

8: Inheritance and evolution – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	March	32
6	2016	March	32
6	2016	June	32

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 Fig. 2.1 shows three mammals.

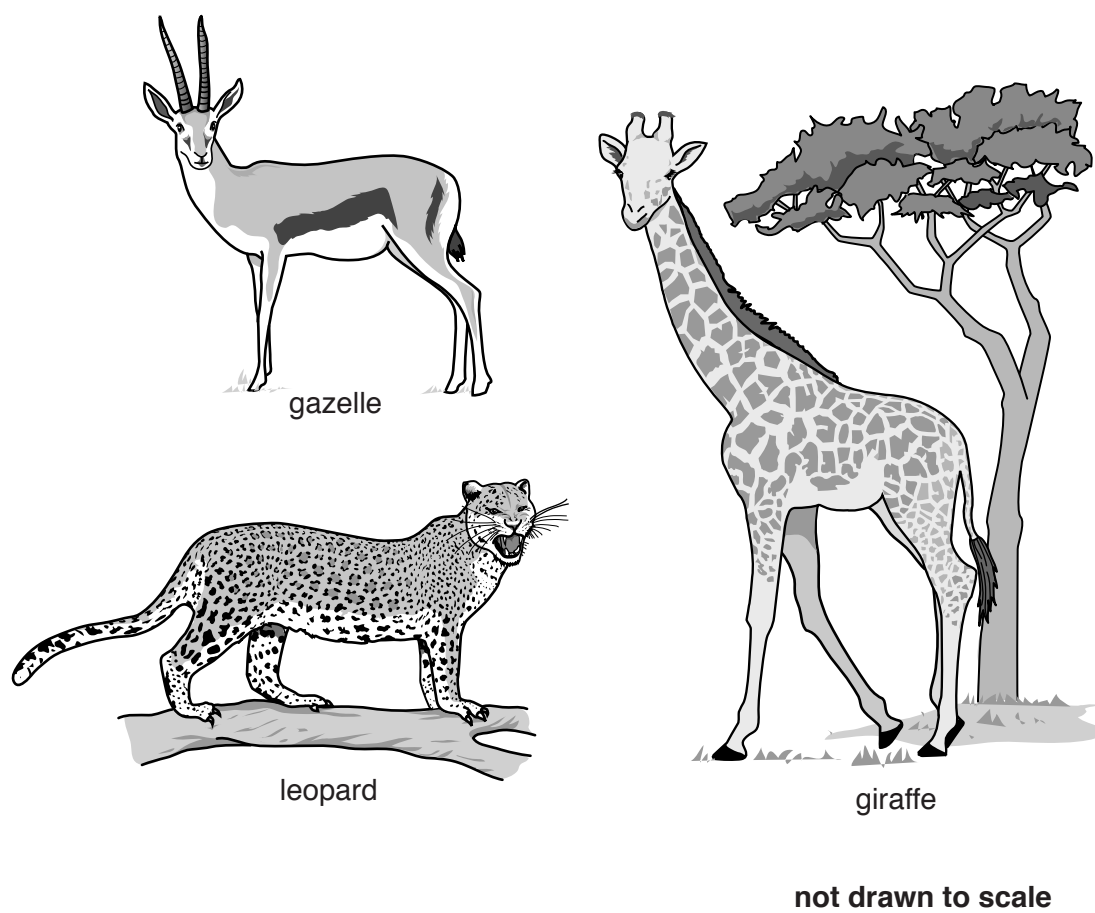


Fig. 2.1

For each mammal, choose **one** adaptive feature **visible** in Fig. 2.1 and outline how it helps the mammal to survive in its environment.

Choose a **different** feature for each mammal.

Write your answers in Table 2.1.

Table 2.1

name of mammal	adaptive feature	how feature helps the mammal to survive in its environment
gazelle		
giraffe		
leopard		

[6]

[Total: 6]

6 (a) (i) Define the term *chromosome*.

.....

.....

.....

.....

..... [2]

(ii) Fig. 6.1 shows a plant cell.

On Fig. 6.1, draw a line labelled **W** to show where chromosomes are found in this cell.

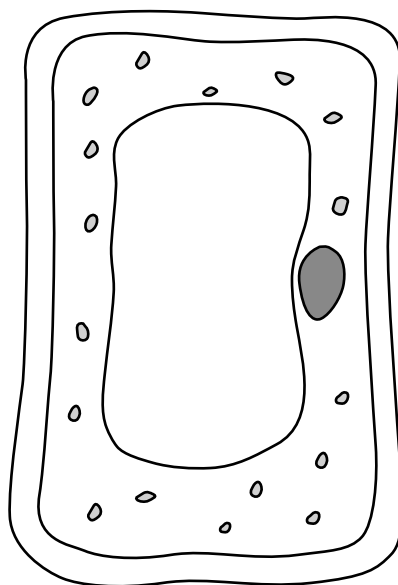


Fig. 6.1

[1]

(b) In mice the allele for black fur (**B**) is dominant to the allele for white fur (**b**).

A mouse with black fur was mated with a mouse with white fur.

The mouse with black fur had the genotype **Bb**.

Complete Fig. 6.2 to show how fur colour is inherited by the offspring of this mating.

<i>parental phenotypes</i>	black fur	×	white fur
<i>parental genotypes</i>	×
<i>gametes</i> +	× +
 <i>Punnett Square</i>			
<i>offspring genotypes</i>
<i>offspring phenotypes</i>
<i>ratio</i> black : white		

Fig. 6.2

[5]

(c) Sex inheritance in mice is the same as in humans.

