

GRADE 12 LIFE SCIENCES

K-TESTS

POPULATION DYNAMICS - MEMORANDUMS

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DISCLAIMER

Where pertinent, questions that have been inspired by other examiners outside of St. Peter's College have been acknowledged. All other questions come from the author along with credit to Mrs A Greeff.

For space purposes, references for images have been removed in this document. Consult the Question booklet for references.

To educators: When checking answers with the Memorandum document, please note that differences of opinion between schools and educators may exist, and that this is provided as a hopeful guideline to students to assist where possible.

To students: Please be critical when checking through your answers, especially for higher-order questions. Do not assume your written answers will necessarily be accepted if they deviate from the Memorandum answers provided.

Aim for students: Do not use your textbook or notes to answer the questions. These should be done from what has been memorized and understood. Time management must also be practiced. Critical reflection should focus on:

- *What terminology has not been effectively memorized*
- *Why you may not be receiving the full compliment of marks for longer questions*
- *Paying attention to instruction verbs of questions*
- *Linking concepts between different strands*

K-TEST 01 – 50 marks (45 minutes)

QUESTION 1

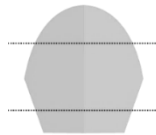
Several Multiple Choice questions are provided below. Choose the most correct answer by writing down the letter of your choice:

- 1.1. Which of the following best describes a *population*? (1)

C. A group of termites living underground ✓

A and B are communities – D is abiotic factor

- 1.2. Which of the graphs below most likely represents a declining population? (1)



D ✓

A is rapidly increasing, B is increasing, C is stable

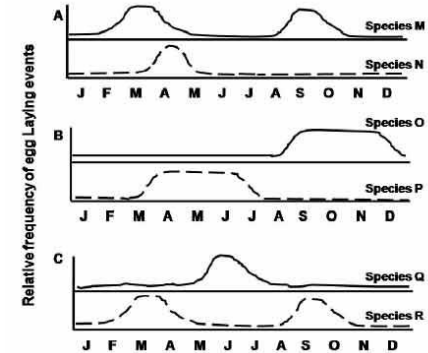
- 1.3. An investigation was conducted to estimate how many frogs were in a pond. The scientist caught 20 frogs and marked them. In his second catch of 75 frogs, he found that 10 were marked. What is the estimated population size? (2)

A. 150 ✓✓

First catch X second catch / number marked in second catch

$$(20 \times 75) / 10 = 150$$

- 1.4. Analyse the following data that collected on several egg laying species throughout one year. Each graph was assessed in different areas. Which statement below is TRUE based on the data? (2)



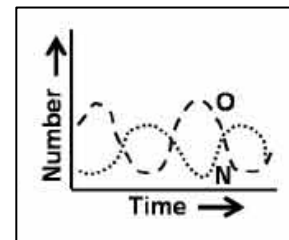
- D. Species M and Species N have the greatest need to partition resources in April ✓✓ (Due to breeding at the same time)**

A – not exclusion, just breeding numbers, so not whole population no.

B – Species Q only once

C – Each graph is different area, cant be competition between P & Q if not in same area

- 1.5. Which of the graphs below shows a predator-prey relationship? (1)



C ✓ (A and B are interspecific competition variations)

QUESTION 2

Provide the correct biological term for the following:

(4)

2.1. All the factors required by an organism to survive and reproduce

(Ecological) niche ✓

2.2. A precautionary measure used in the quadrat method to ensure accuracy

Random sampling ✓

2.3. A strategy employed by plants in a forest to partition the resource light

Stratification ✓

2.4. Type of succession that occurs after a disturbance

Secondary ✓

Provide a definition for the following terms:

(4)

2.5. Ecosystem

All the living and non-living (biotic and abiotic) factors interacting within an area ✓

2.6. Emigration

Individuals leaving a population ✓

2.7. Climax community

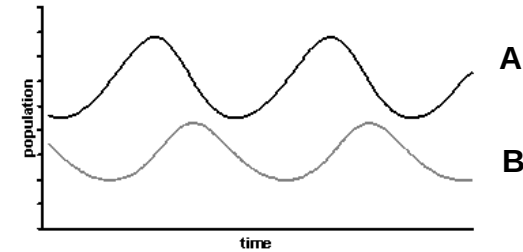
The semi-stable end point of ecological succession ✓

2.8. Eusocial

The highest form of social organization amongst animals (usually involving a caste system) ✓

QUESTION 3

A game farm in the Northern Cape has been tracking its warthog population for several years. They also have a leopard population that lives within the area that preys on the warthogs; the farm has also tracked the numbers of leopard at the same time. The following graph represents the data collected over several years:



3.1. Which line (A or B) represents the warthog? Justify your choice. (2)

A ✓

Prey population number in general is greater than predator ✓

OR The predator line will always lag behind the prey line ✓

3.2. Explain why these populations are described as being stable. (2)

They fluctuate around the carrying capacity ✓ over a sustained period of time ✓

3.3. Warthogs generally live in herds of up to 40. Describe ONE benefit of this to avoid predators. (2)

(ONE of the following) (Factor ✓ + description ✓)

More eyes to see a predator ✓ - easier to escape for time ✓

Dilution effect ✓ - chance of being attacked is lowered ✓

Confusing / distracting predators ✓ - escaping in different directions ✓

Mobbing ✓ - the group attacking and wounding a predator ✓

- 3.4. Suggest ONE density-independent factor that will affect the size of the leopard population. (1)

Rainfall (not water) / humidity / temperature / natural disasters

Any ONE of the above only ✓

- 3.5. The populations above were tracked using the mark-recapture method. Describe ONE precaution that would need to have been observed during this procedure. (2)

(Any ONE of the following) (Factor ✓ + description ✓)

Marking must not harm animal ✓ or hinder their movement / make more visible to predators ✓

A short time between catch 1 and 2 to minimize effect of births and deaths ✓✓ (all or nothing description in total)

A long enough time between catch 1 and 2 to allow population to intermingle with marked individuals ✓✓ (all or nothing description)

Population must be closed ✓ to minimize effect of immigration and emigration ✓

QUESTION 4

Consider the following case of Hunga Tonga, a volcanic island created four years ago.

Incredibly, Hunga Tonga is only the third known volcanic pop-up island like this to have arisen in the last 150 years. Perhaps the most remarkable thing about this young, originally barren island is how quickly a community of life seems to have embraced it.

- 4.1. Identify the type of succession that existed on this island. Justify your answer. (2)

Primary ✓ Began on volcanic rock which had no life beforehand ✓

- 4.2. Differentiate between the terms 'population' and 'community'. (2)

Population is many individuals of same species only ✓

Community is many individuals of different species ✓

- 4.3. State ONE factor that may influence the ecological end point of the Hunga Tonga community (1)

Rainfall / environmental conditions / pH or salinity of soil / invasive species presence / overgrazing (Any ONE ✓)

**Avoid discussing a 'human' influence unless specifically asked*

- 4.4. Construct a flow diagram that includes the following: (8)
- The stages of ecological succession on the island
 - ONE example of flora per stage of succession.

Mark allocation:

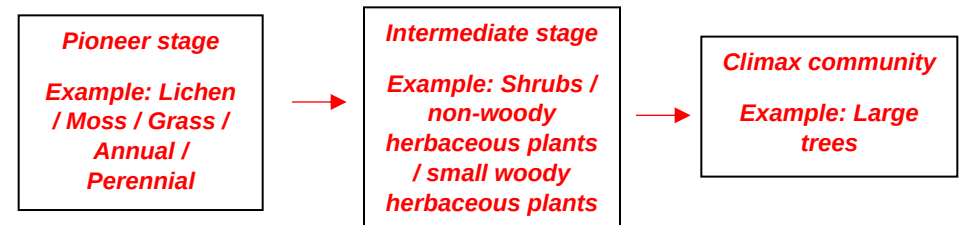
Heading present and correct ✓

In the format of a flow diagram ✓

Stages of ecological succession correct: ✓✓✓ (Per stage)

Example of flora correct: ✓✓✓ (First example taken if multiple provided)

A flow diagram of ecological succession on Hunga Tonga



** Specific names of flora examples not required, just categories as above*

QUESTION 5 (Credit: C Marangoni)

A game farmer in the Northern Cape introduced kudu and springbok on his fenced farm. A borehole supplied the animals with water all year round. Herding dogs ensured that there were no large predators on the farm. The following data was collected over twenty years. Use the information to answer the questions below.

