

## **Human Biology**

Advanced Subsidiary GCE

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

### **Mark Scheme for January 2012**

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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
1	(a) (i)	primary care / visit to GP / AW ; (prescribed), medicines / drugs / named drug ; diagnostic testing / monitoring ; purchase of medical equipment ; visit to accident and emergency / AW ; surgical procedure / named procedure ; stay in hospital / AW ; rehabilitation / AW ; educational information / leaflets / websites, to inform / AW ; AVP ;	2 max	<b>Mark the first two answers.</b> If the answers are correct and an additional answer is given that is incorrect or contradicts the correct answer then subtract one mark for each additional incorrect answer.  e.g. paramedics e.g. coronary bypass, angioplasty
	(ii)	not earning a wage / AW ; (through) premature death / AW ; (through) incapacity / AW ; (through) caring for person (with CHD) ;	2 max	<b>ACCEPT</b> dependent on state  <b>ACCEPT</b> loss of time at work
	(b)	41 ; ;	2	<b>Correct answer = 2 marks</b>  If answer incorrect or incorrectly rounded, <b>ALLOW</b> one mark for correct working: $\frac{2\ 909}{7\ 055} \times 100$
	(c)	call an ambulance immediately / AW ; sit the person down (with knees bent) / make person comfortable ; provide reassurance ; ask if on medication for, CHD / heart disease ; monitor, heart rate / breathing rate / consciousness ; be prepared to resuscitate if necessary ;	4 max	<b>ACCEPT</b> call 999 <b>IGNORE</b> lie down / raise legs above heart <b>ACCEPT</b> calm down <b>IGNORE</b> give aspirin unqualified <b>ACCEPT</b> check <b>ACCEPT</b> description of CPR

Question		Answer	Marks	Guidance
(d)	(i)	endothelial / endothelium ; <u>smooth</u> muscle ; elastic ; collagen ; fibrous / connective, tissue ;	2 max	<b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b> <b>ACCEPT</b> squamous epithelium <b>ACCEPT</b> elastin
	(ii)	divide ; by <u>mitosis</u> ; differentiate ; as some genes switched, off / on ; cell makes new proteins ; cell becomes specialised ;	3 max	<b>DO NOT CREDIT</b> divide / by mitosis, if referring to specialised cells <b>ACCEPT</b> sections of DNA switched, off / on <b>ACCEPT</b> specific / different / many, types of cell <b>ACCEPT</b> description of a type of a specialised cell
	(iii)	(progenitor cells are) the same as patients own cells / AW ; will not be rejected / AW ; no need to wait for a suitable, donor / match ; will not raise ethical issues ; will not transmit, an infectious disease / named disease ;	2 max	<b>DO NOT ACCEPT</b> less chance of being rejected <b>ACCEPT</b> reduces risk of infection
	(e)	peptides have a, complementary / specific, shape / 3D structure ; binds, to (target) proteins ; in (exposed) basement membrane ; of endothelial cells;	2 max	<b>ACCEPT</b> glycoproteins / receptors

Question		Answer	Marks	Guidance
(f)		no need for surgical intervention / less invasive / AW ;  (so) less risk of infection ; (so) less risk of further damage to artery wall ; may be active at, more than one site / a site unsuitable for stents ;	2 max	<b>IGNORE</b> nanoburrs last for longer than stents  <b>ACCEPT</b> no risk of infection <b>ALLOW</b> scarring
		<b>Total</b> 21		

Question		Answer	Marks	Guidance
2	(a)	<p>accident / injury / wounded ;  childbirth ;  anaemia / sickle cell disease / thalassaemia / low RBC count ;  leukaemia ;  haemophilia ;  treatment of kidney failure ;  having chemotherapy ;  having a bone marrow transplant ;  Rhesus incompatibility ;</p>	2 max	<b>Mark the first two answers.</b> If the answers are correct and an additional answer is given that is incorrect or contradicts the correct answer then subtract 1 mark for each additional incorrect answer.
	(b)	<p><i>vein</i>  <i>idea that blood in (vein) at a lower blood pressure ;</i>  <i>wall of (vein), thinner / AW ;</i></p>	2	<b>Mark the first two answers.</b> If the answers are correct and an additional answer is given that is incorrect or contradicts the correct answer then subtract 1 mark for each additional incorrect answer.  <b>CREDIT</b> ora for artery  <b>ACCEPT</b> (veins) are nearer surface so easy to find
	(c)	<p><i>blood typing</i>  testing blood to find out the blood group / AW ;   <i>cross matching</i>  <i>idea of making sure there is no reaction between</i>  donor and patient blood / AW ;</p>	2	<b>DO NOT CREDIT</b> blood type as in the stem <b>CREDIT</b> to find out which antigens if linked to RBCs  <b>CREDIT</b> no agglutination / no clumping <b>IGNORE</b> coagulation / clotting <b>DO NOT CREDIT</b> incompatible because in the stem

