PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
FACULTY OF NATURAL RESOURCES
SCHOOL OF FORESTRY

FIRST SEMESTER EXAMINATION

FR111 BIOLOGY (PLANT AND ANIMAL)
WEDNESDAY 29th MAY 2024
TIME ALLOWED: THREE (3) HOURS
TIME: 12:50 – 4:00 PM

VENUE: TENT.

INSTRUCTIONS FOR STUDENTS.

1. **ALL mobile phones should be switched OFF now.**
2. WRITE YOUR NAME, STUDENT NUMBER, SUBJECT CODE and ALL correct information with your SIGNATURE on the first page of the Attendance form in the answer booklet. Tear the section along the mark shown and put it aside for collection.
3. You have ten (10) minutes to read this paper. You may make notes during this time if you wish to.
4. This examination is divided into five (5) parts: **Part A** is composed of Multiple Choice Questions. **Part B** is composed of Remembering and Understanding Questions. **Part C** is composed of Application and Problem Solving Questions. **Part D** is composed of Analytical and Evaluation Questions. **Part E** is composed of a Synthesis Question. Write your answers clearly in the spaces provided. Marks are indicated beside each part or section.
5. Write all your answers in the examination booklet provided. Any written materials other than the examination booklet will not be accepted.
6. This is a closed book examination. Any notes that you have should be given to the examination supervisor.

You must attempt **ALL** the questions.

TOTAL MARKS: _____/ 108 MARKS

PART A: MULTIPLE CHOICE QUESTIONS (30 MARKS)

Write A, B, C, D or E for correct answer to each question: (1 mark each).

1. Which of the following statements briefly defines the cell theory?
A. It is *'cella'* meaning storeroom
B. It is unit of the existing cells.
C. It is basic life unit.
D. It is cell organelle.
E. It is before the cell.

2. Which characters can you use to identify a eukaryotic cell?
A. Complex structure, plasmid absent, nucleus absent, membranous organelles absent.
B. Plasmid present, DNA has no ends, lacks nucleus, has membranous organelles.
C. DNA either has ends or without ends, has true nucleus, no membranous organelles
D. Histones present, DNA has ends, true nucleus present, membranous organelles present.
E. Has organelles, nucleoid region present, has faster growth rate, has large ribosomes.

3. Identify the cell components that share similar functions in all eukaryotes.
A. Vacuole, nucleus, membranous organelles, centrioles.
B. Cell membrane, cytoplasm, nucleus, mitochondria.
C Cell wall, nucleus, cell membrane, cytoplasm.
D. Nucleus, plasma membrane, chloroplasts, centrioles.
E. Mitochondria, endoplasmic reticulum, golgi apparatus, cell wall.

4. What is the main character that differentiates the two endoplasmic reticulums?
A. Interconnected sacks.
B. Cover of ribosomes.
C. Production of proteins.
D. Digestion of lipids.
E. Convoluted tubes.

5. Which organelle in eukaryotes assists the cell in photosynthesis?
A. Nucleus
B. Cell wall
C. Peroxisomes
D. Plastids
E. Plasmodesmata

6. What evolutionary characteristics are present in plants?
A. Chlorophyll, cellulose, rRNA genes, alternation of degeneration life cycle.
B. Chlorophyll, cellulose, rRNA genes, alternation of generation life cycle.
C Chloroplast, cellulose, RNA genes, alternation of generation life cycle
D. Chloroplast, cellulose, RNA genes, alternation of degeneration life cycle.

7. Select the plant group that evolved accordingly on the evolutionary timeline?
A. Bryophytes, Pteridophytes, Gymnosperms, Angiosperms, Charophyceans.
B. Bryophytes, Charophyceans, Pteridophytes, Gymnosperms, Angiosperms.
C. Charophyceans, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms.
D. Bryophytes, Charophyceans, Pteridophytes, Angiosperms, Gymnosperms.

8. What is the correct characteristic for the plant division Sphenophyta?
A. Sphenophyta have monoecious gametophytes.
B. Sphenophyta have basal meristems in sporophyte generation producing new cells.
C. Sphenophyta have vascular tissues.
D. Sphenophyta have sporangia arranged in clusters on undersides of leaves.
E. Sphenophyta have dioecious gametophytes.

