

Human Biology

Advanced GCE F222

Growth, Development and Disease

Mark Scheme for June 2010

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Question		Expected Answers	Marks	Additional Guidance
1	(a)	wheezing ; (complaining of) tight chest ; difficulty in breathing / shortness of breath / AW ; coughing ;	3 max	DO NOT CREDIT chest pain ALLOW breathlessness / struggling to breathe DO NOT CREDIT heavy breathing / panting / fast breathing
	(b)	PEFR / peak expiratory flow rate ; FEV 1 / forced expiratory volume per second ;	2	IGNORE descriptions that do not use the term

Question		Expected Answers	Marks	Additional Guidance																														
(c)	1	<i>(overall / 1991 - 1998)</i> more children are treated but primary care visits have declined ;		ACCEPT 'GP visits' for 'primary care visits' throughout ACCEPT negative correlation between numbers treated and primary care visits / hospital admissions ACCEPT 'plateau' for children treated CREDIT data quotes with correct units Look for 2 x axis values and 2 y axis values for mp 7,8 and 9 CREDIT calculated differences or % decrease <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td colspan="4" style="text-align: center;">no per 1 000</td> </tr> <tr> <td></td> <td style="text-align: center;">1991</td> <td style="text-align: center;">1994</td> <td style="text-align: center;">1995</td> <td style="text-align: center;">1998</td> </tr> <tr> <td>treated</td> <td style="text-align: center;">93</td> <td style="text-align: center;">118</td> <td style="text-align: center;">119</td> <td style="text-align: center;">119</td> </tr> <tr> <td></td> <td colspan="4" style="text-align: center;">no per 100 000</td> </tr> <tr> <td>1^{er} care</td> <td style="text-align: center;">86-87</td> <td style="text-align: center;">81-82</td> <td style="text-align: center;">74</td> <td style="text-align: center;">48-50</td> </tr> <tr> <td>hosp</td> <td style="text-align: center;">26-28</td> <td style="text-align: center;">13,14</td> <td style="text-align: center;">8-10</td> <td style="text-align: center;">4-6</td> </tr> </table>		no per 1 000					1991	1994	1995	1998	treated	93	118	119	119		no per 100 000				1 ^{er} care	86-87	81-82	74	48-50	hosp	26-28	13,14	8-10	4-6
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	2	more children treated but hospital admissions have declined ;																																
	3	<i>Up to 1994:</i> more children are treated but fewer / little change in, primary care visits / AW, ;																																
4	more children are treated but fewer hospital admissions ;																																	
5	<i>After 1994 / 1995</i> no / little change in number of children treated but primary care visits decline ;																																	
6	no / little change in number of children treated but hospital admissions, decline;																																	
7	figures with units to support more children treated ;																																	
8	figures with units to support fewer primary care visits ;																																	
9	figures with units to support fewer hospital admissions ;																																	