Size of Animal Populations on a Northern Cape Farm

YEAR	KUDU	SPRINGBOK
2007	0	0
2008	4	20
2009	10	36
2010	12	52
2011	15	70
2012	19	100
2013	21	80
2014	23	103
2015	21	100
2016	20	96

- 5.1. Describe the ecological niche of Kudu. (2)

Any two of the following can be mentioned ✓✓:

Warm, temperate environment / savannah or grassland biome / access to water / access to mates / grass or food / ability to evade predators or lack of predators

- 5.2. What type of competition exists between the Kudu and Springbok? Justify your answer. (2)

Interspecific ✓ as they are two different species ✓

- 5.3. State ONE density-dependent factor that would affect the population size of Springbok. (1)

Spread of disease OR access to resources ✓

NOT predators in this scenario, as that factor has been removed

- 5.4. Explain the change in population number for Springbok between 2012 and 2013. (3)

The population was exceeding the carrying capacity / there population number was too great for the resources available ✓

Therefore, increased mortality rate lowered population number ✓

- 5.5. Suggest ONE advantage and ONE disadvantage to the use of herding dogs in this scenario. (2)

*** Answer must be stated as Adv is.... ; Disadv is Or else 0 awarded**

Advantage ✓: Form of natural control / less danger to humans / can cover larger area

Disadvantage ✓: Dogs may harm the buck / predators can still get in, cant cover whole area / predators can harm the dogs

- 5.6. In your opinion, does the creation of game reserves help or prevent conservation efforts in South Africa? Justify your answer with ONE well-explained point. (3)

Decision is provided (Helps or Prevents definitively stated) and matches reasoning given ✓

*** Note: There is no correct answer between Yes or No, only the skill or arguing the decision given**

Reasoning ✓✓ (based on the accuracy and quality of reasoning)

HELPS – Creates an area where human construction is kept to a minimum / game rangers can help prevent poaching and the overkilling of populations / ecotourism can help generate money for conservation projects / breeding programs can be implemented to assist raising numbers

PREVENTS – Land must be developed for human interaction / increased human interaction can influence food webs in the area / Increased number of cars can have an impact on natural habitat / organisms become more concentrated and localized for poachers to find

K-TEST 02 – 50 marks (45 minutes)

QUESTION 1

Study the following table which consists of two items (numbered 1 and 2) in the first column and a term in the second column. **Decide which item(s) relate to the term.**

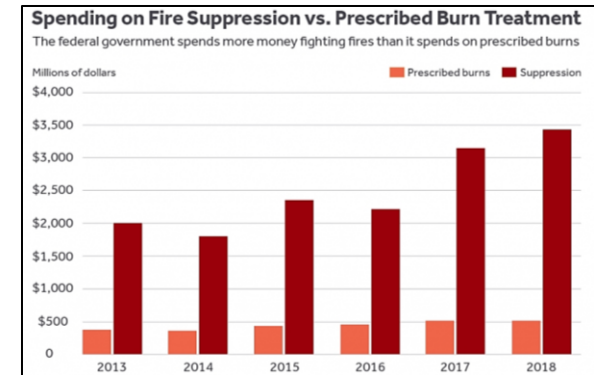
Write down your choice (A – D) making use of the following codes:

- A** only item 1 relates to the term
- B** only item 2 relates to the term
- C** both item 1 and 2 relate to the term
- D** neither item 1 or 2 relates to the term

(6)

Item	Term	ANSWER
1. Competition within the same species 2. Competition between species	Interspecific	B ✓
1. Lion feeding on zebra 2. Aphids being fed on by ladybirds	Resource partitioning	D ✓
1. Low birth rate 2. High death rate	More developed country	A ✓
1. Dominant breeding pair 2. Pack hunting	Wild dogs	C ✓
1. Mark-recapture 2. Quadrat	Direct method	D ✓
1. Moving out of a population 2. Moving into a population	Immigration	B ✓

1.2. Analyse the information below:



1.2.1. State whether the following claims are Supported, Contradicted or Unknown based on the above data: (4)

- a) In 2017, prescribed burns cost the US government roughly \$3 200 (millions of dollars) **Contradicted ✓ (wrong bar read off)**
- b) The cost of suppressing fires displays an increasing trend over time **Supported ✓**
- c) More money was spent on prescribed burns in 2015 vs 2018 **Contradicted ✓ (Bar in 2018 is greater)**
- d) More animals were killed in prescribed burns in 2013 compared to fires that needed suppressing **Unknown ✓ (cannot tell from data present, can only be inferred)**

1.2.2. Suggest ONE disadvantage to the use of controlled/prescribed fires. (1)

Any one of the following: ✓

Can become uncontrolled easily / still causing habitat destruction / can kill animals in the area unnecessarily / may be killing plants that can regenerate / requires many resources to ensure that can become costly

1.3. State the biological term for the following: (3)

a) The highest form of social organization

Eusocial / Eusociality ✓

b) Many individuals of the same species interacting within an area

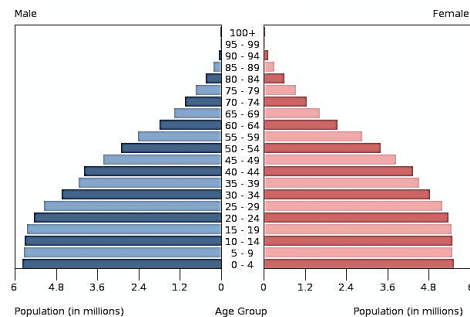
Population ✓

c) The total number of factors limiting a population from reproducing at its maximum rate

Environmental resistance ✓ (Not 'Limiting factors' for this definition)

QUESTION 2

Analyse the population pyramid below and answer the questions that follow:



2.1. Approximately how many females are in the 40 – 44 category? (2)

Acceptable range: 4,4 – 4,6 million ✓✓ (no million unit, max 1)

2.2. Describe what type of country the above pyramid may represent. Use information from the graph to justify your answer. (4)

Following must be in description: More developed country ✓ + stable population ✓

Evidence - Any two of the following: ✓✓

Low birth rate / low death rate / high life expectancy / reproductive group roughly same or minor decrease from pre-reproductive

2.3. To produce this graph, a census must be conducted. Describe what a census is. (1)

Physically counting every individual of a population ✓

2.4. A census can be a costly exercise. Defend the utility of a census by providing TWO reasons why they are important to a country. (2)

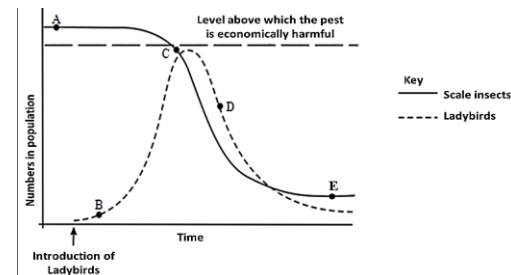
***Note: NOT an opinion question. Can only be argued in favour**

Any two of the following: ✓✓

Government needs to know how many people live in the country / can be used to assess dependency ratios / can be used to assess medical or agricultural needs / can be used to assess if interventions are working (such as contraceptives or other medical) / can be used to inform policy / can check if there are gender deficiencies / assess which part of population has greatest need

QUESTION 3

Insects are important to the success of citrus farming. Some, like the honeybee, are vitally important as they are the pollinators that are crucial for fruit production. However, some insects, like scale insects, are pests that destroy citrus trees by feeding on their phloem sap. Biologists wanted to find out what effect the introduction of ladybirds, would have on the population of scale insects. They introduced ladybirds to a citrus tree that was infected with scale insects. The results of their investigation are shown in the graph below:



3.1. Provide a suitable hypothesis for this investigation. (3)

Ind variable (ladybirds vs no ladybirds) ✓

Dep variable (scale insect population size) ✓

Format of hypothesis ✓ (lose if stated as a question, includes personal pronouns, includes an explanation or proviso)

e.g. The introduction of ladybird will decrease the scale insect population

**Note: Hypothesis does not need to be correct, marking of format is the focus. Must not be vague - 'ladybird will have an effect' – this is vague*

3.2. What conclusion can be drawn based on the information? (2)

Ladybirds can reduce the population size of scale insects ✓✓

3.3. Name the type of relationship represented in the above graph. (1)

Predator-prey ✓

3.4. Explain why the ladybird population is decreasing at point D. (2)

Their food source (scale insects) decreased too low / not enough food to sustain population ✓

Mortality rate increases lowering ladybird population ✓

3.5. What is expected to happen to the scale insect population at point E? Justify your answer. (2)

Their population will increase ✓

The limiting effect of the ladybird/predator is reduced ✓

3.6. Do you feel humans should be artificially controlling insect population numbers as in the above example? Justify your answer with TWO points. (3)

Decision is provided (Yes or No stated) and matches reasoning given ✓

** Note: There is no correct answer between Yes or No, only the skill or arguing the decision given*

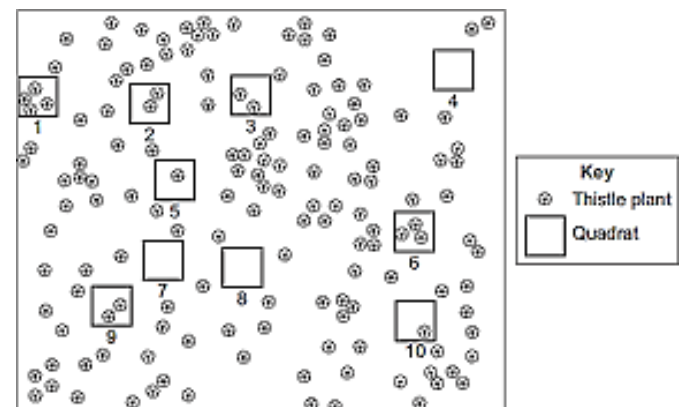
Reasoning ✓✓ (One mark for each separate point)

