Classification and Evolution (4.2.2): OCR A Level Biology Exam Question

17 questions · 38 marks · about 46 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 3 · June 2018 · Q5(a)(ii) · 2 marks

(ii) Explain why *Pinus glabra* and humans, *Homo sapiens,* are classified in the same domain but in different kingdoms.

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..... **[2]**

Question 2 · AS Paper 1 · June 2023 · Q24(c) · 3 marks

(c) Diatoms are members of the domain Eukarya.

Complete the sentences about domains using the most appropriate terms.

The process of sorting of organisms into taxonomic groups is called ..... .

Domains represent the highest taxonomic level; they are the groups that contain the largest number of species. The number of kingdoms in each domain is different. The domain Eukarya contains ..... different kingdoms. The domains Bacteria and ..... both contain species from only the kingdom Prokaryotae.

[3]

Turn over

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Question 3 · AS Paper 2 · June 2025 · Q4(a)(i) · 1 mark

4

(a)

(i) The European dust mite is an insect with the binomial name *Dermatophagoides pteronyssinus*.

State **one** advantage of the binomial naming system.

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.....

..... **[1]**

Question 4 · AS Paper 2 · June 2025 · Q4(b) · 2 marks

(b) Organisms were originally classified into five kingdoms.

State **two** general features of organisms classified in the Plantae kingdom that are **not** features of organisms that are classified in the Fungi kingdom.

Feature 1 .....

.....

Feature 2 .....

.....

[2]

Question 5 · AS Paper 2 · June 2025 · Q4(c) · 1 mark

(c) State the relationship between classification and phylogeny.

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..... **[1]**

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Question 6 · AS Paper 2 · June 2025 · Q4(d) · 2 marks

(d) State **two** differences between the five kingdom and three domain classification systems.

1 .....

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2 .....

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[2]

Turn over

Question 7 · information from earlier in the question

3 **(a)** The Scottish wildcat and European wildcat are both classified in the same species, *Felis silvestris*. Researchers have suggested that both wildcats originated from the same population.

During the Ice Age, the British Isles were connected by ice to mainland Europe.

- After the Ice Age, sea levels rose and the British Isles became isolated from the rest of Europe. The isolated population of wildcats in the British Isles developed slightly different characteristics from the mainland population in Europe.
- A subspecies is a group of individuals that is geographically isolated from others of the same species and that is distinguishable from other populations of the same species.
- The Scottish wildcat is now classified as the subspecies *Felis silvestris grampia* and the European wildcat as the subspecies *Felis silvestris silvestris*.

(i) Name the genus of the Scottish wildcat.

..... **[1]**

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Question 7 · AS Paper 2 · June 2019 · Q3(a)(ii) · 2 marks

(ii) The information above states that 'the isolated population of wildcats in the British Isles developed slightly different characteristics from the mainland population in Europe'.

What is the term used to describe the differences between the two populations of wildcat?

..... **[2]**

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Question 8 · information from earlier in the question

20 The cheetah, *Acinonyx jubatus*, is a member of the cat family, Felidae.

Cheetahs display less intraspecific variation than other members of the family Felidae.

Fig. 20.1 shows the mean body length of a population of cheetahs from southern Africa.

The error bars on Fig. 20.1 show the standard deviation of mean body length.

