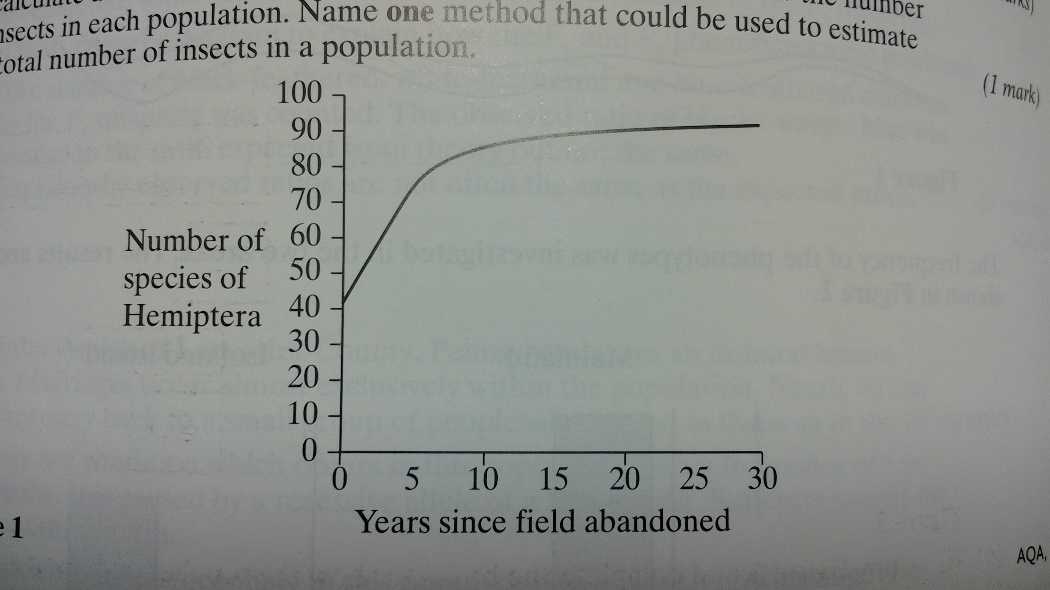
UNIT 4 END OF TOPIC QUESTIONS

1. **(a) What is meant by a community?**

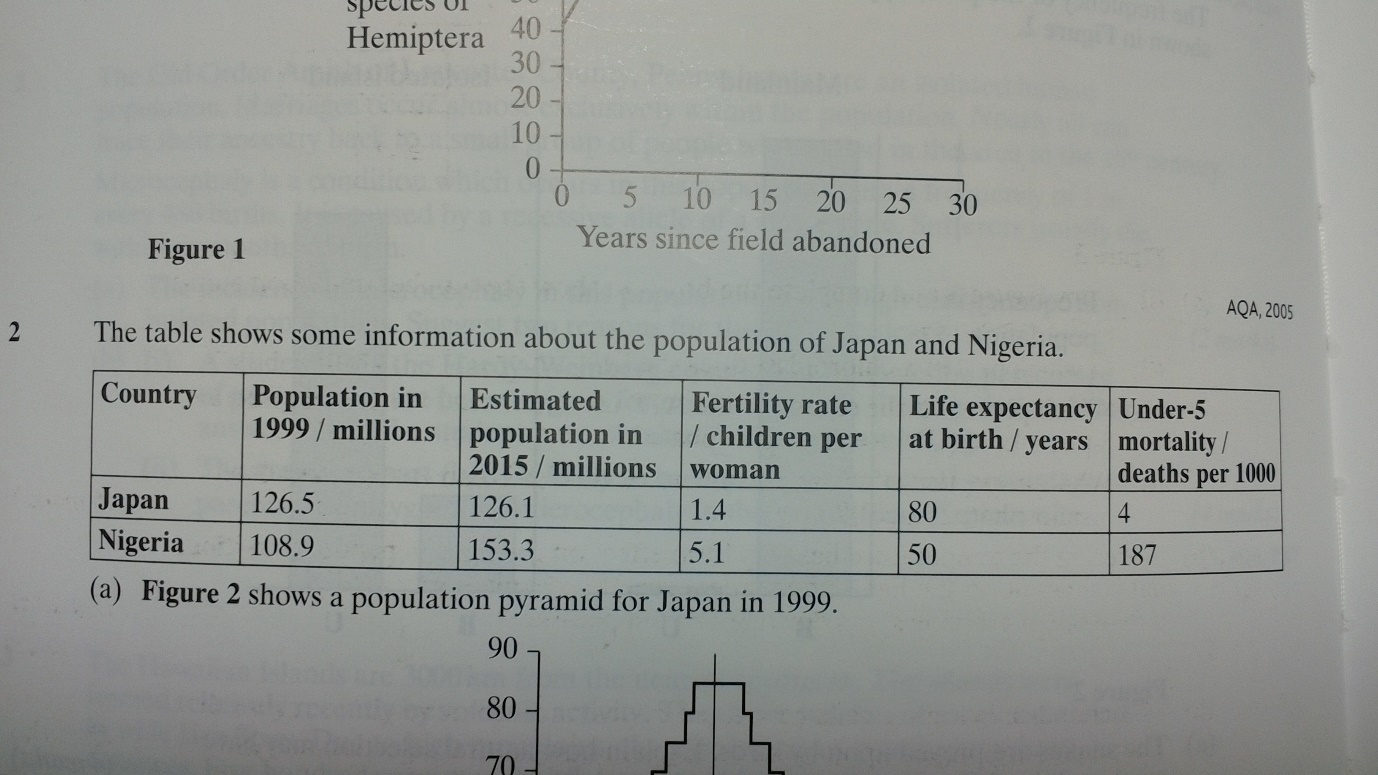
populations of different species; living in the same environment / habitat