				AVP ;	4 max	CREDIT correct reference to any appropriate time period from the graph e.g. highest treatment at 119 per 1 000 but lowest hospital admissions at 5 per 100 000 highest treatment at 119 per 1 000 but lowest primary care units at 49 per 100 000
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Question	Expected Answers	Marks	Additional Guidance
(d)	allergens ; bronchioles / bronchi ; smooth ; constricted / narrowed ; mucus / phlegm ; membrane(s) ; reduce ;	7	ALLOW phonetic spelling ALLOW smaller / decreased / reduced DO NOT CREDIT shortened / tightened / swollen / squeezed / restricted / small ALLOW decreased / lower DO NOT CREDIT relieve
(e)	makes inhaler more effective / drug goes straight to airways / AW ; helps to deliver more of medicine to lungs / AW ; reduce side effects ; gradual delivery / taken in over more than one breath / AW ; AVP ;	1 max	DO NOT CREDIT "easier to use" as it is given in the question stem ACCEPT idea that it overcomes the problem of breathing in as the inhaler is pressed e.g. lower dosage able to be prescribed
(f)	(i)	1 max	
	(ii)	1 max	DO NOT CREDIT albuterol is less effective in people who have AA alleles as it is given in stem DO NOT CREDIT 'cheaper' without further qualification e.g. don't waste money on drugs that won't work / able to prescribe something more suitable
	Total	[19]	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	<u>mitosis</u> ;	1	
		(ii)	<p><i>organ</i> made up of more than one kind of tissue / AW ;</p> <p>which) combine, to carry out a function ; pharynx / intestine / testes / testis ;</p> <p style="text-align: right;"><i>max 2</i></p> <p><i>tissue</i> a collection / AW, of, specialised cells / cells carrying out same function ; muscle ;</p>	3 max	<p>Candidates must refer to both organs and tissues to gain full marks CREDIT idea of, collection / group of tissues (plural) DO NOT CREDIT 'similar tissues' CREDIT named function DO NOT CREDIT muscular pharynx, examples not given on diagram</p> <p>ACCEPT a group of similar cells</p> <p>DO NOT CREDIT example not given on diagram DO NOT CREDIT sperm as it is not considered a tissue as cells not working together</p>
	(b)		<p>(cell) shrinks ;</p> <p>blebbing / described ; DNA / protein, breaks down ;</p> <p>mitochondria / cell organelles / other named organelle, break down ; (cells finally) break into (membrane bound) fragments ;</p> <p>AVP ;</p>	4 max	<p>IGNORE shrivels ACCEPT cytoplasm condenses e.g. membrane-bound fragments bud or pinch off CREDIT pyknosis / DNA condenses DO NOT CREDIT DNA can be seen) DO NOT CREDIT 'nuclear membrane / envelope breaks down' ACCEPT cell splits into membrane bound, vesicles / sacs</p> <p>e.g. phosphatidyl serine / phospholipid marker / phagocytic markers appear(s) on surface membrane</p>
	(c)		<p>engulfed / destroyed by, phagocytes ; phagocytosis ;</p>	1 max	<p>CREDIT a named phagocyte (e.g. macrophage, neutrophil, granulocyte, monocyte) DO NOT CREDIT engulfed / destroyed on its own</p>

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>Advantage</i> : transparent ; <i>Reason</i> : organs / cells / changes, can be seen using a microscope ;</p> <p><i>Advantage</i> : short life cycle ; <i>Reason</i> : easy to replicate experiment ; quick to get results / AW ;</p> <p><i>Advantage</i> : fewer ethical issues / AW ; <i>Reason</i> : not ethical to do this to humans ; can study without experimenting on humans / AW ;</p> <p><i>Advantage</i> : small number of cells ; <i>Reason</i> : can follow (development of) each cell line / AW ;</p> <p><i>Advantage</i> : easy to breed (in the lab) ; <i>Reason</i> : easy to replicate experiments ; plentiful research material /AW ;</p> <p><i>Advantage</i> : processes / molecules, in worm similar to humans ; <i>Reason</i> : can study without experimenting on humans / AW ; can develop an understanding of processes in humans / AW ;</p> <p>AVP ; ;</p>	4 max	<p>DO NOT CREDIT 'easier to see' on its own</p> <p>e.g. can study whole life cycle in a few days</p> <p>ACCEPT named processes or molecules such as apoptosis, proteins, genes</p> <p>CREDIT any reasonable advantage linked to a reason The same reason may be linked to more than one advantage</p>