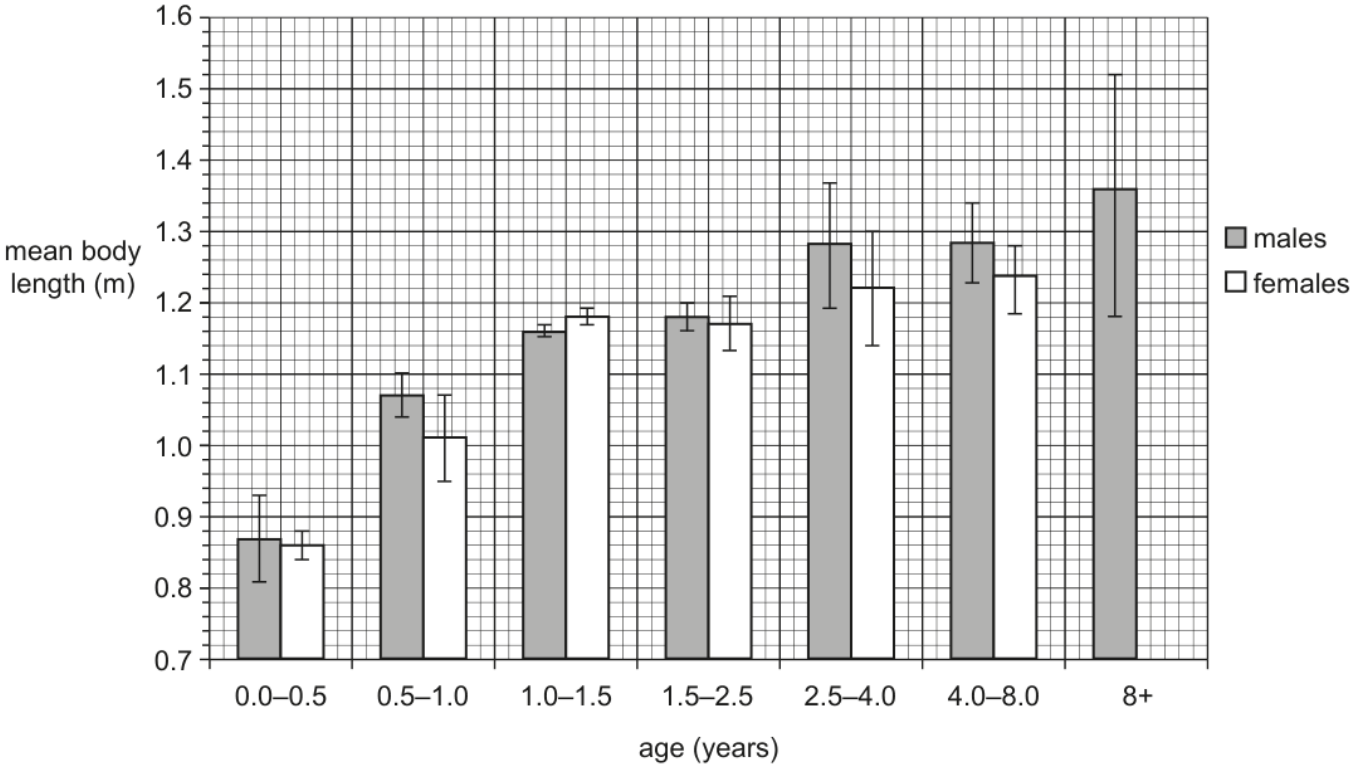


Fig. 20.1

(a) (i) At between 2.5 and 4 years old, the mean length of female cheetahs is less than that of males.

Calculate how much shorter than males female cheetahs are.

Show your working. Express your answer as a percentage to **two significant figures**.

Answer ..... % **[2]**

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Question 8 · A level Paper 2 · June 2018 · Q20(a)(iv) · 2 marks

(iv) State the likely causes of variation in body length in cheetahs.

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..... **[2]**

Turn over

Question 9 · A level Paper 3 · June 2023 · Q4(b)(ii) · 2 marks

(ii) Adaptations can be categorised into three different types:

- anatomical
- behavioural
- physiological.

The table lists four traits that kakapos have evolved.

Complete the table by naming the type of adaptation represented by each of the four kakapo traits.

Kakapo trait	Type of adaptation
Active at night to avoid predators	
Green feathers that camouflage with its surroundings	
Slow digestion to extract nutrients from a high-fibre, low-protein diet	
Strong beak and claws to climb trees	

[2]

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(b) The peppered moth, *Biston betularia*, has two forms, a pale form and a dark form, both shown in **Fig. 6.2**.

