

GCE

Human Biology

Unit **F222**: Growth, Development and Disease

Advanced Subsidiary GCE

Mark Scheme for June 2015

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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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Annotations used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded
	Verbal Construction

*Quality of Written Communication

Question			Answer					Marks	Guidance																									
		ii	<i>heart attack</i> <i>idea that some heart, muscle / cells / tissue, die ;</i> <i>cardiac arrest</i> <i>heart , cannot / no longer , pump(s) blood (round body) ;</i>					2	ACCEPT heart stops beating / no pulse IGNORE consciousness / unconsciousness / heart stops (unqualified)																									
	d	i	<i>idea that first sample , sets baseline / for comparison ;</i> <i>idea of later samples show if glucose, returns to baseline / stays high ;</i>					2	IGNORE reference to control																									
		ii	(might indicate) another medical condition ; <i>idea of patient might be using drugs that interfere with results ;</i>					1 max	e.g. pre-eclampsia IGNORE false positive without qualification IGNORE references to eating/drinking/cheating																									
	e	i	<table border="1"> <thead> <tr> <th>Patient</th> <th>ABO blood group</th> <th>Rhesus blood group</th> <th>Antigen(s) on erythrocytes</th> <th>Antibodies produced in plasma</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>A</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td>Rh+</td> <td></td> <td>None</td> </tr> <tr> <td>3</td> <td></td> <td></td> <td>None</td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td>B</td> <td>Anti-A and Anti-D</td> </tr> </tbody> </table>	Patient	ABO blood group	Rhesus blood group	Antigen(s) on erythrocytes	Antibodies produced in plasma	1	A				2		Rh+		None	3			None		4			B	Anti-A and Anti-D					4	ONE MARK FOR EACH CORRECT ROW ACCEPT neither , no, NA or a dash or hyphen for 'none'
Patient	ABO blood group	Rhesus blood group	Antigen(s) on erythrocytes	Antibodies produced in plasma																														
1	A																																	
2		Rh+		None																														
3			None																															
4			B	Anti-A and Anti-D																														

Question			Answer	Mark	Guidance
		ii	donor = 3 and recipient = 2 ;	1	IGNORE if blood groups are given because question asks for the numbers of patients.
			Total	23	

Question			Answer	Marks	Guidance
2	a	i	<i>idea of a preparation containing antigens, which, triggers / AW , an immune response / AW ;</i>	1	LOOK FOR idea of a weakened or dead microorganism OR fragments of a microorganism DO NOT CREDIT 'disease' for 'microorganism' CREDIT a description of the immune response e.g. producing memory cells
		ii	(mother =) artificial active and (baby =) natural passive ;	1	
		iii	increases , (number of) memory cells ; <i>idea of</i> memory cell numbers fall over time ; faster (immune) response OR ref to <u>secondary</u> (immune) response ;	2 max	ACCEPT maintains memory cell numbers ACCEPT more antibody production
	b	i	<i>idea of</i> no, active ingredient / medicinal properties ; looks / smells / tastes , like the drug / vaccine ; <i>idea of</i> no adverse effects ;	2 max	ACCEPT does not affect the condition being treated ACCEPT no side effects DO NOT CREDIT 'No effect on the body' without further qualification.
		ii	<i>idea of</i> some patients not receiving any effective treatment ;	1	IGNORE gives false hope or disappointment

Question		Answer	Marks	Guidance
	iii	<p>1. bind / attach , to antigen on , macrophage / phagocyte / antigen-presenting cell ;</p> <p>2. release / secrete , chemicals / interleukins ;</p> <p>3. (chemicals) stimulate / AW , phagocytosis ;</p> <p>4. activate T killer cells to destroy infected cells ;</p> <p>5. stimulate / AW , B lymphocytes to , produce / AW , antibodies ;</p> <p>6. stimulate B lymphocytes to form , plasma / memory , cells ;</p>	3 max	<p>2. ACCEPT cytokines</p> <p>3. ACCEPT (chemicals) activate , phagocytes / macrophages</p> <p>5. ACCEPT stimulate clonal expansion of B cells</p> <p>6. ACCEPT form memory cells ;</p>
	iv	<p>non-specific</p> <p>specific</p> <p>non-specific</p> <p>non-specific ;;</p>	2	<p>3 correct answers = 1 mark</p> <p>4 correct answers = 2 marks</p>

