

GCE

Human Biology

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

Advanced Subsidiary GCE

Mark Scheme for June 2016

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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

*Quality of Written Communication

Question			Answer	Marks	Guidance																									
1	a	i	less genetic influence in CVD ; <i>idea of</i> (named) risk factors / lifestyle choices , controlled (for CVD) ; more easily treated ; <i>idea of</i> cancer incidence being more random than CVD cases ;	2 max	ACCEPT ora throughout																									
		ii	<table border="1"> <thead> <tr> <th>Screening technique</th> <th>Type of radiation detected?</th> <th>Produces three-dimensional image</th> <th>Requires injection of radioactive substance</th> <th></th> </tr> </thead> <tbody> <tr> <td>MRI scans</td> <td>Radio waves</td> <td>✓</td> <td>X</td> <td>;</td> </tr> <tr> <td>PET scans</td> <td>Gamma (rays)</td> <td>X</td> <td>✓</td> <td>;</td> </tr> <tr> <td>Thermography</td> <td>Infrared radiation</td> <td>X</td> <td>X</td> <td>;</td> </tr> <tr> <td>CT scan</td> <td>X-rays</td> <td>✓</td> <td>X</td> <td>;</td> </tr> </tbody> </table>	Screening technique	Type of radiation detected?	Produces three-dimensional image	Requires injection of radioactive substance		MRI scans	Radio waves	✓	X	;	PET scans	Gamma (rays)	X	✓	;	Thermography	Infrared radiation	X	X	;	CT scan	X-rays	✓	X	;	4	One mark per correct row IGNORE (electro) magnetic or ionising radiation
Screening technique	Type of radiation detected?	Produces three-dimensional image	Requires injection of radioactive substance																											
MRI scans	Radio waves	✓	X	;																										
PET scans	Gamma (rays)	X	✓	;																										
Thermography	Infrared radiation	X	X	;																										
CT scan	X-rays	✓	X	;																										

Question		Answer	Marks	Guidance
	iii	<p><i>idea that</i> chronic viral infection may weaken immune system / virus goes undetected by immune system ;</p> <p>(viruses) insert , genetic material / DNA , into cell's , genome / DNA / chromosomes ;</p> <p>(virus causes) <u>mutation</u> of host (proto-oncogenes or tumour suppressor) genes / DNA ;</p> <p><i>idea that</i> virus , activates / contains , oncogenes ;</p> <p><i>idea that</i> virus inhibits , tumour suppressor / <i>p53</i> , gene ;</p>	2 max	
	iv	<p><i>proto-oncogenes:</i> <i>idea that</i> controls cell division by coding for , growth factor / growth factor receptor / cyclins / CDKs ;</p> <p><i>tumour suppressor genes:</i> <i>idea of</i> prevents , damaged cells / cells with damaged DNA , dividing ;</p>	2	ACCEPT apoptosis of damaged cells/cells with damaged DNA
b	i	<p>exercise ;</p> <p>genetics ;</p> <p>age of population ;</p> <p>obesity ;</p> <p>blood pressure ;</p>	3 max	<p>IGNORE reference to health care provision / education</p> <p>IGNORE ethnicity</p> <p>IGNORE age unqualified</p>
	ii	<p><i>idea of</i> improved , screening / diagnosis / <u>medical</u> advice ;</p> <p><i>idea of</i> improved , medication / treatment / surgical techniques ;</p>	2	ACCEPT named example

Question		Answer	Marks	Guidance
	c	<p>(25 %) reduction will not be achieved for , women / men , even if risk factor targets met ;</p> <p>(25 %) reduction can be achieved for men if tobacco use is reduced to levels lower than the target ;</p> <p>(25%) reduction cannot be achieved for women if tobacco use is reduced lower than the target ;</p> <p>correct use of <u>probability</u> figures at 2025 to support argument (for either gender) ;</p>	3 max	
	d	<p><i>Fast-acting:</i> beta agonists ; <i>Explanation:</i> relax muscles in the airways / (act as) bronchodilators ;</p> <p><i>Slow-acting:</i> steroids ; <i>Explanation:</i> reduce inflammation (in the airways) ;</p>	4	<p>IGNORE prompt lines</p> <p>ACCEPT correct examples of named beta-agonists</p> <p>ACCEPT correct examples of named steroid(s)</p> <p>ECF for mp2 and mp4</p>
		Total	22	