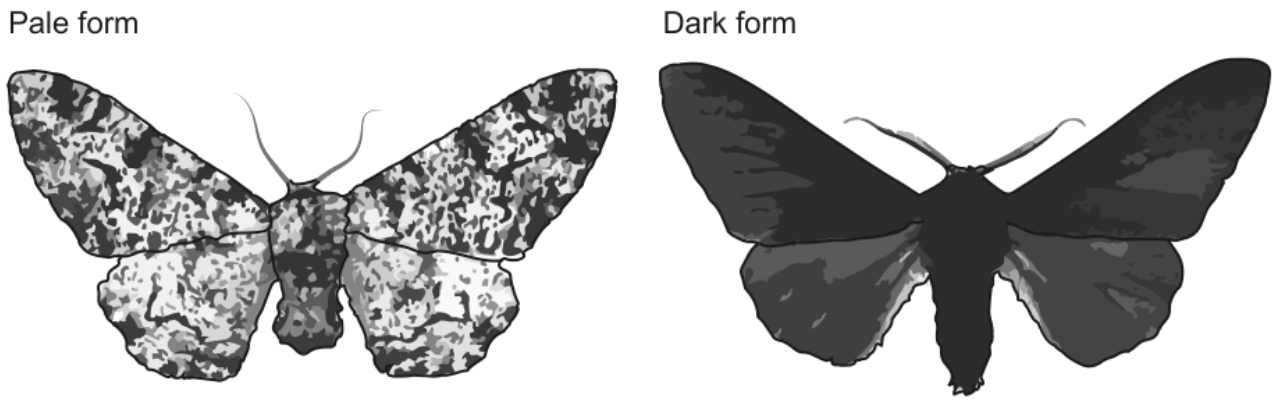


Fig. 6.2

Predators of the peppered moth include birds such as the robin and nuthatch. Peppered moths avoid these predators by flying at night and resting on tree trunks during the day. Many trees have light coloured lichens growing on them. However, many lichens are unable to tolerate high levels of air pollution. Without lichens the bark of trees appears darker.

The dark form of the peppered moth first appeared in Britain during the industrial revolution.

Various surveys have shown that the percentage of the dark form of the peppered moth population is higher in parts of England where there is a lot of heavy industry compared with more rural areas.

Explain how the process of natural selection has resulted in this distribution of the two forms of the peppered moth.

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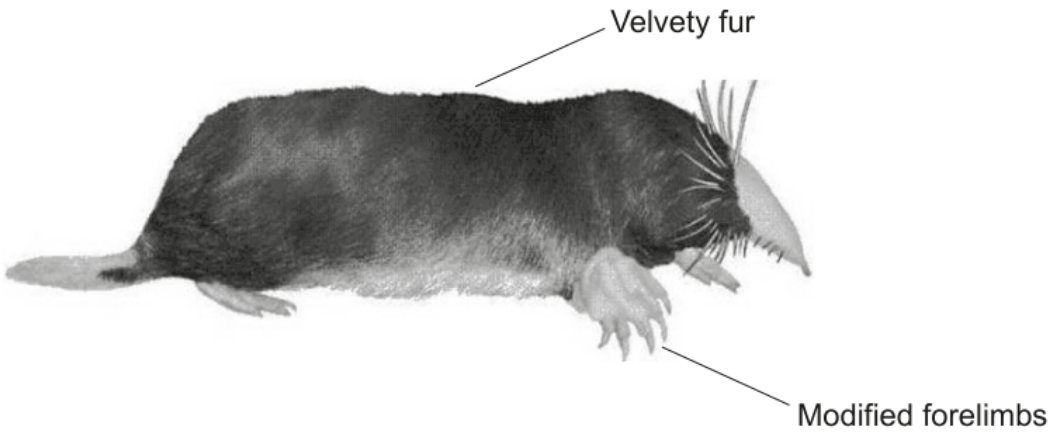
..... **[4]**

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(c) **Fig. 6.3** shows two types of mole and some information about each type.

Placental mole family *Talpidae*

Found in: North America, Asia and Europe
Habitat: Lives in burrows in soft soil
Food: Grubs and worms