9. Select the plant group that lack or do not have vascular tissues?
A. Bryophytes and Pteridophytes.
B. Bryophytes and Pteridophytes.
C. Gymnosperms and Pteridophytes
D. Bryophytes and Charophyceans.
E. Pteridophytes and Angiosperms.

10. Which of the following is a typical feature of an early non-terrestrial plant?
A. They have rosette cellulose.
B. They have their development from unicellular embryos.
C They have similar flagellated sperms.
D. They have cell division through phragmoplast.

11. What is the best reason why most plants find it difficult to carry out photosynthesis in very hot, dry environment like deserts?
A. Because carbon dioxide builds up in the leaves and blocks the carbon fixation.
B. Because plants must rely on photorespiration to make ATP.
C. Because the closing of stomata is preventing the carbon dioxide from entering and oxygen from leaving the plant.
D. Because the light is too hot and overpowers the pigment molecules.
E. Because of global warming that is intensifying in a desert environment.

12. Select the correct reason why the Calvin cycle reaction is not directly dependent on light but it usually does not occur at night.
A. Because it is often too cold at night for these reactions to take place, O_2 concentrations decrease at night.
B. Because most of the plants do not make four-carbon compounds, which they would need for the Calvin cycle at night.
C. Because it is often too cold at night for these reactions to take place, CO_2 concentrations decrease at night.
D. Because carbon dioxide concentrations decreases at night.
E. Because the Calvin cycle depends on NADPH and ATP from the light reactions that are used by the Calvin cycle.

13. What is the product of non-cyclic photophosphorylation?
A. CO_2 and H_2O
B. NADP+ and ADP
C. ATP, NAFPH and Oxygen
D. CO_2 and ATP
E. ATP and NADPH

14. _____ is a tissue where cells found there are capable of cell division. Select your answer from the following tissues.
A. Epidermis
B. Xylem
C. Phloem
D. Periderm
E. Meristem

15. Which of the following makes up the dermal tissue in plants?
A. Parenchyma cells
B. Epidermis and periderm
C. Collenchyma cells
D. Xylem and Phloem
E. Parenchyma, collenchyma and sclerenchyma

16. How many important systems of tissues are found in plants? Select the correct answer from the following?
A. 1
B. 2
C. 3
D. 4
E. 5

17. Select the correct reason how water is absorbed into the roots of plants in transportation?
A. High concentration of sugar
B. Positive water potential
C. Negative water potential.
D. Low concentration of sugar.
E. Equal water potential

18. In plant cell growth, select the correct explanation from the list below.
A. Cell differentiation begins. large vacuoles become smaller
B. The amount of cytoplasm decreases as cell grows larger.
C. Cell differentiation begins. small vacuoles become larger.
D. The amount of cytoplasm remains unchanged as cell grows larger.

19. Relate the growth stages of plants to the correct type of changes in the cytoplasm.
A. Mature tree – no changes
B. Small tree – no changes
C. seedling – no changes
D. seedling – changes
E. Seed – changes

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21. Select the characteristic that does not represent bacteria in nature?
A. Mode of nutrition
B. Aerobic in nature
C. Anaerobic in nature
D. Multicellular in nature.
E. Absence of flagella

22. Which of the following is the best example of an elongated shaped bacterium?
A. Staphylococcus
B. Bacteriophage
C. Streptococcus
D. Bacillus
E. Diplococcus

23. Which of the following virus is the largest of all the viruses that is large enough to be seen under the light microscope?
A. Influenza virus
B. Adenovirus
C. Vaccinia virus
D. Rotavirus
E. Coronavirus

24. Which of these type of associations does fungi have with certain plants that provide the plants with nutrients?
A. Commensalism
B. Amensalism
C. Competition
D. Mutualism
E. Parasitism

25. Select the correct ecological interaction that refers to a situation where both species are suffering from each other.
A. Commensalism
B. Amensalism
C. Competition
D. Mutualism
E. Parasitism

26. The 'differentiation of microorganism' refers to which of the basic methods in microbiology. Choose the correct answer from the following.
A. Enumeration of microorganisms
B. Identification of microorganisms
C. Staining technique
D. Isolation of pure culture
E. Culturing of microorganisms

27 Select the microbiological technique used to isolate microorganisms.

A. Pour Plate technique
B. Stake Plate technique
C. Serial Dilution technique
D. Pure culture technique
E. Spread Plate technique