					<p>DO NOT CREDIT cheap or inexpensive unqualified</p> <p>CREDIT a correct advantage linked to a correct reason even if reason and advantage are transposed e.g. Advantage 1 'cell division monitored under microscope' Reason 1 'worm's skin is transparent' gets both A and R mark</p> <p>CREDIT a correct advantage or correct reason even if reason and advantage are transposed e.g. Advantage 1 'gets quick results' Reason 1 'worm's skin is transparent' R mark only is given</p> <p>if more than one advantage linked to a reason mark first advantage given</p>
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Question	Expected Answers	Marks	Additional Guidance
(e)	<p>skin covered in, gel / jelly ; probe / AW, moved over surface of abdomen ;</p> <p>sound waves reflected back, from fetus / AW ; converted into an image ;</p> <p><u>electronic</u> callipers used ; (used to measure) crown – rump length ; (used to measure) bi-parietal diameter ; compare measurements with standards ;</p> <p>(used to) check position of fetus / placenta ; Identify twin pregnancy ; Identify, (physical) abnormality / named physical abnormality ;</p>	4 max	<p>DO NOT CREDIT stomach ACCEPT belly / tummy</p> <p>ACCEPT picture</p> <p>IGNORE “head to toe” IGNORE “head width”</p> <p>e.g. Down’s syndrome / spina bifida DO NOT CREDIT cystic fibrosis, Turner’s syndrome, Klinefelter’s syndrome</p>
(f)	tumour suppressor gene ;	1	<p>ALLOW ‘proto-oncogene’ DO NOT CREDIT ‘oncogene’</p>
	Total	[18]	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	50 ; ;	2	2 marks for correct answer even if no / wrong working shown If answer given is incorrect, award 1 mark for correct working e.g. $\frac{(600 - 400)}{400} \times 100$
	(b)	(i) needed for development of / reduces risk of damage, to, neural tube / spinal cord / brain ; for example spina bifida ; synthesis of erythrocytes ;	2 max	CREDIT CNS / nervous system IGNORE 'spine' ACCEPT 'red blood cells'
		(ii) to supply more, amino acids ; for the production of, new proteins ; for growth / AW ;	2 max	CREDIT named protein e.g. growth of baby, growth of maternal or fetal tissue, producing new cells
		(iii) for development of (fetal) retina ; to synthesise, rhodopsin / visual pigments ; maintains healthy skin ; maintenance of collagen ;	2 max	ACCEPT 'light sensitive cells' or 'rod cells' or 'rods in the, eye / retina'
	(c)	menstruation stops in pregnancy ; (so) no loss of, blood / blood cells / AW ; iron stored (in the liver) ;	2	

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>General points:</i></p> <p>1 low birth weight / reduced fetal growth ;</p> <p>2 (increased risk of) miscarriage / premature birth / perinatal mortality / still birth ;</p> <p><i>Alcohol:</i></p> <p>3 alcohol, crosses placenta / enters fetal bloodstream ;</p> <p>4 (causes) fetal alcohol syndrome ;</p> <p>5 facial defects / described ;</p> <p>6 abnormal limb development / described ;</p> <p>7 heart defects / described defect ;</p> <p>8 brain / CNS defects / neural defects / AW ;</p> <p><i>Smoking:</i></p> <p>9 nicotine, crosses placenta / enters fetal bloodstream ;</p> <p>10 (nicotine) reduces diameter of blood vessels, vasoconstriction ;</p> <p>11 carbon monoxide combines with haemoglobin ;</p> <p>12 forms carboxyhaemoglobin ;</p> <p>13 reduces oxygen supply (to fetal cells) ;</p> <p>QWC - for discussion of alcohol AND nicotine AND carbon monoxide ;</p>	<p>8 max</p> <p>1</p>	<p>e.g. small head, narrow eyes, small upper jaw</p> <p>DO NOT CREDIT affects development unqualified</p> <p>ACCEPT 'damage to heart'</p> <p>ACCEPT 'brain damage'</p> <p>IGNORE reference to learning difficulties as this is not an effect on the fetus</p> <p>CREDIT for ref to either fetal or maternal blood vessels</p> <p>CREDIT for fetal or maternal blood</p>
Total		[19]	

