Name	Date started	Target end date

GCE AS / A LEVEL — BIOLOGY UNIT 2 QUESTION PACK

1072-01 (Legacy BY2) · New spec Unit 2 Topic 6 · AS unit, first sat 2016, 80 marks, 1h 30min paper

REVISE
.wales

BIOLOGY — UNIT 2 · GAS EXCHANGE &MDASH; MAMMALIAN LUNGS & BREATHING

BY2.2.4 Adaptations for gas exchange — mammalian lungs, alveoli and ventilation

Mammalian respiratory anatomy from trachea to alveolus, the mechanism of inspiration and expiration, alveolar histology and the effects of smoking on gas exchange surfaces.

LEGACY 2008 SPECIFICATION

Estimated time for entire question pack: ~46 min

Derived from the legacy BY2 paper's pace of ~1.1 min/mark, padded for long-prose answers (29 marks over 3 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 6 (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.

For Examiner's use only

Q	Source	Max	Mark
1	Jun 12 Q2	6	
2	Jun 13 Q3	13	
3	Jun 15 Q3	10	
Total		**29**	

Gas Exchange — Mammalian Lungs & Breathing — what the new spec asks

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

Lung anatomy

- Trachea → bronchi → bronchioles → alveoli.
- Trachea / bronchi reinforced by C-shaped cartilage rings.
- Bronchioles — smooth muscle, no cartilage.

Alveoli

- Huge total SA (~70 m^2 in humans).
- Single squamous epithelial cell + capillary endothelium ⇒ short diffusion path.
- Surfactant from septal cells prevents collapse.

Ventilation mechanism

- Inspiration: external intercostals contract, diaphragm flattens ⇒ thorax volume up, pressure down, air in.
- Expiration: muscles relax; elastic recoil; volume down, pressure up, air out.
- Forced expiration: internal intercostals + abdominal muscles.

Smoking & lung disease

- Tar damages cilia ⇒ mucus accumulation ⇒ chronic bronchitis.
- Enzymes from chronic inflammation break down alveolar walls ⇒ emphysema.
- Carcinogens cause lung cancer.

Crib sheet »

Gas Exchange — Mammalian Lungs & Breathing in one page

Quick-reference notes — revisit before each question.

Airway anatomy

Trachea → primary bronchi → secondary → bronchioles → alveoli.

Cartilage rings in trachea & bronchi prevent collapse.

Ciliated epithelium + goblet cells trap & sweep mucus.

Alveoli — gas exchange

~300 million in human lungs; 70 m^2 total SA.

Single squamous epithelium + capillary endothelium = ~0.5 µm diffusion path.

Moist surface; surfactant prevents collapse.

Inspiration

External intercostals contract ⇒ ribs up and out.

Diaphragm contracts ⇒ flattens.

Thorax volume ↑; pressure ↓ below atmospheric ⇒ air in.

Expiration

External intercostals relax; diaphragm relaxes.

Elastic recoil of lungs.

Volume ↓; pressure ↑ ⇒ air out.

Forced: internal intercostals + abdominals.

Smoking

Tar paralyses cilia ⇒ mucus + bacteria accumulate.

Chronic bronchitis; emphysema (alveolar wall breakdown).

Carcinogens (PAHs) ⇒ lung cancer.