Question			Answer	Marks	Guidance
2	a	i	<p><i>mothers advised :</i></p> <p>not to smoke ;</p> <p>not to , drink (too much) alcohol / take recreational drugs ;</p> <p>about , exercise / physical activity ;</p> <p>to avoid contact with cat , litter / faeces ;</p> <p>to have test for , kidney health / blood pressure / gestational diabetes ;</p> <p>to have (antibody) tests for , hepatitis / HIV / syphilis / rubella ;</p> <p>to have a test for , blood group / Rhesus factor / blood disorder ;</p>	5 max	<p>IGNORE reference to gene screening as not regular antenatal advice.</p> <p>ACCEPT German Measles for rubella</p>
		ii	<p>ultrasound ;</p> <p>checking the development of , umbilical cord / placenta ;</p> <p>measure maternal , haemoglobin / red blood cell count / blood glucose ;</p>	2 max	
		iii	tape measure around widest part (of head) ;	1	
		iv	<p><i>nervous system</i></p> <p>A / 0-5 (years) ;</p> <p><i>reproductive system</i></p> <p>D / 15-20 (years) ;</p>	2	
	b		<p>type 2 / late onset (diabetes) ;</p> <p><i>idea that</i> type 2 diabetes results from , changes in metabolism / obesity ;</p> <p><i>idea of</i> genetic influence ;</p> <p>(type 2) is not an autoimmune condition ;</p>	3 max	2 max for explanation

Question	Answer	Marks	Guidance
c	<p><i>gender:</i> females show a greater increase (in prevalence) than males ;</p> <p><i>ethnicity:</i> decrease in Asian Pacific Islanders AND Native American Indian OR increase in Hispanic AND Caucasian OR Hispanic show the largest increase (of any group) ;</p> <p>correct use of figures ;</p>	3	<p>Look for comparative figures per 1000 between 2001 and 2009 for either gender or ethnicity linked to mp1 or 2</p>
d	<p>increases blood pressure ;</p> <p>damages artery lining ;</p> <p>increases probability of , atheroma / blood clot ;</p> <p><u>nicotine</u> increases , platelet stickiness / vasoconstriction ;</p>	3 max	
	Total	19	

Question		Answer	Marks	Guidance
	b	<i>Error: cytokinesis</i> <i>Replacement: cytokines ;</i> <i>Error: exocytosis</i> <i>Replacement: endocytosis ;</i> <i>Error: ribosomes</i> <i>Replacement: lysosomes ;</i>	3	
		Total	12	

Question		Answer			Marks	Guidance												
4	a	colchicine ; metaphase ; stain / dye ; chromosomes / chromatids ;			4													
	b	i	<i>idea that</i> 10 weeks is too early for amniocentesis ; risk of miscarriage ; <i>idea that</i> Turner syndrome not life-threatening (no need for amniocentesis) ; <i>idea of</i> low incidence in population (no need for amniocentesis) ;		2 max	ACCEPT idea that at this early stage CVS is normally used instead												
		ii	non-invasive ; no risk of miscarriage / damage to fetus ; sampling can be performed earlier (than amniocentesis) ;		2 max	IGNORE reference to cost												
	c	i	<table border="1"> <thead> <tr> <th>Condition diagnosed</th> <th>Sex chromosomes present</th> <th>Total number of chromosomes in each body cell</th> </tr> </thead> <tbody> <tr> <td>Turner syndrome</td> <td>X / X0</td> <td>45</td> </tr> <tr> <td>Klinefelter syndrome</td> <td>XXY</td> <td>47</td> </tr> <tr> <td>Normal male</td> <td>XY</td> <td>46</td> </tr> </tbody> </table>	Condition diagnosed	Sex chromosomes present	Total number of chromosomes in each body cell	Turner syndrome	X / X0	45	Klinefelter syndrome	XXY	47	Normal male	XY	46	; ; ;	3	One mark for each correct row ACCEPT '45 and 46' (mosaic form) ACCEPT '46 and 47' (mosaic form)
Condition diagnosed	Sex chromosomes present	Total number of chromosomes in each body cell																
Turner syndrome	X / X0	45																
Klinefelter syndrome	XXY	47																
Normal male	XY	46																