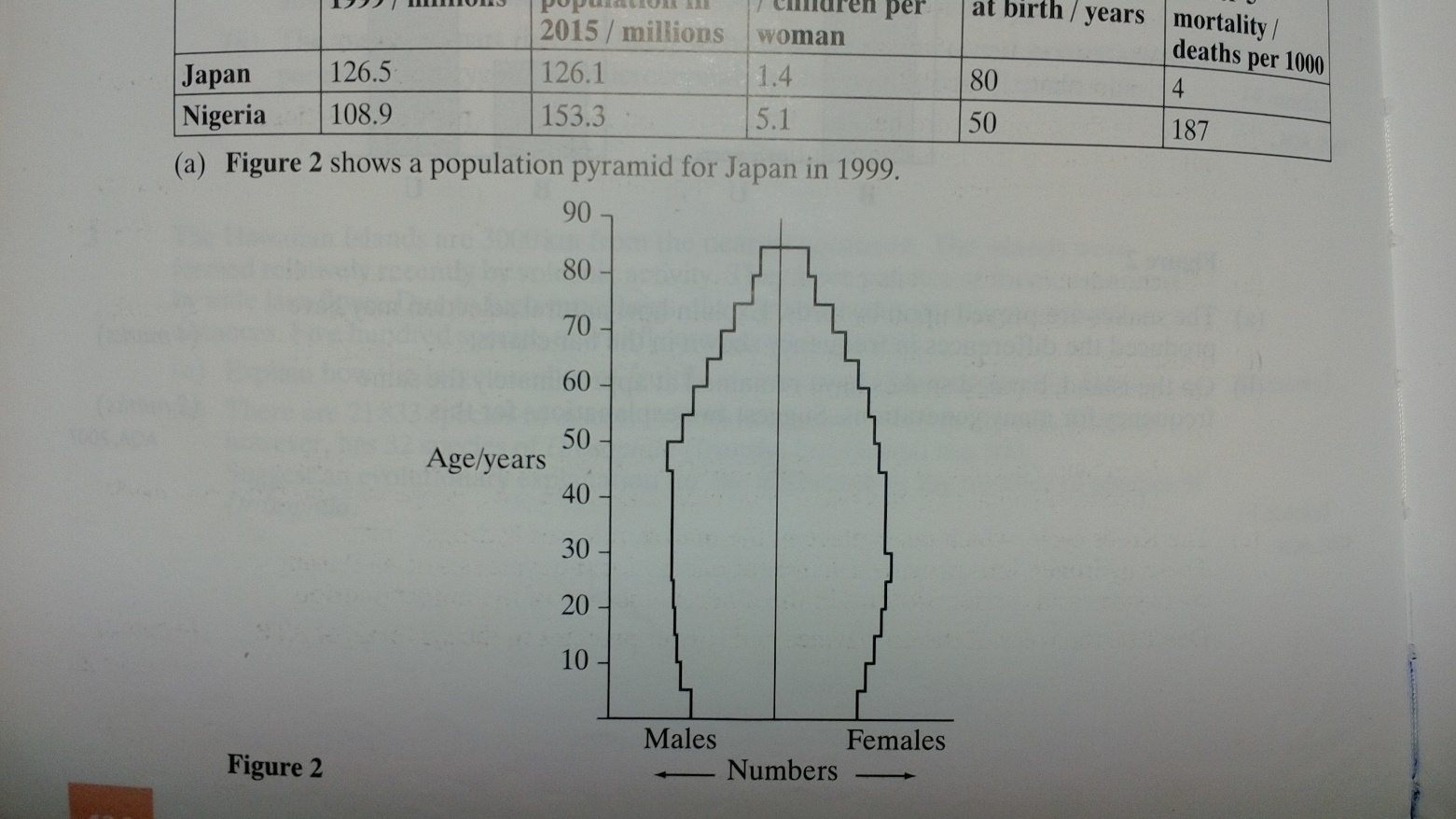
**(b) a farmer stopped using a field for growing crops. Scientists studied succession in the field over the next 30 years. The graph below shows the number of species of Hemiptera (an order of insects) present during that period. Explain the increase in the number of species of Hemiptera.**