Marsupial mole family *Notoryctidae*

Found in: Australia
Habitat: Lives in burrows in soft soil
Food: Grubs and worms

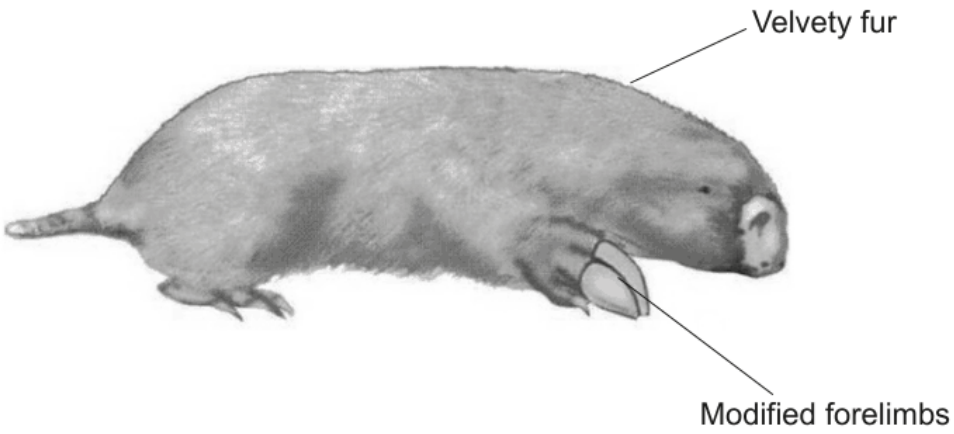


Fig. 6.3

Explain how **Fig. 6.3** supports the theory of convergent evolution.

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..... **[2]**

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Question 12 · A level Paper 3 · November 2021 · Q3(e) · 1 mark

(e) Many crop plants are eaten by herbivorous insects. Humans use insecticides to reduce the consumption of crop plants by insects.

Explain why an insecticide might be less effective after being used for many years.

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..... **[1]**

Question 13 · A level Paper 2 · June 2025 · Q21(a) · 2 marks

21 Antibiotics are drugs that treat bacterial infections.

The first antibiotic became widely available in the second half of the 20th century and antibiotics have been widely used ever since.

Many bacteria have now evolved resistance to antibiotics.

(a) Explain why the evolution of antibiotic resistance has implications for human populations.

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..... **[2]**

Question 14 · A level Paper 2 · June 2025 · Q21(b) · 2 marks

(b) Explain how antibiotic resistance in bacteria provides evidence for the theory of evolution by natural selection.

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..... **[2]**

Questions, mark schemes and examiners' report extracts © OCR.

Question 15 · A level Paper 2 · June 2025 · Q21(c)(i) · 5 marks

(c) Biological molecules provide another strand of evidence supporting the theory of evolution by natural selection.

(i) Complete the sentences using the most appropriate terms.

Mutations in DNA are random, so the more time that has passed the more mutations will have occurred. The sequence of ..... in DNA and the sequence of ..... in ....., such as haemoglobin and cytochrome c, can be ..... between species.

Species with more similar biological molecules are likely to have evolved from a common ancestor more ..... than species with less similar biological molecules.

This helps to explain why species with different features that live close together geographically often have very similar sequences in their biological molecules.

[5]

Question 16 · A level Paper 2 · June 2025 · Q21(c)(ii) · 3 marks

(ii) Explain how fossils can be used to support the theory of evolution by natural selection.

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..... **[3]**

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Question 17 · information from earlier in the question

(b) Puffins, like many species on the Farne Islands, eat small fish. Their main predators are large gulls. Puffins are on the IUCN Red List for threatened species.

The puffin population can be estimated from the number of burrows that are occupied.

After the bird flu outbreak in 2023 the number of occupied burrows declined.

(i) It is important not to disturb the burrows and there is not enough money available to allow puffin burrows to be constantly monitored, either by humans or cameras.

Suggest **one other** type of evidence that could be used to infer that a burrow was being occupied by puffins.

..... **[1]**

Question 17 · A level Paper 2 · June 2025 · Q19(b)(iii) · 2 marks

(iii) Explain why the existence of a predator can improve the long-term survival of a species such as the puffin.

