Classification (18.1): Cambridge (CIE) A Level Biology 9700 Exam Questions by Topic

22 questions · 57 marks · about 68 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · Paper 4 · February/March 2022 (42) · Q9(a) · 3 marks

9 **(a)** Describe the biological species concept.

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Question 2 · Paper 4 · February/March 2022 (42) · Q9(b) · 1 mark

(b) Suggest when the morphological species concept is more useful than the biological species concept.

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Question 3 · information from earlier in the question

8 Bears are several species of mammal in the family Ursidae.

Climate change and loss of habitats due to human activity have reduced the size of some bear populations in recent years.

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(b) Grizzly bears, *Ursus arctos horribilis*, and polar bears, *Ursus maritimus*, are found in North America.

Fig. 8.1 shows a grizzly bear and a polar bear.



grizzly bear



polar bear

Fig. 8.1

Grizzly bears have:

- a varied diet that includes grasses, roots, berries, nuts, rodents, insects and fish
- a habitat of woodland or grassland
- a maximum mass of 270 kg.

Polar bears have:

- a diet that consists of other animals, such as seals
- a habitat of land and sea ice
- a maximum mass of 450 kg.

Climate change has caused populations of grizzly bears to spread further north and populations of polar bears to spread further south. In some areas there is habitat overlap and, on rare occasions, breeding between grizzly bears and polar bears has occurred.

The offspring of grizzly bears and polar bears are known as pizzly bears.

Pizzly bears can breed together in the wild.

Fig. 8.2 shows a pizzly bear.



Fig. 8.2

With reference to **three** different species concepts, discuss whether grizzly bears and polar bears should be classified as separate species.

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Question 4 · information from earlier in the question

3 (a) The sea blush, *Plectritis congesta*, is a flowering plant that grows on the west coast of North America.

Individual sea blush plants produce fruit that is either winged or wingless. Investigations have shown that this characteristic is controlled by a single gene with two alleles:

- a dominant winged fruit allele
- a recessive wingless fruit allele.

Fig. 3.1 shows the difference in structure between winged fruit and wingless fruit phenotypes.

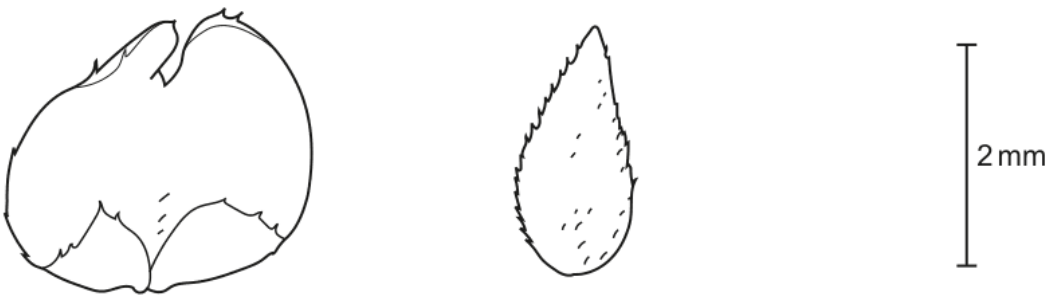


Fig. 3.1

Question 4 · Paper 4 · May/June 2023 (42) · Q3(a)(iii) · 3 marks

(iii) Early taxonomists classified sea blush plants with winged fruits as a different species to sea blush plants with wingless fruits.

Since this time, evidence from observations and experiments has confirmed that the plants belong to the same species.

Suggest **three** examples of the evidence obtained that helped to confirm that these sea blush plants belong to the same species.

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Question 5 · information from earlier in the question

1 The Visayan warty pig, *Sus cebifrons*, is found on two islands in the Philippines.

Fig. 1.1 shows a female Visayan warty pig with her young.



Fig. 1.1

Question 5 · Paper 4 · October/November 2018 (42) · Q1(b) · 3 marks

(b) Sometimes the Visayan warty pigs will breed with domestic pigs, *Sus domesticus*.

Suggest the consequences of this interspecific breeding.

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Question 6 · Paper 4 · May/June 2022 (41) · Q1(a)(i) · 2 marks

1 **(a)** The golden mantella, *Mantella aurantiaca*, is a small terrestrial frog found in Madagascar.

Fig. 1.1 shows a golden mantella.



Fig. 1.1

(i) Name the domain and kingdom to which the golden mantella belongs.

domain .....

kingdom .....
[2]

Question 7 · Paper 4 · May/June 2023 (42) · Q4(a) · 1 mark

4 Genetic technology uses many different enzymes and techniques.

(a) Restriction endonucleases are used in genetic modification. These enzymes occur naturally in prokaryotic cells. More than 3500 different restriction endonucleases have been identified and it is thought there are many more to discover.