YES – Can help improve agriculture / improve produce / insects can be pests / insects spread disease / no need for harmful chemicals, natural process / sustainable process / no pollution created

NO – Can cause localized extinction / introduction of alien species / can change the local food web / may spread to other farms and become uncontrolled / may be too slow a process for effect / requires constant monitoring, so labour intensive

QUESTION 4

A biologist wanted to estimate the number of thistles in a field. They decided to use the quadrat method for their calculation. He placed ten (numbered on the diagram) 2m x 2m quadrat squares randomly in the field. The total area of the field was 200m². His method was set up as per below:



4.1. Why was a quadrat method appropriate for this investigation? (1)

Stationary / non-moving organism ✓

4.2. Calculate the estimated population of thistles in the field. Show all your working. (4)

Average per quadrat = 1,5 ✓

**Method correct ✓:
$$\frac{\text{Av per quadrat} \times \text{area}}{\text{Size of 1 quadrat}}$$**

Substitution shown ✓: $(1,5 \times 200) / 4$

Answer: 75 ✓

***Note: Size of quadrat must be calculated from 2×2 ; important to write out the word equation before substituting**

4.3. State TWO specific density-dependent factors that may influence the thistle population in this field. (2)

Any two of the following ✓✓:

Spread of disease / access to sunlight / space available / access to water

NOT predation (as they are plants) or 'Rainfall' (or any other independent factors)

4.4. Would adding more quadrats make the calculation more accurate in the above example? Justify your answer. (3)

***NOTE: Can argue either way - first mark decision is given + matches ✓**

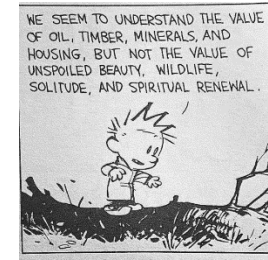
Next two marks to either 2 reasons or one well-explained ✓✓

YES: Makes the average value more accurate / counts as repetition / more reflective quadrats of population

NO: Only meant to be an estimate, not accurate / ends up being a census / if placed randomly first time no need

QUESTION 5

5.1. How does the cartoon below highlight the debate of human demands versus the conservation of the natural environment? (2)



First mark to use of cartoon – e.g. words or images ✓

Second mark based on link to demand vs conservation ✓

e.g. "The cartoon shows how there is greater focus on humans demands, as we cut down trees for timber and the boy is standing on a dead tree. Our demand leads to the death of conservation efforts"

OR "The cartoon highlights the need for conservation, as our demands are destroying the environment. The boy is standing on a dead tree, saying we do not appreciate 'unspoiled beauty'. Wildlife is in danger based on our need for housing

5.2. Some rabbits colonised an island for the first time. The population growth pattern shows a typical s-shaped pattern. What explains the cause for the population change during the accelerated growth phase? (2)

B Increasing number of rabbits able to reproduce with little environmental resistance ✓✓

A = carrying capacity stage / C = growth slow down before equilibrium / D = declining population size

K-TEST 03 – 50 marks (45 minutes)

QUESTION 1

Select the term in column B which matches the phrase in Column A. (9)

COLUMN A	COLUMN B
1. When organisms move out of a populatio	A. Density-independent
2. Physically counting all the organisms in a population	B. More developed country
3. Factors that limit population growth that have a greater effect in a large population size	C. Pioneer stage
4. An organism that has a eusocial lifestyle	D. Intraspecific
5. A country that has a high birth and death rate	E. Interspecific
6. Ecological succession phase that is first after a disturbance	F. Emigration
7. Competition that exists between the individuals of the same species	G. Mortality
8. All the factors required by an organism to survive and reproduce	H. Termites
9. Death rate	I. Census
	J. Less Developed Country
	K. Immigration
	L. Niche
	M. Density-dependent

1 = F ; 2 = I ; 3 = M ; 4 = H ; 5 = J ; 6 = C ; 7 = D ; 8 = L ; 9 = G

One mark per correct match (✓ x 9)

QUESTION 2

Provide definitions for the following terms:

(3)

2.1. Ecological succession

A predictable pattern of change in the species structure of an ecological community over time ✓

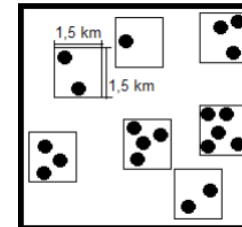
2.2. Natality

Number of births occurring in a population ✓

2.3. Community

A group of individuals from different species (OR many different populations) interacting within an area ✓

2.4. A student wanted to estimate the number of baobab trees in a 10 km² area. He used the quadrat method depicted below.



Calculate the estimated total population of baobabs. Show all your working. (4)

Average per quadrat = 2,86 ✓

Method correct ✓: $\text{Av per quadrat} \times \text{area}$

Size of 1 quadrat

Substitution shown ✓: $(2,86 \times 25) / 2,25$

Answer: 31 OR 32 ✓ (Must be whole number, either round off is fine)

***Note: Size of quadrat must be calculated from 1,5 x 1,5 ; important to write out the word equation before substituting**

QUESTION 3

The African Wild Dog, *Lycaon pictus*, is one of the world's most endangered mammals. The largest populations remain in southern Africa and the southern part of East Africa. Wild dogs are some of Africa's most successful hunters, with a kill rate as high as 80%. This means they are even more successful than lions.

- 3.1. Discuss why the social structure of African Wild Dog packs makes them such successful hunters. (3)

Hunt in packs, so coordinated hunting to increase their success ✓ / tireless runners, so chase prey into exhaustion ✓ / dominant breeding pair, so division of labour, more energy for the hunt ✓

- 3.2. A lone, isolated animal would be easy prey for the African Wild Dog pack, but animals that live in herds are more difficult to capture. Explain TWO reasons why this might be the case if the pack were to attempt to capture a young zebra from its herd. (4)

Any two of the following (Strategy ✓ + explanation ✓)

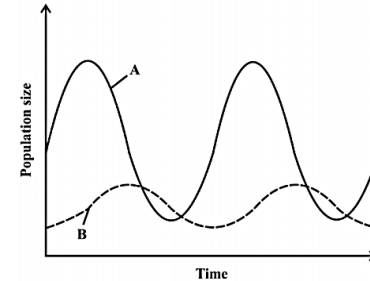
Dilution effect ✓ - chance of being attacked decreases in numbers ✓

Confusion/Distraction ✓ - escape predator in multiple directions ✓

Mobbing ✓ - Group can attack predator to chase them away ✓

Eyes to spot predators ✓ - can escape much easier ✓

- 3.3. The graph below shows how the numbers of predators and prey fluctuate over time. Which lines (A or B) would represent the African Wild Dog population in a reserve? Give TWO visible reasons for your choice. (3)



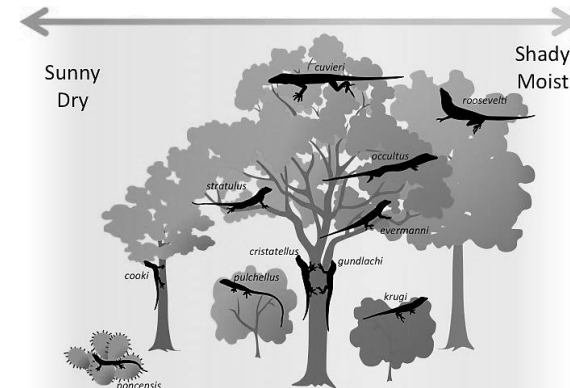
B ✓

Line B less than A, predator number always lower than prey ✓

Line B lags after A, predator number always peaks after prey ✓

QUESTION 4

The following image displays successful partitioning of resources between the species of Anole lizard in Puerto Rico.



