# Yr 2 Web Class #5
# Ecology

## Tuesday 30/10/2018 at 7pm

**Topics for this weeks class:**

Ecosystems are dynamic and controlled by biotic and abiotic factors

Species occupy a specific niche

Ecosystems have a carrying capacity

Organism compete with each other: Intraspecific, Interspecific & Predator - Prey Inertactions

Sampling ecosystems

Succession

**Playlist of videos to take notes on before the web class:**

| AQA VIDEOS | OCR VIDEOS | EDEXCEL VIDEOS |
|---|---|---|
| Population Key Terms | Introduction To Ecosystems | Introduction To Ecosystems |
| The Niche Concept | The Niche Concept | The Niche Concept |
| Abundance & Distribution of Organisms | Abundance & Distribution of Organisms | Abundance & Distribution of Organisms |
| Transects & Quadrats | Transects & Quadrats | Transects & Quadrats |
| Investigating Populations - Sampling | Investigating Populations - Sampling | Investigating Populations - Sampling |
| Succession | Succession | Succession |
| Types of Succession | Types of Succession | Types of Succession |
| Mark - Release - Recapture | Managing Ecosystems | |
| | Conservation & Preservation | |

**Q1.**

(a)   What term is used to describe populations of different species living in the same habitat?

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**(1)**

(b)   Different species occupy different ecological niches.

Explain the advantage of species occupying different niches.

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**(1)**

Scientists recorded the number of water beetle species in 30 lakes. In each lake, they measured the pH of the water and recorded whether there were any fish present.

The graph shows their results.



□ Lakes without fish
● Lakes with fish
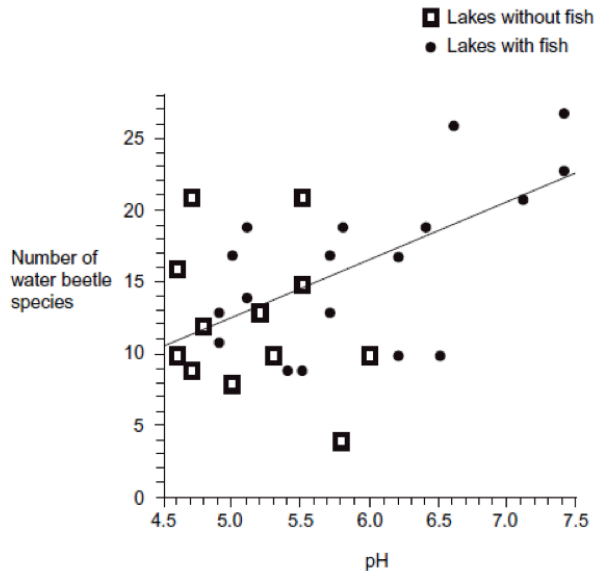
(c)   A student concluded that a decrease in acidity caused an increase in the number of water beetle species.

Evaluate this conclusion.

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**(3)**

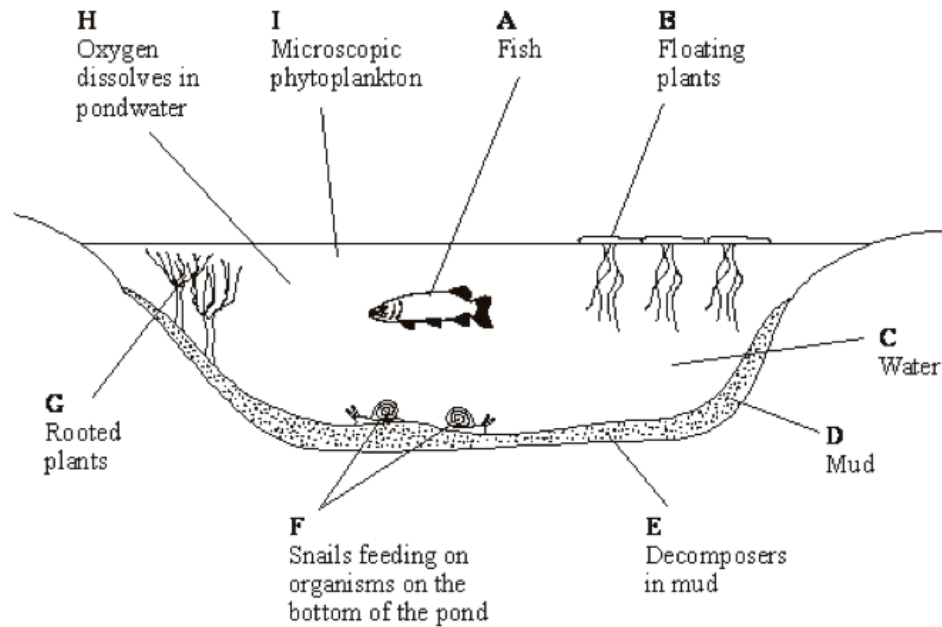(d)   Explain how the presence of fish in a lake could cause an increase in the number of water beetle species.