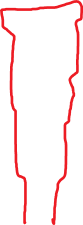
more species and more diversity in the field so more niches / habitats and more feeding opportunities available

**(c) to calculate a diversity index at a given time, it is necessary to know the number of insects in each population. Name 1 method that could be used to estimate the total number of insects in a population**

mark, release, recapture

1. **The table shows some information about the population of Japan and Nigeria.**
2. **The graph below shows a population pyramid for Japan in 1999. Draw the pyramid as you’d expect it to appear in 2015**

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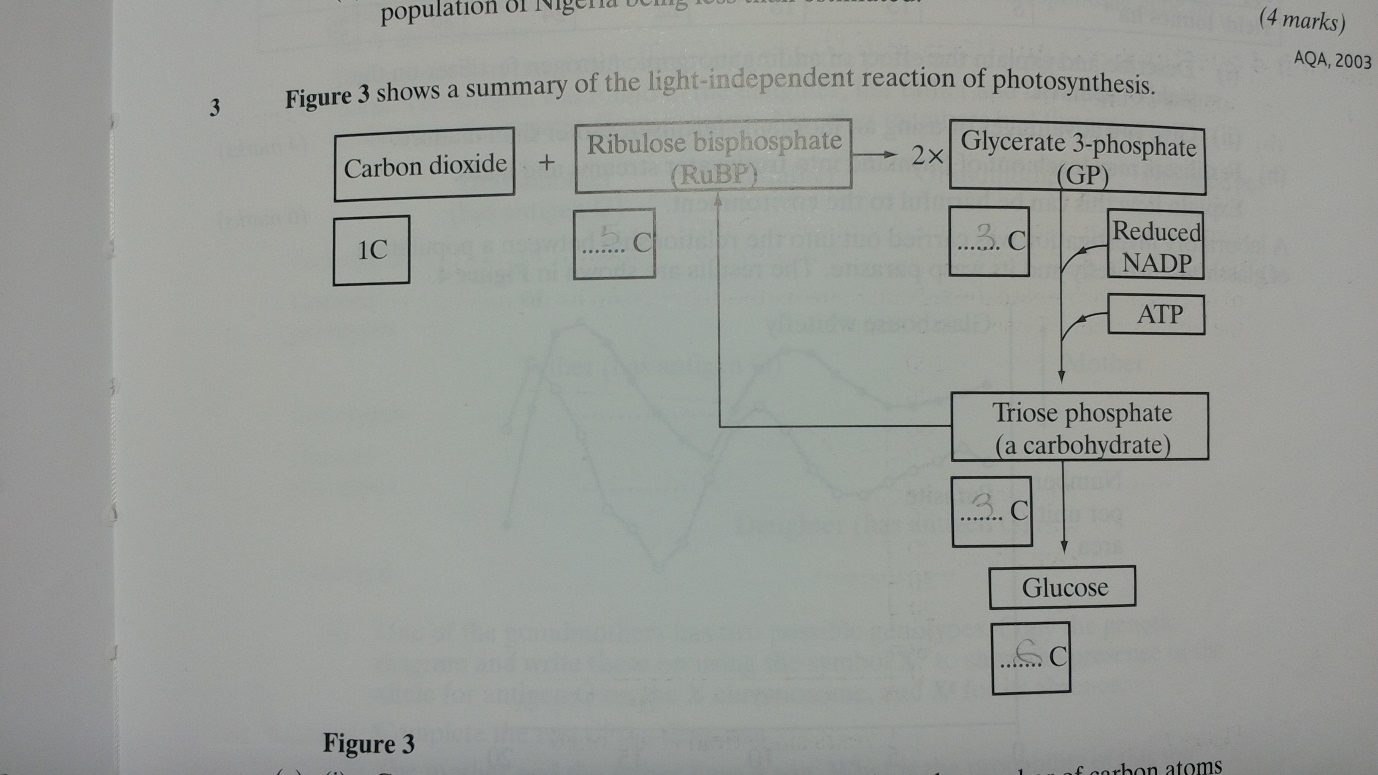