- 4.1. Using evidence from the image, explain how this group of lizards has been able to successfully partition their resources. (4)

Dividing up vegetation in one area / different Anole use different parts of the vegetation ✓ + one specific example of comparison from image ✓

Different Anole occupy different environmental condition – Sunny Dry vs Shady Moist ✓ + one specific example of comparison from image ✓

- 4.2. Name ONE density-dependent factor which may affect these lizards. (1)

Access to food / water / shelter / resources / spread of disease / predation (Any one ✓)

- 4.3. Although not harmful to humans, these lizards can become an invasive species. Discuss the impact an invasive species would have on the ecosystem of the above picture. You must make reference to food webs. (3)

Invasive species steal resources of native species ✓ / invasive species dominate the area and cause native extinctions ✓

Invasive species alter the food web by reducing the number of organisms that can survive in the web ✓

- 4.4. Some humans consider the Brown Anole a threat to the local Green Anole species. Removal of the Brown Anole species can involve removal of food sources or catching them in traps to kill them. Do you agree that humans should intervene to remove this invasive species? Justify your opinion with TWO distinct arguments. (4)

For this question, no mark awarded for decision given, but one must be stated in order to determine side of argument

** Note: There is no correct answer between Yes or No, only the skill or arguing the decision given*

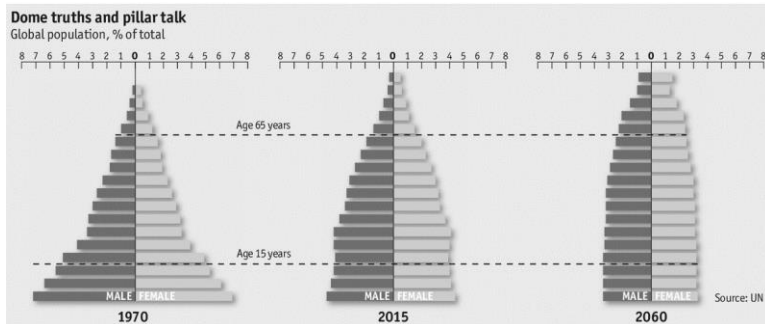
Reasoning ✓✓ x 2 (One mark for each separate point + explanation)

YES – Invasive species alter food webs / would allow for greater biodiversity to develop in the area /

NO – Can cause localized extinction / introduction of alien species / can change the local food web / may spread to other farms and become uncontrolled / may be too slow a process for effect / requires constant monitoring, so labour intensive

QUESTION 5

The United Nations is concerned; recent calculations have raised the possibility that the total human population curve is going to change from a pyramid shape to a dome shape. This is highlighted in the image below:



- 5.1. Identify the type of population pyramid (growth pattern) displayed by each year shown in the models above. (3)

1970 – Rapidly growing ✓

2015 – Stable ✓

2060 – Stable ✓

*** Important to set answer out as 'Year – type of graph' or else no marks**

- 5.2. Discuss TWO reasons why the human population curve is expected to become 'dome shaped'. Make specific reference the graphs given. (4)

Any two of the following (Reason ✓ + link to graph ✓)

Increased medical care (access or advancement) ✓ - greater number of post reproductive present ✓

Access to contraceptives ✓ - birth rate has become lower ✓

Increased education (greater need for working class than family / education around contraceptive use) – lower or stable birth rate ✓

Desire for large families decrease (cultural changes) ✓ - low birth rate ✓

- 5.3. Suggest and explain ONE reason why the United Nations is concerned regarding the 2060 predictions. (2)

Suggestion ✓ + explanation ✓

Greater number of elderly to take care of, strain on medical resources (or strain on the working class to support) / future shortage of working class from low births / greater demand from agriculture which may not be met / greater demand from housing but limited space (or strain on environment due to need for habitat destruction for infrastructure / increased pollution due to greater need for infrastructure and industry

- 5.4. Discuss the forecasted population growth pattern of South Africa over the next 20 years specifically. (3)

The population will still increase ✓ but the rate at which we increase will decrease ✓ (predicted to fall from just over 2% to under 1%)

For 20 years, expected to maintain a stable growth pattern ✓ (not expected to become declining population in this time)

K-TEST 04 – 50 marks (45 minutes)

QUESTION 1

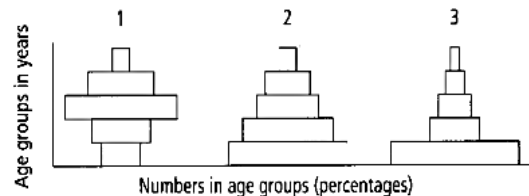
Several Multiple Choice Questions are provided below. Choose the most correct answer by writing down the letter of your choice.

1.1. The major benefit of zebra living in a herd is: (1)

B Intimidation of predators thus increasing chances of survival ✓

**A – Cannot hide large number / C – No dominant breeding pair in zebras
/ D No task division among zebra**

1.2. The diagram below illustrates types of human population pyramids by age. Which shows a declining population? (1)



A Graph 1 ✓

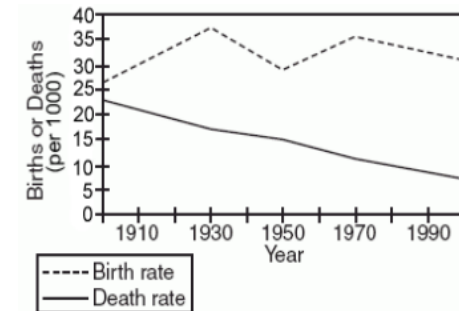
Graphs 2 and 3 are increasing populations

1.3. After a volcanic eruption has covered an area with lava, which of the following is the most likely order of succession in the repopulation of the area? (1)

C Lichens; Grasses; Shrubs; Trees ✓

Must have pioneers first, then intermediate, lastly climax

1.4. The graph below shows the birth and death rate of a particular country. From 1900 to 2000 the total population has: (2)



C Increased ✓✓

Although birth rate stays the same, the number of deaths continually decreases. Therefore, births are continually more than deaths by a bigger number; thus an increasing population.

QUESTION 2

Provide the correct biological term for the following: (4)

2.1. Many different species interacting within an area **Community ✓**

2.2. Wild dogs use this type of reproduction strategy

Dominant breeding pair ✓

2.3. The middle stage of ecological succession **Intermediate ✓**

2.4. Competition that exists between different species **Interspecific ✓**

Provide definitions for the following terms:

(4)

2.5. Carrying capacity

The maximum number of individuals in a population an environment can sustain based on demand ✓

2.6. Density-independent factor

A limiting factor that can prevent a population reproducing at its maximum rate regardless of population size ✓

2.7. Immigration

Individuals moving into a population ✓

2.8. Food web

A series of interconnected and interdependent food chains ✓

2.9. A biologist was tracking a rhino population. Using the mark-recapture method, he marked 15 rhino. A short time later, he caught 20 rhino and found that 12 had already been marked. Calculate the estimated population size. Show all your working. (3)

*Method stated ✓:
$$\frac{\text{First catch} \times \text{second catch}}{\text{Number marked in second catch}}$$*

Substitution correct and shown ✓:

$$(15 \times 20) / 12$$

Answer: 25 rhino ✓

2.10. For the above estimation in 2.9., discuss TWO precautions that the biologist would have needed to adhere to when conducting this population estimation. (4)

(Any TWO of the following) (Factor ✓ + description ✓)

Marking must not harm animal ✓ or hinder there movement / make more visible to predators ✓

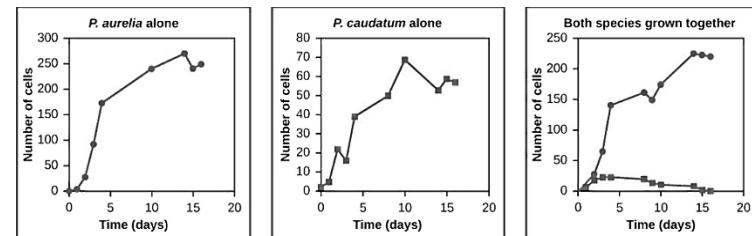
A short time between catch 1 and 2 to minimize effect of births and deaths ✓✓ (all or nothing description in total)

A long enough time between catch 1 and 2 to allow population to intermingle with marked individuals ✓✓ (all or nothing description)

Population must be closed ✓ to minimize effect of immigration and emigration ✓

QUESTION 3

The graphs below represent an investigation comparing the growth of two different bacteria in similar ecological niches under laboratory settings:



3.1. What is meant by the term 'ecological niche?' (1)

All the factors required by an organism / population to survive and reproduce ✓

- 3.2. Would the competition between these two bacteria be considered intraspecific or interspecific competition? Justify your answer. (2)

Interspecific ✓ between two different species (genus same, species different) ✓

- 3.3. Provide a conclusion for the results shown in the above graphs, focusing particularly on what principle is being indicated in the third graph relating to shared ecological niches. (2)

When grown together / when sharing ecological niche, on P. aurelia will survive ✓

This displays the concept of competitive exclusion ✓

- 3.4. Suggest ONE advantage and ONE disadvantage to the use of bacteria as a means to investigate ecological relationships. (2)

*** NOTE: Must state Adv is, Disadv is..... – or else no marks**

ADV: Easy to grow / grow fast / cheap to find / can perform multiple repetitions quickly (any one ✓)

