

# MARK SCHEME

# GCSE

## BIOLOGY

## AQA - COMBINED SCIENCE

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B 6 - TEST 4

INHERITANCE, VARIATION AND EVOLUTION

Intermediate

## Mark schemes

<b>1.</b>	(a) grow from parents, by vegetative reproduction/asexual reproduction/ no sexual reproduction <i>for 1 mark each</i>	2	<b>[3]</b>
	(b) e.g. different environmental conditions/named condition <i>for 1 mark</i>	1	
<b>2.</b>	(a) asexual reproduction	1	
	(b) mitosis	1	
	(c) clones	1	
	(d) 44	1	<b>[4]</b>
<b>3.</b>	(a) <i>idea</i> identical (do <u>not</u> allow simply “the same number”) <i>for 1 mark</i>	1	
	(b) <i>idea</i> chromosomes double/duplicate/copies made <i>for 1 mark</i>		
	separate into 2 sets/divide* <i>gains 1 mark</i>		
	<b>but</b> separate into 4 sets/divide twice* <i>gains 2 marks</i>		
	number halved compared to bodycell <b>or</b> single set (only) 16 accept in terms of cells but only if chromosomes referred to in first and/or last items) <i>for 1 mark</i>	4	<b>[5]</b>

4.

(a) woman XX  
man XY

*for 1 mark each*

2

(b) 50% / 1 in 2 / evens / 0.5 / 50:50

*for 1 mark*

mark scheme for genetic diagram

gametes all correct

genotypes of offspring all correct in relation to gametes

*for 1 mark each*

1

mark scheme for written explanation

half sperm have X chromosome, half have Y

and

all eggs have X chromosome

50% / 1 in 2 / evens / 0.5 chance of egg being fertilised  
by X or Y sperm

*for 1 mark each*

2

[5]

5.

**Level 3:** Relevant points (advice / reasons) are identified, given in detail and logically linked to form a clear account.

5-6

**Level 2:** Relevant points (advice / reasons) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3-4

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1-2

**No relevant content**

0

**Indicative content**

**precautions with reasons**

- do not prescribe fluoroquinolone / antibiotics for mild infections
- because they will get better due to the body's normal immune system
  
- do not prescribe fluoroquinolone / antibiotics for viral infections / colds / flu
- because antibiotics do not kill viruses
  
- if you do prescribe fluoroquinolone / antibiotics make sure the patient finishes the course
- because any bacteria left may develop resistance, survive and reproduce rapidly (due to lack of competition)
  
- only prescribe fluoroquinolone if the patient has the new strain
- because routine use would lead to an increase in resistant bacteria

**other relevant content**

- doctors and nurses in the practice / hospital should be using antibacterial / alcohol hand wash between each patient **and / or** disinfectant to clean wards to kill (resistant) bacteria
  
- doctors should isolate patients with this strain of bacteria
- to prevent other patients getting the resistant infection

[6]

6.

- (a) cell membranes 1
- (b) (i) two recessive / cystic fibrosis / faulty / diseased / the allele(s) / genes  
*two can be implied by second marking point*  
*ignore chromosomes* 1
- from Bob **and** Carol / both parents / the parents  
*if no other marks awarded 'Carol is a carrier' gains 1 mark* 1
- (ii) (inherited) dominant / normal allele / gene 1
- from Carol / mother  
*ignore references to recessive allele / gene from father / Bob*  
*if no other marks awarded he has just / only one recessive allele*  
*gains 1 mark* 1

(c) (i) reduce number of people with cystic fibrosis (in population)

**or**

reduce health-care costs

**or**

expensive to have baby with cystic fibrosis

*accept to allow decision / emotional argument qualified  
eg allows abortion*

**or**

*allows people to make choices about termination*

**or**

*help to prepare financially / emotionally etc*

1

(ii) any **one** from:

- possible damage / risk to embryo / fetus / baby  
*allow possible harm / risk to mother*
- screening / it is expensive
- (may) have to make ethical / moral / religious decisions  
*ignore not natural / playing God / unethical / immoral / religious  
unqualified*
- right to life

1

[7]

7.