1. **(i) use information in the table to explain why the population of Nigeria is expected to increase to over 150 million by 2015.**

high fertility rate (higher than replacement of 2.0 – when fertility rate is above 2.0 there should be an increase in the population). not balanced by under-5 mortality. life expectancy greater than reproductive life

**(ii) suggest and explain factors that could results in the actual increase in the population of Nigeria being less than estimated.**

disease / AIDS (affecting people of reproductive age) - shortage of resources / starvation increases as population rises - improved standard of living - contraception, so fewer children born - effects of war reducing number of parents, or causing starvation - shortage of resources

1. **Below shows a summary of the light-independent reaction of photosynthesis**



1. **(i) complete the boxes to show the number of carbon atoms in the molecules.**

**(ii) in which part of a chloroplast does the light-independent reaction occur.**

stroma

**(iii) which process is the source of the ATP used in the conversion of GP to TP?**

light-independent reaction

**(iv) what proportion of TP molecules is converted to RuBP?**

5 out of 6 / 83%

1. **Lowering the temperature has very little effect on the light-dependent reaction, but it slows down the light-independent reaction. Why does it slow down?**

enzymes involved. slow rate of enzyme reaction at low temperature as less kinetic energy so fewer collisions

1. **(a) mitochondria in muscle cells have more cristae than mitochondria in skin cells. Explain the advantage of muscle cells having more?**

more cristae so a larger surface area for electron transport chain and more enzymes for ATP production as muscle cells use more ATP than skin cells

