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## GCE AS / A LEVEL – BIOLOGY UNIT 2 QUESTION PACK

1072-01 (Legacy BY2) · New spec Unit 2 Topic 7 · AS unit, first sat 2016, 80 marks, 1h 30min paper

# REVISE

.wales

## BIOLOGY – UNIT 2 · GAS EXCHANGE & PLANTS & LEAVES

### *BY2.2.4 Adaptations for gas exchange – leaves, stomata and xerophytic adaptations*

*Leaf structure and the role of stomata in gas exchange, guard cell control of stomatal aperture, and adaptations of xerophytes such as Erica and Ligustrum to limit water loss while still respiring and photosynthesising.*

#### LEGACY 2008 SPECIFICATION

#### Estimated time for entire question pack: ~1 h 18 min

*Derived from the legacy BY2 paper's pace of ~1.1 min/mark, padded for long-prose answers (49 marks over 4 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

#### ABOUT THIS QUESTION PACK

This is a **comprehensive practice question pack**, not a single mock paper. It contains every question from the legacy WJEC BY2 papers (2008 modular spec, 2011–2017) that maps onto new-spec AS Unit 2 Topic 7 (2.4).

Questions are ordered by source paper date.

#### INSTRUCTIONS

Use black ink or black ball-point pen. Show all working – quality of written communication will affect marks. A calculator is allowed. Diagrams included in answers must be fully annotated.

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Q	Source	Max	Mark	Q	Source	Max	Mark
1	Jun 11 Q4	10		3	Jun 12 Q7	16	
2	Jun 11 Q5	7		4	Jun 16 Q3	16	
<b>Total</b>						<b>49</b>	

# Gas Exchange – Plants & Leaves – what the new spec asks

WJEC GCE AS / A Level Biology (from 2015) · Unit 2: Biodiversity & Physiology of Body Systems · Topic 2.4.

## Leaf as a gas exchange surface

- Thin, flat shape ⇒ short diffusion path + large SA.
- Spongy mesophyll cells loosely packed – air spaces.
- Palisade mesophyll packed with chloroplasts for photosynthesis.

## Stomata & guard cells

- Pairs of guard cells regulate stomatal aperture.
- Turgid guard cells ( $K^+$  influx, water entry) ⇒ pore open.
- Open in light (photosynthesis); closed in drought (ABA).

## Xerophytes

- Sunken stomata – trap humid air, reduce gradient.
- Rolled / hair-covered leaves (e.g. *Erica* heather).
- Thick waxy cuticle; reduced leaf SA (needles).

## Mesophytes vs hydrophytes

- Mesophytes (most flowering plants) – adapted to moderate water.
- Hydrophytes (water lily) – aerenchyma, stomata on upper surface.
- *Ligustrum* (privet) is a typical mesophyte for comparison.

# Gas Exchange – Plants & Leaves in one page

Quick-reference notes – revisit before each question.

## Leaf anatomy

Upper / lower epidermis; waxy cuticle.  
Palisade mesophyll – chloroplast-rich.  
Spongy mesophyll – air spaces.  
Stomata mostly on lower surface.

## Stomata

Pore between two guard cells.  
Open: photosynthesis ( $O_2$  out,  $CO_2$  in).  
Closed: limit water loss.

## Guard cell mechanism

$K^+$  pumped in  $\Rightarrow$  water enters by osmosis.  
Guard cells become turgid – thin outer / thick inner walls  $\Rightarrow$  bow outwards.  
Pore opens.

## Xerophytic adaptations

Sunken stomata in pits – humid microclimate.  
Hair / trichome cover – reduces wind, traps water vapour.  
Rolled leaves (e.g. marram grass), thick cuticle, needle leaves.