(a) circles round right hand **X** and **Y** gametes

*put two ticks **or** crosses by the circles*

2

(b) 50:50 **or** 1:1 **or** 50% **or** 0.5 **or** ½ equal **or** evens

*credit even*

*do not accept 2:1 **or** 50 / 50*

1

- (c) (i) 23 1
- (ii) 23  
*credit the same as the one above to be marked consequential* 1
- (d) DNA  
*do not accept nucleic acid* 1
- (e) same 1

[7]

8.

- (a) sexual / sex  
*for 1 mark* 1
- (b) *idea that*  
sexual reproduction brings about a mixture of genes  
or similar / different genes / parents / gametes / DNA /  
characteristics / chromosomes (*not* features)  
*for 1 mark* 1
- (c) (i) asexual / cloning (*allow* vegetative)  
*for 1 mark* 1
- (ii) (A) *idea that* (they are exactly the same). *Do not allow*  
similar or just one named feature.  
*for 1 mark* 2
- (B) different (*allow* similar but *do not allow* same).  
*Allow* any one named difference  
*for 1 mark*
- (d) (i) greater the X-ray dose, greater the % of mutations  
**or** % of mutations increases steadily / in proportion to X-ray dose  
*for 1 mark* 1
- (ii) ionising radiations / ultra-violet light / alpha particles / beta particles  
/ gamma rays / radio activity / chemicals / drugs / smoking / natural  
in meiosis / spontaneous / cell replication / toxic waste / pollution 1
- Accept* radioactivity but not radiations alone.  
*for 1 mark*

[7]

<b>9.</b>	(a) <i>Oryx</i>	1
	(b) any <b>two</b> from:	
	<ul style="list-style-type: none"> <li>• white / light colour (to reduce thermal gain)</li> <li>• short fur (to reduce thermal insulation)</li> <li>• little body fat</li> <li>• large hooves (to walk in sand)</li> <li>• camouflaged (against sand by light colour)</li> </ul>	2
	(c) any <b>three</b> from:	
	<ul style="list-style-type: none"> <li>• variation in population</li> <li>• animals with longest horns more likely to survive / reproduce</li> <li>• passing on alleles for long horns</li> <li>• repeated over many generations</li> </ul>	3
	(d) breeding programme	1
	(e) any <b>one</b> from:	
	<ul style="list-style-type: none"> <li>• to increase genetic diversity <i>do not accept to increase biodiversity</i></li> <li>• species may be unable to cope if environment changes</li> <li>• all susceptible to same diseases / inbreeding problems <i>allow otherwise all offspring would have similar genes or a decreased gene pool</i></li> <li>• prevents inbreeding</li> </ul>	1
		<b>[8]</b>
<b>10.</b>	(a) remains / traces of organisms	1
	from millions of years ago	1
	(b) no individuals of a species still alive	1
	(c) microorganisms have a simpler structure than a trilobite	1
	stromatolites are found in older rock than trilobites	1
	(d) <i>Marginocephalia</i>	1

- (e) Protoceratops **and** Triceratops  
(in either order)

*allow*

*Coronosaurus **and** Triceratops*

**or**

*Coronosaurus **and** Protoceratops*

**or**

*Marginocephalia **and** Pachycephalosaurus*

1

- (f) any **one** from:

- the fossil record is not complete
- new fossils may have been found since 1970s
- DNA / chemical analysis may have given new information

1

[8]

11.

- (a) (different / alternative) forms of a gene

*do **not** accept types of genes*

1

- (b) DNA isolated from embryo

1

(fluorescent) probe mixed with embryo DNA

1

probe (then) binds with embryo DNA

1

(UV light) to show alleles / gene for disorder

1

- (c) genotypes of parents and gametes correct (Man **D** and **d**, Wife **d** and **d**)

*allow half-size genetic diagram with only one **d** from wife*

1

offspring genotypes correct ( $\frac{1}{2}$  = **Dd** and  $\frac{1}{2}$  = **dd**)

*allow ecf if parental genotypes are wrong*

1

offspring phenotypes correctly assigned to genotypes

1



(d) genotypes of parents and gametes correct (**N** and **n**)  
*allow ecf if parental genotypes are wrong*

1

offspring genotypes correct (**NN**, 2 × **Nn**, and **nn**)

1

offspring phenotypes correctly assigned to genotypes;

1

correct probability = 0.25 /  $\frac{1}{4}$  / 25% / 1 in 4 / 1:3, only;  
*do not allow '3:1' / '1:4'*

1

[12]