Question	Expected Answers	Marks	Additional Guidance								
4	<table border="1" data-bbox="376 371 851 715"> <tr> <td data-bbox="376 371 607 443"></td> <td data-bbox="607 371 851 443"><u>antigens</u> antibodies ;</td> </tr> <tr> <td data-bbox="376 443 607 515"><u>lysosome</u> lysozyme ;</td> <td data-bbox="607 443 851 515"><u>passive</u> active ;</td> </tr> <tr> <td data-bbox="376 515 607 651"><u>thrombocyte</u> neutrophil / monocyte / macrophage ;</td> <td data-bbox="607 515 851 651"><u>thyroid</u> thymus ;</td> </tr> <tr> <td data-bbox="376 651 607 715"><u>anti-histamine</u> histamine ;</td> <td data-bbox="607 651 851 715"><u>leucocytes</u> lymphocytes ;</td> </tr> </table>		<u>antigens</u> antibodies ;	<u>lysosome</u> lysozyme ;	<u>passive</u> active ;	<u>thrombocyte</u> neutrophil / monocyte / macrophage ;	<u>thyroid</u> thymus ;	<u>anti-histamine</u> histamine ;	<u>leucocytes</u> lymphocytes ;	7	<p>1 mark per box</p> <p>DO NOT CREDIT if underlined more than one word, or no word, even if answer correct</p>
	<u>antigens</u> antibodies ;										
<u>lysosome</u> lysozyme ;	<u>passive</u> active ;										
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<u>anti-histamine</u> histamine ;	<u>leucocytes</u> lymphocytes ;										
	Total	[7]									

Question		Expected Answers	Marks	Additional Guidance
5	(a)	(diabetes) non-insulin dependent / not treated with injections of insulin / AW ; (pancreas) fails to produce enough insulin ; (cells) fail to respond to insulin ; usually develops in, older people / people over 40 / AW ;	2 max	ACCEPT body fails to respond to insulin ACCEPT desensitised to insulin DO NOT CREDIT immune or resistant to insulin CREDIT idea of mature onset

	(b)	<p>(i) (prevalence) increases with economic development ; correct figures to illustrate difference between LEDC and EDC ;</p> <p>increase bigger in some ethnic groups compared to others ; correct figures to compare increase between 2 named ethnic groups;</p>	4	<p>from within one group or between groups Asian 4, 22 Arab 2, 25 Chinese 3, 14 African 1, 14 European 3, 8 any figures must include unit (percentage) CREDIT calculated differences / multiples</p> <p>CREDIT calculated differences / multiples</p>
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Question	Expected Answers	Marks	Additional Guidance
(ii)	<p>increase in, quantity of food consumed / energy in-take (kcal / k J) ;</p> <p>increased intake of, sugar / refined carbohydrate / low GI food ; increased intake of, junk food / fast food / processed food ; decrease in exercise / described ; increase in, BMI / weight / obesity ; longer life expectancy ;</p> <p>genetic, variation / differences (to explain difference in response between ethnic groups) ;</p> <p>cultural or religious difference (to explain differences between ethnic groups) ;</p>	4 max	<p>ACCEPT reverse argument for economically less developed regions look for idea of increased consumption e.g. people in rich countries can afford more food ACCEPT simple carbohydrate</p> <p>e.g. more cars used, less manual labour</p> <p>CREDIT named cultural or religious difference relating to diet or lifestyle</p>
(c)	<p>identify at-risk ethnic groups ; targeting of, treatment / advice / education ;</p> <p>specific example of, treatment or advice / education ;</p> <p>future, prevalence / incidence can be estimated ; cost of treatment estimated ;</p>	3 max	<p>target identified ethnic group or economically developed region e.g. more exercise, less sugar in diet, lose weight, eye care, foot care, medication DO NOT CREDIT general comments on lifestyle such as improve, diet / lifestyle ACCEPT estimation of numbers</p>

