

Name	Date started	Target end date
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## GCE AS / A LEVEL – BIOLOGY UNIT 2 QUESTION PACK

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

# REVISE

.wales

## BIOLOGY – UNIT 2 · CLASSIFICATION & TAXONOMY

### *BY2.2.1 Classification – kingdoms, three-domain system and the taxonomic hierarchy*

*Five-kingdom and three-domain systems, the taxonomic hierarchy (kingdom → phylum → class → ... → species), binomial nomenclature, and how molecular phylogeny refines classical taxonomy.*

#### LEGACY 2008 SPECIFICATION

#### Estimated time for entire question pack: ~1 h 12 min

*Derived from the legacy BY2 paper's pace of ~1.1 min/mark, padded for long-prose answers (45 marks over 5 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 1 (2.1).

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
1	Jun 12 Q1	5	
2	Jun 13 Q1	8	
3	Jan 14 Q1	4	
4	Jun 17 Q3	15	
5	Jun 16 Q6	13	
<b>Total</b>		<b>45</b>	

# Classification & Taxonomy – what the new spec asks

WJEC GCE AS / A Level Biology (from 2015) · Unit 2: Biodiversity & Physiology of Body Systems · Topic 2.1.

## Five kingdoms

- Prokaryotae (bacteria) – no nucleus.
- Protoctista – mostly unicellular eukaryotes.
- Fungi – heterotrophic, chitinous cell wall, saprotrophic.
- Plantae – multicellular, photoautotrophic, cellulose wall.
- Animalia – multicellular heterotrophs, no cell wall.

## Three-domain system

- Carl Woese (1990) – based on ribosomal RNA sequencing.
- Bacteria, Archaea, Eukarya.
- Archaea differ from Bacteria in lipids and ribosomes.
- All eukaryotes (animals, plants, fungi, protists) sit in Eukarya.

## Taxonomic hierarchy

- Domain → Kingdom → Phylum → Class → Order → Family → Genus → Species.
- Each level (taxon) groups organisms by shared features.
- Binomial nomenclature: *Genus species* (italicised).

## Species & phylogeny

- Species: a group whose members can interbreed to give fertile offspring.
- Phylogeny: evolutionary relationships shown by cladograms.
- Modern classification uses DNA / RNA / protein sequence data.

# Classification & Taxonomy in one page

Quick-reference notes – revisit before each question.

## Five kingdoms

Prokaryotae (bacteria), Protoctista, Fungi, Plantae, Animalia.  
Whittaker's 5-kingdom system – based on cellular structure & nutrition.

## Three-domain system

Woese: Bacteria, Archaea, Eukarya.  
Based on 16S/18S rRNA sequencing.  
Archaea live in extreme environments; have unique membrane lipids.

## Taxonomic hierarchy

D K P C O F G S – "Did King Phillip Come Over For Good Soup?".  
Each rank is a taxon.  
Higher ranks group more organisms; species is most specific.

## Binomial nomenclature

*Genus species* – Latinised, italicised.  
Genus capitalised; species lowercase.  
e.g. *Homo sapiens*, *Panthera uncia*.

## Species concept

Biological species concept: interbreed to give fertile offspring.  
Reproductive isolation defines a species.  
Issues: extinct, asexual, hybrid organisms.

## Modern phylogeny

Cladograms show evolutionary relationships.  
Built from DNA / RNA / protein sequence data.  
Molecular phylogeny has reshaped traditional kingdom boundaries.

1. Complete the following table using the characteristics to identify each kingdom.

[5]

<i>Characteristics</i>	<i>Kingdom</i>
Heterotrophic eukaryotes Cell wall of chitin Reproduce by spores	
Heterotrophic Multicellular eukaryotes No cell wall Nervous coordination	
Eukaryotes Single celled No tissues differentiation	
Unicellular Microscopic No membrane bound organelles Cell wall not cellulose Cell wall made of murein	
Multicellular eukaryotes Photosynthetic Cellulose cell wall	