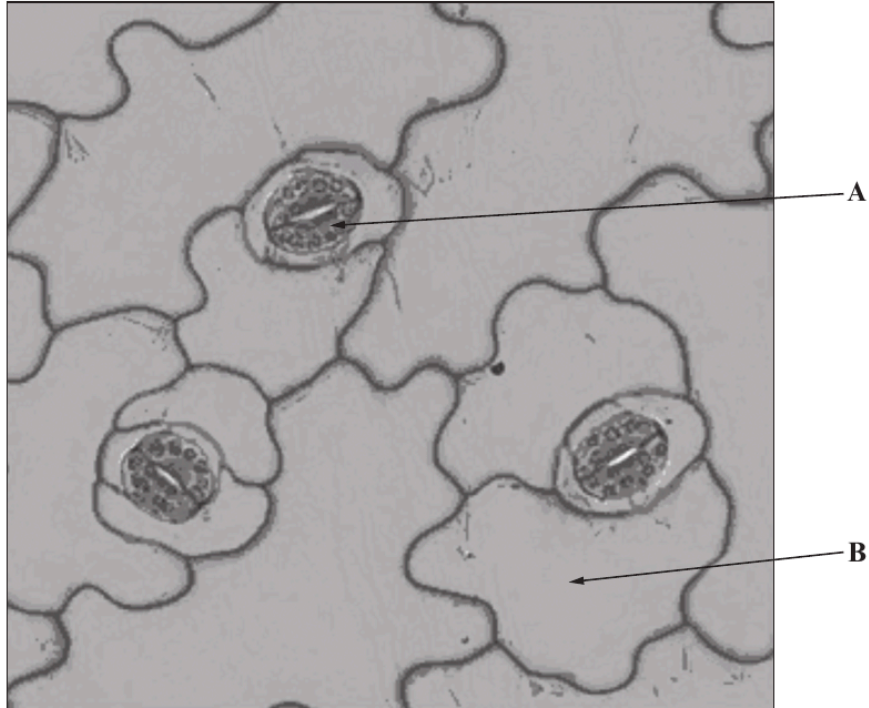
## *Erica & Ligustrum*

*Erica* (heather, xerophyte): rolled leaves, hairs, sunken stomata.  
*Ligustrum* (privet, mesophyte): typical broad leaf.  
Useful contrast for exam comparisons.

## Hydrophytes

Aerenchyma (air channels) for gas movement.  
Stomata on upper leaf surface only (water lily).  
Thin / no cuticle; submerged leaves rely on diffusion through epidermis.

4. The photograph below shows the surface view of stomata found on the lower surface of of *Kalanchoe* (*Kalanchoe* sp.) leaves.



© Image by J. Adds, courtesy of SAPS

- (a) Identify cells **A** and **B**. [2]

**A** .....

**B** .....

- (b) Give **two** functions of stomata in leaves. [2]

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(c) Explain how the flow of water into cells A leads to opening of stomatal pores. [4]

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(d) When cells A were treated with cyanide the stomatal pores failed to open. Explain why cyanide is having this effect on these cells. [2]

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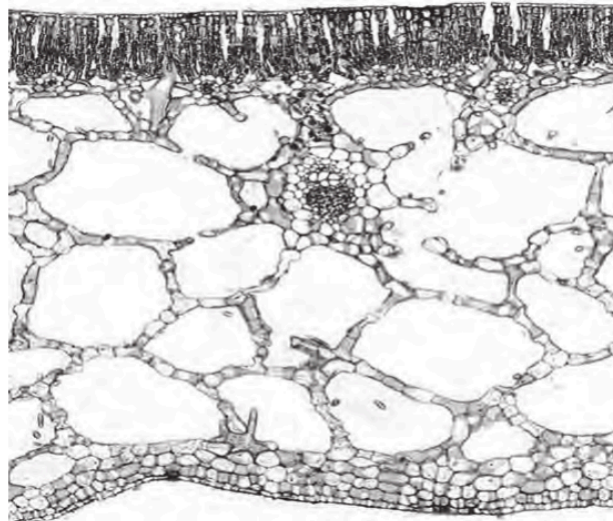
**(Total 10 marks)**

10

5. The photographs below show sections of two leaves from two species of plant. *Ligustrum* is a mesophyte plant.



TS *Ligustrum* leaf (Privet)



TS *Nymphaea* leaf (Waterlily)

(a) What type of plant is *Nymphaea*? [1]

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(b) Using the information in the photographs, describe **two** visible differences between the two species. [2]

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(c) State **three** adaptations of *Nymphaea* for living in an aquatic environment and state why each is important. [3]

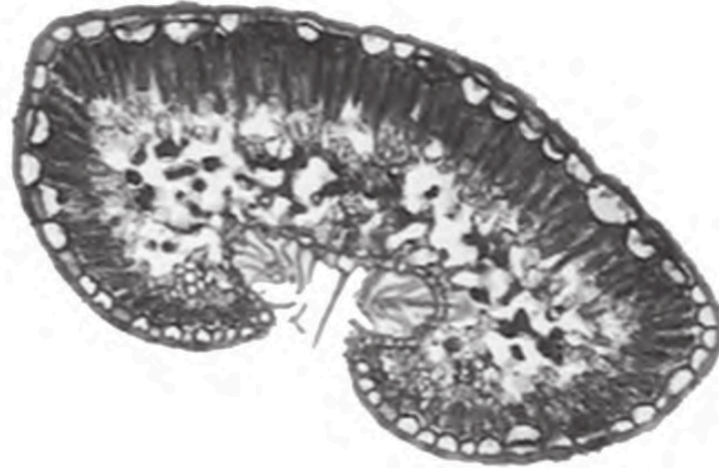
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(d) Give **one** feature of *Ammophila* (Marram Grass) which shows how it is adapted to its environment. [1]

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**(Total 7 marks)**

7. The photograph below shows a transverse section through the leaf of heather (*Erica cinerea*). This heather lives in a dry, windy environment.



- (a) (i) State **three** features of the leaf shown above which indicate that it lives in a dry environment. [3]

Feature 1 .....

Feature 2 .....

Feature 3 .....