Name **two** domains that are a source of restriction endonucleases.

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Question 8 · Paper 4 · February/March 2024 (42) · Q8(c) · 4 marks

(c) Differences between members of the domain Eukarya and members of the domain Bacteria include the presence or absence of particular membrane-bound cell structures.

Outline **other** differences in the characteristic features of members of the domain Eukarya and members of the domain Bacteria.

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Question 9 · Paper 4 · February/March 2022 (42) · Q9(c) · 4 marks

(c) Compare the characteristics of members of the domain Archaea with the characteristics of members of the domain Bacteria.

Include similarities and differences.

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Question 10 · Paper 4 · May/June 2025 (41) · Q9(a) · 3 marks

9 A species is classified into one of three domains.

(a) Two of the domains contain only prokaryotic species.

With reference to the two prokaryotic domains, describe the features used to classify prokaryotic species into two different domains.

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Question 11 · information from earlier in the question

8 **(a)** Approximately 2×10^9 people in the world are currently infected with the bacterial disease tuberculosis (TB) caused by *Mycobacterium tuberculosis*. Early diagnosis is important so that treatment can begin.

APOPO is a non-profit organisation that has trained African giant pouched rats, *Cricetomys gambianus*, to use their sense of smell to detect *M. tuberculosis*. They do this by sniffing a sample of thick mucus from the lungs of people who may have TB. The African giant pouched rats are able to detect the presence of *M. tuberculosis* with an accuracy of 87–93%.

Fig. 8.1 shows an African giant pouched rat.



Fig. 8.1

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Question 11 · Paper 4 · February/March 2024 (42) · Q8(a)(ii) · 2 marks

(ii) Suggest why African giant pouched rats trained to detect *M. tuberculosis* may also be able to detect other species of *Mycobacterium* that cause TB.

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Question 12 · Paper 4 · February/March 2024 (42) · Q8(b) · 2 marks

(b) The African giant pouched rat belongs to the kingdom Animalia in the domain Eukarya.

Complete Table 8.1 to show the full classification of the African giant pouched rat.

Table 8.1

kingdom	Animalia
.....	Chordata
class	Mammalia
.....	Rodentia
family	Nesomyidae
.....	.....
species	*gambianus*

[2]

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6 (a) The sea otter, *Enhydra lutris*, is a marine mammal that lives on the coasts of the North Pacific ocean.

Fig. 6.1 shows a sea otter.



Fig. 6.1

Table 6.1 shows part of the classification of the sea otter.

Table 6.1

taxonomic group	name
phylum	Chordata
.....	Mammalia
order	Carnivora
.....	Mustelidae
genus	*Enhydra*
species	*lutris*

Complete Table 6.1 by adding the correct taxonomic groups in the **two** spaces provided. [2]

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Question 14 · Paper 4 · October/November 2018 (42) · Q1(c) · 2 marks

(c) Table 1.1 shows part of the classification of the Visayan warty pig.

Complete Table 1.1.

Table 1.1

taxonomic group	name
domain	.....
kingdom	animalia
phylum	chordata
.....	mammalia
order	artiodactyla
family	suidae

[2]

Question 15 · Paper 4 · February/March 2021 (42) · Q2(a)(i) · 1 mark

2 **(a)** The grey wolf, *Canis lupus*, is a large predator. During the 20th century, the grey wolf in south-west Europe was hunted almost to extinction.

Fig. 2.1 shows a grey wolf.



Fig. 2.1

(i) State the genus of the grey wolf.

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Question 16 · information from earlier in the question

3 Mammals such as sheep, *Ovis aries*, and goats, *Capra hircus*, are important agricultural animals that are sometimes kept together in mixed flocks. Very occasionally, live offspring are born from a mating between a male sheep and a female goat.

In sheep 2n = 54 and in goats 2n = 60.

Question 16 · Paper 4 · October/November 2018 (42) · Q3(a)(ii) · 1 mark

(ii) Outline why the classification of sheep and goats suggests that hybridisation between them should **not** be likely to occur.

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Question 17 · Paper 4 · May/June 2021 (42) · Q3(a)(ii) · 3 marks

(ii) Explain how the classification of species into a taxonomic hierarchy assists the work of conservation bodies such as the IUCN.

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Question 18 · Paper 4 · May/June 2022 (42) · Q10(d) · 4 marks

(d) The African penguin is a member of the kingdom Animalia.

Outline the characteristic features of the kingdom Animalia.

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10 (a) The moose, *Alces alces*, is a large member of the deer family. It lives in temperate forests in North America and northern Europe, where snow is present for large parts of the year.

Fig. 10.1 shows an adult male moose feeding in a lake.



Fig. 10.1

The moose feeds on a plant in the lake called watermilfoil, *Myriophyllum aquaticum*.