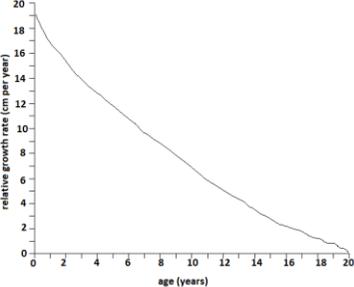
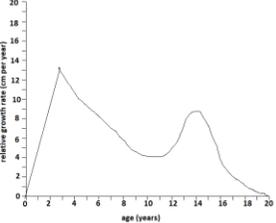
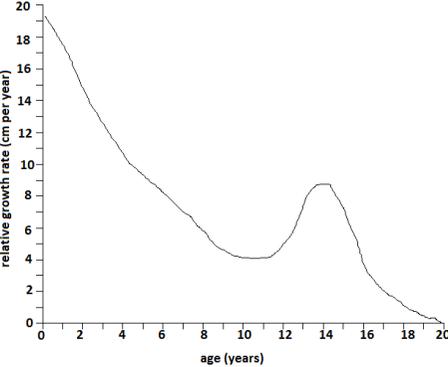
Question			Answer				Marks	Guidance
		v	Statement	T lymphocyte	B lymphocyte	Both	5	1 mark for each correct row
			Produced in bone marrow			✓		
			Mature in thymus gland	✓				
			Undergo clonal expansion			✓		
			Some cells can secrete hydrogen peroxide to destroy infected cells	✓				
			Can produce opsonins		✓			
	c		(antibiotics) ineffective against / AW , viruses ;				1	CREDIT antibiotics only effective against bacteria IGNORE 'cannot be treated by antibiotics' as this is given in the question.
			Total				18	

Question		Answer	Mark	Guidance	
3	a	<p><i>Differences</i></p> <p>Different ,(nitrogenous / organic) , bases ;</p> <p>only one bond between bases ;</p> <p>bases , joined / AW, by hydrophobic interactions ;</p> <p><i>Similarity (1 mark maximum)</i></p> <p>complementary bases (in both) ;</p> <p>(both contain) nucleotides / bases ;</p> <p>5 carbon sugar / deoxyribose , (in both) ;</p> <p>phosphate (in both) ;</p> <p>antiparallel strands / 3' – 5' and one 5' – 3' ;</p>	3	<p>Mark the first answer on each line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT Q and F instead of , A and T / C and G</p> <p>OR</p> <p>only has 2 (different) bases instead of 4</p> <p>CREDIT (bases joined by) hydrophobic interactions rather than hydrogen bonds</p> <p>IGNORE reference to purines & pyrimidines</p> <p>ACCEPT sugar-phosphate backbone</p> <p>ACCEPT strands run in opposite directions</p>	
	b	i	(new DNA molecule) consists of one new strand and one old / original / parent , strand ;	1	DO NOT CREDIT DNA strand consists of one old and one new strand

Question		Answer	Mark	Guidance
	ii	<p><i>Error</i></p> <p>(S phase of) Mitosis adenosine helicase</p> <p><i>Replacement</i></p> <p>(S phase of) interphase ; adenine ; polymerase ;</p>	3	<p>Mark the first answer on each line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p>
	iii	<p>G₁ (2 marks maximum)</p> <p>(more) protein , synthesised / made ; (more) cytoplasm <u>volume</u> increases ; cell , grows / increases in size ; (more) organelles , produced / grow and divide / replicate ;</p> <p>G₂</p> <p>(more) organelles , produced / grow and divide / replicate ; energy stores , increase / AW ; <i>idea of (DNA) proofreading / checkpoint ;</i></p>	4	

Question		Answer	Marks	Guidance	
	c	i	telophase 1 and telophase 2 ;	1	
		ii	Independent / random , assortment ; (independent assortment of) <u>chromosomes</u> AND <u>chromatids</u> ;	2	ACCEPT random distribution, random alignment Max1 if part of a list with crossing over or random / independent segregation
		iii	1. prophase <u>1</u> ; 2. crossing over ; 3. genetic material / DNA / genes / alleles , exchanged ; 1. (exchange between) homologous chromosomes / non-sister chromatids ;	4	ACCEPT chiasma(ta) formation CREDIT 'new combinations of alleles' CREDIT in the context of mark point 2 or 3
			Total	18	

Question			Answer	Marks	Guidance
4	a	i	<u>biparietal</u> diameter ;	1	ACCEPT biparietal width ACCEPT phonetic spelling
		ii	ultrasound (scan) ;	1	CREDIT ultrasonograph(y) / ultrasonogram
	b	i	weight , recorded / measured , on scales ; remove baby's clothes (before weighing) ; repeated, readings / measurements, to calculate mean ; <i>idea of</i> (alternatively) mother holds baby on, <u>zeroed</u> scales ; length/height, recorded / measured , on gauge ; head, circumference / AW, measured , at widest point, with tape / described;	5 max	CREDIT a method which finds the difference between mothers weight and mothers weight holding baby ACCEPT correct description (e.g. baby's head rests at one end of equipment, its feet rest at the other).