28. What factor(s) acts like a trigger for the release of reproductive materials during external fertilization?

A. Daylight hours
B. Night hours
C. Air temperature
D. Animals' body temperature
E. A & D

29. In cell division, select the most unrelated disease caused by abnormal cell growth.

A. Infertility
B. Benign tumor
C. Cancer
D. Malignant tumour
E. A & C only

30. What is the name of the process that is necessary in the formation of a zygote from internal fertilization?

A. Fusion
B Fission
C. Sexual reproduction
D. Asexual reproduction
E. Sexual intercourse

PART B: REMEMBERING AND UNDERSTANDING QUESTIONS (25 MARKS)

The following statements would require answers as either **'TRUE'** or **'FALSE'** and **NOT** as **'T' and 'F' or 'F'** as answers. Each question is worth one (1) mark.

1 The prokaryotic cell is different from the eukaryotic cell by the presence of a plasma membrane. .....
2. The membrane-bound organelle responsible for transporting, modifying, and packaging proteins and lipids into vesicles in cells is mitochondria. .....
3. The vacuole is a space lined with membrane and filled with fluid. .....
4. Angiosperms have triploid endosperm, which are formed after fertilization. .....
5. Gymnosperms are dioecious plants and are pollinated by wind. .....
6. *Cooksonia* is one of the earliest vascular plants among the terrestrial organisms known. .....
7. Pteridophytes are seedless vascular plants. .....
8. The division Coniferophyta composes trees and shrubs with resinous exudates. .....
9. Differentiation in plant growth is permanent change in meristematic tissues. .....
10. In meristematic cells, isodiametric means closely packed with no air spaces between them. .....
11. The function of the plant dermal tissue is to protect the external and hard tissues while preventing water loss. .....
12. The apical meristems are also known as lateral meristems growing in between cork cambium and vascular cambium. .....
13. The log phase of plant growth is the growth phase where it is always slow. .....
14. The meristematic tissues are found at the growing tips of plants. .....
15. Phytohormones are natural or synthetic growth substances that affects and control the growth of plants. .....
16. Bacteria are very small eukaryotic organisms that are free living as saprophytes .....
17. Bacteria have membrane-bound organelles, unicellular and macroscopic .....

18. Air pollution can be monitored effectively by lichens because they loved heavily polluted air. .....

19. Lichens are aquatic plants that have simple structures that possess naked reproductive organs. .....

20. Fungi are composite organisms that help breakdown rocks. .....

21. Facultative symbiosis can be explained as an independent livelihood between two dissimilar organisms .....

22. Saprobes obtain their nutrients from non-living organic matter. .....

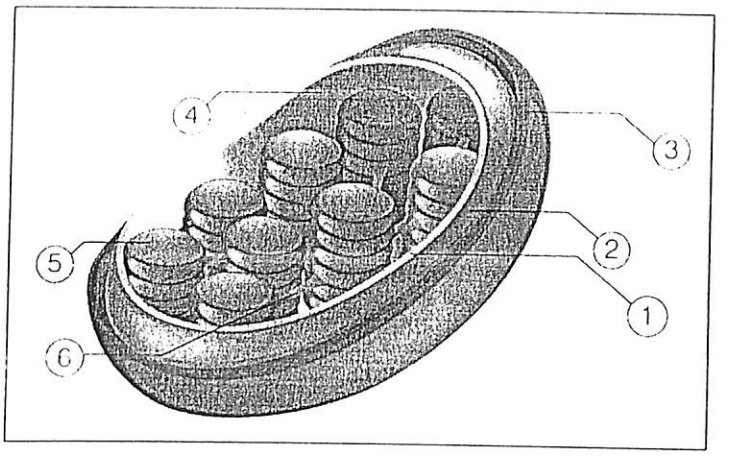
23. During internal fertilization, the fusion of the male and female gamete results in the formation of the embryo .....

24. Homeostasis means to maintain equilibrium from the constant changes happening in the body. .....

25. Reptiles and insects produce leathery eggs while birds produce eggs with high concentrations of calcium carbonate in the shell making them hard. .....

