the role of ATP and hydrogen carriers in each process. [10]

[20]

6 Compare sexual reproduction in plants and humans in terms of

(a) the structure of the male and female reproductive organs which are responsible for production of the gametes, [6]

(b) the processes leading to fertilisation. [14]

[20]

7 **(a)** Compare the hormone insulin in humans to auxin in phototropism in plants in terms of

(i) the site of production of insulin and auxin, [3]

(ii) transport of insulin and auxin, [3]

(iii) the actions of insulin and auxin. [5]

(b) **(i)** Describe the pathway of a light ray through the structures of the human eye and state the functions of the different structures through which the light travels. [5]

(ii) Describe how the eye adjusts to bright light after being in the dark. [4]

[20]

8 **(a)** Compare gaseous exchange in humans to gaseous exchange in plants with reference to

(i) a description of the structures where gaseous exchange takes place, [6]

(ii) the gases involved and the direction in which they travel related to the process using them. [4]

(b) Describe the mechanism of ventilation in humans at rest. [10]

[20]

ANSWER SHEET FOR SECTION B

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