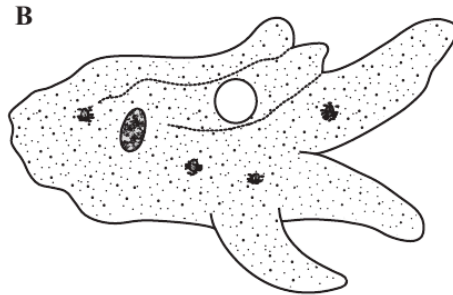
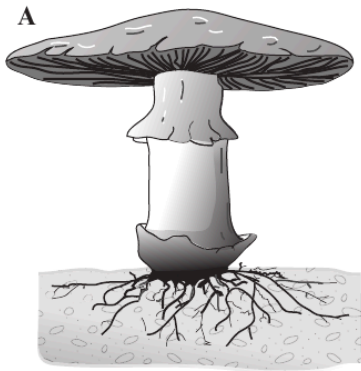
**(Total 5 marks)**

1. (a) Complete the table on classification given below. [4]

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Kingdom	Phylum	Class	Genus
	Angiosperm	Dicotyledons	Ranunculus (Buttercup)
Animalia		Oligochaetae	Lumbricus (Earthworm)
Animalia		Mammalia	Rattus (Rat)
Animalia	Arthropoda		Locusta (Locust)

(b) The diagrams, **A** and **B** below, show two organisms from **two** other Kingdoms *not* given in the table.



(i) Name the **two** Kingdoms to which the two organisms belong. [2]

**A** .....

**B** .....

(ii) State **one** characteristic of each organism which is a feature of its Kingdom. [2]

**A** .....

**B** .....

8



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1. The table below shows certain characteristics of four kingdoms. If the characteristic is present in members of the kingdom this is shown with a tick (✓). If the characteristic is not present this is shown with a cross (X).

Complete the table below by giving the name of each kingdom. [4]

		Kingdom			
Characteristic	Eukaryotic	✓	✓	X	✓
	Chloroplast	✓	X	X	some species
	Cell wall	✓	X	✓	some species
	Nucleus	✓	✓	X	✓

4

2. The atrio-ventricular node (AVN), bundle of His and Purkyne (Purkinje) fibres are specialised cardiac muscle tissues which are involved in the control of heartbeat.

(a) State the function of the following structures in the functioning of the heart.

- (i) atrio-ventricular node (AVN); [2]

.....

.....

- (ii) bundle of His and Purkyne fibres. [2]

.....

.....

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3. (a) Complete the table below with a tick (✓) for each kingdom, if the statement is true. [4]

Feature of Kingdom	Kingdom				
	Prokaryotae	Protocista	Fungi	Plantae	Animalia
Contains eukaryotic organisms					
Contains organisms with cell walls made of chitin					
Contains photosynthetic organisms					
Contains organisms with 70S ribosomes					

(b) There are two species of chimpanzee, the common chimpanzee (*Pan troglodytes*) and the pygmy chimpanzee (*Pan paniscus*). The complete classification of the pygmy chimpanzee is shown below.

Animalia  
Chordata  
Mammalia  
Primata  
Hominidae  
*Pan*  
*paniscus*

(i) State **one** feature of pygmy chimpanzees that places them into the phylum Chordata. [1]

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(ii) State **one** feature of pygmy chimpanzees that places them into the class Mammalia. [1]

.....

(iii) State the name of the family and the order to which the pygmy chimpanzee belongs. [2]

I. Family: .....

II. Order: .....

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- (c) Why are pygmy chimpanzees and common chimpanzees considered to be separate species? [1]

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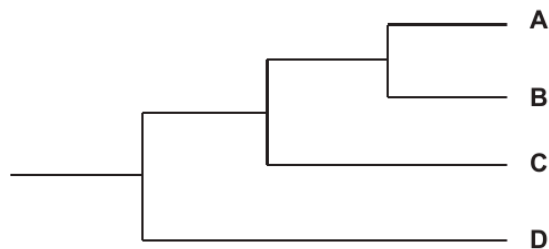
- (d) In DNA hybridisation, purified DNA from two species is heated to separate the strands. These are mixed together and allowed to cool. As they cool the strands re-join to form double helices. However, some helices will be hybrid, consisting of one strand from each species.

The temperature at which double stranded human DNA separates is 94 °C. Hybrid DNA will separate at temperatures lower than 94 °C as shown in the table below.

Two species from which hybrid DNA was produced		Temperature required to separate strands of DNA /°C
human	gorilla	91.7
human	common chimpanzee	92.4
human	orang-utan	90.4

The separation temperature is lower where there is greater divergence between the species.