PART C: APPLICATION AND PROBLEM SOLVING QUESTIONS (24 MARKS)

Q1 to Q6. The following diagram is one of plant cell organelles. State the name of each part of this organelle designated by the numbers one (1) to six (6). **(6 marks)**

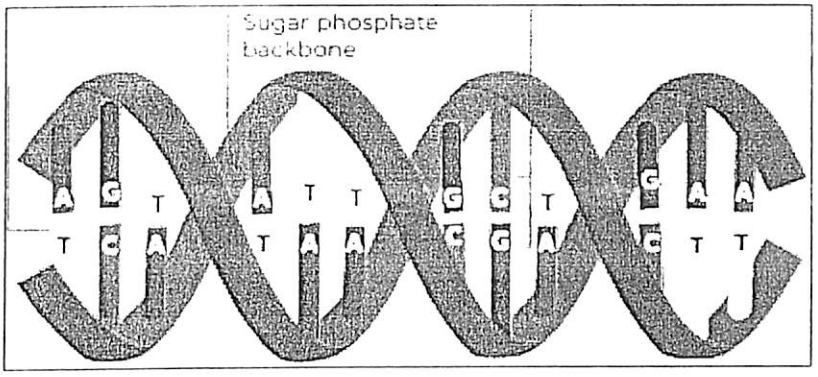


Q1. _____
Q2. _____
Q3. _____
Q4. _____
Q5. _____
Q6. _____

Q7. Briefly describe how the leaves of plants are adapted to prevent water loss under normal conditions. **(1 mark)**

Q8. List two of the five major hormones that controls the growth of plants and briefly describe their specific activity in the plant during development. **(2 marks)**

Study the diagram of the DNA helix below to answer questions 9 to 12 below.



Q9. What is a chromosome? **(1 mark)**

Q10. Define the basic building blocks of these nucleotide base pairs. **(6 marks)**

Q11. Name and describe the triplets' basic function within the cell. **(2 marks)**

Q12. Explain how mutation occurs from within the DNA of the animal species. **(1 mark)**

The following questions are based on a worksheet abstract about sex-linked traits. Read the abstract below in order to answer the questions 13 to 15 below. (Marks are allocated to the questions).

Sex-linked traits are those whose genes are found on the X chromosome but not on the Y chromosome. In humans the X chromosomes are much larger than the Y chromosome and contains thousands of more genes than the Y chromosome. For each of the genes that are exclusively on the X chromosomes, females, who are XX, would obviously have two alleles. Males, who are XY, would have only one allele. Thus females with one recessive allele and one dominant allele, for a gene that is unique to the X chromosome, will always display the dominant phenotype. However, a male with a recessive allele for a gene unique to the X chromosome will always exhibit that recessive trait because there is no other corresponding allele on the Y chromosome. In humans, each of two different sex-linked genes has a defective recessive allele that causes a disease. The diseases are hemophilia and colorblindness. In hemophilia, the defective allele prevents the synthesis of a factor needed for blood clotting. In colorblindness, the defective allele prevents a person from seeing certain colors.
X^H- X chromosome with normal dominant allele (no hemophilia) X^h - X chromosome with recessive hemophilia allele Y - Y chromosome (does not contain comparable gene) X^B - X chromosome with normal dominant allele (not colorblind) X^b - X chromosome with recessive colorblind allele Y -Y chromosome (does not contain comparable gene)

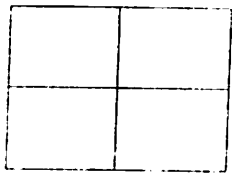
Q13. Write the genotypes for the following phenotypes of red-green color blindness. **(2 marks)**

a) Normal female carrying no colorblind alleles (Homozygous).
b) Normal female carrying the colorblind allele (Heterozygous).

Q14. X^BX^B x X^bY **(2 marks)**

a) What proportion/percent of the male children are colorblind?

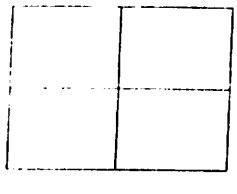
b) What proportion/percent of the female children are colorblind?



Q15. For the following sex-linked Punnett Squares: **H = normal blood clotting, h = hemophilia**

X^HX^h x X^HY. **(1 mark)**

a) What is the probability that any of their offspring will have hemophilia?