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**(1)**
**(Total 6 marks)**

**Q2.**

The diagram shows some of the components of a pond ecosystem.



**H** Oxygen dissolves in pondwater

**I** Microscopic phytoplankton

**A** Fish

**B** Floating plants

**C** Water

**D** Mud

**G** Rooted plants

**F** Snails feeding on organisms on the bottom of the pond

**E** Decomposers in mud

(a)  (i)  What is an ecosystem?

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**(1)**

(ii)  List the letters that represent those components that are part of the pond community.

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**(1)**

(b)  New Zealand pygmy weed has been introduced into many garden ponds and has spread to some natural ponds. Here, it competes with naturally occurring plants. Suggest how the introduction of pygmy weed may lead to a reduction in the diversity of the community in a natural pond.

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**(3)**

**(Total 5 marks)**

**Q3.**

(a) Explain the meaning of these ecological terms.

Population _____

_____

Community _____

_____

**(2)**

(b) Some students used the mark-release-recapture technique to estimate the size of a population of woodlice. They collected 77 woodlice and marked them before releasing them back into the same area. Later they collected 96 woodlice, 11 of which were marked.

(i) Give **two** conditions necessary for results from mark-release-recapture investigations to be valid.

1. _____

_____

2. _____

_____

**(2)**

(ii) Calculate the number of woodlice in the area under investigation. Show your working.

Answer _____

**(2)**

(c) Explain how you would use a quadrat to estimate the number of dandelion plants in a field measuring 100 m by 150 m.
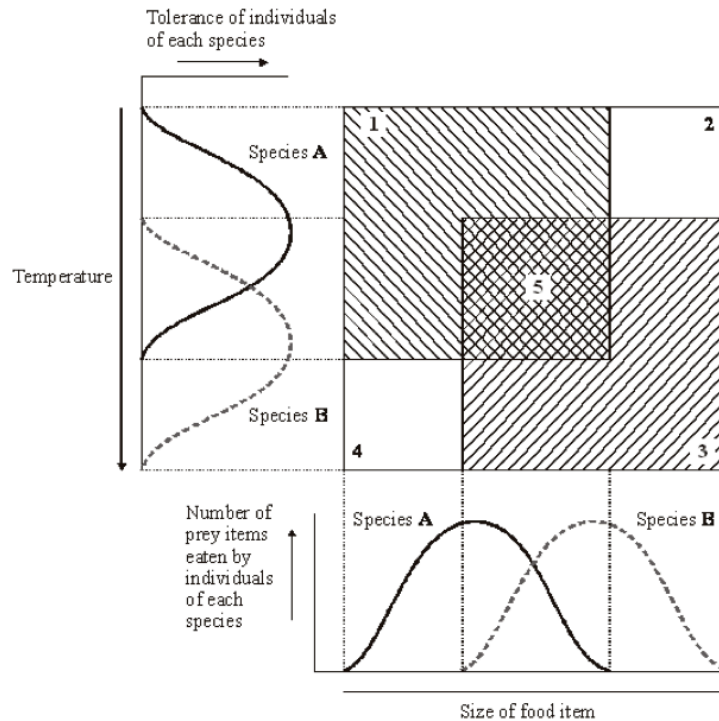
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**(3)**

(d)    Two similar species of birds (species **A** and species **B**) feed on slightly different sized insects and have slightly different temperature preferences. The diagram represents the response of each species to these factors.



(i)    Which of the numbered boxes describes conditions which represent

| | |
|---|---|
| the niche of species **A** | |
| the niche of species **B** | |
| insects too small for species **B** and temperature too warm for species **A** | |
| insects too large for species **A** and temperature too cool for species **B** | |

(2)

(ii)   These two species are thought to have evolved as a result of sympatric speciation. Suggest how this might have occurred.
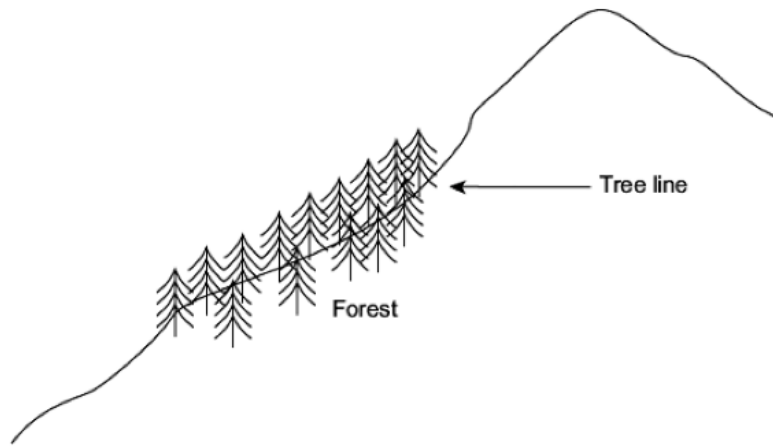
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(4)
**(Total 15 marks)**

**Q4.**

Mountains are harsh environments. The higher up the mountain, the lower the temperature becomes. The diagram shows a forest growing on the side of a mountain.
The upper boundary of the forest is called the tree line. Trees do not grow above the tree line.