The moose and the watermilfoil belong to the domain Eukarya, which includes the kingdoms Animalia and Plantae.

Describe the main differences between the kingdom Animalia and the kingdom Plantae.

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Question 20 · Paper 4 · October/November 2023 (42) · Q2(d) · 2 marks

(d) State **two** features, other than reproduction using spores, of the kingdom Fungi.

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Question 21 · Paper 4 · May/June 2023 (41) · Q2(c)(ii) · 2 marks

(ii) Seaweeds were once thought to be plants but are now classified in the kingdom Protoctista.

Outline the features of the kingdom Protoctista that are shown by **seaweeds**.

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Question 22 · Paper 4 · February/March 2024 (42) · Q8(d) · 2 marks

(d) Describe, with reference to the structure of viruses, how viruses are classified.

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Mark schemes

Question 1 · Paper 4 · February/March 2022 (42) · Q9(a) · 3 marks

9(a)	1	individuals (within a population) can, breed / mate / reproduce ;	3
	2	to produce fertile offspring ;	
	3	are reproductively isolated (from other species) / AW ;	

Question 2 · Paper 4 · February/March 2022 (42) · Q9(b) · 1 mark

9(b)	*any **one** from:*		1
	1	for organisms that, do not breed sexually / are asexual ;	
	2	for, fossil / extinct, organisms ;	
	3	morphological differences are easier to determine ;	
	4	often not possible to observe reproductive behaviour ;	
	5	time required for mating behaviour may take too long (to be observed) / not possible to achieve conditions in which mating can occur (while being observed) ;	

Question 3 · Paper 4 · May/June 2024 (41) · Q8(b) · 6 marks

8(b)	*any **six** from*:	6
	biological species (concept)	
	1 no / not separate species / same species ;	
	2 as can, interbreed / breed together, to produce, fertile offspring / pizzly bears **or** they are not reproductively isolated ;	
	morphological species (concept)	
	3 yes / separate species / different species ;	
	4 as have different, colours / mass / size / hump size ;	
	ecological species (concept)	
	5 yes / separate species / different species ;	
	6 as have different, niches / diets / habitats ;	
	genetic / phylogenetic, species (concept)	
	7 unsure / don't know ;	
	8 as no information about genetic similarity ;	
	9 AVP ;	

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Question 4 · Paper 4 · May/June 2023 (42) · Q3(a)(iii) · 3 marks

3(a)(iii)	*any **three** from:* *both types* 1 (inter)breed to produce fertile offspring / not reproductively isolated ; 2 occupy the same niche ; 3 same / similar, morphology / physiology / biochemistry ; **A** description **I** fruit shape 4 have, similar / same, genes / DNA sequences / genomes ; 5 similar / same, proteins / amino acid sequences ;	**3**

Question 5 · Paper 4 · October/November 2018 (42) · Q1(b) · 3 marks

1(b)	*any three from* **1** hybrids formed / fewer warty pigs produced ; **2** may be sterile ; **3** genetically different (from warty pigs) ; **4** (hybrid) less adapted for natural environment ; **5** (hybrid) *ref. to* susceptibility to, diseases / parasites ;	**3**

Question 6 · Paper 4 · May/June 2022 (41) · Q1(a)(i) · 2 marks

1(a)(i)	Eukarya ; Animalia ;	**2**

Question 7 · Paper 4 · May/June 2023 (42) · Q4(a) · 1 mark

4(a)	Bacteria **and** Archaea ;	**1**

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Question 8 · Paper 4 · February/March 2024 (42) · Q8(c) · 4 marks

8(c) *any **four** from:* **4**

comparative statements required

	Eukarya		Bacteria	
1	linear DNA	**and**	plasmids / circular DNA	;
2	histones	**and**	no histones	;
3	cell walls only in some	**and**	cell walls in all	;
4	cellulose / chitin, cell walls	**and**	peptidoglycan cell wall	;
5	divide by mitosis	**and**	divide by binary fission	;
6	some sexual reproduction	**and**	asexual reproduction	;
7	(70S and) 80S ribosomes	**and**	70S ribosomes (only)	;
8	have cells > 5 μm diameter	**and**	cells1–5 μm diameter	;

Question 9 · Paper 4 · February/March 2022 (42) · Q9(c) · 4 marks

9(c) *any **four** from:* **4**

*max **three**:*

1 both are prokaryotes
or
both have no, nucleus / (double) membrane-bound organelles ;

2 both have circular DNA ;

3 both have 70S ribosomes ;

4 both reproduce by, binary fission / budding / fragmentation ;

*max **three**:*

5 bacteria cell wall made of peptidoglycan whereas Archaea cell wall does not have peptidoglycan ;

6 bacteria cell membrane has ester-linked lipids whereas Archaea cell membrane has ether-linked lipids ;

7 have different ribosomal RNA ;