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..... **[2]**

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Mark schemes

Question 1 · A level Paper 3 · June 2018 · Q5(a)(ii) · 2 marks

		ii	*In the same domain because* (plants / pines, and, animals / humans) are both eukaryotes **or** description of similarity between plant and animal (eukaryotic) cells✓ *In different kingdoms because* description of difference between plants and animals ✓	2	**ALLOW** 'they are both eukaryotic' **ALLOW** 'all eukaryotes are classified in the same domain' e.g. 'both the pine and humans have cells with membrane-bound organelles' e.g. 'pines carry out photosynthesis but humans do not' 'plant cells have permanent vacuole but animal cells do not' 'difference is animal cells do not have cell wall'

Question 2 · AS Paper 1 · June 2023 · Q24(c) · 3 marks

	(c)		classification ✓ four / 4 ✓ Archaea ✓	**3**	**ALLOW** Archea / Archaebacteria
			Total	**8**	

Question 3 · AS Paper 2 · June 2025 · Q4(a)(i) · 1 mark

4	**(a)**	**(i)**	standardises classification across the world / AW ✓ each organism has its own unique name / AW ✓ avoids confusion, in naming species ✓ simplifies communication between, people with different languages / scientists in different countries ✓	
	Max 1	**1.1**	**ALLOW** 'universal naming system' / 'used across the world' **IGNORE** 'universal' unqualified **ALLOW** avoids ambiguity caused by common local names **ALLOW** universally understood (between countries with different languages)	

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Question 4 · AS Paper 2 · June 2025 · Q4(b) · 2 marks

(b)	*Organisms in Plantae kingdom:* (have) cell wall composed of cellulose ✓ (contain) chlorophyll / chloroplasts ✓ photosynthesise / autotrophic ✓ store starch ✓	**Max 2**

2.1	**IGNORE** multicellular **IGNORE** membrane bound organelles **IGNORE** reference to no mycelium

Question 5 · AS Paper 2 · June 2025 · Q4(c) · 1 mark

(c)	classification is based on phylogeny / AW ✓	**1**	**1.1**

IGNORE individual definitions of both terms as the questions asks for the **relationship** between the terms

ALLOW 'phylogeny informs classification'

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Question 6 · AS Paper 2 · June 2025 · Q4(d) · 2 marks

(d)	*Mark first 2 answers* *Three domain system has:* six kingdoms (not five) ✓ domains are Archaea, Bacteria and Eukarya ✓ domains are based on (similarities in biological) molecules ✓ organisms in different domains contain a, specific / unique, form of rRNA ✓

Max 2	**2.1**	**ALLOW** ORA for five kingdom **ALLOW** description of the 6 kingdoms e.g. 4 eukaryotic and 2 prokaryotic **ALLOW** 'eukaryotes' for Eukarya

Question 7 · AS Paper 2 · June 2019 · Q3(a)(ii) · 2 marks

(ii)		**2**	If additional terms are given then = max 1 for complete correct answer.
	intraspecific ✓		**ALLOW** intra-species
	variation ✓		**IGNORE** phenotypic / genetic / species **DO NOT ALLOW** variance / variety

Question 8 · A level Paper 2 · June 2018 · Q20(a)(iv) · 2 marks

(iv)	environment ✓	**2 max**
	genes / genetic / alleles , and environment ✓	
	many genes / polygenic ✓	
	age ✓	

ALLOW suitable example, e.g. diet

Note 'genes and environment' = 2 marks
IGNORE refs to mutation

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Question 9 · A level Paper 3 · June 2023 · Q4(b)(ii) · 2 marks

Question	Answer
4 (b) (ii)	

ıit	Type of adaptation
ɹ predators	behaviour(al)
mouflage	anatomical
act nutrients	physiological
s to climb	anatomical

✓ ✓

Mark	AO Element	Guidance
2	2.1	**2 correct = 1 mark** **4 correct = 2 marks** **ALLOW** 'anatomy' for 'anatomical' **ALLOW** 'physiology' for 'physiological' **ALLOW** 'anatomy' for 'anatomical'

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Question 10 · AS Paper 2 · June 2022 · Q6(b) · 4 marks

6	(b)	**1** (pale and) dark / colour difference, due to, genetic variation / (different) alleles / (random) mutation ✓ *in, industrial / polluted / urban / lichen-free, area:* **2** pale, selected against / eaten / less likely to survive **OR** dark, selected for / not eaten / more likely to survive ✓ **3** (more) dark, reproduce / pass on <u>allele</u> / pass on mutation **OR** fewer / no, pale, reproduce / pass on their <u>allele</u> ✓ **4** <u>frequency</u> of <u>allele</u> for, dark colour increases / pale colour decreases ✓