(a)  (i)  The position of the tree line is determined by abiotic factors.
What is meant by an abiotic factor?

_____

_____

**(1)**

(ii)  Other than temperature, suggest **one** abiotic factor that is likely to affect the position of the tree line on the mountain.

_____

**(1)**

(b)  The population of trees in the forest evolved adaptations to the mountain environment.
Use your knowledge of selection to explain how.

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**(3)**
**(Total 5 marks)**

**Q5.**

Impala and wildebeest are species of herbivore that live in large groups. They spend most of their time feeding with their heads near the ground.

Scientists investigated the relationship between the number of predators in an area and the mean proportion of time these herbivores spent with their heads up, looking around rather than feeding. They obtained data from groups of impala and wildebeest in two areas. In one area there were few predators and in the other area there were many predators.

The graph shows their results. The bars show standard deviations.
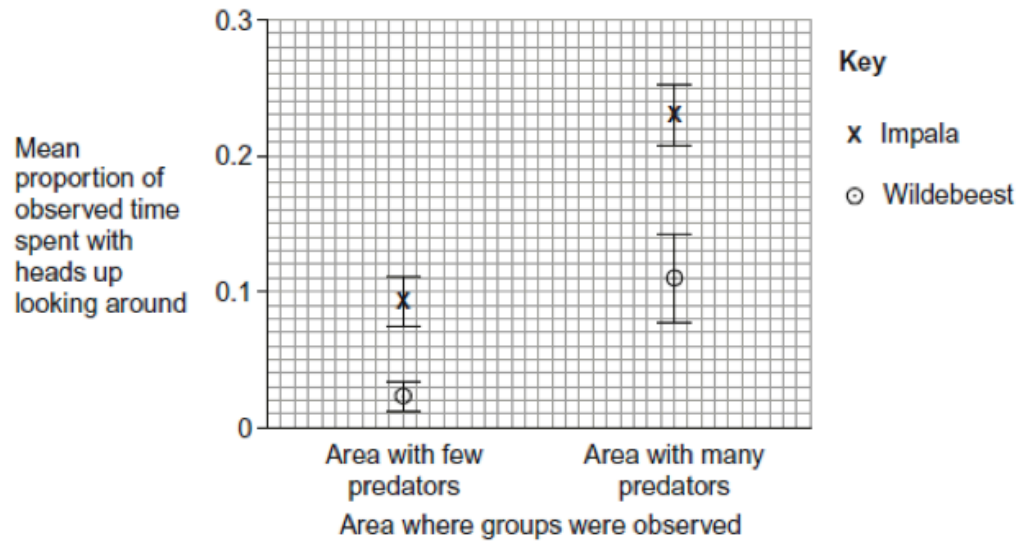


(a)   The scientists observed both groups of animals for 75 hours.

Use data from the graph to calculate the difference in the mean number of hours spent by each species looking around in the area where there were **many** predators.

Show your working.

Difference _____ hours

(2)

(b)    The scientists concluded that these
       herbivores spend more time looking for predators in areas where there are many
       predators.

       Do these data support this conclusion? Give reasons for your answer.

       _____

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                                                                                    **(4)**

(c)    The behaviour of the herbivores in having their heads up has a benefit but it also has
       costs. The benefit is being able to see, and escape from, predators.

       Suggest and explain **one** cost to the herbivores of this behaviour.