**(b) Substance X enters the mitochondria from the cytoplasm. Each molecule of substance X has 3 carbon atoms**

1. **Name substance X**

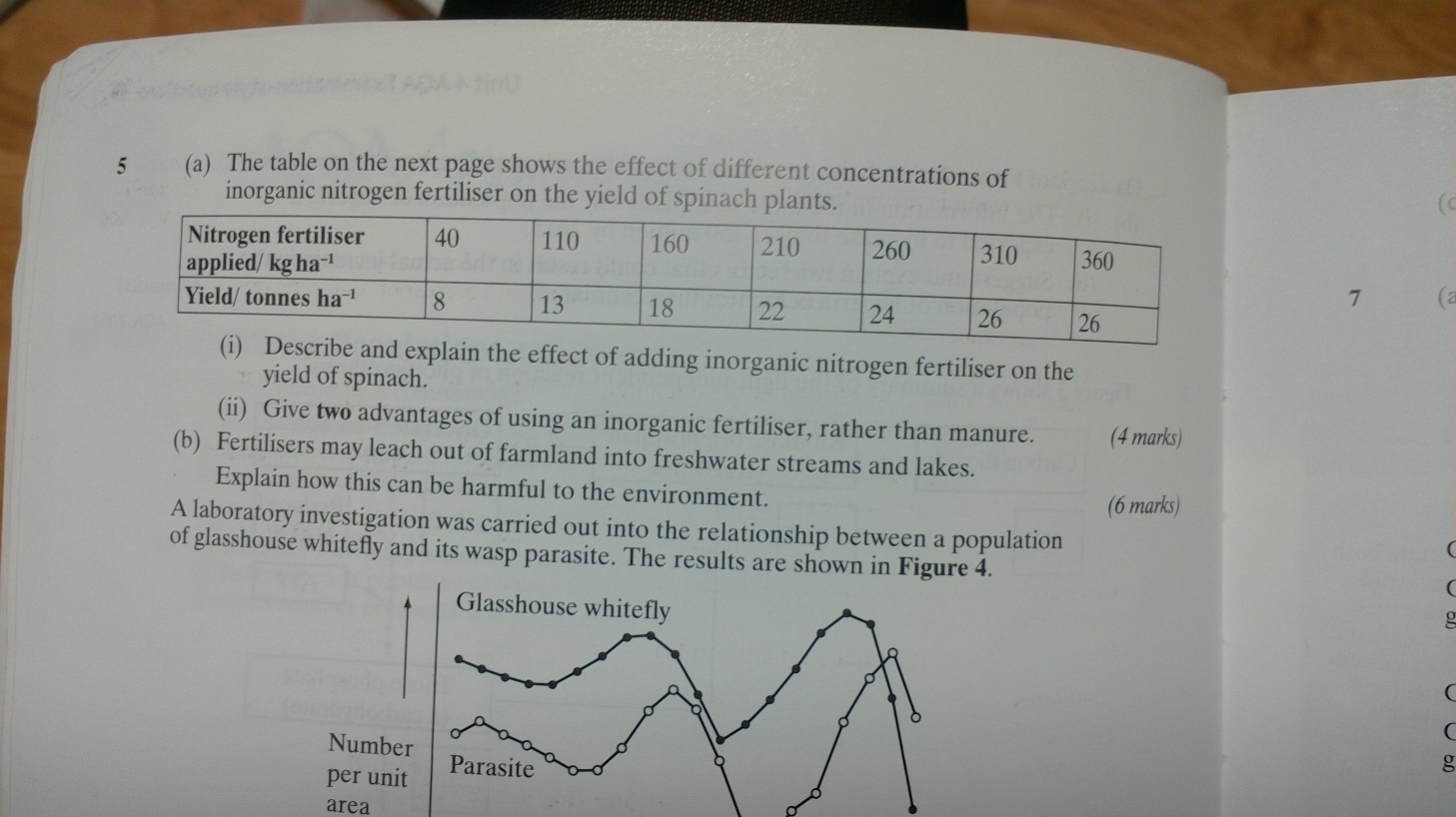
puruvate

1. **In the link reaction, substance X is converted to a substance with molecules effectively containing only 2 carbon atoms. Describe what happens in this process.**

carbon dioxide formed and hydrogen released so reduced NAD is formed and acetyl coenzyme A produced (acetyl coenzyme A is often referred to as a 2 carbon molecule)

1. **The krebs cycle, which takes place in the matrix, releases hydrogen ions. These hydrogen ions provide a source of energy for the synthesis of ATP, using coenzymes and carrier proteins in the inner membrane of the mitochondria. Describe the roles of the coenxymes and carrier proteins in the synthesis of ATP**

NAD and FAD are reduced. Electrons are transferred from coenzyme to coenzyme (carrier to carrier) in a series of redox reactions so that energy is made available as electrons passed on to the carrier at lower energy level. This energy is used to synthesize ATP from ADP and P using ATPase. H+ / protons are passed into intermembrane space and then flow back through the enzyme

1. **(a) the table below shows the effect of different concentration of inorganic nitrogen fertiliser on the yield of spinach plants.**
2. **Describe and explain the effect of adding inorganic nitrogen fertiliser on the yield of spinach**

