

Biotechnology and Genetic Engineering

Mark Scheme 4

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Biotechnology and Genetic Engineering
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 4

Time Allowed: 63 minutes

Score: /52

Percentage: /100

<p>1 (a)</p>	<p><i>full marks may be possible from a fully annotated genetic diagram</i></p> <p>females are XX, males are XY ;</p> <p>female gametes are X, male gametes are X or Y ;</p> <p>ref to random fusion of gametes / shown in a Punnett square or alternative ;</p> <p>1:1 / 50:50 / described, shown / stated ;</p>	<p>[4]</p>	
<p>(b)</p>	<p>ref to, identify / separate, sperm with X (chromosome) ;</p> <p>semen / sperm, inserted / injected, into, uterus / oviduct ;</p> <p>at / around time of, ovulation / AW ;</p>	<p>max [2]</p>	
<p>(c)</p>	<p>1 formula milk is, similar / closer in composition, to human milk ;</p> <p>2 any nutrient with similar quantities in formula and human milk ;</p> <p>3 <i>idea that</i> human milk meets requirements of human babies ; <i>comparisons with cow's milk</i></p> <p>4 formula supplies less protein which is harder to digest ;</p> <p>5 formula supplies more iron, for haemoglobin formation / to prevent anaemia ;</p> <p>6 formula supplies more vitamin D for, absorption of calcium / formation of bone / for strong bones / prevention of rickets ;</p> <p>7 formula supplies more vitamin A, for immune system / retina / rods / vision in dim light / prevention of night blindness ;</p> <p>8 use of comparative figures <u>with correct units</u> ;</p>	<p>max [4]</p>	
<p>(d)</p>	<p>biological / made by cells ;</p> <p>catalyst / speeds up the rate of a reaction ;</p> <p>made of protein ;</p>	<p>max [2]</p>	

<p>1 (e)</p>	<p>1 2 3 4 5 6 7 8 9 10</p>	<p>tubes 1 and 3 – the effect of pH</p> <p>lysozyme is active in, 1/pH 4.0/acid ;</p> <p><u>cell walls</u>, broken down/digested/destroyed in tube 1 ;</p> <p>no (bacterial) growth in tube 1 ;</p> <p>tubes 1 and 4 – the effect of type of bacteria</p> <p>lysozyme, destroys /AW, bacteria, A/in tube 1 ;</p> <p>lysozyme does not, destroy/AW, bacteria, B/in tube 4 ;</p> <p>ref to specificity to bacteria A/bacteria B is resistant ;</p> <p>ignore bacteria are immune</p> <p><i>idea that</i> nothing in (cell wall of) bacteria B for lysozyme to digest ;</p> <p>tubes 1 and 2 – the effect of boiling</p> <p>lysozyme denatured (by boiling) ;</p> <p>lysozyme not, active ;</p> <p><i>idea that</i> tube 2 is a control to show that lysozyme is responsible for no growth in tube 1 ;</p>	<p>max [6]</p>	
<p>(f)</p>	<p>1 2 3 4</p>	<p>gives (passive) <u>immunity</u> ;</p> <p>defends against, infection/illness/disease/pathogens /AW ;</p> <p>ref to diseases that the mother has had ;</p> <p>any one function of antibodies ;</p>	<p>max [2]</p>	

Question	scheme		Guidance
2 (a) (i)	<p><i>any two suitable examples</i></p> <p>flood ; tsunami / tidal wave ; monsoon ; volcanic eruption ; A volcano(es) earthquake ; typhoon / hurricane / storm / cyclone ; fire ; drought ; crop / animal, disease ; R disease unqualified plague of pests of, crops / animals ; (e.g. locusts) AVP ;</p>	[max 2]	R snowstorms / tornadoes / landslides / avalanches / mudslides
	(ii)	[max 1]	<p>R volcanoes / volcanic eruptions R famine R drying up of land</p>
(b)	<p>1 overall increase (over the time period of Fig. 6.1) ; 2 natural disasters, fluctuates / described / irregular ; 3 human induced, increase ; 4 comparative data quote for named cause <i>or for</i> total causes ;</p> <p>5 sudden onset increase / ora ; 6 economic factors increase / ora ; 7 comparative data quote for same cause ;</p>	[max 5]	<p>2 increase + decrease is minimum 4 with year and number of shortages for each quote 7 as for 4</p>