       _____

       _____

       _____

       _____

                                                                                    **(2)**
                                                                         **(Total 8 marks)**

**Q6.**

Lemmings are small mammals which live in the Arctic. Their main predator is the stoat, a small carnivorous mammal, which feeds almost entirely on lemmings. The graph shows the changes in the numbers of lemmings and stoats from 1988 to 2000.
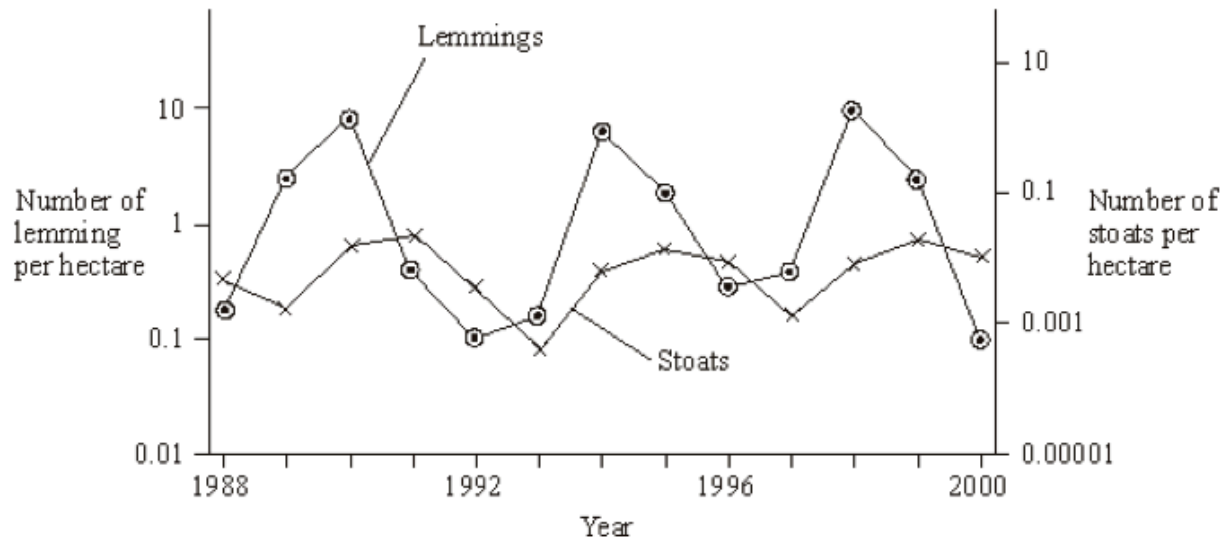


(a)    Describe and explain the changes which occur in the lemming and stoat populations.

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(6)

(b)   Lemmings often live in isolated populations.
      From time to time some lemmings move and join other populations. Explain how this
      movement is important in maintaining genetic variability in lemming populations which
      have large fluctuations in size.

      _____

      _____

      _____

      _____

                                                                                    **(2)**

(c)   James Bay is a large ocean bay in northern Canada. It was formed by the melting of
      glaciers. One species of lemming inhabits the eastern side of James Bay and another
      species of lemming inhabits the western side. Before the glaciers melted there was only
      one species of lemming present. Explain how two species of lemming evolved from the
      original species.

      _____

      _____

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      _____

      _____

                                                                                    **(4)**
                                                                        **(Total 12 marks)**

**Q7.**

A Sri Lankan scientist investigated the effect of human disturbance on the organisms living on a rocky seashore. He chose three areas for the study. These areas had different amounts of human disturbance.

The scientist measured human disturbance by walking from one end of the beach to the other. He recorded the number of people he encountered. **Figure 1** shows his results.

**Figure 1**

|  | Site **R** | Site **G** | Site **U** |
|---|---|---|---|
| Mean number of people encountered per hour (± standard deviation) | 2.2 (± 2.1) | 17.6 (± 9.6) | 34.6 (± 11.6) |

(a)  (i)  What conclusions can you draw about the number of people visiting Site **R** compared with the number of people visiting the other two sites? Give evidence from **Figure 1** to support your answer.

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**(2)**

(ii)  The scientist reported that the difference between the number of people visiting Site **R** and the number visiting the other two sites differed significantly ($p < 0.05$).

Use the words probability and chance to explain the meaning of *differed significantly ($p < 0.05$)*.

_____

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**(2)**

(b)  The scientist used quadrats to find the
     number of species at each of the three sites. He carried out a preliminary investigation and
     recorded the total number of species in an increasing number of quadrats. **Figure 2** shows
     the results.
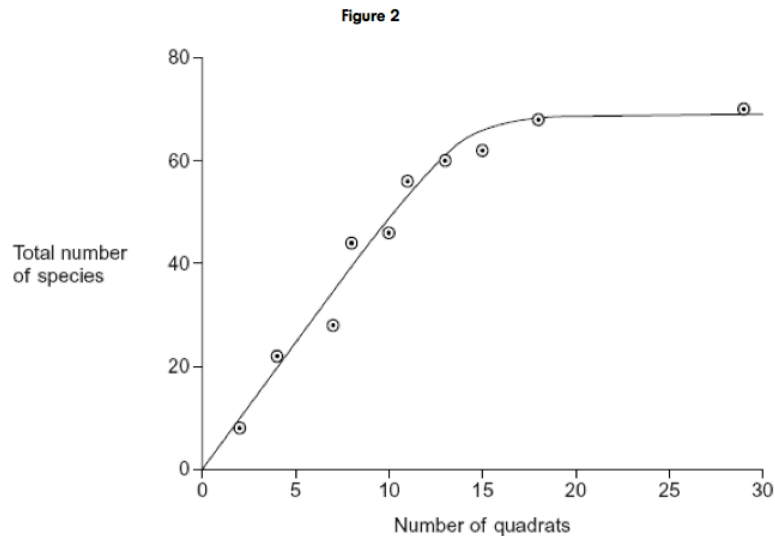
**Figure 2**



(i)   Use **Figure 2** to explain why 10 would **not** be an appropriate number of quadrats to
      use.