8 Bacteria do not have (DNA associated with) histones whereas Archaea do have (DNA associated with) histones ;

9 Bacteria form spores whereas Archaea do not form spores ;

Question 10 · Paper 4 · May/June 2025 (41) · Q9(a) · 3 marks

9(a) *any **three** from*: **3**

1 (domains are) Archaea and Bacteria ;
2 membrane lipids ester-linked (Bacteria) vs. ether-linked / not ester-linked (Archaea) ;
3 single type of rRNA (Bacteria) vs. 3 types (Archaea)
or
Archaea, rRNA / ribosomal subunit, similar to eukaryotic ;
4 peptidoglycan (Bacteria) vs. not peptidoglycan / different (Archaea) ;
5 AVP ;

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Question 11 · Paper 4 · February/March 2024 (42) · Q8(a)(ii) · 2 marks

8(a)(ii)	*any **two** from:* 1 (different mycobacterial species produce) the same / similar, chemicals / proteins ; 2 (since) share common ancestors / same genus / share many genes / closely related ; 3 **same** chemoreceptors stimulated ;	**2**

Question 12 · Paper 4 · February/March 2024 (42) · Q8(b) · 2 marks

8(b) **2**

kingdom	Animalia
phylum	Chordata
class	Mammalia
order	Rodentia
family	Nesomyidae
genus	***Cricetomys***
species	*gambianus*

4 correct = 2 marks
1 / 2 / 3 correct = 1 mark

Question 13 · Paper 4 · February/March 2020 (42) · Q6(a) · 2 marks

6(a) class ; family ; **2**

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Question 14 · Paper 4 · October/November 2018 (42) · Q1(c) · 2 marks

1(c)	Eukarya ; **R** eukaryote(s) / Eukaryota class ;	**2**

Question 15 · Paper 4 · February/March 2021 (42) · Q2(a)(i) · 1 mark

2(a)(i)	*Canis* ;	**1**

Question 16 · Paper 4 · October/November 2018 (42) · Q3(a)(ii) · 1 mark

3(a)(ii)	different, species / genus ;	**1**

Question 17 · Paper 4 · May/June 2021 (42) · Q3(a)(ii) · 3 marks

3(a)(ii)	*any **three** from:* **1** records / assesses, biodiversity ; **2** so conservation decisions can be made / AW ; **3** example of conservation action 1 ; **4** example of conservation action 2 ; e.g. (IUCN) red list of threatened species / identifying endangered species (CITES) regulation of trade ref. assisted reproduction or ref. captive breeding seed banks place in, zoos / national parks / marine parks / botanical gardens **5** (taxonomic hierarchy is) internationally, recognised / standardised / AW ;	**3**

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Question 18 · Paper 4 · May/June 2022 (42) · Q10(d) · 4 marks

10(d)	*any **four** from:* 1 multicellular ; 2 eukaryote / eukaryotic / (cells) contain a nucleus ; 3 specialised cells / tissues / organs ; 4 heterotrophic (nutrition) / described ; 5 nervous system ; 6 cilia / flagella ; 7 mobile / motile ;	**4**

Question 19 · Paper 4 · May/June 2023 (43) · Q10(a) · 4 marks

10(a) *any **four** from:* **4**

	Animalia		Plantae	
1	no cell walls	and	cell walls	;
2	no, chlorophyll / chloroplasts	and	chlorophyll / chloroplasts	;
3	heterotroph	and	autotroph / photosynthesis	;
4	glycogen	and	starch	;
5	nervous system	and	no nervous system	;
6	move from place to place	and	unable to move from place to place	;
7	no, permanent / central, vacuole	and	permanent / central, vacuole	;

Question 20 · Paper 4 · October/November 2023 (42) · Q2(d) · 2 marks

2(d)	*any **two** from:* 1 eukaryotic (cells) / described ; 2 heterotrophic / saprotrophic / parasitic / described ; 3 chitin cell walls ; 4 (most have) hyphae / mycelium ; 5 multinucleate (cells) ; 6 multicellular and unicellular ;	**2**

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Question 21 · Paper 4 · May/June 2023 (41) · Q2(c)(ii) · 2 marks

2(c)(ii)	*any **two** from:* **1** eukaryotic (cells) ; **2** autotrophic / photosynthetic ; **3** cellulose cell wall ; **4** aquatic ; **5** not motile / sessile ; **6** multicellular ; **7** no, vascular tissue / xylem / phloem ;	**2**

Question 22 · Paper 4 · February/March 2024 (42) · Q8(d) · 2 marks

8(d)	*any **two** from:* 1 have DNA or RNA ; 2 nucleic acid is double or single stranded ; 3 AVP ; e.g.presence or absence of phospholipid envelope presence or absence of tail sheath type of host type of disease caused	**2**

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