Question	scheme		Guidance
2 (c)	1 land needed for, building / urbanisation / AW ; 2 (so) not enough land to grow crops ; 3 increase in food production damages land ; 4 salination ; 5 desertification / erosion ; 6 overgrazing ; 7 not enough water ; 8 <i>idea that</i> increase in demand for food makes food too expensive for poorer people to buy ; 9 richer nations take more of food / food crops exported (for foreign currency) / agricultural land used for, cash crops / non food crops ; 10 difficult to distribute food ; 11 increased competition / conflict, if food production stays the same while population increase ; 12 AVP ; e.g. food production does not keep up with population growth, increase population leads to increase pollution	[max 3]	3 A overcultivation 7 disruption to water supply <i>or</i> e.g. such as dams
(d)	1 suitable named crop plant or domesticated animal ; 2 suitable feature to improve ; 3 select individuals for breeding ; 4 select offspring that show improvement ; 5 use these for future breeding / AW ; A 'repeat the process'	[max 4]	R genetic modification R 'cows bred together' A cattle with high milk yield are bred together / high yielding corn are bred together = 3 marks R cow for milk x bull for meat
(e)	transfer of, a gene / an allele, from one species to another ; A 'type of organism' <i>or</i> 'from one variety to another'	[1]	
[Total: 16]			

3 (a) *idea that* gene(s) are transferred ; **A** genetic information / DNA **R** chromosome from one, species / organism, to another, species / organism ; [2]

(b) DNA / RNA / nucleic acid ; [1]

(c) (i) testosterone ; **R** spellings with 'oge' [1]

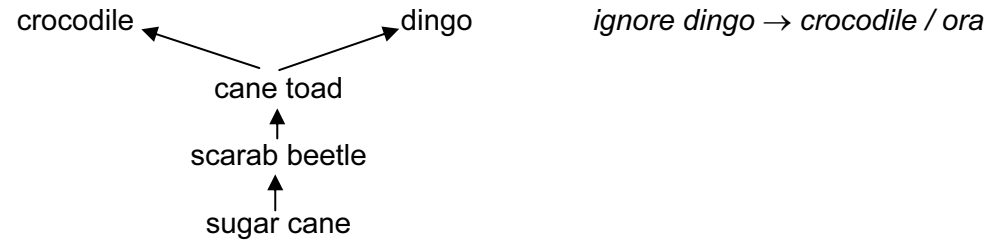
(ii) voice will break / AW ;
hair on, chest / face / under arms / in pubic area / around sex organs ;
shoulders broaden ;
muscle develops ;
penis enlarges ;
testes / scrotum, enlarge ; } **A** genitals, grow / enlarge
produce, sperm / seminal fluid / AW ;
named behavioural change ; [max. 2]

put ticks and crosses in a column on right hand side of answer

(d) (i) (x axis) time / years / months ;
(y axis) number of toads / number of individuals / population / AW ;
R 'toads' unqualified **A** 'amount of toads'
S shaped curve ;
exponential / log, phase labelled on straight part of curve (bracket or line) ; [4]

(ii) (lack of) food / prey ; **A** fewer scarab beetles
ref. to habitat change or damage ;
change in temperature / global warming ;
ref. to pollution ;
(bacterial) disease / parasite ;
(lack of) breeding places ;
shortage of water / drought ; [max. 1]

(e) (i) ignore references to virus



- i. arrows must point from food to feeder (even if incorrect organisms) ;
- ii. all five organisms included in correct order with lines even if no arrows ;
 A if more organisms included

[2]

- (ii) *no other answers are acceptable*
(carnivore) cane toad + dingo + crocodile ;
(herbivore) scarab beetle ;
(producer) sugar cane ;

[3]

[Total: 16]