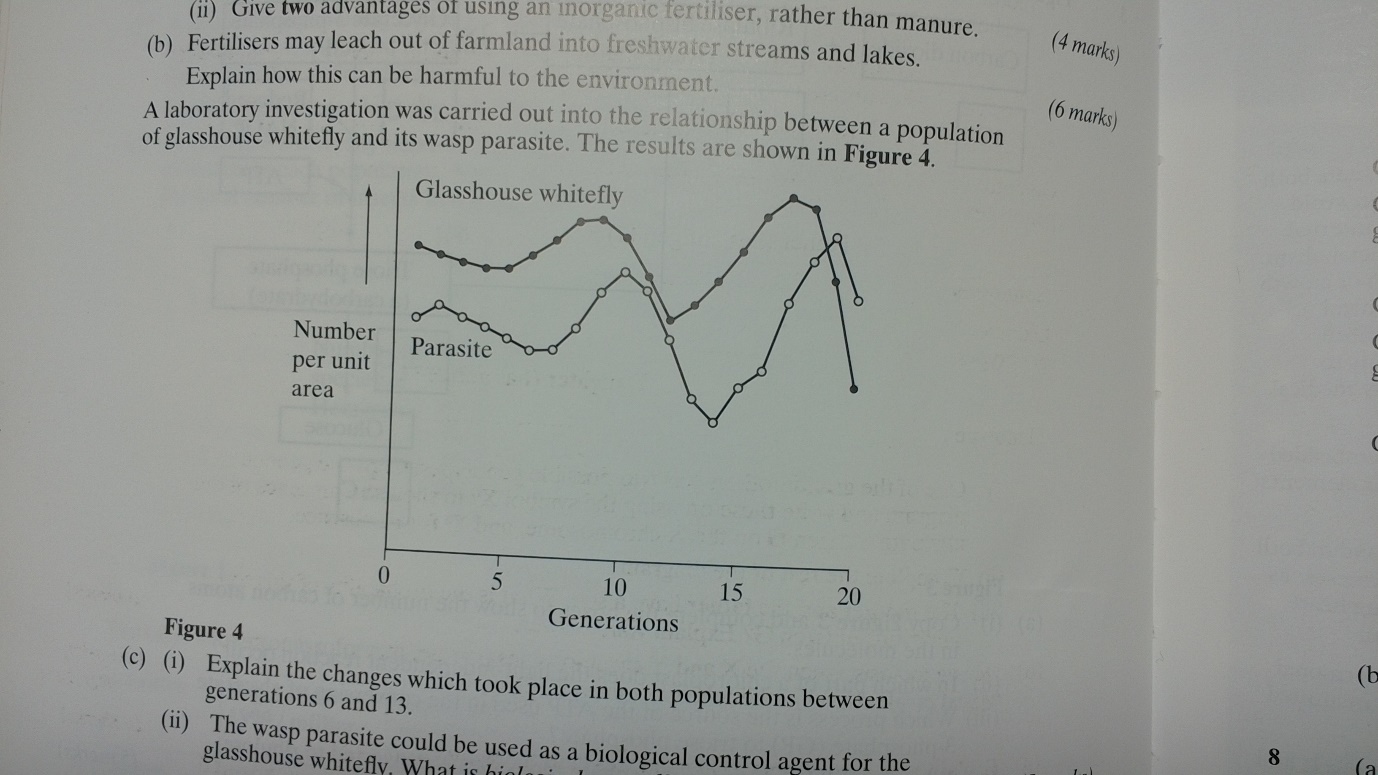
increases, then levels as nitrogen is needed for proteins and nucleic acids in plants so there is a constant yield at higher concentrations as idea that nitrogen is a limiting factor

1. **Give advantages of using an inorganic fertiliser rather than manure**

composition known and thus can be varied - cleaner to apply and is less smelly - concentrated so less needed and more compact to transport resulting in lighter machinery - spread evenly so you can control the amount you can apply - no seeds / pests - immediate release of nutrients

**(b) fertilisers may leach out of farmland into freshwater streams and lakes. Explain how this can be harmful to the environment.**

more growth of algae and surface plants which blocks light so plants lower down unable to photosynthesise. They die and the dead plant material is broken down by bacteria / decomposers which respire and respiration uses oxygen in water so aerobic organisms decrease

**(C) a laboratory investigation was carried out into the relationship between a population of glasshouse whitefly and its wasp parasite. The results are shown below**

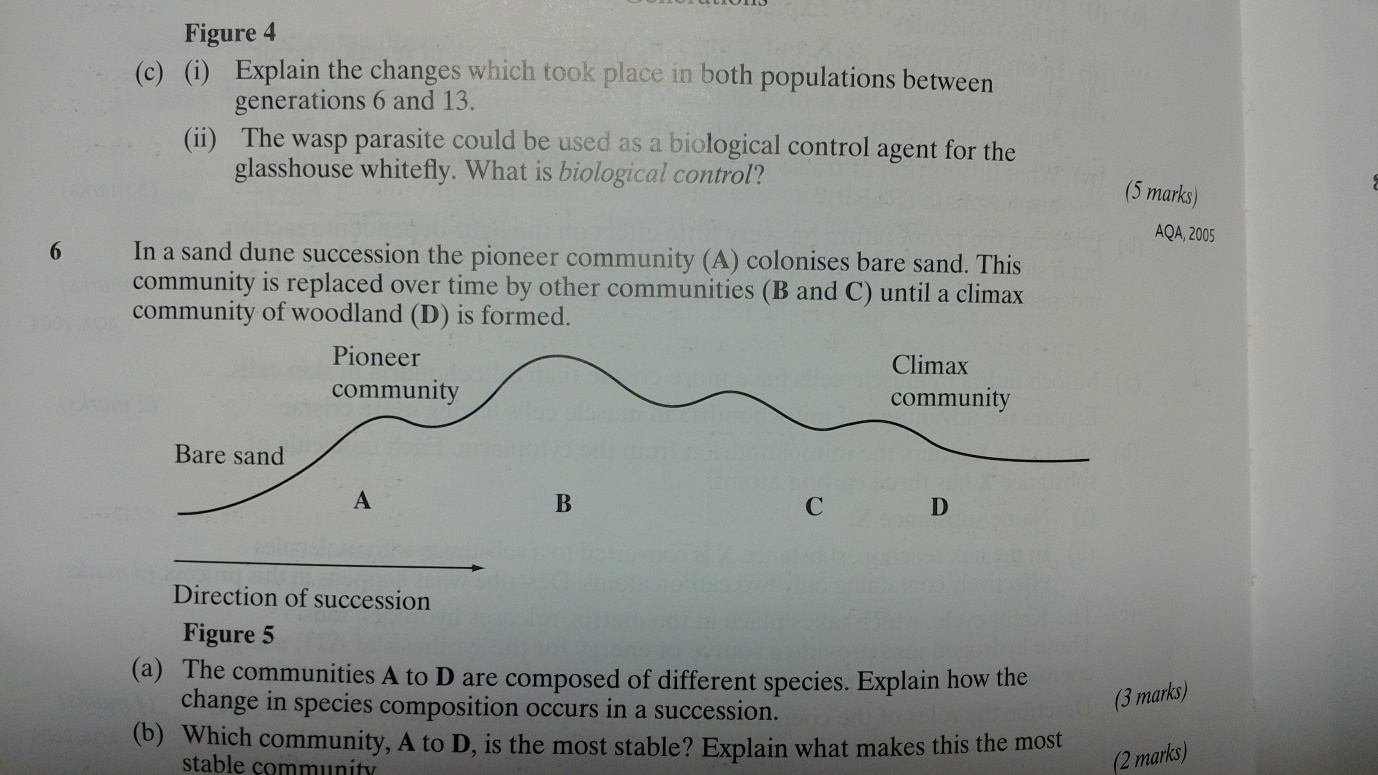
1. **Explain the changes which took place in both populations between generations 6 and 13**