4	AO 1.2 AO 2.1	**1** look for statement **ALLOW REVERSE ARGUMENTS** *in, non-industrial / unpolluted / rural / lichen-rich, area:* **2** pale, selected for / not eaten / more likely to survive **OR** dark, selected against / eaten / less likely to survive **3** (more) pale, reproduce / pass on their <u>allele</u> **OR** fewer / no, dark, reproduce / pass on <u>allele</u> / pass on mutation **4** <u>frequency</u> of <u>allele</u> for, pale colour increases / dark colour decreases

Question 11 · AS Paper 2 · June 2022 · Q6(c) · 2 marks

6	(c)	**1** not closely related / no (recent) common ancestor / evolved separately, as, in different (named) families **OR** live / evolved, in different parts of the world ✓ **2** adapted / evolved, similarly / for same niche / for soil, as, both have / share, streamlined shape / modified fore limbs / velvety fur / diet of grubs and worms ✓	**2**	AO 1.2 AO 2.6

1 ALLOW different (named), countries / continents for 'parts of the world'

2 ALLOW developed to suit, same environment / same diet / soil, for 'adapted similarly' idea

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Question 12 · A level Paper 3 · November 2021 · Q3(e) · 1 mark

	e		insects (may) develop resistance ✓	1	2.1	**ALLOW** 'insects become resistant' **DO NOT ALLOW** references to immunity **DO NOT ALLOW** insecticides cause mutations leading to resistance

Question 13 · A level Paper 2 · June 2025 · Q21(a) · 2 marks

21	**(a)**	bacterial , diseases / infections , harder to treat **or** antibiotics cannot kill (resistant) bacteria ✓ **increased** deaths / AW ✓ need for new antibiotics ✓	**2 max**

1.2	**ALLOW** bacterial infections untreatable / fewer treatment options for bacterial infections / need larger dose **IGNORE** antibiotics , less effective / do not work **IGNORE** bacteria are immune **ALLOW** (more people affected so) reduced population **ALLOW** more serious illness **ALLOW** greater healthcare costs **ALLOW** *idea of* increased spread (of infection) **ALLOW** *idea of* limited / finite number of different antibiotics available

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Question 14 · A level Paper 2 · June 2025 · Q21(b) · 2 marks

21	**(b)**	antibiotic is selection pressure ✓ evolution is observable ✓ in short period of time / AW ✓	**2 max**	**3.2**

ALLOW it demonstrates how a population adapts or changes in response to a selection pressure

ALLOW within a human lifetime
ALLOW reproductive rate of bacteria is fast
ALLOW figures that demonstrate fast reproductive rate

Question 15 · A level Paper 2 · June 2025 · Q21(c)(i) · 5 marks

Question			Answer	Mark	AO
21	**(c)**	**(i)**	bases / nucleotides ✓ amino acids ✓ proteins ✓ compared ✓ recent(ly) ✓	**5**	**4 x 1.1** **3.1**

IGNORE pairs / bp

IGNORE polypeptides
ALLOW different / similar / conserved

Guidance

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Question 16 · A level Paper 2 · June 2025 · Q21(c)(ii) · 3 marks

Question			Answer	Mark	AO
21	(c)	(ii)	**1** evidence of , extinction / AW ✓ **2** *idea of* (fossils show) , development / evolution / changes (in anatomical features) , over time / over generations ✓ **3** can be dated ✓ **4** *idea of* age is based on depth (of fossil) ✓ **5** DNA can be , sequenced / profiled ✓	3 max	1.1

ALLOW general trend from , small / simple to , large / complex

ALLOW descriptions of changes
ALLOW fossils show missing links

ALLOW carbon dating

ALLOW sequencing described
ALLOW amino acid sequences

Question 17 · A level Paper 2 · June 2025 · Q19(b)(iii) · 2 marks

Question			Answer	Mark	AO
19	(b)	(iii)	predators are a selection pressure ✓ weaker individuals , removed from population / die ✓ (more) beneficial alleles , passed on / in next generation ✓	2 max	2.5

Guidance

ALLOW selective pressure

ALLOW better adapted individuals more likely to reproduce
IGNORE selected against

ALLOW alleles that are less useful are (gradually) removed from a population

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