      _____

      _____

      _____

                                                                                              **(1)**

(ii)  Use **Figure 2** to explain why 25 would **not** be an appropriate number of quadrats to
      use.

      _____

      _____

      _____

                                                                                              **(1)**

**Part (c) AQA & OCR ONLY**

The scientist measured the dry biomass of seaweeds at each of sites **R**, **G** and **U**. He collected all the
     organisms of a particular species in a quadrat and incubated them in an oven at a temperature
     of 80 °C.

(c)  The scientist incubated the seaweeds at 80 °C. Suggest why incubating them at a higher
     temperature would **not** produce valid results.

     _____

     _____

     _____

                                                                                              **(1)**
                                                                                  **(Total 7 marks)**

**Q8.**

The photograph shows marram grass growing on a sand dune.



Marram grass on sand dune by Nigel Chadwick [CC-BY-SA], via Wikimedia Commons

(a)     Describe how you would investigate the distribution of marram grass from one side of the dune to the other.

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**(3)**

(b)     Marram grass is a pioneer species that grows on sand dunes. It has long roots and a vertically growing stem that grows up through the sand.
Sand dunes are easily damaged by visitors and are blown by the wind. Planting marram grass is useful in helping sand dune ecosystems to recover from damage.

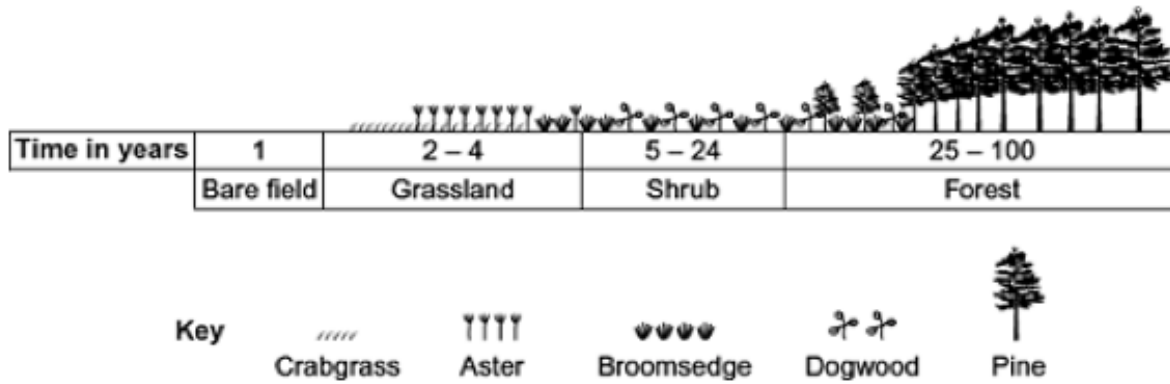Use your knowledge of succession to explain how.

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**(2)**
**(Total 5 marks)**

**Q10.**

The diagram shows the dominant plants in communities formed during a succession from bare soil to pine forest.



| Time in years | 1 | 2 – 4 | 5 – 24 | 25 – 100 |
|---|---|---|---|---|
| | Bare field | Grassland | Shrub | Forest |

Key: Crabgrass, Aster, Broomsedge, Dogwood, Pine

(a)     Name the pioneer species shown in the diagram.

_____

                                                                                                 **(1)**

(b)     The species that are present change during succession. Explain why.

_____

_____

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                                                                                                 **(2)**

(c)     The pine trees in the forest have leaves all year. Explain how this results in a low species diversity of plants in the forest.

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                                                                                                 **(1)**
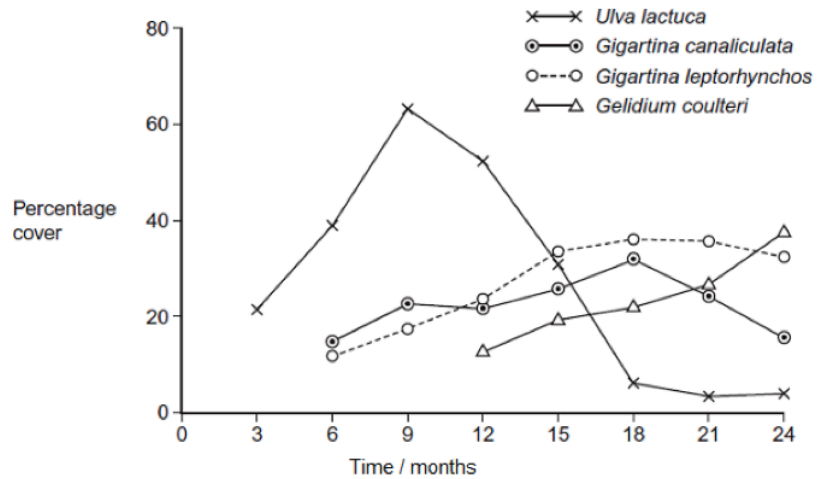                                                                                   **(Total 4 marks)**

**Q11.**

Algae are photosynthesising organisms. Some algae grow on rocky shores. A scientist investigated succession involving different species of algae. He placed concrete blocks on a rocky shore. At regular intervals over 2 years, he recorded the percentage cover of algal species on the blocks. His results are shown in the graph.