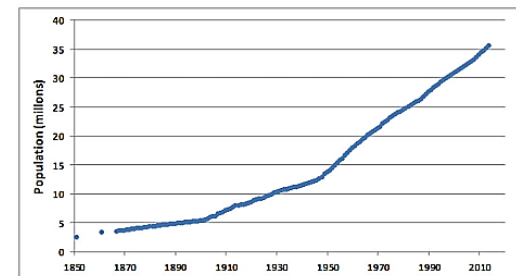
DISADV: Limited scope of results (can only speak about the bacteria themselves, not other organisms) / bacteria can be harmful to investigators (either one ✓)

QUESTION 4

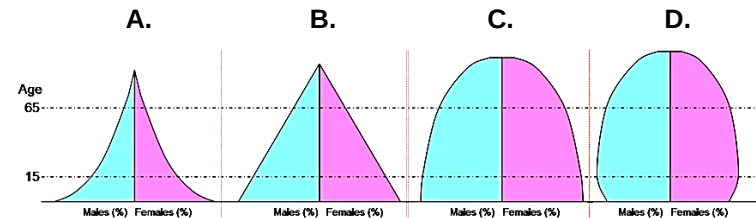
Analyse the following text and graph to assist you in answering the questions that follow:

Canada's recorded population history begins in the 16th century. High rates of fertility and immigration caused the country's overall population to grow rapidly until the 19th century, when it slowed slightly. Population growth continued to be slow through the First World War, Great Depression and Second World War, following which growth rates began to increase again. Today, Canada's population growth is dependent on international migration. Mortality levels have been declining. The major gains in life expectancy can be attributed to developments in public health, including childhood immunization, improved nutritional and personal hygiene levels, better housing and rising standards of living. Medical innovations — particularly the discovery of antibiotics — have played a major role in life expectancy gains.

Figure 1: Canada's overall population graph from 1850 to 2011



- 4.1. Select which of the following population pyramids (A – D) best represents Canada's population growth pattern. Substantiate your answer with TWO points. (3)



**Answer: B ✓ As the population is increasing ✓ but not rapidly ✓
(A is rapidly ; C is stable so not increasing (line would be flat) ; D is declining (line would go down))**

4.2. Provide an alternate term for “rates of fertility”. (1)

Natality OR Birth rate ✓

4.3. Discuss TWO factors, as mentioned in the passage, that may have contributed to the decline in Canada’s mortality rate. (4)

Factor from passage ✓+ explanation ✓ (x2)

Factors that can be discussed: Child immunization / improved nutrition and hygiene levels / better housing / higher standard of living / invention of antibiotics

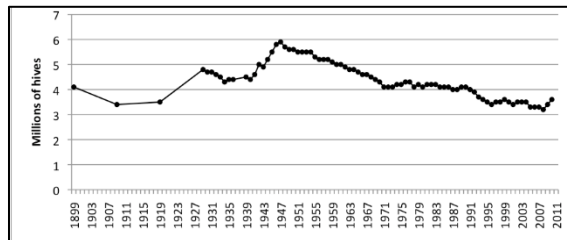
4.4. Describe ONE way the ecological footprint of Canada may differ to that of South Africa. (2)

Canada will have a greater ecological footprint in comparison to South Africa ✓

A more developed country by comparison so demands are greater ✓

QUESTION 5

The graph below tracks the number of beehives (in millions) in the USA over the last century.



5.1. Explain why bees are considered a eusocial animal. (2)

Definitive caste system / cooperative care of brood / reproductive division with queen and sterile workers / overlapping generations (Any two points ✓✓)

5.2. Another eusocial animal you have studied is the termite. Construct a table showing the different roles a termite can perform in the colony, as well as providing ONE function of each potential role. (5)

Heading provided and complete ✓

In table format and appropriate ✓

Correct caste AND one appropriate associated function (✓x 3)

A table summarizing the castes of a termite colony

Caste	Function
Reproductive / Winged Alate / Queen / King	Production of new offspring or colonies
Soldier	Protection of colony
Worker	Gather food / care for young / build and maintain the nest

5.3. Identify from the graph roughly how many hives were present in the USA in 1963. (2)

Accepted range: 4.8 – 4.9 ✓million ✓ (No mark for just million, number must be right to be able to get second mark)

- 5.4. The 'plight' of the honeybee has become rather common knowledge, with many activists petitioning for sweeping environmental changes to 'save the dwindling bee population'. Based on the graph above, does this argument still have merit? Justify your answer with ONE well-explained point. You must also use evidence from the graph in your answer. (4)

**NOTE: Can argue either way - first mark decision is given + matches ✓*

Next two marks to one well-explained point ✓✓

Final mark to the use of information from the graph to aid reason ✓

YES: Still a decrease from 100 years and a 2 million drop from its peak / This only covers USA, other countries are not accounted for / Although number is the same, the agricultural needs have significantly increased

NO: The drop in numbers is a 'cherry picked' timeframe, overall still the same / beehives does not equate to number of bees, so less hives could still be the same number of bees

**NOTE: When talking about a 'well-explained point' – you are generally looking at two significant sentences worth of justification. The first sentence being what the factor of argument is, and the second being an extension (not repetition) of this factor / argument*

K-TEST 05 – 50 marks (45 minutes)

QUESTION 1

Study the following table which consists of two items (numbered 1 and 2) in the first column and a statement in the second column. **Decide which item(s) relate to the term.**

Write down your choice (A – D) in the space provided in the "answer" column, making use of the following codes:

- A** only item 1 relates to the statement
- B** only item 2 relates to the statement
- C** both item 1 and 2 relate to the statement
- D** neither item 1 or 2 relate to the statement

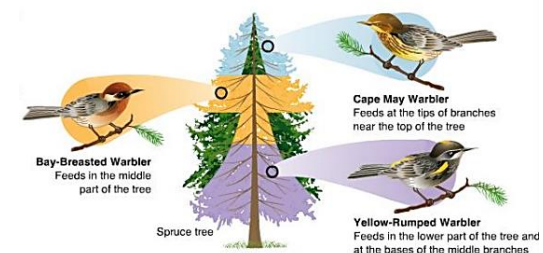
Item	Statement
1. Population 2. Community	A group of organisms of the same species interacting within a defined area
1. Rainfall 2. Earthquakes	Density-dependent factors that limit the growth of a population
1. Emigration 2. Immigration	Individuals moving out of a population
1. Stratification 2. Competitive exclusion	The vertical layering of a forest to partition the resource of light
1. Interspecific 2. Intraspecific	Competition that occurs between individuals of the same species

(5)

ANSWER: 1 – A ; 2 – D ; 3 – A ; 4 – A ; 5 – B

QUESTION 2

A diagram showing different species of bird, the Warblers, has been provided below. Answer the questions that follow.



- 2.1. State the type of competition that is presented in the above diagram. (1)

Interspecific ✓

- 2.2. In your own words, briefly explain how the warblers are able to co-exist. (3)

Resource partitioning ✓

Warblers occupy or use different areas of the tree ✓

They occupy their own personal niche within the same tree ✓

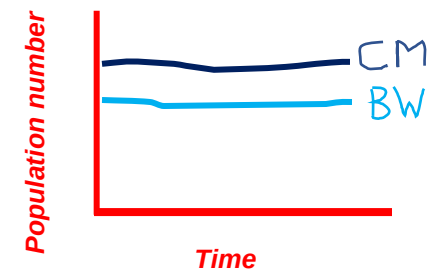
- 2.3. Sketch a rough graph to illustrate the relationship between the populations of the Cape May Warbler and the Bay-Breasted Warbler. You must include a heading and axes titles. (4)

Heading ✓

Axes labelled ✓

Graph shows co-existence ✓✓

***NOTE: NOT a predator-prey graph!**



- 2.4. Describe ONE other example in animals you have studied that follows a similar relationship to the Warblers. (3)

Name of example ✓ + 2 points of description ✓✓ (any one of the below)

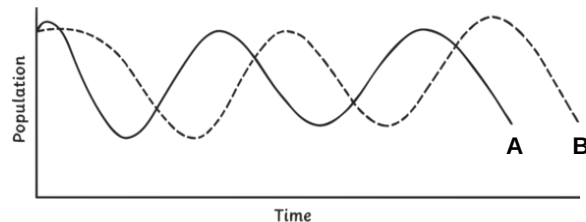
Giraffe and buck – feed on same tree, but giraffe take top and buck take lower part of the tree

Shorebirds – Inhabit different areas of the shoreline to divide resources, rocks, tideline, in the wavebreak, high and low sand (pickers and probers)

Predators in same area – hunt at different times of the day as well as hunting many different types of prey instead of sticking to one

QUESTION 3

The Kruger National Park tracks several animal species as part of their conservation and research projects. Included in this research are the wild dog and warthog populations. Wild dogs are considered an endangered species. The following graph represents the data collected over several years:



- 3.1. Select the line (A or B) that represents the wild dog population. Provide ONE reason for your answer. (2)

B ✓ - Lags behind A / predator will always peak after prey ✓

- 3.2. Explain why the above graph does not truly confirm to what a normal predator-prey graph should look like. (2)