State the sex chromosomes of a male mouse and a female mouse.

male mouse

female mouse

[2]

[Total: 10]

- 6 (a) Define the term *genetic engineering*.

.....

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.....

.....[2]

- (b) (i) Outline why bacteria are useful in genetic engineering.

.....

.....

.....

.....

.....[2]

- (ii) Table 6.1 contains six statements about biological processes. Only **two** of these use genetic engineering. Identify these two processes. Place a tick in the box (✓) next to your choices.

Table 6.1

statement	uses genetic engineering
producing fruit juice using pectinase	
introducing genes into crop plants to provide additional vitamins	
selective breeding to produce organisms with desirable features	
placing a section of DNA into bacteria to produce human insulin	
using yeast to produce ethanol	
using a contraceptive implant as a method of birth control	

[2]

(c) Scientists have used genetic engineering to develop crop plants which are resistant to herbicides.

(i) Explain why farmers use herbicides.

.....

.....

.....

.....

.....[2]

(ii) A field contains genetically modified crop plants which are resistant to herbicides. It also contains some weeds. The plants are sprayed with herbicides.

State how the herbicide affects:

the weeds

.....

.....

the crop plants.

.....

.....[2]

[Total: 10]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
()	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks						
2	(feature and reason must match for 2 marks; A AVP (visible) with associated reason; A possession of fur for one animal only; A							
	<table><tr><th>mammal</th><th>feature</th><th>survival advantage</th></tr><tr><td>gazelle</td><td>long legs; large ears; horns; eyes placed laterally; fur pattern;</td><td>escape predators; warning of danger; defence ; to detect predators; camouflage;</td></tr></table>	mammal	feature	survival advantage	gazelle	long legs; large ears; horns; eyes placed laterally; fur pattern;	escape predators; warning of danger; defence ; to detect predators; camouflage;	[max 2]
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	<table><tr><td>giraffe</td><td>long legs; long neck; fur pattern; long eye-lashes; eyes placed laterally; large ears;</td><td>reaching food/ escaping predators; reaching food/ leaves; camouflage ; protection against dust/ insects / thorns; to detect predators ; warning of danger;</td></tr></table>	giraffe	long legs; long neck; fur pattern; long eye-lashes; eyes placed laterally; large ears;	reaching food/ escaping predators; reaching food/ leaves; camouflage ; protection against dust/ insects / thorns; to detect predators ; warning of danger;	[max 2]			
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<table><tr><td>leopard</td><td>fur pattern; long tail; large claws; long/pointed teeth; forward facing eyes; whiskers;</td><td>camouflage; balance; disable prey; disable/ eat prey; focus on prey; increased sensitivity;</td></tr></table>	leopard	fur pattern; long tail; large claws; long/pointed teeth; forward facing eyes; whiskers;	camouflage; balance; disable prey; disable/ eat prey; focus on prey; increased sensitivity;	[max 2]				
leopard	fur pattern; long tail; large claws; long/pointed teeth; forward facing eyes; whiskers;	camouflage; balance; disable prey; disable/ eat prey; focus on prey; increased sensitivity;						
description/AW)								

Question	Answer	Marks														
6 (a) (i)	thread like structure/AW; contains DNA; carries genes / genetic information/ hereditary material;	[max 2]														
6 (a) (ii)	line ending on the nucleus;	[1]														
6 (b)	<i>parental genotypes:</i> $Bb \times bb$; <i>gametes:</i> $B + b \times b + b$; <i>F₁ genotypes:</i> $Bb + bb + Bb + bb$; <i>F₁ phenotypes:</i> black + white + black + white; <i>ratio:</i> 1 black : 1 white;	[5]														
6 (c)	(I indeterminate letters) (male) XY; (female) XX;	[2]														
[Total: 10]																
6 (a)	Change the genetic material (of an organism) ; By removing / changing / inserting (individual) genes ; From one organism / species to another ;	[max 2]														
6 (b) (i)	rapid reproduction ; can make complex molecules ; cheaper to produce ; ref. to no ethical issues ;	[max 2]														
6 (b) (ii)	3 ticks deduct 1 mark 4, 5 or 6 ticks = 0 marks <table><tr><th>statement</th><th>uses of genetic engineering?</th></tr><tr><td>producing fruit juice using pectinase</td><td></td></tr><tr><td>introducing genes into crop plants to provide additional vitamins</td><td>✓</td></tr><tr><td>selective breeding to produce organisms with desirable features</td><td></td></tr><tr><td>placing a section of DNA into bacteria to produce human insulin</td><td>✓</td></tr><tr><td>using yeast to produce ethanol</td><td></td></tr><tr><td>the use of contraceptive implants in birth control</td><td></td></tr></table>	statement	uses of genetic engineering?	producing fruit juice using pectinase		introducing genes into crop plants to provide additional vitamins	✓	selective breeding to produce organisms with desirable features		placing a section of DNA into bacteria to produce human insulin	✓	using yeast to produce ethanol		the use of contraceptive implants in birth control		[2]
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the use of contraceptive implants in birth control																
6 (c) (i)	to kill weeds; to reduce competition, with weeds / for resources; to increase crop yield;	[max 2]														
6 (c) (ii)	(the weeds) kills them AW ; (the crop plants) no effect/ does not kill them ;	[2]														
[Total: 10]																