Question	Expected Answers	Marks	Additional Guidance
(d)	<p>1 (used in) glucose biosensor ;</p> <p>2 enzyme, attached to test strip / immobilised ;</p> <p>3 (enzyme is) specific to glucose / active site is, complementary ;</p> <p>4 catalyses, reaction between glucose and oxygen / oxidation of glucose ;</p> <p>5 to produce, gluconolactone / gluconate (and hydrogen peroxide) ;</p> <p><i>testing blood</i></p> <p>6 drop of blood (placed on test strip) ;</p> <p>7 test strip placed in, portable meter / described ;</p> <p>8 reaction (produces a signal which) is, converted / transformed to, an electrical, current / potential ;</p> <p>9 (by) transducer ;</p> <p>10 size of electrical current / potential is dependent on glucose concentration ;</p> <p>11 result, displayed on (digital) screen / quantitative ;</p> <p><i>testing urine</i></p> <p>12 ref to named test strip ;</p> <p>13 (dipped into) urine sample ;</p> <p>14 reaction results in colour change ;</p> <p>15 colour recorded after specified time ;</p> <p>16 comparison with, colour charts / standards ;</p> <p>17 result, estimate of glucose concentration / qualitative ;</p> <p>QWC - organising information clearly and coherently AND use of two specialist terms ;</p>	<p>6 max</p> <p>1</p>	<p>ACCEPT testing for blood glucose</p> <p>CREDIT glucose testing machine</p> <p>ACCEPT idea of electrical activity</p> <p>ACCEPT idea of concentration e.g. level, amount, but QWC requires concentration</p> <p>CREDIT numerical values / example / units</p> <p>CREDIT Clinistix® , Diastix®</p>
	Total	[20]	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	A (protein) capsid / protein subunit(s) / capsomere / AW ; B glycoprotein / gp 120 / antigen ; C membrane / phospholipid bilayer ;	3	ACCEPT 'protein coat' DO NOT ACCEPT protein ACCEPT lipid, membrane / envelope DO NOT CREDIT 'outer / cell / protein, membrane' can credit answers in either order
	(b)	RNA ; reverse transcriptase ;	2	DO NOT CREDIT an answer that includes DNA and RNA
	(c)	a group of / AW, signs or symptoms ; <i>such as</i> low T-cell count ; weakened immune system ; extreme / AW, weight loss ; extreme / AW, diarrhoea ; skin lesions ; Kaposi's sarcoma / non-Hodgkin's lymphoma ; opportunistic infections ; named opportunist infection ;	3 max	DO NOT CREDIT weight loss, diarrhoea, unqualified e.g. TB, thrush, infection of brain / cryptococcal meningitis / PCP / <i>Pneumocystis carinii</i> / pneumonia

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>Transmission</i></p> <p>1 exchange of body fluids / AW ;</p> <p>2 unprotected sex ;</p> <p>3 contaminated / AW, blood / blood products ;</p> <p>4 contaminated / AW, needles / surgical instruments ;</p> <p>5 pregnancy / child birth / breast feeding ;</p> <p><i>Pandemic reasons</i></p> <p>6 no, cure / vaccine ;</p> <p>7 (many people), undiagnosed / unaware, HIV positive ;</p> <p>8 stigma attached to being tested / testing not available / AW ;</p> <p>9 condoms not available / cultural or religious objection to use ;</p> <p>10 multiple sex partners / prostitution ;</p> <p>11 lack of screening, blood / blood products ;</p> <p>12 (poverty means) many mothers breast feed / no special arrangements for birth ;</p> <p>13 lack of availability, medication / drugs / anti-viral drugs / AW, (to treat HIV positive) ;</p> <p>14 lack of, education / knowledge, about transmission routes ;</p> <p>15 increased mobility of populations / migration ;</p> <p>QWC - make at least one explicit reference to a declaration statements to support argument ;</p>	<p>8 max</p> <p>1</p>	<p>ACCEPT named body fluids e.g. at least two from: blood, semen, vaginal fluid, breast milk DO NOT CREDIT sexual intercourse without description of unprotected sex</p> <p>ACCEPT implication that contamination has occurred as long as it is clear there is an HIV link ACCEPT from mother to unborn child</p> <p>DO NOT CREDIT education on its own</p> <p>CREDIT numbered references to statements</p>
	Total	[17]	

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