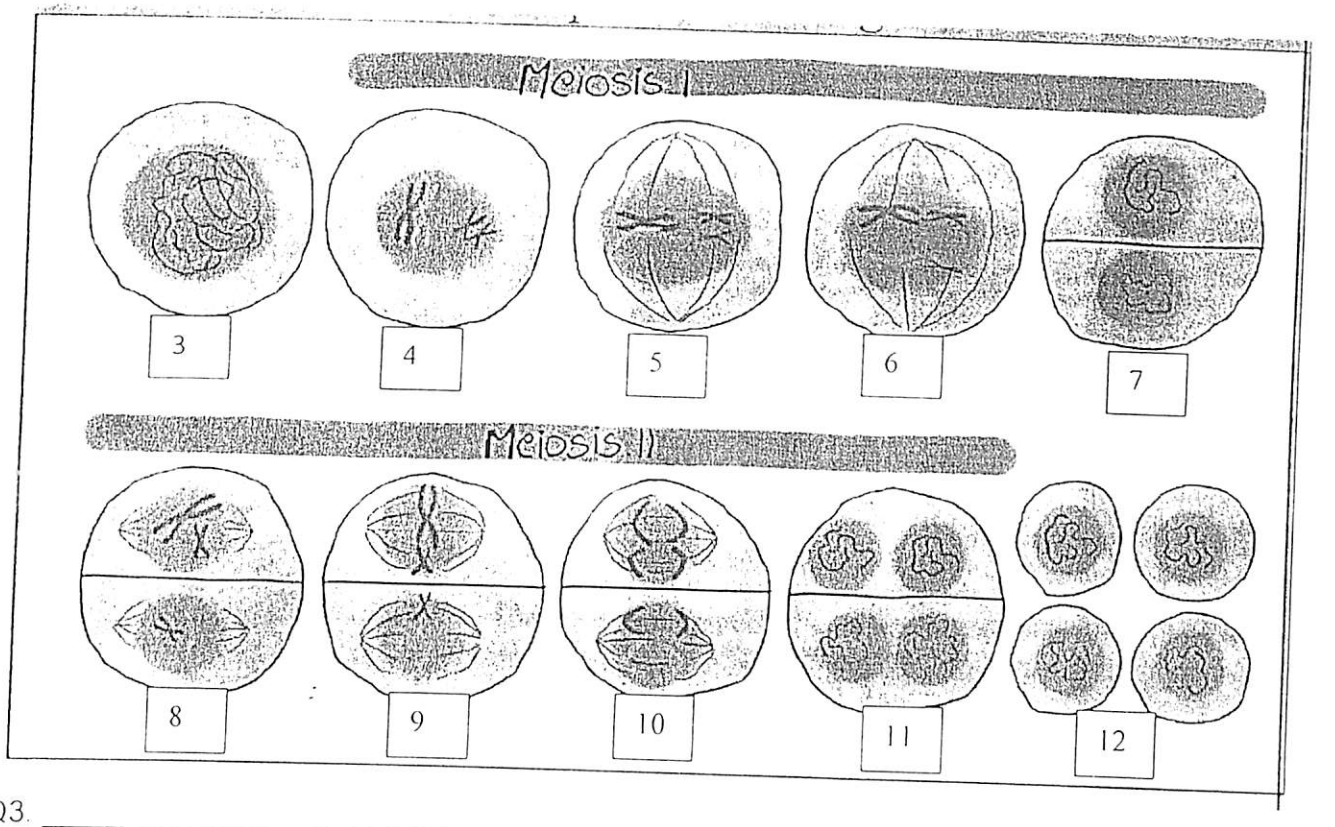


PART D: ANALYTICAL / EVALUATION QUESTIONS. (19 MARKS)
The marks are allocated to each of the question below.

Q1 Name and briefly describe the six environmental factors that affect the growth and development of plants. **(6 marks)**

Q2. Name and describe the three plant growth phases of a plant. **(3 marks)**

Q3 to Q12. Name the two phases of Meiosis from figure numbers 3 to 12 in the diagram below **(10 marks)**



Q3. _____
Q4. _____
Q5. _____
Q6. _____
Q7. _____
Q8. _____
Q9. _____
Q10. _____
Q11 _____
Q12. _____

PART E: SYNTHESIS QUESTION. (10 MARKS)

As a tropical forester, you have been assigned by your government department to make some recommendations to protect some of the endemic plants and animals from the nine major threats to biodiversity. The copy of the situation model is to guide you in answering the following question.