(a)    Name the pioneer species.

------------------------------------------------------------------------

**(1)**

(b)    (i)    The scientist used percentage cover rather than frequency to record the abundance of algae present. Suggest why.

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**(1)**

(ii)    Some scientists reviewing this investigation were concerned about the validity of the results because of the use of concrete blocks.
Suggest **one** reason why these scientists were concerned about using concrete blocks for the growth of algae.

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**(1)**

(c)    Use the results of this investigation to describe and explain the process of succession.

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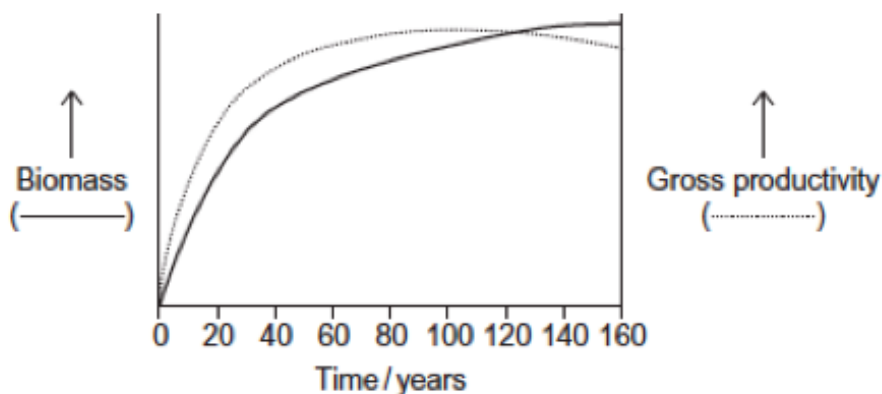------------------------------------------------------------------------

**(4)**
**(Total 7 marks)**

**Q12.**

The graph shows how gross productivity and biomass in an area changed with time in the succession from bare soil to mature woodland.



(a)　(i)　Suggest appropriate units for gross productivity.

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**(1)**

　　(ii)　Explain the decrease in gross productivity as the woodland matures.

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**(2)**

(b)　Use your knowledge of succession to explain the increase in biomass during the first 20 years.

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**(3)**

(c)    Use the information in the graph and your
       knowledge of net productivity to explain why biomass shows little increase after 100 years.

_____

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_____

                                                                        **(2)**

(d)    Suggest **one** reason for conserving woodlands.

_____

_____

_____

                                                                        **(1)**
                                                                **(Total 9 marks)**

**Q13.**

(a)    Succession occurs in natural ecosystems. Describe and explain how succession occurs.

_____

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                                                                        **(5)**
                                                                **(Total 5 marks)**

**Q1.**

    (a)    Community

                                               **1**

    (b)    (Less) competition for food/resource

                        *Ignore: competition for niche/habitat.*
                        *Accept: space/named resource.*
                        *Reject: intraspecific competition.*

                                               **1**

    (c)    1.    <u>Correlation</u> **but** does not mean a causal effect
                        *Ignore: positive/ negative (correlation).*
            2.    Other abiotic/biotic/named factor involved
                        *Accept: due to presence/absence of fish.*
                        *Reject: 'other factors' unless further qualified.*
            3.    Variation in numbers of beetles species at same/similar
                   particular pH
                        *Accept: same number of beetles at different pHs.*
                        *Accept: 'scattered results' / 'anomalies' / 'spread of results'.*
            4.    Large sample

                                        **Max 3**

    (d)    Fish feed on predator/consumer of water beetle
                        *Accept: beetles feed on fish/faeces.*

                                           **1**

                                            **[6]**

**Q2.**

    (a)    (i)    ecosystem is (self-supporting) system in which all organisms / community interact with
                   physical environment / community + environment / biotic + abiotic

                                           **1**

            (ii)    A + B + E + F + G + I

                                           **1**

    (b)    pygmy weed competes for $CO_2$ / light / nutrients reduction in numbers of original plants
            some of original plant <u>species</u> lost
            loss of habitats / niches / shelter / food sources
            consumers die / some migrate

                                         **3 max**

                                              **[5]**

**Q3.**

(a)    Population − organisms of one species in an ecosystem / habitat / area
Community − organisms of all species / all populations in an
ecosystem / habitat / area