parasite / wasp numbers low, so whitefly can increase and more food or egg-laying sites for wasp, so wasp increases. increase in wasps causes fall in whitefly population and decrease in whiteflies causes fall in wasp population

1. **The wasp parasite could be used as a biological control agent for the glasshouse whitefly. What is biological control?**

use of predator / parasite / pathogen to control pest

1. **In a sand dune succession, the pioneer community (A) colonises bare sand. This community is replaced over time by other communities (B and C) until a climax community of woodland (D) is formed.**

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1. **The communities A and D are composed of different species. Explain how the change in species composition occurs in a succession.**

species present change the habitat so other species able to colonise and new species may be better competitors

1. **Which community, A to D, is the most stable?**

D – as more species present, more complex food webs so a change in one species will have little effect on others as there will be alternative food sources

1. **Many species in the pioneer community are xerophytes. Suggest and explain how having sunken stomata is an advantage to these plants.**

sand drains easily so sunken stomata reduce (not stop!) transpiration as pockets of saturated air are trapped near stomatal pore and this reduces diffusion / water potential gradient

1. **Explain why it would be more appropriate to use a transect line rather than random quadrats when investigating this succession.**

series of changes over a distance so there will be a gradient of environmental factor present so it ensures sampling of each community

1. **(a) a protein found on red blood cells, called antigen G, is coded for by a dominant allele of a gene found on the X chromosome. There is no corresponding gene on the Y chromosome.**

**The members of one family were tested for the presence of antigen G in the blood. The antigen was found in the daughter, her father and her fathers mother, as shown in the genetic diagram below. No other members had the antigen**

**Grandmother Grandfather Grandmother Grandfather**

**(has antigen G)**

**GENOTYPES** XG XG **or** XG Xg XG YXg Xg Xg Y

**GAMETES** XG  **or** XG Xg XG and YXg and Xg Xg and Y

**Father (has antigen G) Mother**

**GENOTYPES** XG YXG XG

**GAMETE** XG and YXG

**Daughter (has antigen G)**

**GENOTYPE** XG Xg

1. **One of the grandmothers has two possible genotypes. Write these on the digram using the symbol XG to show the presence of the allele for antigen G on the X chromosome, and Xg for its absence.**
2. **Complete the rest of the diagram**
3. **The mother and father have a son. What is the probability of this son inheriting antigen G?**