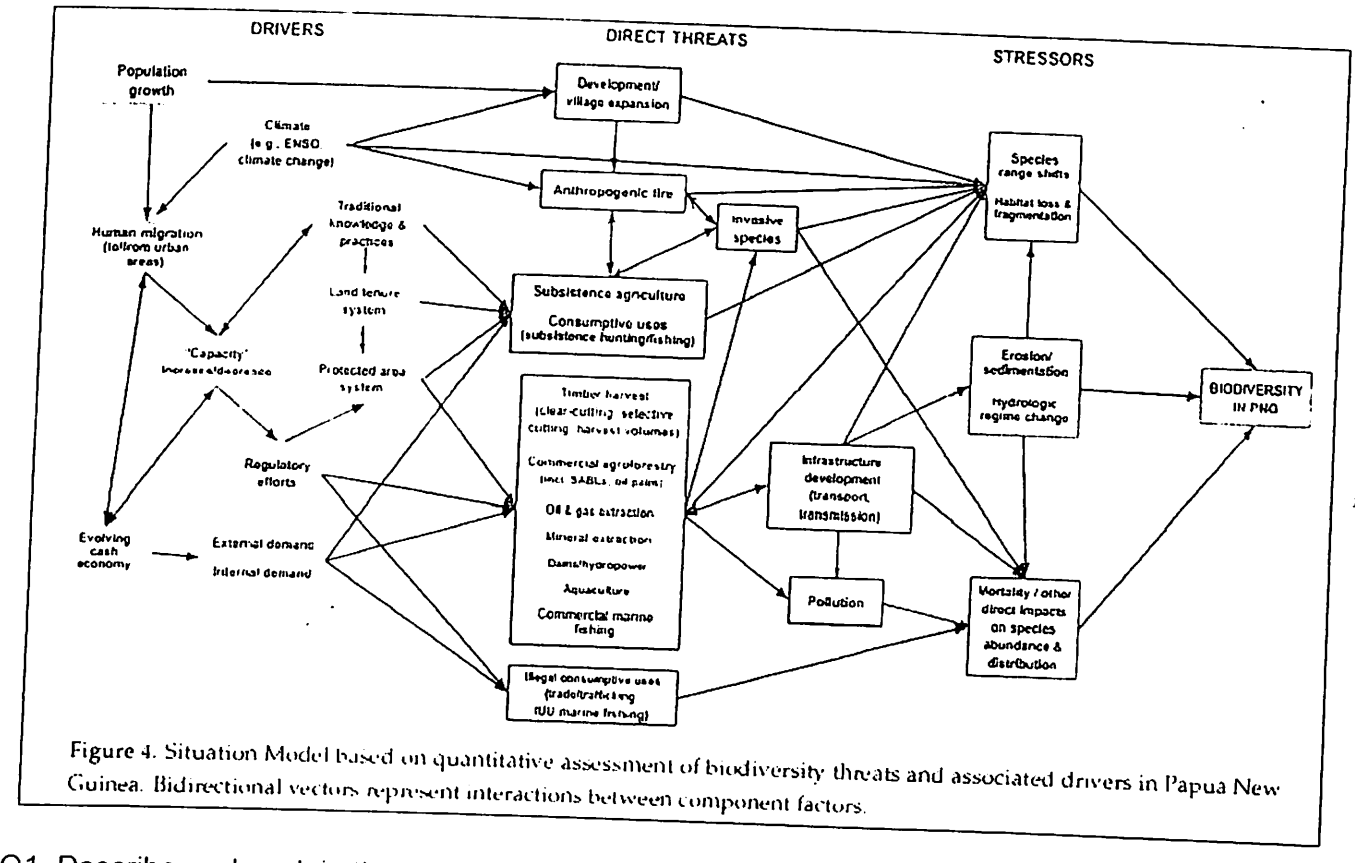


Figure 4. Situation Model based on quantitative assessment of biodiversity threats and associated drivers in Papua New Guinea. Bidirectional vectors represent interactions between component factors.

Q1. Describe and explain three relevant threats to one of the endemic mammal species in Papua New Guinea's Huon Peninsula forest areas and explain how this could affect the habitat of the species. **(10 marks)**

-END OF THE EXAMINATION-