- (i) Use the data above to identify the four species given in the table, labelled **A – D**, on the phylogenetic tree below. [1]



<b>A</b>	
<b>B</b>	
<b>C</b>	
<b>D</b>	

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- (ii) Using your knowledge of DNA structure, suggest why the separation temperature is lower where there is greater divergence between the species. [3]

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- (e) The table below shows the difference in separation temperatures of hybrid DNA from humans and the two species of chimpanzee. Some data suggests that the two species of chimpanzee diverged 3 million years ago.

Species from which hybrid DNA was produced		Difference in separation temperature /°C
human	common chimpanzee	1.6
human	pygmy chimpanzee	1.6
common chimpanzee	pygmy chimpanzee	0.7

Use all this information to calculate how long ago humans and chimpanzees diverged from their common ancestor. Show your working. [2]

Humans and chimpanzees diverged = ..... million years ago

15

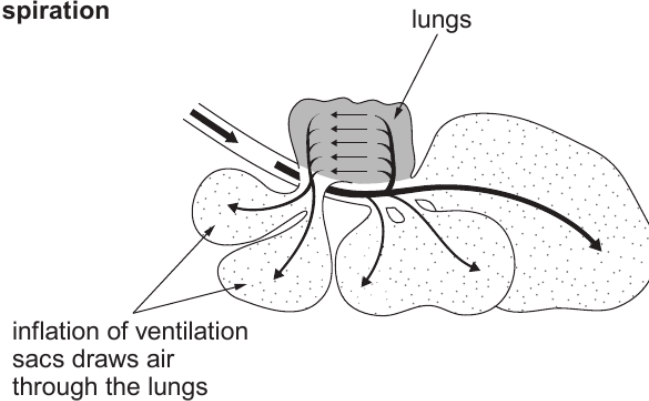
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6. The following passage has been adapted from the book 'Life Ascending' by Nick Lane:

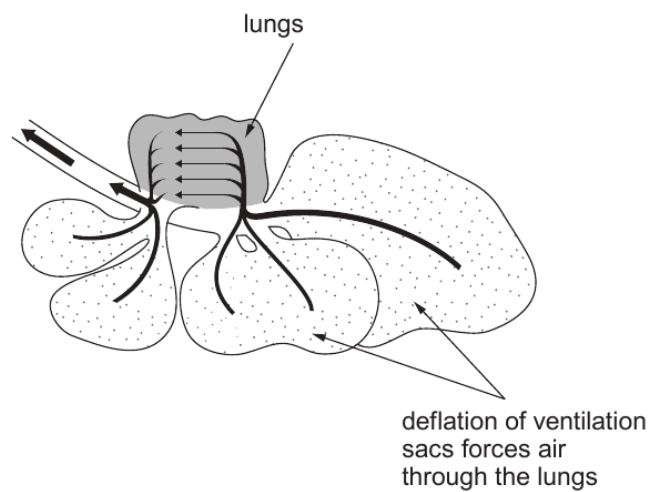
*'Bird lungs are more efficient than mammal's lungs even at low altitudes. At high altitudes birds can extract more oxygen from the air than mammals. This is why migrating bar-headed geese (Anser indicus) can fly thousands of feet above the top of Everest.'*

*Birds have a sophisticated one way system of interconnected ventilation sacs. Rather than entering the lungs directly, air first flows into the ventilation sacs and eventually exits via the lungs, giving a continuous through-flow of air through the lungs.*

### Inspiration



### Expiration



*'Air flows continuously in the same direction through the lungs during both inspiration and expiration, while blood flows in the opposite direction, giving a highly efficient counter-current exchange of gases.'*

(a) Describe **three** features of the gas exchange surface in the goose.

[3]

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(b) What is the advantage of birds having internal lungs for gas exchange?

[1]

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(c) Explain why the counter-current exchange of gases is beneficial to the bar-headed goose.

[4]

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- (ii) What is the disadvantage to the bar-headed goose of the position of the dissociation curve? [1]

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13

## **END OF QUESTION PACK**

5 questions · 45 marks · ~1 h 12 min

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

Curated for WJEC Biology 2015 spec AS Unit 2 – Topic 1 (2.1)

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