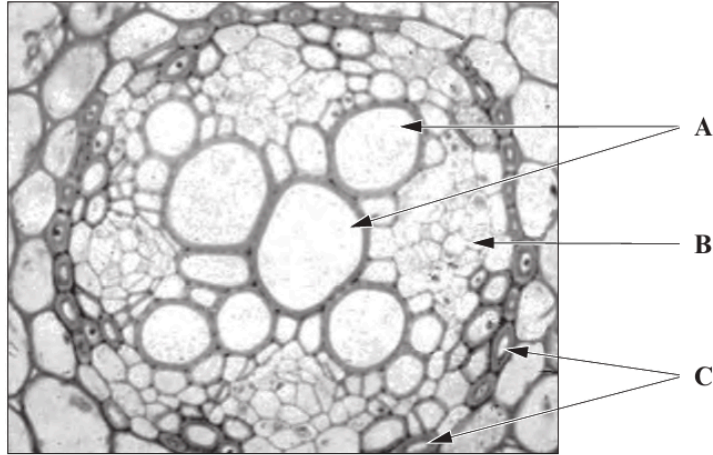
- (ii) Explain how any **one** of these features help *Erica* live in a dry environment. [1]

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- (b) What name is given to plants that live in dry environments? [1]

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- (c) The diagram below shows a transverse section of a buttercup (*Ranunculus sp.*) root as seen under high power with a light microscope.



- (i) Name tissue **A** and explain its role in the plant. [2]

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- (ii) Name tissue **B** and explain its role in the plant. [2]

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- (iii) Name cells **C**. [1]

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- (iv) Draw a simple longitudinal section of cell C clearly labelling the special feature of this cell. [2]

- (v) Explain how cell C carries out its function in the uptake of water and minerals in the plant. [4]

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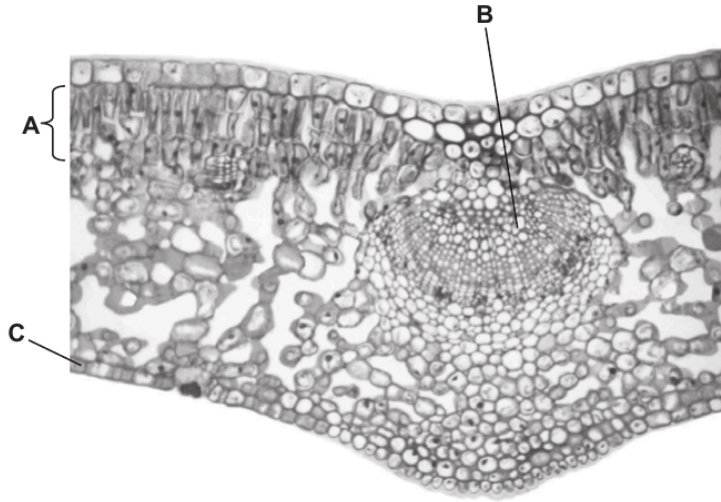
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**(Total 16 marks)**

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3. The image below shows a transverse section of a leaf from the Chinese privet plant, *Ligustrum lucidum*, a mesophyte.



- (a) Name **tissues A, B and C.** [3]

A .....

B .....

C .....

- (b) Describe **and** explain **four** ways in which the leaf is adapted to absorb sunlight. [4]

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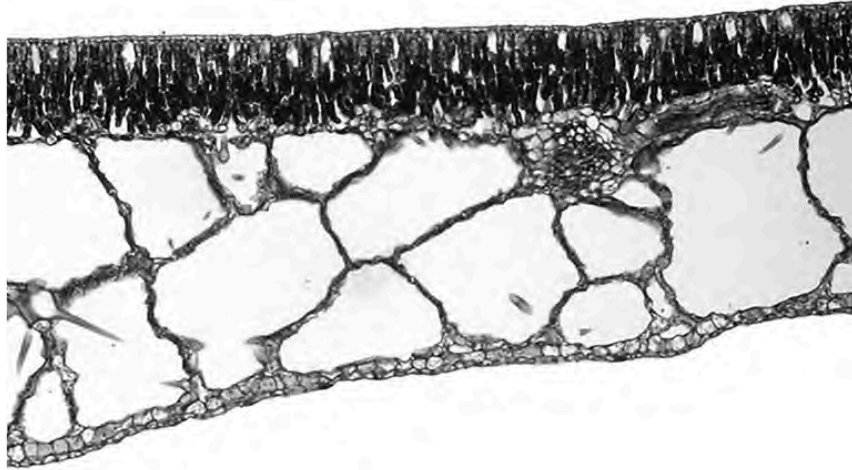
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- (e) The photograph below is of a transverse section of a leaf from a different type of plant from that in part (a). Both photographs are of the same scale.



State the **type** of plant from which this leaf was taken, giving reasons for your choice. [3]

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## **END OF QUESTION PACK**

4 questions · 49 marks · ~1 h 18 min

Source: WJEC BY2 (2008 modular spec, 2011–2017)

Curated for WJEC Biology 2015 spec AS Unit 2 – Topic 7 (2.4)

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