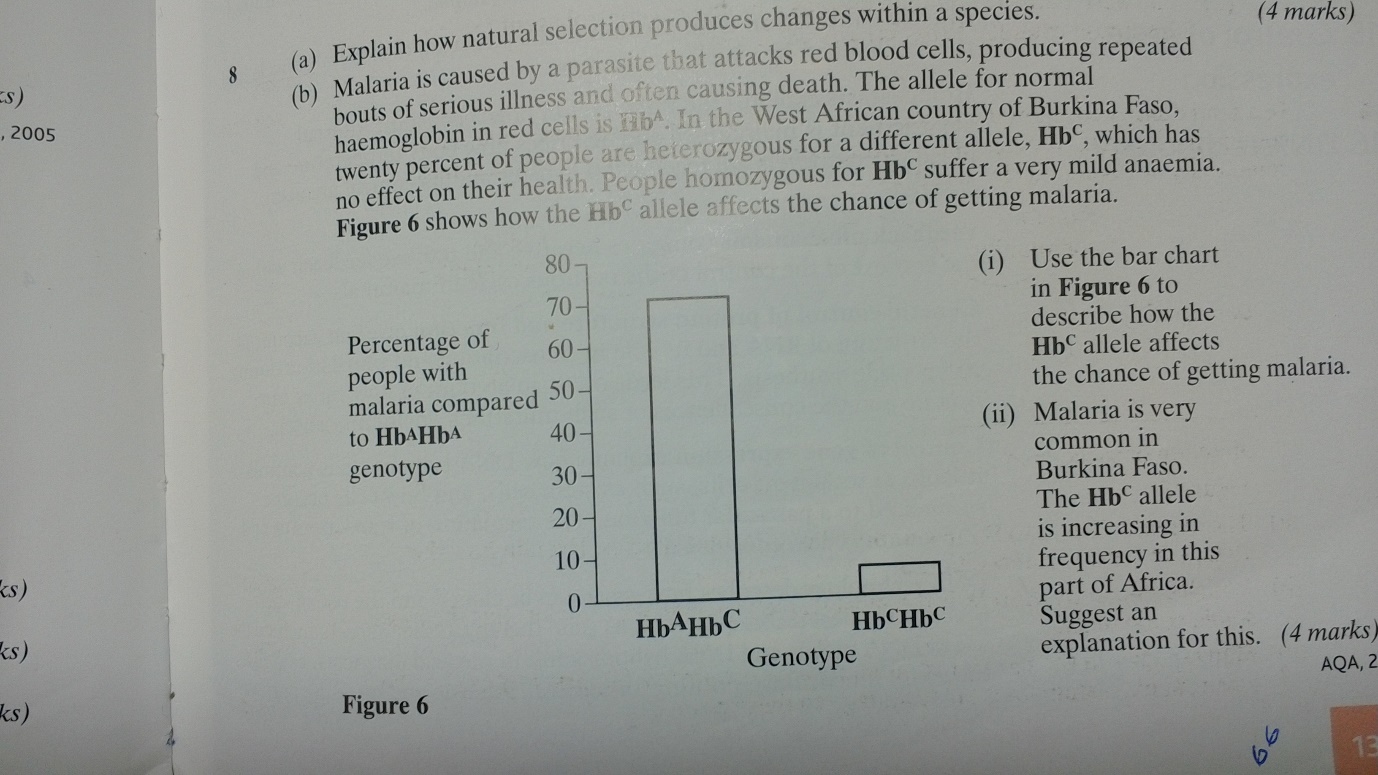
Nil. X chromosome, without G allele, inherited from mother and Y must be inherited from father, not XG

**(b) during meiosis, when X and Y chromosomes pair up, they do not form a typical bivalent as do other chromosomes. Why?**

X and Y chromosomes are different sizes/shapes so chromatids are unable to line up and form bivalent as there is only a short pairing region so most of length not homologous

1. **(a) explain how natural selection produces changes within a species**

variation between members of population / species. predation / disease / competition results in differential survival. Some will have adaptations that favour survival so they reproduce and pass on their alleles. This produces changes in frequency of alleles / gene pool

**(b) malaria is caused by a parasite that attacks red blood cells, producing repeated bouts of serious illness and often causing death. The allele for normal haemoglobin in red blood cells is HbA. In the West African country of Burkina Faso, 20% of people are heterozygous for a different allele, HbC, which has no effect on their health. People homozygous for HbC suffer a very mild anaemia. The graph shows how the HbC allele affects the chance of getting malaria.**

1. **Use the bar chart to describe how the HbC allele affects the chance of getting malaria**

reduces it - homozygous much more; hetero by 30% and homozygous by 94%

1. **Malaria is very common in Burkina Faso. The HbC allele is increasing in frequency in this part of Africa. Suggest and explanation for this.**

people without HbC have a lower survival rate, so less likely to pass on HbA allele which leads to an increasing chance of children where both parents carry HbC. homozygous HbC most likely to survive and pass on allele