Question			Answer					Marks	Guidance																												
	(c)	(ii)						4	<p>Award 1 mark for each correct row</p> <p><b>DO NOT CREDIT</b> hybrid ticks</p> <p><b>ALLOW</b> mark if ticks in row correct and no crosses in whole of table</p>																												
			<table border="1"> <thead> <tr> <th rowspan="2">donor's blood group</th> <th colspan="4">recipient's blood group</th> </tr> <tr> <th>A</th> <th>B</th> <th>AB</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>✓</td> <td>✗</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>B</td> <td>✗</td> <td>✓</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>AB</td> <td>✗</td> <td>✗</td> <td>✓</td> <td>✗</td> </tr> <tr> <td>O</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>						donor's blood group	recipient's blood group				A	B	AB	O	A	✓	✗	✓	✗	B	✗	✓	✓	✗	AB	✗	✗	✓	✗	O	✓	✓	✓	✓
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		(iii)	<ol style="list-style-type: none"> <li>1. antibodies in (recipient's) blood (plasma) ;</li> <li>2. antigens on surface of (donor's) red blood cells ;</li> <li>3. (antibodies) have a specific variable region ;</li> <li>4. complementary to antigen ;</li> <li>5. antibodies bind to antigens ;</li> <li>6. causes (red blood cells) to, agglutinate / clump together ;</li> <li>7. block blood vessels ;</li> <li>8. reduce oxygen supply to tissues ;</li> <li>9. red blood cells damaged ;</li> <li>10. and engulfed by, macrophage / phagocyte ;</li> <li>11. contents / haemoglobin, leak out of cell ;</li> <li>12. (haemoglobin) is toxic (in solution in plasma) ;</li> </ol>	6 max	<p><b>6 IGNORE</b> coagulate / clot</p> <p><b>7 DO NOT CREDIT</b> veins</p>																																

Question			Answer	Marks	Guidance
	(d)	(i)	(enzymes) have a (specific) active site that binds to antigen / AW ; break down / digest, antigen ; removing antigen A (from cell surface membrane) / AW ; AVP ;	2 max	<b>CREDIT</b> alternative terms for antigen: protein, glycoprotein, carbohydrate <b>ACCEPT</b> breaks link between antigen and cell surface
		(ii)	pH ; temperature ; water potential ;	2 max	<b>Mark the first 2 answers</b>  <b>ACCEPT</b> concentration of red blood cells
	(e)	(i)	aspirin slows down blood clotting / AW ; patient would lose more blood / AW ; delays healing ;	2 max	<b>IGNORE</b> thins blood <b>ACCEPT</b> patient would lose blood more quickly
		(ii)	<i>idea that</i> patient will not have a reaction to their own blood / AW ; <i>idea that</i> no chance of transmitting, infection / named infection ;	1 max	<b>ACCEPT</b> description of the reaction  <b>DO NOT CREDIT</b> less chance of rejection
			<b>Total</b>	<b>23</b>	

Question		Answer	Marks	Guidance
3	(a)	<p>A prophase 1 ; B metaphase 1 ; C anaphase 2 ;</p>	3	<p><b>Mark the first answer on each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p>Each answer must include the name and number</p>

Question			Answer	Marks	Guidance
(b)	(i)		<p><i>first meiotic division</i></p> <ol style="list-style-type: none"> <li>1. chromosomes become visible ;</li> <li>2. each chromosome is a pair of chromatids ;</li> <li>3. chromosomes, pair up / are in homologous pairs / are in bivalents described ;</li> <li>4. pairs of / AW , chromosomes line up at , centre / equator, (of cell) ;</li> <li>5. attached to spindle fibres by centromeres ;</li> <li>6. <u>chromosomes</u> are separated / <u>chromosomes</u> pulled to opposite poles ;</li> <li>7. nuclear, envelope / membrane forms around each group of chromosomes ;</li> <li>8. two cells formed (each), haploid / with half the original number of chromosomes ;</li> </ol> <p><i>second meiotic division</i></p> <ol style="list-style-type: none"> <li>9. (single) chromosomes line up at, centre / equator, of cell ;</li> <li>10. centromeres split in two ;</li> <li>11. <u>chromatids</u>, separate / pulled to opposite poles ;</li> <li>12. four (haploid), cells / gametes, formed ;</li> </ol>	8 max	<b>IGNORE</b> incorrect references to stages – this is not being assessed <b>CREDIT</b> condense / DNA condenses and becomes visible  <b>CREDIT</b> in meiosis 1 or meiosis 2  <b>CREDIT</b> in meiosis 1 or meiosis 2 <b>ACCEPT</b> 23 chromosomes from 46
			QWC ~ order of events should be clear ;	1	<b>mp 6 awarded before mp 11</b> (for the idea that chromosomes separate before chromatids)

