# IB Style Test - Topic 9: Plant Biology

## Includes new elements of the 2016 guide

**Multiple choice questions**

1. Which of the following uses are made of micropropagation?

   I Growth of plantlets for use as crop plants
   II Bulking up of stocks of new plant varities
   III Conservation

   A I only
   B 1 and II only
   C I and III only
   D I, II and III

2. Which of the following tissues can, at particular times in the life cycle of a plant, be both a source and a sink of sugar?

   A. Photosynthesising mature leaves
   B. Cotyledons
   C. Fruits
   D. Meristems

3. Which of the following could be used to induce greenhouse plants to flower out of season?

   I Cutting the shoot tips
   II Lighting the plants to increase the length of the day
   III Planting the seeds in a different season
   IV Darkening the greenhouse to decrease the length of the day

   A I only
   B 1 and II and IV only
   C IIand III only
   D All of them

4. Which of the following statements about the structure and function of xylem vessels are correct?

   I The cells have lignin walls
   II The cells are non-living
   III The thick walls can withstand low pressures
   IV They can form new xylem tissue by mitosis

   A I only
   B 1 and II and III only
   C I and III only
   D All of them

5. Which of the following most accurately describes the relationship between angiosperms and pollinators?

   A. Symbiosis
   B. Producer and consumer
   C. Commensalism
   D. Mutualism

6. Which of the following are adaptations of flowering plants to living in saline soils? (1 mark)

   A. Water storage tissue, thick waxy cuticle and many stomata.
   B. Ability to remove salt, long tap roots and many stomata
   C. Water storage tissue, thick waxy cuticle and reduced leaf area
   D. Long tap roots, succulent leaves and a large leaf surface area.

7. Which of the following technical developments has aided in the scientific understanding of phloem transport?

   I Light microscopes
   II X-ray diffraction
   III Electron microscopes
   IV Radioactive labelling

   A IV only
   B 1 and III and IV only
   C III and IV only
   D All of them

8. Which is the correct sequence of events in the development of primary xylem from meristematic tissue?

   A. Mitosis, →meiosis, →differentiation,
   B. Lignification, → gene expression, → differentiation
   C. Mitosis, →gene expression, → differentiation
   D. Gene expression, → lignification, →meiosis

9. Which of the following are involved in the transport of materials from photosynthetic cells to the phloem vessels?

I Protein pumps
II Mitochondria
III Sieve plates
IV Cell walls

A I and II only
B 1, II and IV only
C I and IV only
D All of them

10. The phytochromes, $P_R$ and $P_{FR}$ can control the time of flowering because;

A. They are both formed at night

B. They inhibit each other

C. $P_{fr}$ concentrations can affect gene expression but $P_r$ does not

D. $P_r$ concentrations can affect gene expression but $P_{fr}$ does not.

**Structured answer questions**

11. Describe how transpiration is an inevitable consequence of gas exchange in leaves. (3 marks)

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12. One xerophytic adaptation of flowering plants is an "ephemeral lifestyle". Outline how this adaptation, or any other named adaptation of xerophytes, helps these plants to survive. (2 marks)

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13. Describe the role of auxin efflux pumps in the response of a shoot to uneven illumination. (3 marks)

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14. Explain why the active transport of sucrose from leaf cells into the phloem causes entry of water into the sieve tubes. (2 marks)

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15. Explain how aphid stylets aid in the scientific understanding of phloem transport. (3 marks)

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16. Draw a diagram showing the structure of the seed of a dicotyledonous plant. (4 marks)

17. List four tissues that can develop from cells produced in an apical meristem. (4 marks)

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18. Outline the mutualistic relationship between pollinating insects and the flowers of many species of flowering plants. (5 marks)

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19. The data below on water uptake was collected from a potometer using a geranium plant and then using absorbent paper in place of the plant in the potometer. The absorbent paper was allowed to become fully soaked in water before measurements were made. Sufficient time for equilibration was allowed and then the time taken to absorb 1 $mm^3$ of water was measured on 5 consecutive trials at two different temperatures for both the plant and the absorbent paper.

Environmental temperature $15^0$C

| Time taken to absorb 1$mm^3$ of water in minutes ± 1 | | | | |
|---|---|---|---|---|
| Test material | Geranium plant | | Absorbent paper | |
| Condition | Light | Dark | Light | Dark |
| Trial 1 | 13 | 34 | 7 | 6 |
| Trial 2 | 11 | 29 | 8 | 8 |
| Trial 3 | 12 | 28 | 6 | 9 |
| Trial 4 | 14 | 31 | 5 | 7 |
| Trial 5 | 15 | 29 | 8 | 8 |

Environmental temperature $25^0$C

| Time taken to absorb 1$mm^3$ of water in minutes ± 1 | | | | |
|---|---|---|---|---|
| Test material | Geranium plant | | Absorbent paper | |
| Condition | Light | Dark | Light | Dark |
| Trial 1 | 9 | 29 | 4 | 5 |
| Trial 2 | 10 | 27 | 5 | 4 |
| Trial 3 | 8 | 26 | 4 | 3 |
| Trial 4 | 9 | 25 | 4 | 5 |
| Trial 5 | 10 | 27 | 3 | 4 |

a. List two variables that should have been controlled in this protocol. (2marks)

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b. Suggest and explain why water uptake is faster at a higher temperature for the absorbent paper. (2 marks)

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c. Explain why the rate of water uptake in the dark is lower for the plant but is unchanged for the absorbent paper (3 marks)

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d. Deduce from the data available for water uptake in the light whether water uptake by a plant is an active process. (3 marks)

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e. The use of the absorbent paper is an attempt to model plant transpiration. Evaluate, using the data, to what extent the model is successful in portraying transpiration in a living system. (4 marks)

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**Extension question**

20. Explain why CAM physiology is an important adaptation possessed by many xerophytes. (3 marks)

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