1. June/2023/Paper_ 9700/41/No.3

Oryza is a genus of grass plants that includes the rice, *Oryza sativa*, a food crop.

(a) Farmers flood fields of rice because this encourages faster growth and higher yields.

(i) An adaptation of rice plants that allows them to grow in water is the development of aerenchyma.

State the function of aerenchyma.

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..... [2]

(ii) State **one other** way in which the roots of rice are adapted to being submerged in water.

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..... [1]

(iii) Another adaptation in some varieties of rice is the fast growth of stems.

Describe how selective breeding could produce varieties of rice with fast-growing stems.

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(iv) Auxin is a plant growth hormone that affects the growth of rice stems.

Explain how auxin affects the growth of rice stems.

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(b) *O. rufipogon* and *O. nivara* are two species of wild rice.

- *O. rufipogon* grows in places where water is always available.
- *O. nivara* grows within the same geographical range as *O. rufipogon*.
- The habitat of *O. nivara* can lack water for part of the year.
- The two species flower at different times of the year.

These two rice species may have evolved by sympatric speciation.

Explain how *O. rufipogon* and *O. nivara* may have evolved through sympatric speciation.

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[Total: 12]

2. June/2023/Paper_ 9700/42/No.3

(a) The sea blush, *Plectritis congesta*, is a flowering plant that grows on the west coast of North America.

Individual sea blush plants produce fruit that is either winged or wingless. Investigations have shown that this characteristic is controlled by a single gene with two alleles:

- a dominant winged fruit allele
- a recessive wingless fruit allele.

Fig. 3.1 shows the difference in structure between winged fruit and wingless fruit phenotypes.

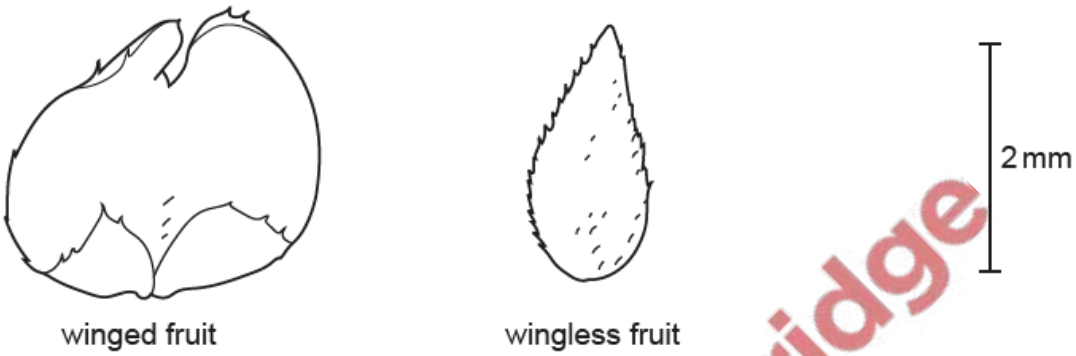

Fig. 3.1

(i) A large sample of sea blush fruits was collected and their fruit-wing characteristic was recorded.

Name the type of variation that is shown for the fruit-wing characteristic of the sea blush.

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(ii) Different sea blush plants can have fruit with different colours.

Suggest **two** ways in which a new fruit colour could naturally occur in a sea blush population.

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(iii) Early taxonomists classified sea blush plants with winged fruits as a different species to sea blush plants with wingless fruits.

Since this time, evidence from observations and experiments has confirmed that the plants belong to the same species.

Suggest **three** examples of the evidence obtained that helped to confirm that these sea blush plants belong to the same species.

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(b) Natural selection occurs in populations, such as in populations of sea blush plants.

Explain why natural selection occurs in populations.

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[Total: 11]

3. June/2023/Paper_ 9700/43/No.2

Humans use antibiotics to treat bacterial infections. The increased use of antibiotics has led to an increase in the number of strains of bacteria that are resistant to antibiotics.

The evolution of antibiotic resistance in bacteria has resulted from natural selection.

Outline how bacteria become resistant to antibiotics.

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[Total: 7]