Question		Answer	Marks	Guidance
	(ii)	crossing over / chiasma formation ; independent assortment ;	2	<b>Mark the first 2 answers</b> <b>ACCEPT</b> random assortment
		<b>Total</b>		<b>14</b>

Question			Answer		Marks	Guidance									
4	(a)	(i)	0.12 / 0.13 $\mu\text{m}$ ;			2  <b>Correct answer = 2 marks</b>  If answer incorrect <b>CREDIT</b> one mark for correct working out $\frac{61\ 000}{500\ 000} \text{ or } \frac{62\ 000}{500\ 000} \text{ or } \frac{63\ 000}{500\ 000}$  If answer out by a factor of 10 <b>CREDIT</b> 1 mark									
		(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">structure found</th> </tr> <tr> <th>only in HIV</th> <th>only in <i>Mycobacterium tuberculosis</i></th> <th>in both <i>Mycobacterium tuberculosis</i> and HIV</th> </tr> </thead> <tbody> <tr> <td>outer membrane ; capsid ;</td> <td>peptidoglycan cell wall ; ribosomes ; DNA ;</td> <td>enzymes ; RNA ;</td> </tr> </tbody> </table>			structure found			only in HIV	only in <i>Mycobacterium tuberculosis</i>	in both <i>Mycobacterium tuberculosis</i> and HIV	outer membrane ; capsid ;	peptidoglycan cell wall ; ribosomes ; DNA ;	enzymes ; RNA ;	7  <b>DO NOT CREDIT</b> any term that has been used more than once, as this will be contradictory
structure found															
only in HIV	only in <i>Mycobacterium tuberculosis</i>	in both <i>Mycobacterium tuberculosis</i> and HIV													
outer membrane ; capsid ;	peptidoglycan cell wall ; ribosomes ; DNA ;	enzymes ; RNA ;													
	(b)		AIDS, compromises / weakens, the immune system ; (antibiotics used) to treat, opportunistic infections / named bacterial infection ;			1 max  <b>IGNORE</b> reference to antibiotics prevent infection  e.g. TB									

Question		Answer	Marks	Guidance
(c)		<p><i>patients</i></p> <ol style="list-style-type: none"> <li>1. self medicating / buying antibiotics over internet / buying without prescription (in some countries) ;</li> <li>2. taking them when not needed ;</li> <li>3. may not complete the course of antibiotics ;</li> <li>4. demanding to be prescribed antibiotics ;</li> </ol> <p><i>GPs</i></p> <ol style="list-style-type: none"> <li>5. may prescribe antibiotics ;</li> <li>6. when they are not needed / for a virus infection AW ;</li> <li>7. prescribe, ineffective / wrong antibiotic / AW ;</li> <li>8. not informing patients on importance of completing the course ;</li> </ol> <p><b>QWC</b> ~ balanced account of actions of patients and GPs ;</p>	4 max	
(d)		<p>use alcohol-based hand wash between patients ;</p> <p>use of, disposable gloves / aprons ;</p> <p>thorough cleaning of, beds / lockers / equipment ;</p> <p>adequate spacing between beds / avoid overcrowding ;</p> <p>isolate patients with drug-resistant forms ;</p> <p>(hospital staff / visitors) to ward use alcohol-based hand wash before entering ;</p> <p>AVP ;</p>	1 4 max	<p><b>1 mp awarded from mps 1 - 3 and 1 mp awarded from mps 4 - 6</b></p> <p><b>ACCEPT</b> antibacterial / hand sanitiser <b>DO NOT CREDIT</b> wash hands unqualified <b>DO NOT CREDIT</b> gloves / aprons unqualified</p> <p><b>ACCEPT</b> antibacterial / hand sanitiser <b>DO NOT CREDIT</b> wash hands unqualified</p>
			<b>Total</b>	<b>19</b>