Question	Answer	Marks	Guidance
<p>ii</p>	<p>1. line beginning before 2 years and finishing after 18 years, with growth rate finishing at a lower value than it began ;</p> <p>2. rise (at any point) between 8 and 18 years, followed by a fall to below the value at the beginning of the rise ;</p>  <p>Gets mark point 1</p>  <p>Gets mark point 2</p>	<p>2</p>	<p>1. ACCEPT line beginning at any growth rate value</p> <p>DO NOT CREDIT a line that starts at zero</p> <p>2. peak of rise must not be higher than highest point drawn</p> <p>2 marks =</p> 

Question		Answer	Marks	Guidance
	b	iii	0.275 ;	2 ACCEPT 0.3 or 0.28 for two marks AWARD 1 mark for $\frac{15.3 - 12}{12} / \frac{3.3}{12}$
		iv	shows / AW , efficiency , of growth ; (allows) comparison / AW , to measurement at , start / AW ;	1 max IGNORE ref to speed or rate of growth
	c		3 max	CREDIT ora throughout points C1 to C4 CREDIT greater height / higher CREDIT idea that (growth of) Q fluctuates more CREDIT a description of rate of growth e.g. a bigger increase in the height for P up to 6 years OR a smaller increase in height between 6 and 13 e.g. poor diet / illness for Q IGNORE ref to heredity / genetics e.g. compensatory growth / Q 's diet improves / Q no longer ill
			Total	15

Question			Answer	Marks	Guidance
5	a	i	<i>infectious</i> spread / AW , between , people / organisms , by pathogens / AW ;	1	ACCEPT “communicable” for “spread between people”.
		ii	one correct example of an infectious disease and one correct example of a non-infectious disease ;	1	e.g. HIV infection, malaria, HPV infection ACCEPT MRSA IGNORE TB e.g. diabetes, emphysema, chronic bronchitis, cancer, asthma, COPD IGNORE CHD

Question		Answer	Mark	Guidance															
	b	<p><i>For Mark Points 1 and 2, penalise lack of correct units on data once</i></p> <ol style="list-style-type: none"> TB higher in The Gambia (than UK) and data with correct units to support ora ; CHD higher in UK (than The Gambia) and data with correct units to support ora ; UK , below / AW , global (mean) and The Gambia , above / AW for TB ; UK and The Gambia both below global (mean) for CHD ; Correct manipulation of data in support of mark points 1 - 4 ; A correct reason for TB being spread more easily in The Gambia (than in UK) ora ; A correct reason for CHD (mortality) being higher in UK (than The Gambia) ora ; <i>idea of genetic difference in predisposition for CHD ;</i> <i>idea of good health care (system) in UK , limits deaths from CHD / keeps CHD deaths below global average ;</i> <p>QWC</p>	<p>7</p>	<table border="1"> <thead> <tr> <th rowspan="2">Disease</th> <th colspan="3">Mortality per 100 000</th> </tr> <tr> <th>Global</th> <th>UK</th> <th>Gambia</th> </tr> </thead> <tbody> <tr> <td>TB</td> <td>24.0</td> <td>0.5</td> <td>48.0</td> </tr> <tr> <td>CHD</td> <td>138.6</td> <td>122.0</td> <td>108.5</td> </tr> </tbody> </table> <p>e.g. “UK mortality from CHD is 13.5 per 100,000 greater than The Gambia.” gets mp2 and 5 “The Gambia’s mortality from TB is 200 % of the global average.” gets mp 5</p> <p>6. e.g. overcrowding / poor diet / poor health / less access to health care 7. e.g. more smoking / less physical activity / diet higher in , saturated fat / cholesterol</p> <p>Award QWC when 2 marks from mp 1-5 are given and 2 marks from mp 6-9 are given.</p>	Disease	Mortality per 100 000			Global	UK	Gambia	TB	24.0	0.5	48.0	CHD	138.6	122.0	108.5
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		Total	10																

