1. Nov/2021/Paper_41/No.2

(a) Cotton, *Gossypium hirsutum*, and false flax, *Camelina sativa*, are crop plants that are grown in different parts of the world.

Rubisco activase is an enzyme in the stroma of chloroplasts that is needed to maintain the activity of a second enzyme, rubisco.

Scientists measured the activity of rubisco activase in cotton and in false flax at a range of temperatures.

Fig. 2.1 shows the results.

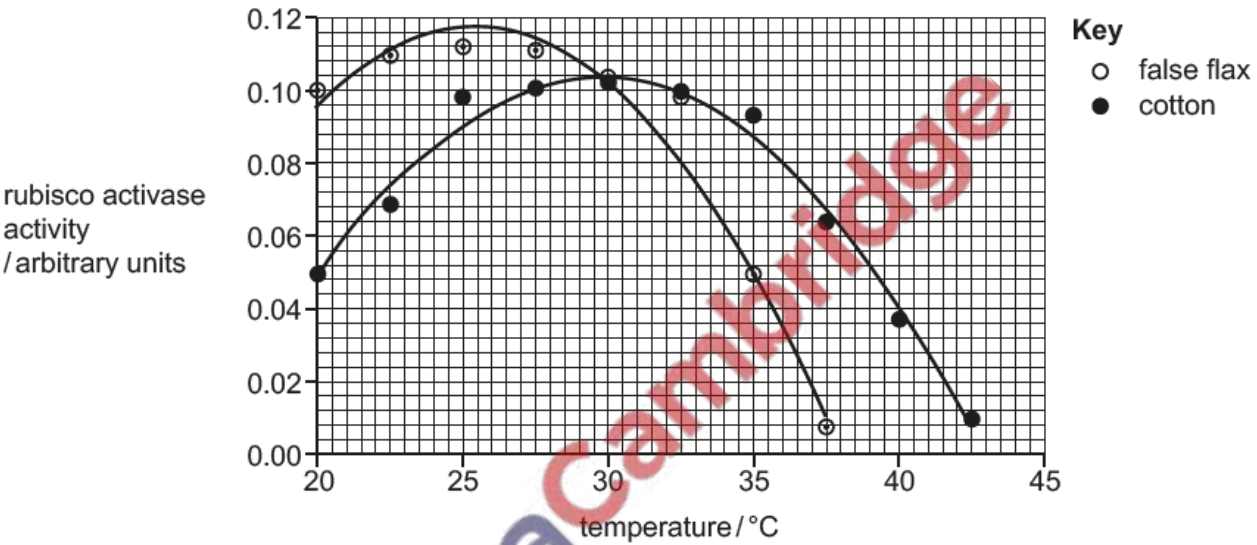

Fig. 2.1

(i) With reference to Fig. 2.1, compare the results obtained for cotton and false flax.

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(ii) Suggest reasons for the differences shown in Fig. 2.1.

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(b) Rubisco enzymes from cotton and false flax are active at temperatures up to 45 °C and will denature at 45 °C.

Explain how the Calvin cycle is affected when rubisco denatures.

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(c) One goal of genetic engineering is to make crops that are heat tolerant. This means that crops can grow and produce a good yield at high environmental temperatures.

Use the information given in Question 2 to suggest **and** explain a way to improve the tolerance of a crop to high temperatures.

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[Total: 12]

2. Nov/2021/Paper_41/No.9

(a) Describe **and** explain the mechanism by which guard cells open stomata. [7]

(b) Explain how the anatomy **and** physiology of the leaves of maize or sorghum are able to maximise carbon dioxide fixation at high temperatures. [8]

[Total: 15]