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 varieties

III Conservation

A I only

B 1 and II only

C I and III only

D I, II and III

1. 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

1. 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 II and IV only

D All of them

1. 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 withstand low pressures

IV They can form new xylem tissue by mitosis

A I only

B I, II and III only

C I and III only

D All of them

1. Which of the following most accurately describes the relationship between angiosperms and pollinators?
   A. Symbiosis
   B. Producer and consumer
   C. Commensalism
   D. Mutualism

1. 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.

1. 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 I, II and IV only

C III and IV only

D All of them

1. 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

1. 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 and II and IV only

C I and IV only

D All of them

1. 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

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

    Gaseous exchange / CO_2 is necessary for photosynthesis

    CO_2 enters leaves through stomata which are open

    and evaporation/diffusion of water will occur

1. Discuss what is meant by the term “ephemeral lifestyle” as applied to flowering plants and explain why this is an adaptation to xerophytic habitats.

(2 marks)

Ephemeral plants: (description)Short lifespan of adult plant/explanation (1 mark)

(explanation) In hostile conditions, survive as seeds/resistant to environmental damage (1 mark)

Other adaptations could include – long tap roots, succulent water storage, reduced leaf area, sunken stomata, thick waxy cuticle.

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

Auxin efflux pumps can transport auxin across cell membranes

From the brightly illuminated side to the darker side of a shoot

Increasing growth / cell elongation rates

Causing (positive) phototropism

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

Entry of sucrose causes hypertonicity/increase of sucrose concentration

Causes entry of water by osmosis

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

Stylets (of aphids) penetrate single sieve tubes;

Heads of aphids are removed;

Liquid/sap collected from stylet;

The sap collected can be analysed / can give data on the direction and speed of phloem transport

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

Features correctly drawn and labelled (1 mark each)

- Testa
- Micropyle

- Cotyledon
- Plumule/embryo shoot
- Radicle/embryo root

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

Any four named tissues, including vascular tissues, flowers or leaves. –

Protoderm

Procambium

Ground meristem

Leaf primordial

Flower primordial/floral buds

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

Many insect pollinated flowers produce nectar to feed insects.

Insects visiting the flower benefit from the abundance of food.

The Plants benefit from the service of pollination - the insects transport pollen from one flower to the next, helping cross pollination.

Mutualistic relationships are those where both species benefit from the interaction.

Good examples are: Hawk moths are uniquely adapted to the hawk moth orchid

Fig wasps: The wasp pollinates the fig when the female lays her eggs in the developing fruit. She picks up pollen on her ovipositor and then transfers it to a new plant as she lays eggs.

Wild bees: Wild bees i are responsible for pollinating many wild and agricultural plants

1. 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 15^0C

Time taken to absorb 1mm3 of water in minutes ± 1				
Test material	Geranium plant		Absorbent paper	
•	•	•	•	•
Trial 1	1.	1.	1.	1.
Trial 2	1.	1.	1.	1.
Trial 3	1.	1.	1.	1.
Trial 4	1.	1.	1.	1.
Trial 5	1.	1.	1.	1.

Environmental temperature 250C

Time taken to absorb 1mm3 of water in minutes ± 1				
Test material	Geranium plant		Absorbent paper	
•	•	•	•	•
Trial 1	1.	1.	1.	1.
Trial 2	1.	1.	1.	1.

Trial 3	1.	1.	1.	1.
Trial 4	1.	1.	1.	1.
Trial 5	1.	1.	1.	1.

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

Humidity

Air movement

Size/leaf area of plant/size/area of absorbent paper

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

Evaporation rate

Diffusion rate increase with temperature

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

Leaf has stomata

Which close in the dark/less gaseous exchange

Limit water loss

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

The water uptake by the absorbent paper increases at higher temperatures

As does the plant uptake/mirrors result for plant

Loss from paper is passive/plant similar

Difference due to stomatal closure in the dark

1. 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)

Successful:

Demonstrates passive nature of transpiration

Can model effect of changing environmental condition (2 marks)

Not successful

Stomatal opening and closure

Variation in leaf structure e.g. xerophytic adaptation (2 marks)

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

   Stomata open at night

   Carbon dioxide (enters and) is stored

   As a 4 carbon compound/malic acid

   So carbon dioxide for photosynthesis is available by day

   With less water loss by transpiration