**2**

(b)    (i)    No immigration / migration (Ignore references to emigration)
No reproduction *(Ignore references to death)*
Idea of mixing
Marking does not influence behaviour / increase vulnerability
to predation
Sample / population large enough

**max 2**

(ii)    672
*Correct answer (however derived) scores 2 marks*
*Incorrect answer with evidence of correct method scores 1 mark.*

**2**

(c)    Principle of randomly placed quadrats and method of producing random
quadrats *(Reject 'throwing')*
Valid method of obtaining no. dandelions in given area (mean per
quadrat / total no. in many quadrats)
Multiply to give estimate for total field area

**3**

(d)    (i)    Niche of A − 1
Niche of B − 3
Too small for B / too hot for A − 4
Too large for A / too cold for B − 2
*All four correct = 2 marks any 2 correct = 1 mark*

**2**

(ii)    Original population living in one area / 2 species evolved in
the area
Idea of genetic variability
Concept of reproductive isolation
Possible mechanism
Gene pools become increasingly different
Until interbreeding does not produce fertile offspring

**max 4**

**[15]**

**Q4.**

(a)    (i)    Non-living / physical / chemical factor / non biological

                *Do not accept named factor unless general answer given.*

                **1**

    (ii)    Accept an abiotic factor that may limit photosynthesis / growth

                *Reject altitude / height*

       Water

       Named soil factor

                *Not "soil" / "weather"*

       Light

       Carbon dioxide

                *Accept Oxygen*

       Incline / aspect

       Wind / wind speed

                **1**

(b)    1.    Variation in original colonisers / mutations took place

    2.    Some better (adapted for) survival (in mountains)

                *2. Allow "advantage so able to survive"*

    3.    Greater reproductive success

    4.    <u>Allele</u> frequencies change

                *4. Reject gene / genotype*

                **3 max**

                **[5]**

**Q5.**

(a)    9 (hours)

If multiply 75 by 0.11 and 0.23 but wrong answer, then 1
mark

*Accept for **one** mark if multiply 75 by two wrong proportions
near to 0.11 ± 0.01 and 0.23 ± 0.01 or multiply by the
difference between the two (wrong) proportions*

**2**

(b)    (Yes because)

1.    Both/Each species (mean) time spent looking around
        greater where many predators
2.    Differences (appear to be) significant because SDs do
        not overlap

(No because)

3.    Wildebeest spend same (mean) time looking around
        where many predators as impalas where few
        predators
4.    Don't know what they are looking for (when heads up)
5.    Habitats might be different in different areas (which
        could affect the behaviour)

*Accept 'mean proportion' means 'time'*

*1. Require idea of both, not just quoting numbers*

*2. This point must be in the context of point 1*

*2. Do not accept results significant*

*2. Accept 'because bars do not overlap'*

*2. Do not accept SE for SD*

*3. Accept overlap in SD as equivalent to same time*

*5. Ignore 'other factors' unqualified and discussions of
experimental variables*

**4 max**

(c)    1.    Less time spent feeding
               **OR**
               More energy lifting head/looking round
        2.    (So) less food/biomass for respiration
               **OR**
               less energy for growth/reproduction/care of young
               **OR**
        3.    Raising head makes them more visible to predators
        4.    So more likely to be attacked/eaten/killed

*2. Accept any appropriate suggestion of less energy for
something to do with life of the herbivore*

*2. Allow less food/biomass for growth/reproduction*

*2. Ignore references to energy for respiration*

**2**

**[8]**

**Q6.**

(a)
1   4 year cycles
2   predator / stoat peaks after prey / lemming
3   lemmings increase due to low numbers of stoats / available food
4   more food for stoats so numbers increase
5   increased predation reduces number of lemmings
6   number of stoats decreases due to lack of food / starvation

**6**

(b)   smaller populations have fewer different alleles / more homozygosity / less heterozygosity / smaller gene pool / lower genetic variability
migrants bring in new alleles / increase gene pool

**2**

(c)   geographical isolation of populations
variation present in population(s)
different environmental conditions / different selection pressures / different phenotypes selected
change in genetic constitution of populations / gene pools / allele frequency

**4**

**[12]**

**Q7.**

(a)   (i)   Fewest people at site R as mean is lowest
*Accept use of mean values to show 2.2 is the lowest*

Standard deviations do not overlap so significant / not due to chance
*Accept use of values / description of standard deviation
even in wording 'standard deviation' is not used*

**2**

(ii)   There was a probability of less than 0.05 / 5 in a hundred / 5%
*In the context of less than
Accept converse: probability of more than 95%*

That the difference was due to chance
*Look for idea of difference (between sites)*

**2**

(b)   (i)   (Would not be reliable as) number of species is still increasing
*Accept: has not reached peak / maximum or if shown by values*