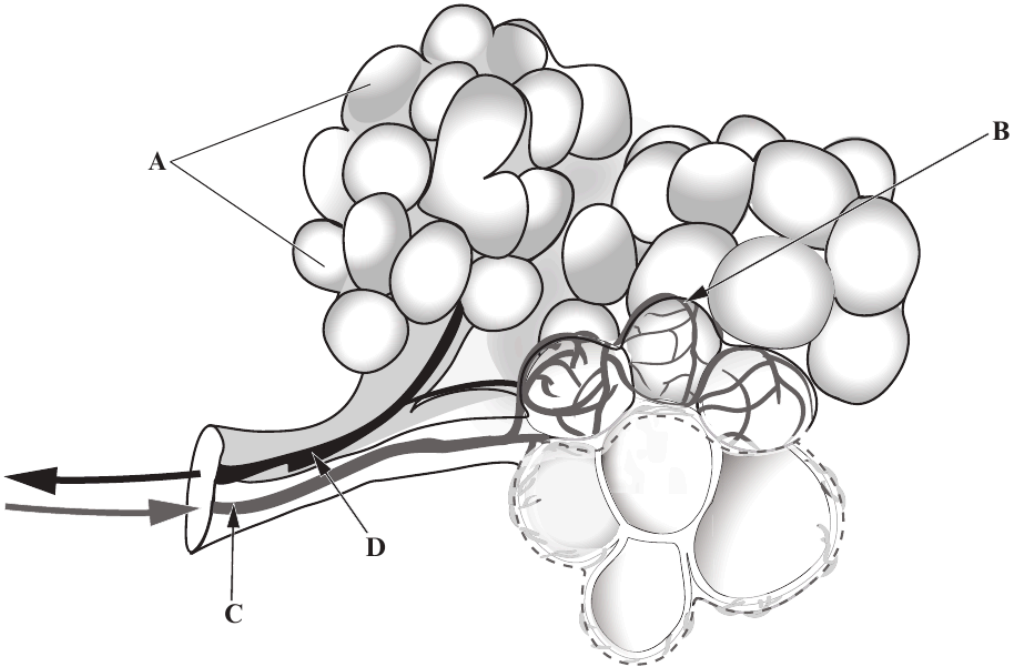
Spirometer traces

Tidal volume, inspiratory reserve, vital capacity.

Residual volume cannot be measured by spirometer.

Examiner only

2. The image below shows part of the lung viewed under high magnification. The arrows indicate direction of blood flow.



(a) (i) Identify the structures **A** and **B**. [1]

A .....

B .....

(ii) Identify the blood vessels which connect **C** and **D** to the heart. [1]

C .....

D .....

(b) State two important structural features of **A visible in the diagram**. [2]

1 .....

2 .....

(c) Briefly explain how inspiration is brought about. [2]

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(Total 6 marks)

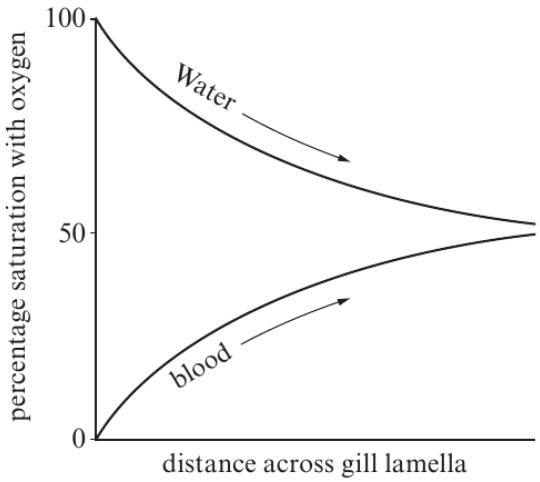
Examiner only

3. *(a)* Describe and explain the process of **inspiration** in a mammal. [4]

(b) (i) Explain how counter current flow works in the gills of bony fish. [4]

Examiner only

The graph below shows another type of flow.



(ii) Name the type of flow shown in the graph above. [1]

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(iii) Explain why this is less efficient than counter current flow. [2]

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(c) Suggest why gill filaments/ lamellae would not provide an efficient gas exchange surface on land. [2]

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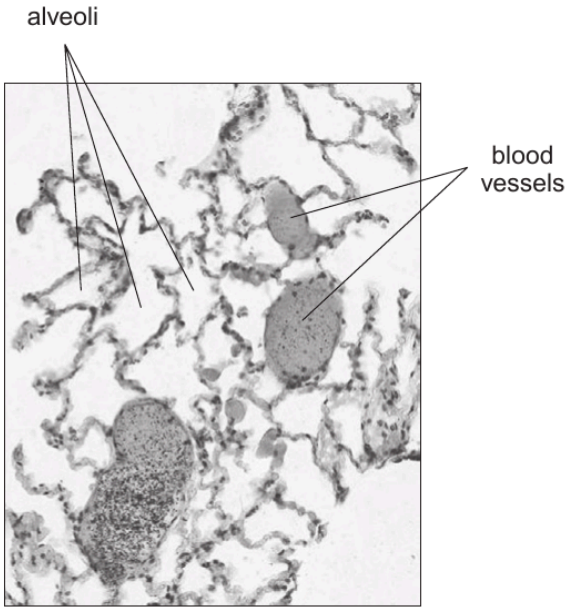
13

Examiner only

3. Shown below is a micrograph of a section through part of a mammalian lung.



(a) Describe and explain how **two** features **shown in the micrograph** are adaptations for efficient gas exchange. [4]

Examiner only

(b) (i) Describe and explain the process of expiration in a mammal. [4]

(ii) Mammals have a high oxygen demand. Suggest why they need a complex ventilation mechanism. [2]

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END OF QUESTION PACK

3 questions · 29 marks · ~46 min
Source: WJEC BY2 (2008 modular spec, 2011–2017)
Curated for WJEC Biology 2015 spec AS Unit 2 — Topic 6 (2.4)