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BIOLOGY

GENETICS, POPULATIONS, EVOLUTION & ECOSYSTEMS

Level & Board	AQA (A-LEVEL)
TOPIC:	POPULATIONS IN ECOSYSTEM
PAPER TYPE:	SOLUTION - 3
TOTAL QUESTIONS	6
TOTAL MARKS	39

Populations in Ecosystems - 3

1.

(a) Gross primary production (GPP) is the amount of chemical energy which is created from light energy in a given amount of time. The units are mass / area / time – mass of carbon per unit area per year (g C m^{-2} yr^{-1}) is the most common unit.

OR

Unit of energy / mass, per area, per year / Kg m^{-2} $year^{-1}$.

(b) The larger trees block out the sun so there is less light and more competition so there is reduced photosynthesis

2.

(a)

Pioneer species

Change in abiotic conditions / less hostile / more habitats / niches

Increase in number / amount / diversity of species / plants / animals.

(b)

Net productivity= Gross productivity + respiratory losses

Decrease in gross productivity/photosynthesis or Increase in respiration.

(c) Certain things about woodland make it particularly valuable: trees provide shelter from wind and rain. it's often quieter in woods than in more open spaces – trees can reduce noise levels. trees and woods give a sense of cover and seclusion.

OR

Conserving / protecting habitats / niches

Conserving / protecting (endangered) species / maintains / increases (bio) diversity

Reduces global warming / greenhouse effect / climate change / remove / take up carbon dioxide

Source of medicines / chemicals / wood

Reduces erosion / eutrophication.

3.

(a)

Capture / collect sample, mark and release

Method of marking does not harm lizard / make it more visible to predators

Leave sufficient time for lizards to (randomly) distribute (on island) before collecting a second sample

Population = number in first sample × number in second sample divided by number of marked lizards in second sample / number recaptured.

(b)

High concentration of / increase in carbon dioxide linked with respiration at night / in darkness

No photosynthesis in dark / night / photosynthesis only in light / day

Neutral: less photosynthesis

In light net uptake of carbon dioxide / use more carbon dioxide than produced / (rate of) photosynthesis greater than rate of respiration

Decrease in carbon dioxide concentration with height.

At ground level less photosynthesis / less photosynthesizing tissue / more respiration / more micro-organisms / micro-organisms produce carbon dioxide.

4.

(a) No, it was not the same insect species as the graph only shows the number of species, not the type of species.

(b) No, as mutations are spontaneous and random

Environmental factors only affect the rate at which mutations occur

Species cannot interbreed as they do not produce fertile offspring

So the mutated allele for resistance to the toxin cannot be passed from one species to another

OR

The idea that mutations caused by Bt crops spread to other insect species is incorrect. Mutations are random, and while resistance may evolve in targeted insects due to selective pressure, it does not transfer between species. Scientists work to counteract resistance by creating new Bt crop versions. It is incorrect.

(c) The time lag between the introduction of Bt crops and the appearance of the first Bt-resistant insect species is due to the process of natural selection. Bacillus thuringiensis (Bt) is a bacterium that produces protein crystals toxic to many insect species.

OR

Initially, one or a few individuals possessed the favored mutated allele enabling resistance

This individual must then survive and reproduce to have more offspring

It takes time for the mutated allele to become the most common allele of a gene within a species.

5.

(a) Organisms that can breed together / interbreed and produce fertile offspring

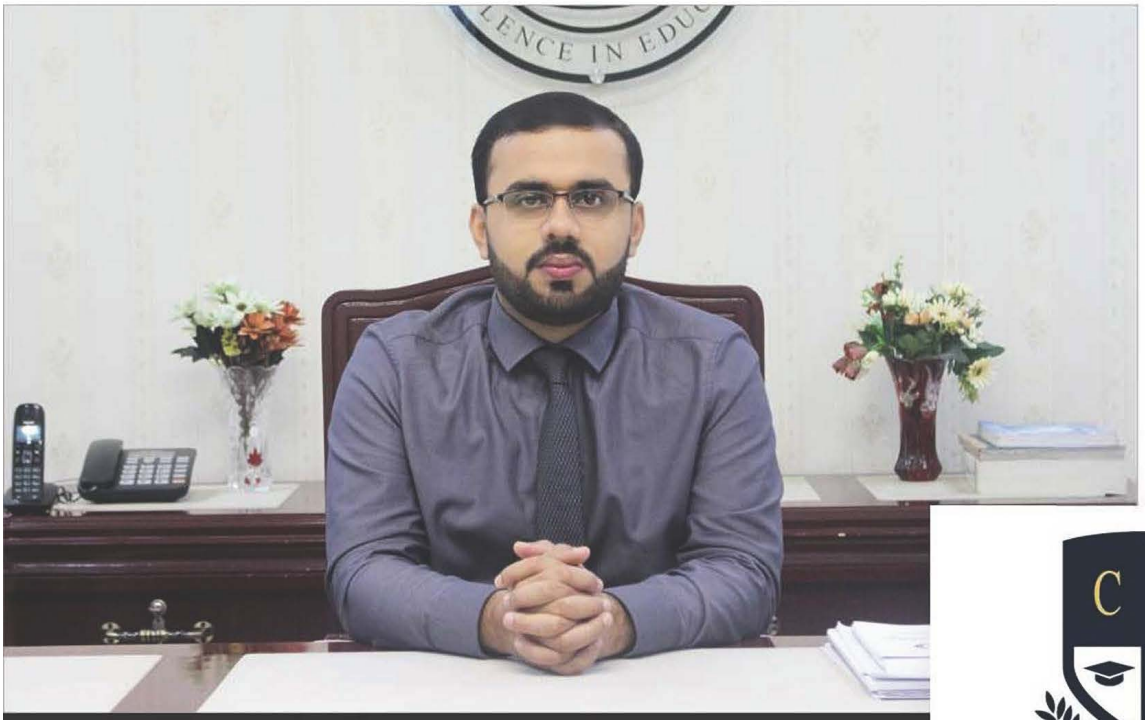
(b) Same number of organisms in each region / organisms equally spread.

6.

(a) P =AS/R

(b) In mark release recapture there is no assumption that organisms are uniformly distributed and size of total area is not required

(c) Animals are from / all part of the same population



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