*Predator should always have a lower number than prey ✓
In this graph, B is the same and sometimes greater ✓*

- 3.3. Discuss ONE way predation helps to create and maintain greater diversity within an ecosystem. (2)

Any one of the following ✓✓

Help to ensure one species does not become dominant and overpopulate the area / keeps prey population genetically fit by preying on weak, old and sick / provides a food source for scavengers when leaving carcasses

- 3.4. The KNP uses the mark-recapture method to estimate the two populations in a small area. The warthog population is currently estimated to be 200 individuals. A recent catch of 40 warthog had 10 tagged individuals. Calculate the number of individuals initially tagged in the first capture. Show all calculations. (3)

*Method stated ✓:
$$\frac{\text{First catch} \times \text{second catch}}{\text{Number marked in second catch}}$$*

Substitution correct and shown ✓:

$$200 = (\text{unknown} \times 40) / 10$$

Answer: 50 warthog ✓

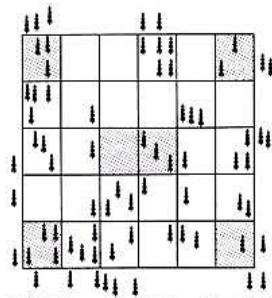
**NOTE: You must rearrange the equation to solve for the unknown first catch*

QUESTION 4

Milkwoods are a protected tree species in South Africa. Although not endangered, individuals are not able to fully remove or cut down any part of a Milkwood tree unless they gain permission from the government. Milkwoods take an extremely long time to grow and have a rich history in South Africa, particularly along the Western and Eastern Cape coasts.



- 4.1. A scientist wanted to estimate the number of Milkwoods in a particular area. His method is shown below:



Using an appropriate population estimation method, calculate (to the nearest whole number) the estimated population of Milkwoods in this 750km² area. Each block is 5km x 5km. Assume only the grey blocks are used in the calculation. (3)

Average per quadrat = 2,17 ✓

Method correct ✓: $\frac{\text{Av per quadrat} \times \text{area}}{\text{Size of 1 quadrat}}$

Substitution shown ✓: $(2,17 \times 750) / 25$

Answer: 65 OR 66 ✓ (Must be whole number, either round off is fine)

- 4.2. Upon further investigation, it is found that the calculation from question 4.1. is inaccurate by more than 25%. Do you feel this result makes the method used invalid? Substantiate your answer. (2)

***NOTE: Can argue either way – but no mark awarded for decision in this question – however, Yes or No must be stated**

Reason ✓ + extension / link to justification ✓

YES: 25% is a large margin of error, even though an estimate relative accuracy important / Milkwoods are protected, this much of an error can severely hinder conservation attempts

NO: Only meant to be an estimate, not accurate / if the need for absolute accuracy was needed rather do a census / the method itself is correct, could be error of scientist not using true random sampling

- 4.3. From the image in 4.1., explain why 6 separate grey blocks are used instead of one large block covering the same combined area. (3)

Random sampling of area is required ✓

One block may be biased for the area ✓

Need a full representation of the area to make the method accurate ✓

- 4.3. Defend the government's decision to make Milkwoods a 'Protected Tree'. (2)

***Note: NOT an opinion question – only arguments in favour**

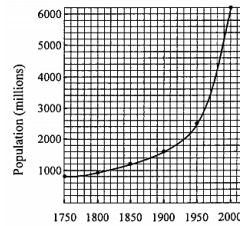
Any two of the following points ✓✓:

Take an extremely long time to grow / part of the WC & EC cultural history / part of a food web that could be disrupted

- 4.4. Suggest and explain which phase of ecological succession the Milkwood would be found in. Justify your answer. (2)

Climax community ✓ - take a very long time to grow ✓

Analyse the following current human population graph:



4.5. Identify the type of growth curve shown in this graph. (1)

Exponential ✓

4.6. What was the world population in 1950? (1)

Accepted range: 2 400 – 2 600 million ✓✓ (must have millions - all or nothing marks)

4.7. State TWO factors that have caused the curve to be this shape. (2)

Advances in medical care / increased capacity of agriculture or food production / greater construction of infrastructure / increased ability to distribute resources to greater area

(Any two of the above ✓✓)

QUESTION 5 (Credit: R McKay)

Oystercatcher birds use the coastal dunes as a breeding area. They build nests in the sand, normally a few meters above the high-water mark. Over a 20-year period the size of an oystercatcher population has been monitored on a coastal dune where off-road vehicles drive (SUVs, bakkies, trucks). The data shown in the table is a portion:

Year	Oystercatcher population size	Number of off-road vehicles using the beach in season
2000 – 2001	250	10
2001 – 2002	320	12
2002 – 2003	205	20
2003 – 2004	134	32
2004 – 2005	170	15
2005 – 2006	175	18
2006 - 2007	100	25

5.1. State the independent variable for this investigation. (2)

Year ✓✓

5.2. Suggest ONE controlled variable for this investigation. (1)

Area sampled for oystercatcher number /

5.3. What conclusion can be drawn from the results from this study? (3)

As number of off-road vehicles increases, oystercatcher population decreases ✓✓ Off-road vehicles will destroy the oystercatcher nests ✓

5.4. Suggest ONE other specific way that the food web of the coastal dunes may be affected by off-road vehicles. (1)

Destruction of vegetation / killing other aquatic birds / scare away predators so overpopulation / kill sand-dwelling organisms (Any one ✓)

5.5. Justify the utility of the study of Population Dynamics in a South African context. (2)

Can be an environmental or human population reason, but well explained ✓✓

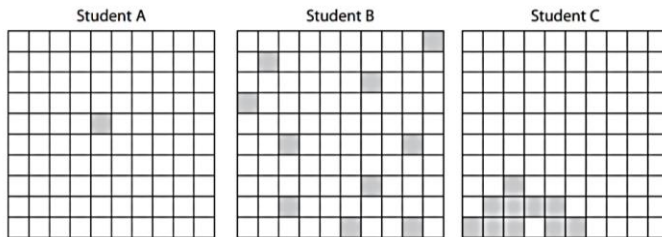
Integral to the ecotourism industry to sustain / biodiversity must be maintained so we can maintain our agricultural needs / predator-prey can help with natural means of population control / can minimize the spread of disease by controlling populations of undesirable pests / human population needs are based on understanding demographics / policy regarding medical care, housing, infrastructure, labour law, human rights / ensuring consistent supply of ocean farming / important for understanding or assessing impact of climate change / important for assessing the impact of pollution (or assessing if interventions are working) / environmental impact assessments important are integral to any new construction project

K-TEST 06 – 50 marks (45 minutes)

QUESTION 1

Several Multiple Choice Questions are provided below. Choose the most correct answer by writing your choice of letter.

- 1.1. Three students were asked to set up a quadrat study in an area. Which of the following is the correct implementation of this? (2)



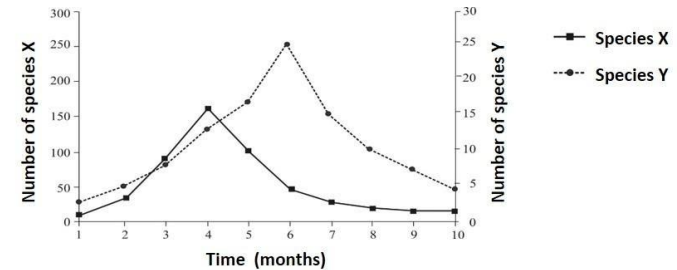
Answer: Student B ✓✓ (randomly selected and enough quadrats)

- 1.2. Which of the following is NOT a precaution related to the mark-recapture method? (1)

C Do not allow individuals to intermix between catches ✓

You MUST allow intermixing between catches

- 1.3. The graph below shows the relationship between 2 species. Which statement is a correct deduction from the graph? (2)



C Species Y is the predator, X is its prey ✓✓

***NOTE: Check which y-axis to read values off. Although line seems higher, the overall number is lower, and it peaks after**

- 1.4. Based on the graph in 1.3, which of the following statements is TRUE? (2)

C At 3 months, there were roughly 8 of species Y ✓✓

***NOTE: Same as above, check which y-axis you should be reading off**

QUESTION 2

Analyse the following text. Use this, as well as your own information, to answer the questions that follow: (Credit: Jordan Calder & Gabi Christie-Smith)

At the tip of the Peninsula, lies Cape Point; 7 750 hectares of protected fynbos vegetation. Living inside the reserve are several antelope species including Eland, Red Hartebeest and Bontebok. The antelope are confined to the park by a fence. Bontebok (*Damaliscus dorcas dorcas*) were not historically present on the peninsula and were introduced to the reserve after the second world war to attract visitors to the park. Since bontebok prefer to graze in grassland areas and fynbos is notoriously nutrient poor, many were concerned that the buck would not survive in the reserve or that they would overgraze the small area. Nonetheless, a small population (10 individuals) was introduced to the reserve and has subsequently thrived. There are currently around 200 bontebok in the reserve.