**1**

(ii)   Idea of curve has flattened / no more species found so no benefit / no point / takes unnecessary time / takes unnecessary
effort / can get same results with fewer quadrats
*Basic idea is of minimising effort.*
*If values used reward idea rather than accuracy of numbers*

**1**

(c)   Combustion / would burn / cause loss of substances (other than water) / named substance / cause loss of <u>dry</u> mass
*Accept: <u>only</u> want water to be lost*
*Ignore: reference to decomposition*

**1**

**[7]**

**Q8.**

(a) 1. Transect / lay line / tape measure (from one side of the dune to the other)

*1. & 2. Reject random in context of placing transect / quadrats*

2. Place quadrats at regular intervals along the line

*Accept references to stratified sampling / different seral stages*

3. Count plants / percentage cover / abundance scale (in quadrats)

*Accept abundance scale*

**OR**

Count plants and record where they touch line / transect

4. Use several transects / repeats

**3 max**

(b) 1. Stabilises sand / stops sand shifting

2. Forms / improves soil / makes conditions less hostile

*Allow credit for example of making conditions less hostile such as:*
*Adds nutrients*
*Improves water retention*

**2**

**[5]**

**Q9.**

(a) Crabgrass

*Reject: grass or grassland*
*Reject: crabgrass if another organism is also included*

**1**

(b) 1. Species / plants / animals change the environment / conditions / add humus / nutrients etc. / less hostile (habitat)

*Accept 'they' for species / plants in mark points 1 and 2*

2. Species / plants better competitors

**2**

(c) (Only) plants which can photosynthesise with less light (remain)

*Accept converse but do not award mark for idea that plants cannot photosynthesise and die because there is no light*
*Answers must be in context of being or not being able to photosynthesise with less light*

**1**

**[4]**

**Q10.**

(a)  *Ulva lactuca*

> *Reject: Ulva on its own*
> *Accept: lactuca on its own*
> *Accept: Incorrect spelling*

**1**

(b)  (i)  Difficult / too many / too many to count / individual organisms not identifiable / too small to identify / grows in clumps

> *Neutral: easier / quicker / representative / more accurate, unless qualified*

**1**

(ii)  Any described feature of concrete eg texture / flat / composition chemicals / nutrients etc

> *Neutral: not natural / man made / are different, without further qualification*

**1**

(c)  1.  Pioneer species / *Ulva* increases then decreases

> *1 and 4. Growth / reproduces = increases. Dies = decrease*

2.  Principle of a species changing the conditions / a species makes the conditions less hostile

> *2. Accept description of change in conditions eg soil / humus forms, nutrients increased*

3.  New / named species better competitor / previous / named / pioneer species outcompeted

> *Pioneer species grows, dies and forms humus = 2 marks*
> *G. coulteri / Gelidium outcompetes other / named species = 2 marks*

4.  *G. coulteri / Gelidium* increases <u>and</u> other / named species decreases

**4**

**[7]**

**Q11.**

(a)   (i)   Unit of energy / mass, per area, per year.

                                                            **1**

       (ii)   1.   Less light / more shading / more competition for light
                        *Neutral: references to animals*

              2.   Reduced photosynthesis.
                        *Accept: no photosynthesis*

                                                             **2**

(b)   1.   Pioneer species
        2.   Change in abiotic conditions / less hostile / more habitats / niches
                        *Accept: named abiotic change or example of change e.g. formation of soil / humus / organic matter / increase in nutrients*
                        *Neutral: reference to change in environment unqualified*
                        *Neutral: more hospitable / habitable / homes / shelters*

        3.   Increase in number / amount / diversity of species / plants / animals.
                        *Accept: other / new species (colonise)*

                                                             **3**

(c)   1.   Net productivity = gross productivity minus respiratory loss
        2.   Decrease in gross productivity / photosynthesis / increase in respiration.
                                                               **2**

(d)   1.   Conserving / protecting habitats / niches
        2.   Conserving / protecting (endangered) species / maintains / increases (bio) diversity
        3.   Reduces global warming / greenhouse effect / climate change / remove / take up carbon dioxide
        4.   Source of medicines / chemicals / wood
        *5.*   Reduces erosion / eutrophication.
                        *Accept: tourism / aesthetics / named recreational activity*

                                                      **1 max**

                                                              **[9]**

**Q12.**

(a)   1.   (Colonisation by) <u>pioneer</u> (species)

        2.   Change in environment / example of change caused by organisms present

        3.   Enables other <u>species</u> to colonise / survive

        4.   Change in <u>diversity / biodiversity</u>

        *5.*   Stability increases / less hostile environment

        6.   Climax community
                        *Example of change e.g. formation of soil / humus / organic matter / increase in nutrients*
                        *Do not accept genetic diversity for mark point 4.*

                                                         **5 max**

                                                               **[5]**