Question		Answer	Marks	Guidance
	ii	one typical characteristic for Turner syndrome AND one typical characteristic for Klinefelter syndrome ;	1	e.g. small fingernails, skin folds , lack of menstruation, short stature, nevi (brown spots) e.g. small testes , reduced facial hair
		Total	12	

Question		Answer	Marks	Guidance
5	a	not pandemic ; only 6 cases / few cases , originating outside West Africa ; use of data to show that probability of dying from Ebola is greater in West Africa ; <i>idea of data too limited for validity statement ;</i>	3 max	e.g. 39.6% and 16.7% or 1 in 2.5 and 1 in 6 (die)
	b	i	2	ACCEPT 0.12 or 0.117 ACCEPT 3.66
		ii	1	ACCEPT ref to remote areas in West Africa having no hospitals
	c	i	2 max	
		ii	2 max	e.g. <i>idea that</i> lack of blood cells avoids the need to match blood groups

Question		Answer	Marks	Guidance
	iii	<i>idea of screening for , other (named) pathogens / red blood cells / ABO antibodies ;</i>	1	IGNORE disease
	d	disease for which cases are reported to the , local / health , authority ;	1	
		Total	12	

Question			Answer	Marks	Guidance
6	a	i	cytokinesis ;	1	ACCEPT cytoplasmic cleavage
		ii	G ₁ ; proteins / cytoplasm / organelles , produced AND (this) is a slow process ;	2	ACCEPT growth phase 1
		iii	<i>Any two from</i> centrioles move to (opposite) poles spindle formation nuclear envelope disintegrates nucleolus disappears ;;	2	If more than two answers given, mark the first two.
		iv	6 AND anaphase ; 5 AND metaphase ;	2	IGNORE prompt lines but must be in correct order according to diagrams ACCEPT 7 AND telophase
	b		(crossing over) enables exchange of genetic information between non <u>sister</u> chromatids ; (sister) chromatids , assort / segregate , randomly / independently ;	2	ACCEPT crossing over results in non-identical sister chromatids
			Total	9	

Question		Answer	Marks	Guidance	
7	a	<p><i>evolve resistance</i></p> <ol style="list-style-type: none"> 1. mutation ; 2. (mutated) gene gives resistance to antibiotics ; 3. resistance genes found on plasmids; 4. example of resistance ; 5. resistant bacteria survive and reproduce ; 6. resistance gene , passed on to offspring / transferred between bacteria / transferred by conjugation ; <p><i>prevent spread</i></p> <ol style="list-style-type: none"> 7. isolation of patients (with resistant <i>M. tuberculosis</i>) ; 8. disinfecting hands / wearing disposable gloves ; 9. cleaning , equipment / bedding / clothing ; 10. regular cleaning of surfaces (on wards) ; <p>QWC</p>	<p>7 max</p> <p>1</p>	<p>ACCEPT gene variant / allele e.g. enzyme that metabolises the antibiotic</p> <p>AWARD QWC if candidate scores 2 marks from mps 1-6 and 2 marks from mps 7-10</p>	
	b	i	capsule ;	1	
		ii	murein / peptidoglycan / carbohydrate and amino acids ;	1	DO NOT CREDIT cellulose

Question		Answer	Marks	Guidance
	iii	<p><i>M. tuberculosis</i> not in nucleus</p> <p>OR circular</p> <p>OR found as plasmids</p> <p>OR no histones ;</p>	1	ACCEPT ora if clearly stated as lymphocytes
	c	<p>all antibiotics more effective than the control / AW ;</p> <p>teixobactin more effective than vancomycin / AW ;</p> <p>teixobactin more effective than oxacillin up to 8 hours / AW ;</p> <p>no (significant) difference between oxacillin and teixobactin after 8 hours ;</p>	3 max	<p>CREDIT ora for vancomycin</p> <p>CREDIT ora for Oxacillin</p>
		Total	14	

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