2.1. What is meant by the term 'carrying capacity'? (2)

The maximum number of individuals of a population the environment can sustain based on demand ✓✓

2.2. Explain why it can be assumed that the carrying capacity of the Bontebok is roughly 200. (2)

The Bontebok have been in the reserve since 2nd World War ✓ therefore they have had time to grow population and find CC ✓

2.3. Quote from the text which proves that the Bontebok population is a closed population. (1)

"The antelope are confined to the park by a fence" ✓

2.4. What type of competition exists between the antelope of Cape Point? (1)

Interspecific ✓

2.5. It has been determined that the Bontebok population is roughly 200 individuals. Explain why the time of year that a population calculation is done is an important factor to consider for accuracy. (3)

Populations will fluctuate seasonally ✓ and annually ✓ The birth and death rates will be different during the year ✓

2.6. Do you feel that the reason for introducing the Bontebok to the reserve was justified? Provide ONE well-explained reason for your answer. (3)

***NOTE: Can argue either way - first mark decision is given + matches ✓**

Next two marks to one well-explained point ✓✓

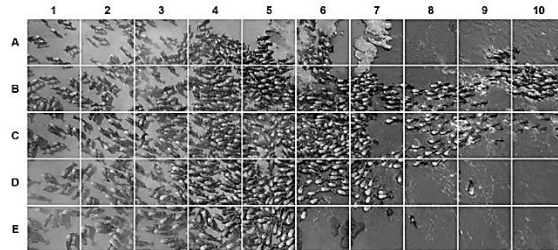
YES: Can aid in increasing the biodiversity of the area / helps with ecotourism to raise more money / provides another source of food for area predators

NO: Alien species, risk of overgrazing since not natural habitat / fynbos is protected area, increased visitors affects this / unknown consequences to the natural food web

***NOTE: When talking about a 'well-explained point' – you are generally looking at two significant sentences worth of justification. The first sentence being what the factor of argument is, and the second being an extension (not repetition) of this factor / argument**

QUESTION 3 (Credit: C Marangoni)

Wildebeest generally perform an annual migration across the Serengeti. Large herds will travel together as they move to more fertile land. An aerial photograph with a quadrat layover of one such herd is presented below:



- 3.1. Is the combination of an aerial photograph and quadrat method appropriate for estimating this wildebeest herd's population number? Justify your answer fully. (3)

***NOTE: Can argue either way - first mark decision is given + matches ✓**

Next two marks to full justification (like a well-explained point) ✓✓

YES: Dangerous animals so this is safer than mark-recapture / group is large so is more efficient / mark-recapture may not be accurate as different wildebeest populations can mix

NO: Difficult to count in one area (dust, covered up), could make estimate inaccurate / difficult to separate different populations that mix in an area / size of the total area may be inaccurate

- 3.2. Would choosing quadrat E10 as one of the quadrat samples be appropriate when performing the quadrat calculation? Justify your answer. (2)

NOTE: Can argue either way - first mark decision is given + matches ✓

Next mark to one reason given ✓

Yes – Quadrats must be randomly sampled / not supposed to pick and choose areas / it is common to have no organisms in a quadrat

No – Clearly will give an inaccurate result / random can still make sure that each has organisms in it

- 3.3. Describe ONE benefit the annual herd migration provides to the wildebeest. (2)

Any one of the following (Factor ✓ + description ✓)

More eyes to see a predator ✓ - easier to escape for time ✓

Dilution effect ✓ - chance of being attacked is lowered ✓

Confusing / distracting predators ✓ - escaping in different directions ✓

Mobbing ✓ - the group attacking and wounding a predator ✓

Access to mates ✓ - improves reproductive success ✓

- 3.4. What is meant by the term 'population'? (1)

Many individuals of the same species interacting within an area

- 3.5. Explain why the annual migration can be referred to as both an emigration and an immigration event. (2)

Emigration – they are leaving the area where they were living ✓

Immigration – to live in a new area ✓

- 3.6. Suggest ONE density-independent factor that will influence the population size of the migrating wildebeest. (1)

Any one of the following ✓:

Rainfall / environmental conditions / temperature / natural disasters

(NOT: pH, salinity or other Physical factors)

QUESTION 4

Analyse the following text. Use this, as well as your own knowledge to answer the questions that follow: (Credit: R McKay)

By late 1890, fewer than 100 White Rhino's had survived in and around the Umfolozi area, the last remaining on Earth. By 1895 the area fortunately received formal protection as a game sanctuary from the Natal Colonial Government as the Umfolozi Junction Reserve, together with the Hluhluwe Valley Reserve. The reserve hosts over 1200 plant species, 84 mammal and 350 bird species not to mention the reptiles, amphibians, fish and insects. The Big 5 (lion, leopard, rhino, elephant and buffalo) roam freely today, as well as Cheetah and Wild Dogs to mention but just a few of the larger species found within the reserve. It is also here that the 'Save the Rhino' campaign was started.

- 4.1. Explain what is meant by the term 'ecosystem'. (2)

All the living and non-living (biotic and abiotic) factors ✓ that interact within an area ✓

- 4.2. Identify ONE predator and ONE prey from the text. (2)

Predator: Lion / Leopard / Cheetah / Wild dog / Fish (Any one ✓)

Prey: Rhino / Elephant / Buffalo / Fish / Insects (Any one ✓)

NOT: generic categories like mammal and birds

- 4.3. Explain why it would be important for game rangers to monitor the predator-prey relationship within the reserve. (2)

*** Either one well-explained or two separate points ✓✓**

Ensure no overpopulation is occurring / ensure sustainability / check for any diseases / monitor poaching that may be occurring / assess human influence and impact on local food webs

- 4.3. Discuss the importance of 'the Big 5' both to the South African economy and South African biodiversity. (4)

Allocation: 2 marks discussing link to economy ✓✓

2 marks discussing link to biodiversity ✓✓

Either one well-explained or 2 separate points for each

Economy: Are a major draw for ecotourism for international visitors / job creation through game reserves and conservation programs / can raise previously disadvantaged communities' profile with infrastructure

Biodiversity: Combination of predator and prey for food web balance / selection of predators for any one of their benefits / megaherbivores are ecological changers, important for sustainability / allow for a greater food web to be sustained

- 4.4. Fires are a regular occurrence in the reserve. State TWO of the first types of plants that would colonise the area after a fire. (2)

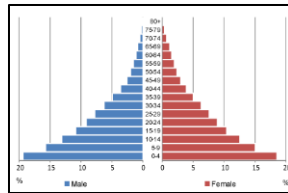
Grasses / Annuals / Perennials (Any two ✓✓)

NOT: lichen and moss (this is not primary succession)

***NOTE: no specific species required to be named**

QUESTION 5

Analyse the population pyramid below and answer the questions that follow:



5.1. State the population growth pattern illustrated in the graph. (1)

Rapidly growing ✓

5.2. Provide TWO reasons why a population would have this growth pattern. (2)

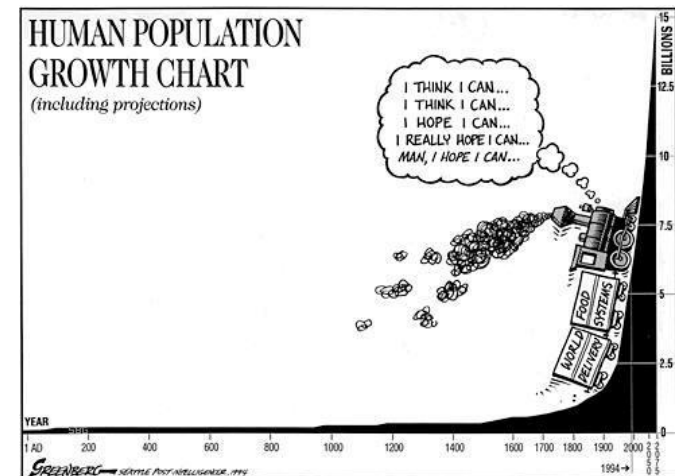
Any two of the following ✓✓:

Minimal education around contraceptives / limited access to contraceptives / poor healthcare infrastructure / poor agricultural infrastructure / culture of large families still prevalent

5.3. Is the graph from a more or less developed country? (1)

Less developed country ✓

5.4. Consider the cartoon below. How does this cartoon effectively illustrate the problem of human overpopulation? You must make reference to the cartoon in your answer. (4)



Allocation: 2 marks to use of cartoon (words / images) ✓✓

2 marks linking to human overpopulation ✓✓ (one well-explained or two separate but linking to cartoon)

Cartoon use (must be stated as per the following): Steep climb of the 'hill' the train must climb / the train is carrying food delivery / the text "I think I can... I really hope I can" / the population graph is showing huge exponential hike up to 15 billion

