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

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

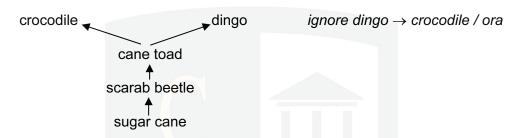
(e)		tubes 1 and 3 – the effect of pH	
	1	lysozyme is active in, 1/pH 4.0/acid;	
	2	cell walls, broken down/digested/destroyed in tube 1;	
	3	no (bacterial) growth in tube 1;	
		tubes 1 and 4 – the effect of type of bacteria	
	4 5 6 7 8 9 10	lysozyme, destroys/AW, bacteria, A/in tube 1; lysozyme does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

Question	scheme		Guidance
2 (a) (i)	any two suitable examples		
	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;	[max 2]	R snowstorms / tornadoes / landslides / avalanches / mudslides
(ii)	·	[max 1]	R volcanoes / volcanic eruptions R famine R drying up of land
(b)	 overall increase (over the time period of Fig. 6.1); natural disasters, fluctuates / described / irregular; human induced, increase; comparative data quote for named cause <i>or for</i> total causes; sudden onset increase / ora; economic factors increase / ora; comparative data quote for same cause; 	[max 5]	 2 increase + decrease is minimum 4 with year and number of shortages for each quote 7 as for 4

Question	scheme		Guidance
₂ (c)	 land needed for, building / urbanisation / AW; (so) not enough land to grow crops; increase in food production damages land; salination; desertification / erosion; 		3 A overcultivation
	6 overgrazing; 7 not enough water;		7 disruption to water supply <i>or</i> e.g. such as dams
	 8 idea that 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 ;	1	
	 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]	
(d)	 suitable named crop plant or domesticated animal; suitable feature to improve; select individuals for breeding; select offspring that show improvement; 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' or 'from one variety to another'	[1]	INF
		Total: 16]	

(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; A genitals, grow / enlarge testes / scrotum, enlarge: produce, sperm / seminal fluid / AW; named behavioural change; [max. 2] (d) (i) (x axis) time / years / months; (y axis) number of toads / number of individuals / population / AW; put ticks and R 'toads' unqualified A 'amount of toads' crosses in a S shaped curve: column on exponential / log, phase labelled on straight part of curve (bracket or line); [4] right hand side of (ii) (lack of) food / prey; A fewer scarab beetles answer 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
- (ii) no other answers are acceptable
 (carnivore) cane toad + dingo + crocodile;
 (herbivore) scarab beetle;
 (producer) sugar cane;
 [3]

[Total: 16]

[2]

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