Question		Answer	Marks	Guidance
5	(a)	(i) <i>untreated type 2 diabetic</i> 8 – 18 mmol l <sup>-1</sup> / 10 mmol l <sup>-1</sup> ;  <i>non-diabetic</i> 3 – 7 mmol l <sup>-1</sup> / 4 mmol l <sup>-1</sup> ;	2	Must have correct units for the mark.  Must have correct units for the mark.  <b>ACCEPT</b> 1 mark if both figures correct but, no / incorrect units given
		(ii) 0800 / 8 am (on day 1 or day 2) ;	1	<b>IGNORE</b> ref to meal-times
	(iii)	tissues insensitive to insulin / insulin ineffective / AW ; less insulin produced ; by, beta cells / $\beta$ cells / islets of Langerhans ; less glucose uptake by cells ; less glucose converted to glycogen ; so failure to lower blood glucose level ; AVP ;	2 max	<b>ACCEPT</b> don't respond to <b>DO NOT CREDIT</b> no insulin  <b>ACCEPT</b> not taken up <b>ACCEPT</b> no glucose converted to glycogen  e.g. liver breaks down more glycogens to glucose and releases it into blood stream

Question		Answer	Marks	Guidance																													
(b)	(i)	number of cases of a disease, at any one time / in a population ;	1																														
	(ii)	<p>1994 - 2001            (prevalence rate) has increased in males and females ;            greater increase (over the time period) in males ;            greater increase after 1998 ;</p> <p><i>males v females</i>            (prevalence rate) is always higher in males ;</p> <p>pairs of comparative figs to support ;</p>	3 max	<table border="1"> <thead> <tr> <th rowspan="2">year</th> <th colspan="2">prevalence per 1 000</th> </tr> <tr> <th>male</th> <th>female</th> </tr> </thead> <tbody> <tr> <td>1994</td> <td>18</td> <td>16</td> </tr> <tr> <td>1995</td> <td>19</td> <td>17</td> </tr> <tr> <td>1996</td> <td>20</td> <td>17</td> </tr> <tr> <td>1997</td> <td>21</td> <td>18</td> </tr> <tr> <td>1998</td> <td>22</td> <td>19</td> </tr> <tr> <td>1999</td> <td>23</td> <td>20</td> </tr> <tr> <td>2000</td> <td>25</td> <td>21</td> </tr> <tr> <td>2001</td> <td>27</td> <td>23</td> </tr> </tbody> </table> <p>comparing male with female in the same year  <b>or</b>            comparing male in one year with another year  <b>or</b>            comparing female in one year with another year</p>	year	prevalence per 1 000		male	female	1994	18	16	1995	19	17	1996	20	17	1997	21	18	1998	22	19	1999	23	20	2000	25	21	2001	27	23
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Question		Answer	Marks	Guidance
	(iii)	more obesity ; taking less exercise ; people living longer / ageing population ; more ethnic groups with higher risk ; more heart disease ; a diet higher in, fat / sugar / low GI foods ; greater awareness so more diagnosis ;  men more susceptible / AW ;	3 max	<b>DO NOT CREDIT</b> obesity unqualified <b>DO NOT CREDIT</b> exercise unqualified  <b>ACCEPT</b> more, heart disease / CHD in men Needs to stress the idea of <i>higher</i>
	(c)	(intake of) more fibre / more complex, sugars or carbohydrates ; slower absorption of glucose ; AVP ;	1 max	eg contain antioxidants that can be beneficial / (intake of) more vitamins
		<b>Total</b> 13		

Question		Answer	Marks	Guidance
6	(a)	<p>antigens / pathogens / bacteria / viruses ;  <i>in either order</i>          plasma ;          memory ;            antibodies ;          breast feeding ;</p>	5	<b>Mark the first answer in each gap.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>  <b>ACCEPT</b> breast milk /colostrum
	(b) (i)	MMR / measles – mumps – rubella ;	1	must refer to all three diseases
	(ii)	<p>to cause a secondary immune response ;            which produces more, antibodies / memory cells ;          a higher level of / longer lasting, immunity / AW ;</p>	2	ora for first dose only producing a primary response
	(iii)	<p>so that children do not contract the disease and become (seriously) ill;            to reduce the risk of spreading the infection in the community / to develop herd immunity ;</p>	2	need to have idea of preventing them from becoming ill not just not catching the disease
		<b>Total</b>	<b>10</b>	

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