P530/2
BIOLOGY
(Theory)
Paper 2
NOV. 2022
2½ Hours

UACE BIOLOGY

CHAMPIONS

(THEORY)

Paper 2

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of **six** *questions.*

Answer question **one** *in section* **A** *plus* **three** *others from section* **B**.

Candidates are advised to read the questions ***carefully***, ***organise*** *their answers and present them* ***precisely*** *and* ***logically***, *illustrating with well labelled diagrams where necessary.*

SECTION A (40 MARKS)

Question **1** *is* **compulsory**.

1. Ultraviolet-Visible (UV-Vis) spectroscopy was used to measure the spectra of phytochrome red (Pr) and phytochrome far red (Pfr), prepared from spinach chloroplasts. The absorbance of each phytochrome over a range of wavelengths was recorded on the same axes. The resultant absorbance spectrum is shown in figure **1**.

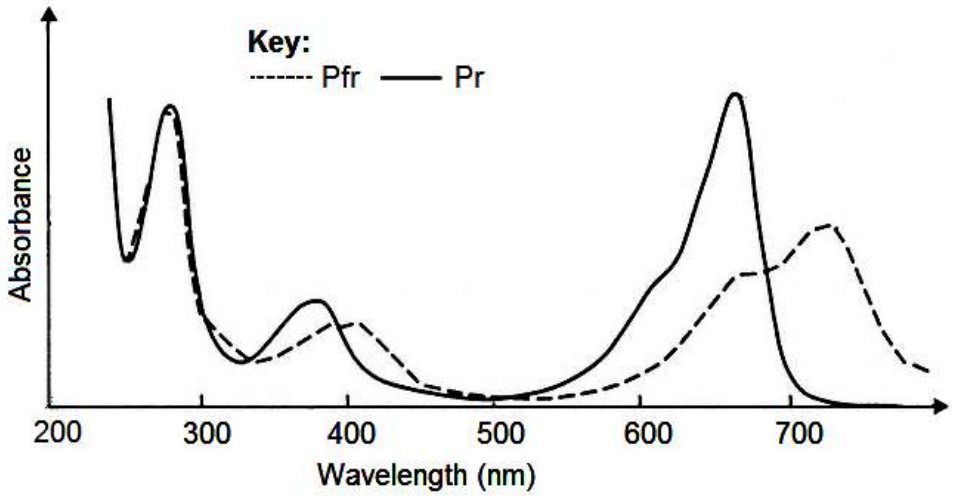

Fig. 1

(a) Compare the absorbance of Pr and Pfr, with reference to figure 1. (*06 marks*)

(b) Describe the molecular mechanisms underlying phytochrome-controlled changes in plants. (*07 marks*)

(c) Explain the role of the phytochrome system in plant growth and development. (*07 marks*)

Figure **2** shows the absorption spectrum for **chlorophyll a** extracted from a plant and an action spectrum for the same living plant, at varying wavelengths of light. The action spectrum was determined as rate of photosynthesis, measured by release of oxygen.

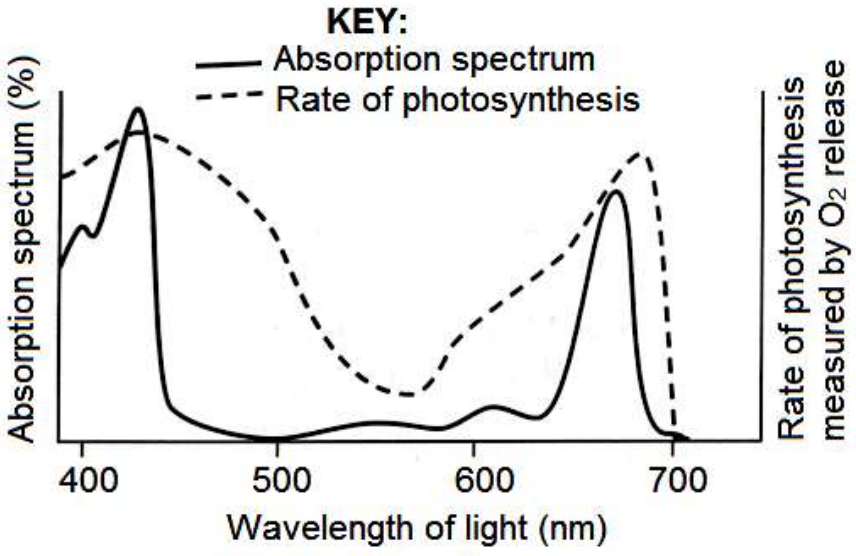

Fig. 2

(d) With reference to plants, distinguish between:
  (i) Absorption spectrum and action spectrum. (*02 marks*)
  (ii) **Chlorophyll a** and accessory pigments. (*02 marks*)
(e) Explain the pattern in rate of photosynthesis, with reference to **fig. 2**. (*09 marks*)
(f) Describe how **chlorophyll a** is involved in photosynthesis. (*07 marks*)

SECTION B (60 MARKS)

Answer **three** *questions from this section.*
Any additional question(s) answered will **not** *be marked.*

2. (a) How is the structure of carbohydrate molecules related to their functions in?
  (i) Starch. (*06 marks*)
  (ii) Cellulose. (*05 marks*)
(b) Describe the formation of a disaccharide molecule from its component molecules. (*09 marks*)

3. The inability to digest starch in some mammalian species is a genetic disorder with equal frequency in males and females, and neither parent of affected offspring suffers from this condition in most cases.
(a) Describe the most probable pattern of inheritance for this condition. (*12 marks*)
(b) Explain how this inability to digest starch could result from mutation. (*08 marks*)

4. (a) Describe the movement of energy and nutrients in an ecosystem. (*10 marks*)
(b) What the effects of global temperature rise on ecosystems? (*10 marks*)

5. (a) What are the distinguishing features of viruses? (*06 marks*)
(b) With reference to viruses in plants, describe:
  (i) The structural organisation of the particle. (*06 marks*)
  (ii) The means of transmission and prevention. (*08 marks*)

6. (a) Describe how non-muscular movement is achieved. (*10 marks*)
(b) Compare jumping movements in a grasshopper and toad. (*10 marks*)

END.