Question			Answer	Marks	Guidance
6	a	i	number of (existing) cases of a disease (in a population) ;	1	DO NOT CREDIT reference to new cases
		ii	<p>p53 (gene) is a <u>tumour suppressor</u> gene ;</p> <p>(benzopyrene causes) <u>mutation</u> (of p53 gene) ;</p> <p>cell cycle not halted / no detection of DNA damage / AW ;</p> <p>no <u>apoptosis</u> (of cells with, damaged/mutated, DNA) ;</p>	3 max	ACCEPT correct detail of p53 pathway (e.g. P53 (gene) not expressed, p53 (protein) no longer produced / p53 protein cannot bind to DNA / p21(gene) not expressed, P21 no longer produced / CDKs continue to be activated

Question		Answer	Mark	Guidance
	iii	<p>heredity / genetic predisposition / family history (of cancer) ;</p> <p>viruses / viral infection ;</p> <p>age / ageing ;</p> <p>(exposure to ionising) radiation ;</p> <p>lack of exercise / being overweight ;</p>	2 max	<p>Mark the first answer on each line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE references to diet/smoking / alcohol as these factors involve chemical carcinogens.</p> <p>ACCEPT genetics</p> <p>CREDIT weakened immune system / AW</p> <p>CREDIT UV , x-ray , gamma rays DO NOT CREDIT radio waves, infrared, microwaves</p> <p>CREDIT HRT</p>
	iv	rapid onset and short-lived / lasts short time ;	1	

Question		Answer	Marks	Guidance																																																						
b	i	<p><i>idea of</i> screened (group) has lower mortality (every year) , after / subsequent to, three years / from four years onwards ;</p> <p>correct figs quote with units comparing the control and screened group ;</p>	1 max	<p>CREDIT reverse argument e.g. After 3 years the control group has a higher mortality</p> <p>FOR FIGURES allow +/- 0.5 and control should be greater than the screened number.</p> <table border="1"> <thead> <tr> <th>Time</th> <th>Control</th> <th>Screen</th> </tr> </thead> <tbody> <tr> <td></td> <td colspan="2" style="text-align: center;">X / 1000</td> </tr> <tr><td>4</td><td>2.5</td><td>2</td></tr> <tr><td>5</td><td>3</td><td>2.5</td></tr> <tr><td>6</td><td>4</td><td>3</td></tr> <tr><td>7</td><td>4.5</td><td>4</td></tr> <tr><td>8</td><td>6.0</td><td>4.5</td></tr> <tr><td>9</td><td>6.5</td><td>5</td></tr> <tr><td>10</td><td>8</td><td>6.5</td></tr> <tr><td>11</td><td>9</td><td>7.5</td></tr> <tr><td>12</td><td>10</td><td>8</td></tr> <tr><td>13</td><td>11</td><td>9</td></tr> <tr><td>14</td><td>12</td><td>10.5</td></tr> <tr><td>15</td><td>13</td><td>11.</td></tr> <tr><td>16</td><td>14</td><td>12.</td></tr> <tr><td>17</td><td>15</td><td>13.</td></tr> <tr><td>18</td><td>16</td><td>13.5</td></tr> <tr><td>19</td><td>18</td><td>13.5</td></tr> </tbody> </table>	Time	Control	Screen		X / 1000		4	2.5	2	5	3	2.5	6	4	3	7	4.5	4	8	6.0	4.5	9	6.5	5	10	8	6.5	11	9	7.5	12	10	8	13	11	9	14	12	10.5	15	13	11.	16	14	12.	17	15	13.	18	16	13.5	19	18	13.5
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		ii	<p>1. <i>idea of</i> (depends on) sample size / statistical tests ;</p> <p>2. <i>idea of</i> design of test / randomised / non-randomised / blind / double blind ;</p> <p>3. (depends on) age / gender / lifestyle / family history ,of participants (at start of study) ;</p>	2 max	<p>IGNORE improvements e.g. use a larger group or do it for a longer time</p> <p>ACCEPT (we do not know) if trials were randomised</p> <p>3. ACCEPT other medical condition</p>
		iii	<i>idea that</i> (detected) blood could be from sources other than a tumour ;	1	ACCEPT blood could be due to other causes
	c	i	<p><i>idea of</i> evaluating effectiveness of (new) drugs (compared to existing drugs) ;</p> <p><i>idea of</i> setting (NHS) guidelines for drug use ;</p> <p><i>idea of</i> ensuring treatment is, cost-effective / value for money ;</p>	2 max	IGNORE reference to side effects, and safety (as this would have been done during trials and licenced)
		ii	nucleus / DNA / chromosome / chromatin ; plasma / cell surface , membrane ; phagocytosis / endocytosis ;	3	
			Total	16	

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