Link to over population (using cartoon cues): Concern that as human population continues to grow, the demands will not be met / food is in short supply and cannot be maintained / overpopulation will be the downfall of humans

K-TEST 07 – 50 marks (45 minutes)

QUESTION 1

Select the term in Column B that matches the phrase in Column A. (10)

COLUMN A	COLUMN B
1. A population parameter that decreases size of a population.	A. Random sampling
2. A group of populations that interact within a defined area	B. Immigration
3. Species that use resources beyond the carrying capacity of the area.	C. Climax stage
4. A direct method of population estimation.	D. Mark-recapture method
5. Improves the accuracy of population estimation methods.	E. More developed country
6. Ecological succession stage characterised by the presence of small carnivores and larger herbivores.	F. Unstable population
7. The interaction of biotic and abiotic components within a defined area.	G. Emigration
8. The highest form of social organisation.	H. Community
9. Characterised by a high birth rate and high death rate	I. Intermediate stage
10. When the ecological footprint exceeds the Earth's biocapacity.	J. Ecosystem
	K. Census
	L. Eusociality
	M. Less developed country
	N. Ecological deficit

ANSWERS: (✓ each x 10)

1 – G ; 2 – H ; 3 – F ; 4 – K ; 5 – A ; 6 – I ; 7 – J ; 8 – L ; 9 – M ; 10 – N

QUESTION 2 (Credit: S Lombaard)

Consider the following scenario:

Entire populations of the Rock Hyrax (dassie) vanished from many areas of the KZN midlands about 19 years ago. The cause is thought to have been sarcoptic mange, a disease that spreads quickly in animals like the dassie that live in colonies. Because dassies are an important part of the food web of an ecosystem - particularly for the black eagle and predators such as caracal - members of the Midlands conservancy decided to establish a reintroduction program in 2009

- 2.1. It is now 10 years after the first introductions have taken place. You are an ecologist who has been asked to get an idea as to the size of the population which will give an indication of how successful the new dassie colony is. You set traps and manage to catch 8 dassies which you then mark. You release these marked dassies and set the same number of traps a week later. The second capture yields 12 dassies of which four are marked. Calculate the estimated dassie population. Show all your working. (3)

Method stated ✓:
$$\frac{\text{First catch} \times \text{second catch}}{\text{Number marked in second catch}}$$

Substitution correct and shown ✓:

$$\text{Population} = (8 \times 12) / 4$$

Answer: 24 dassies ✓

- 2.2. Based on your calculation, do you believe the reintroduction has been successful? Justify your answer with TWO points. (3)

**NOTE: Can argue either way - first mark decision is given + matches ✓*

Next two marks to two separate points ✓✓

YES: Numbers have increased / no sign of extinction occurring / it has been ten years so sustaining / have been integrated into the food web successfully

NO: Would expect larger numbers for member of rodent family / artificial ecosystem / only there due to human influence

- 2.3. Explain why there was a week between the first and second catch. (2)

Ensure population is allowed to intermix with marked individuals ✓

To minimize the effect of births and deaths ✓

- 2.4. Was the original cause of the dassie population vanishing a density-independent or density-dependent factor? Justify your answer. (3)

Density – dependent ✓

Sarcoptic mange is a disease ✓ Larger a population is, easier it is to spread ✓

- 2.5. Explain why the loss of the dassie may not necessarily cause a collapse of the local food web. (2)

** Either one well-explained or two separate*

Not a keystone species / other forms of prey in the area / relatively small size, not used to sustain a predator population

QUESTION 3

Analyse the following text and answer the questions that follow:

Elephants are preferential grazers of grass. However, in a dry season, they also become browsers, eating woody vegetation as well. In a place like the Kruger National Park, this puts elephants in direct competition with many other species, quite unfairly due to their size. If elephant populations are not kept in check, there is a risk of habitat destruction and extinction of sensitive plant species. In the Kruger National Park, the climax-state density has lowered from 13 top-canopy trees per hectare to just under 2 per hectare in 50 years. It is believed to be mainly caused by overpopulation of elephants. The Park must therefore conduct selective culling of elephants to protect the biodiversity

- 3.1. Explain what is meant by the following terms:

a) Population (1)

Many individuals of the same species interacting within an area ✓

b) Climax-state (2)

The semi-stable ✓ end point of ecological succession ✓

- 3.2. Explain why elephants in the Kruger Park can be considered an unstable population. (2)

They are exceeding their carrying capacity ✓

Can cause habitat destruction and extinction of plant species ✓

- 3.3. Suggest TWO other factors (not mentioned in the text) that may influence the climax-state of a particular ecosystem. (2)

Rainfall / environmental conditions (or a change in these) / climate change / alien species / draining of wetlands / overgrazing (Any two ✓✓)

**NOTE: avoid using 'human influence' for this type of question*

- 3.4. Should humans be intervening and culling the elephant population in the Kruger National Park? Justify your answer with TWO separate points. (3)

***NOTE: Can argue either way - first mark decision is given + matches ✓**

Next two marks to two separate points ✓✓

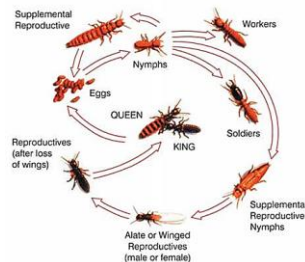
YES: Cause habitat destruction / can lead to extinction of species / selective culling is for the benefit of elephants / biodiversity is maintained rather than destroyed / culling is more humane

NO: No right to kill the animals / not the animal's fault for overpopulation / elephants are endangered / already pressures from poaching

***NOTE: be careful not to give an answer of "They should rather..." – this is not the point of the questions. You are only using arguments for your decision, not saying what should be done instead**

QUESTION 4

The image below shows the different castes of termites in a colony



- 4.1. Describe the role of TWO of the castes shown in the above image. (2)

Correct role to correct task ✓(x2)

Worker – Build or maintain nest / gather food / care for young

Soldier – protect the colony

Queen / King – Produce new offspring

Alate – fly to new area to start new colony

Nymphs – can develop into any caste needed

Supplemental reproductive nymph – Replace King or Queen when needed

- 4.2. Competition still exists within a termite colony, despite its caste system. State the type of competition that exists in the colony. (1)

Intraspecific ✓

- 4.3. Describe ONE benefit of using a caste system to the success of the termite colony. (2)

Factor ✓ + description ✓ (Any one of the following)

Division of labour – roles are set so more work can be done efficiently

Gathering of resources – more efficient gathering and sharing

Care of young – communal effort to increase survival rate

- 4.4. Differentiate between the function of a caste system and the use of a dominant breeding pair by wild dogs. (4)

Allocation: 2 marks to caste description ✓✓

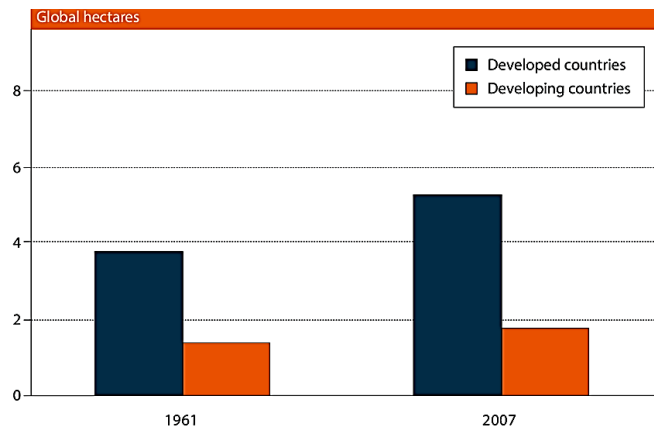
2 marks to dominant breeding pair description ✓✓

Caste: Organisms are physically changed into caste / once in a caste you cannot change to something else / this is the only role you perform (such as a worker or soldier)

Dominant breeding pair: Creates a hierarchy with only one level / who the dominant pair is can change easily (anyone of the pack can) / Everyone contributes in the same way to communal nature

QUESTION 5

Analyse the graph below illustrating the average Ecological Footprint per person of the developed world vs the developing world.



- 5.1. Provide TWO conclusions based on the evidence provided. (4)

Any two of the following in totality:

Ecological footprint of developed countries has increases over time ✓✓

Ecological footprint of developing countries has increased over time ✓✓

The ecological footprint of developed countries is greater than developed ✓✓

The increase of ecological footprint was greater for developed vs developing countries ✓✓

***NOTE: The inverse of 3rd and 4th conclusion also acceptable, but cannot count as a separate conclusion**

- 5.2. Provide ONE reason for the differences shown in the graph. (2)

Developed has greater infrastructure development / greater demand from agriculture and ability to distribute (Point ✓ + extension ✓)

- 5.3. Provide a sketch of a population growth pyramid that would most likely represent a developing nation. No values need to be plotted and no heading is required. (2)

Shape of the graph is correct ✓✓ (all or nothing) – (Not a stable or declining population curve)

